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**Mura 2 (Pty) Ltd**

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# **MURA 2 SOLAR PHOTOVOLTAIC FACILITY**

Final Environmental Scoping Report





Mura 2 (Pty) Ltd

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# MURA 2 SOLAR PHOTOVOLTAIC FACILITY

## Final Environmental Scoping Report

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# GENERAL SITE INFORMATION

## Technical details of the proposed Mura 2 Solar PV Facility

Location of Site	Between Loxton and Beaufort West in the Beaufort West Local Municipality and the Central Karoo District Municipality in the Western Cape Province	
Description of all affected farm portions and 21 digit SG Codes	Farm Name	21-Digit SG Code
	Leeuwkloof Farm 43	C00900000000004300000
	Portion 4 of Duiker Kranse Farm 45	C00900000000004500004
	Bultfontein Farm 13	C00900000000001300000
Central coordinates of the site and activity location	22°29'41.74"E 31°49'32.68"S	
Total Disturbance Footprint	506 ha	
Project Area Footprint	<u>484 ha to allow for the construction of a PV facility, on-site substations, switching stations, BESS, underground cables, internal gravel roads, fencing, construction site camps and other infrastructure within this footprint.</u>	
Design Specifications		
Solar Field	<ul style="list-style-type: none"><li>Solar Photovoltaic facility with capacity up to 400 MW</li></ul>	
Solar Farm Substations	<ul style="list-style-type: none"><li>Up to two on-site solar substations adjacent to Eskom switching stations that will connect to the approved Nuweveld Collector substation</li><li>Maximum height of 12m and will include a high voltage gantry within a 150 m x 75 m substation yard</li></ul>	
BESS and BESS substation	<ul style="list-style-type: none"><li>240 MWac BESS (Lithium-ion or similar solid-state technology)</li><li>BESS Substation: maximum height of 12m and will include a high voltage gantry within a 150 m x 75 m substation yard</li></ul>	
Building Infrastructure	<ul style="list-style-type: none"><li>Maximum height of 8m and includes:<ul style="list-style-type: none"><li>Offices;</li><li>Operational and maintenance (O&amp;M)/ control centre;</li><li>Warehouse/workshop;</li><li>Ablution facilities; and</li><li>Converter/inverter stations.</li></ul></li></ul>	
Other Infrastructure located within the solar area footprint	<ul style="list-style-type: none"><li>Internal underground cables of up to 132 kV;</li><li>Internal gravel roads;</li><li>Fencing (between 2 – 3 m high) around the PV Facility;</li><li>Panel maintenance and cleaning area;</li></ul>	



	<ul style="list-style-type: none"> <li>■ Storm water management system; and</li> <li>■ Site camps</li> </ul>
<b>Associated Infrastructure (outside the solar area footprint).</b>	<ul style="list-style-type: none"> <li>■ Internal access gravel roads with a footprint of 17 ha: <ul style="list-style-type: none"> <li>• Up to 4 m wide driving surface and may require side drains on one or both sides.</li> <li>• During construction the roads may be up to 12 m wide, but this will be a temporary impact and rehabilitated following the construction phase.</li> </ul> </li> <li>■ Site camps: <ul style="list-style-type: none"> <li>• Up to two 2.2 ha site camps within the access road corridor.</li> </ul> </li> </ul>

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TRAFFIC IMPACT ASSESSMENT

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VISUAL IMPACT ASSESSMENT

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SOCIAL ASSESSMENT

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GEOHYDROLOGICAL ASSESSMENT



# GLOSSARY

Abbreviation	Definition
AC	Alternating current
AEL	Atmospheric Emissions License
AIS	Alien and Invasive Species
ATNS	Air Traffic and Navigation Services
BA	Basic Assessment
BAR	Basic Assessment Report
BWLM	Beaufort West Local Municipality
BESS	Battery Energy Storage System
BMS	Battery Management System
CA	Competent authority
CARA	Conservation of Agricultural Resources Act (No. 43 of 1983)
CBA	Critical Biodiversity Area
CKDM	Central Karoo District Municipality
CCIA	Climate Change Impact Assessment
CSP	Concentrated Solar Power
DALRRD	Department of Agriculture Land Reform and Rural Development
DC	Direct current
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DFFE	Department of Forestry, Fisheries and Environment
DMRE	Department of Mineral Resources and Energy
DR	District roads
DWS	Department of Water & Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner

Abbreviation	Definition
ECA	Environmental Conservation Act 73 of 1989
EGI	Electrical Grid Infrastructure
EI&ES	Ecological Importance and Ecological Sensitivity
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
ERA	Electricity Regulation Act (No. 4 of 2006)
ESA	Early Stone Ages
FI	Financial institutions
GA	General Authorisation
GHG	Greenhouse gas
GIIP	Good international industry practice
GNR	Government Notice Regulation
ha	Hectares
HWC	Heritage Western Cape
IBA	Important Bird & Biodiversity Area
ICAO	International Civil Aviation Organisation
IEP	National Integrated Energy Plan
IFC	International Finance Corporation
IRP	Integrated Resource Plan
KNP	Karoo National Park
LSA	Late Stone Ages
LUPA	Land Use Planning Act (Act 3 of 2014)
MSA	Middle Stone Ages
MR	Main roads
Mura 2	Mura 2 (Pty) Ltd

Abbreviation	Definition
NCPGDP	Northern Cape Provincial Growth and Development Plan
NCSDF	Northern Cape Provincial Spatial Development Framework
NDP	National Development Plan
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMAQA	National Environmental Management: Air Quality Act 39 of 2004
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEMPAA	National Environmental Management Protected Areas Act (No. 57 of 2003)
NHRA	National Heritage Resource Act (Act No. 25 of 1999)
NID	Notification of Intent to Develop
NPAES	National Protected Area Expansion Strategy 2010
NR	National Routes
NWA	National Water Act, 1998 (Act No. 36 of 1998)
O&M	Operational and maintenance
OHS Act	Occupational Health and Safety Act (No. 85 of 1993)
PCS	Power Conditioning System
PICC	Presidential Infrastructure Coordinating Commission
PS	Performance Standards
PSDF	Provincial Spatial Development Framework, 2014
PV	Photovoltaic
REC	Recommended ecological condition
REDZ	Renewable Energy Development Zones
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RFI	Radio Frequency Interference
S&EIA	Scoping and EIA
SABS	South African Bureau of Standards
SACAA	South African Civil Aviation Authority
SAHRA	South African Heritage Resources Agency

Abbreviation	Definition
SAHRA	South African Heritage Resources Agency
SALA	Subdivision of Agricultural Land Act
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency
SANS	South African National Standards
SARPs	Standards and Recommended Practices
SAWS	South African Weather Service
SDF	Spatial Development Frameworks
SDG	Sustainable Development Goals
SEF	Solar Energy Facilities
SER	Stakeholder Engagement Report
SG	Surveyor General
SPLUMA	Spatial Planning and Land Use Management Act (Act 16 of 2013 )
TOPs	Threatened or Protected Species
TR	Trunk roads
UNDP	United Nations' Development Programmes
WBG	World Bank Group
WCIF	Western Cape Infrastructure Framework
WEF	Wind Energy Facilities
WSP	WSP Group Africa (Pty) Ltd
WUA	Water Use Authorisation
WUL	Water Use License

# 1 INTRODUCTION

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Changes made from the Draft Scoping Report (DSR) have been underlined in this Final Scoping Report (FSR) for ease of reference to the updates made in the reporting.

WSP Group Africa (Pty) Ltd (WSP) has been appointed by Mura 1 (Pty) Ltd, on behalf of Mura 2 (Pty) Ltd (Mura 2), to undertake an Environmental Impact Assessment (EIA) to meet the requirements under the National Environmental Management Act (Act 107 of 1998) (NEMA), for the proposed Mura 2 Solar Photovoltaic (PV) Facility between Loxton and Beaufort West in the Beaufort West Local Municipality (BWLM) and the Central Karoo District Municipality (CKDM) (**Figure 1-1** and **Figure 1-2**).

The proposed development will be subject to a Scoping and EIA (S&EIA) Process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) (as amended) and Appendix 2 of the EIA Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017. The competent authority for this S&EIA Process is the national Department of Forestry, Fisheries and Environment (DFFE).

## 1.1 PURPOSE OF THIS REPORT

The S&EIA process is an interdisciplinary procedure to ensure that environmental and social considerations are included in decisions regarding projects. Simply defined, the process aims to identify the possible environmental and social effects of a proposed activity and how those impacts can be mitigated.

The FSR (this report) aims to provide stakeholders with information on the proposed development including location, layout and technological alternatives, the scope of the environmental assessment and key impacts to be addressed in the environmental assessment, and the consultation process undertaken through the EIA process.

## 1.2 BACKGROUND INFORMATION

Red Cap Energy is proposing to develop four solar facilities, namely Mura 1, Mura 2, Mura 3, and Mura 4, and an associated grid connection, collectively known as the Mura PV Development between Loxton and Beaufort West. The proposed Mura PV Development is located in close proximity to the approved Nuweveld Wind Farm Development. The Mura PV Development falls partially within the Beaufort West Renewable Energy Development Zones (REDZ). The Mura 1 Solar PV Facility falls within the Beaufort West REDZ and as per GN 142 is therefore subject to an expedited Basic Assessment (BA) Process in terms of NEMA (as amended) and Appendix 1 of the EIA Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017. Mura 2, 3 and 4 fall partially or fully outside of the REDZ and therefore subject to a full S&EIA process in terms of NEMA (as amended) and Appendix 2 and 3 of the of the EIA Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017.

Each solar facility will connect to the Eskom grid via new 132 kV overhead lines (assessed in a separate process to the PV facilities) connecting up to two on-site solar substations via an adjacent Eskom switching stations to the approved Nuweveld Collector Substation.

For the grid connection, an Electrical Grid Infrastructure (EGI) Corridor is proposed and is assessed as a separate project. The grid line is arranged in what is called a "collector ring line". This implies that it is a circular grid line and not just a single line between the Nuweveld Collector Substation and the Mura facilities. The use of a circular "collector ring line" is an approach used by Eskom and others to improve the grid stability and to ensure that if the grid line is damaged on one side of the "collector ring line", that the solar facilities can still export their energy along the other side of the ring line while the fault is repaired. This allows these facilities to be better integrated into the national grid and to better reduce risks of downtime which enables these solar facility projects to be better adapted to potential amendments to future bidding requirements or to potentially give them a competitive advantage over other similar projects.

The Mura EGI Corridor falls within a REDZ and is therefore subject to an expedited BA Process in terms of GNR 145.



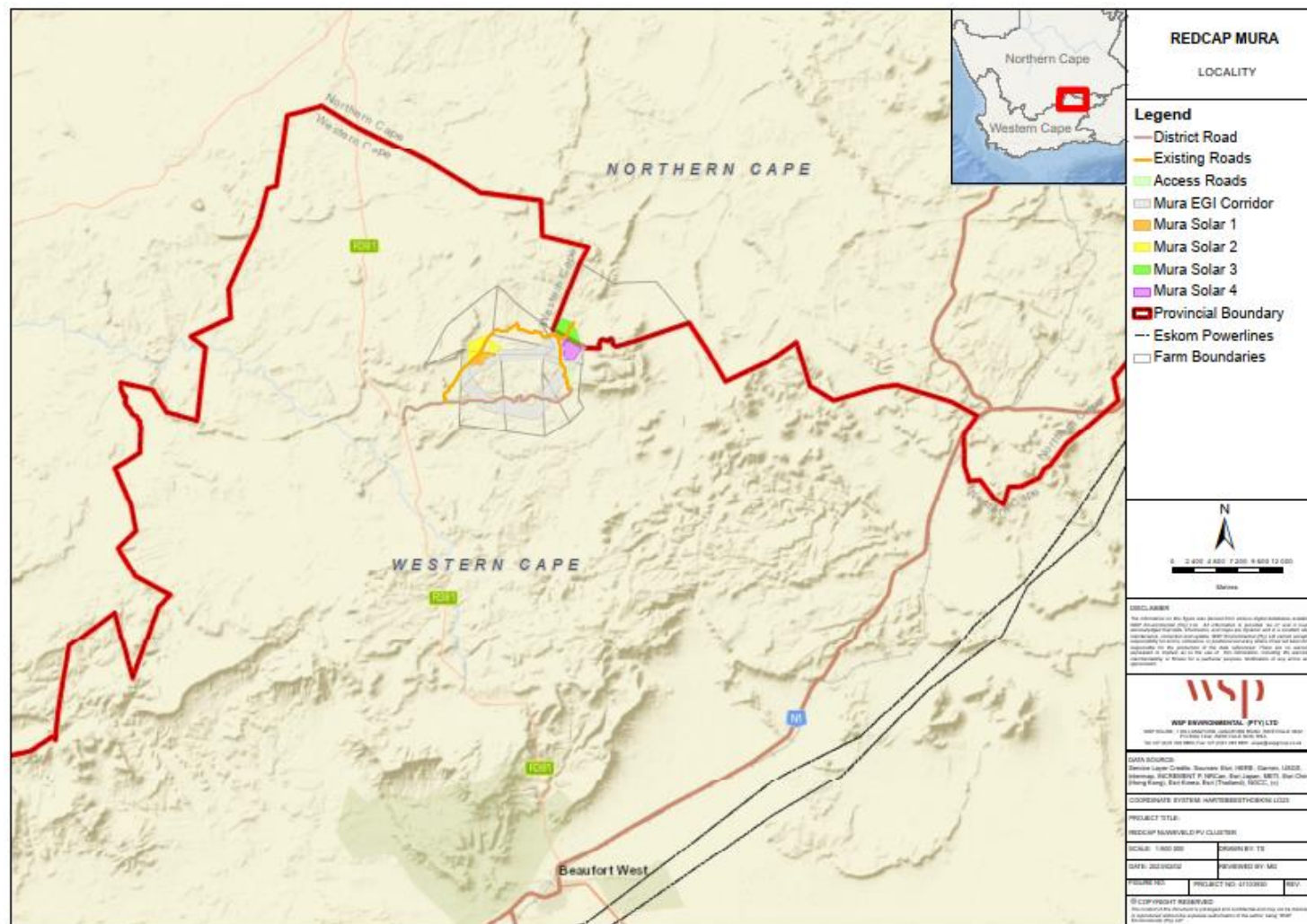
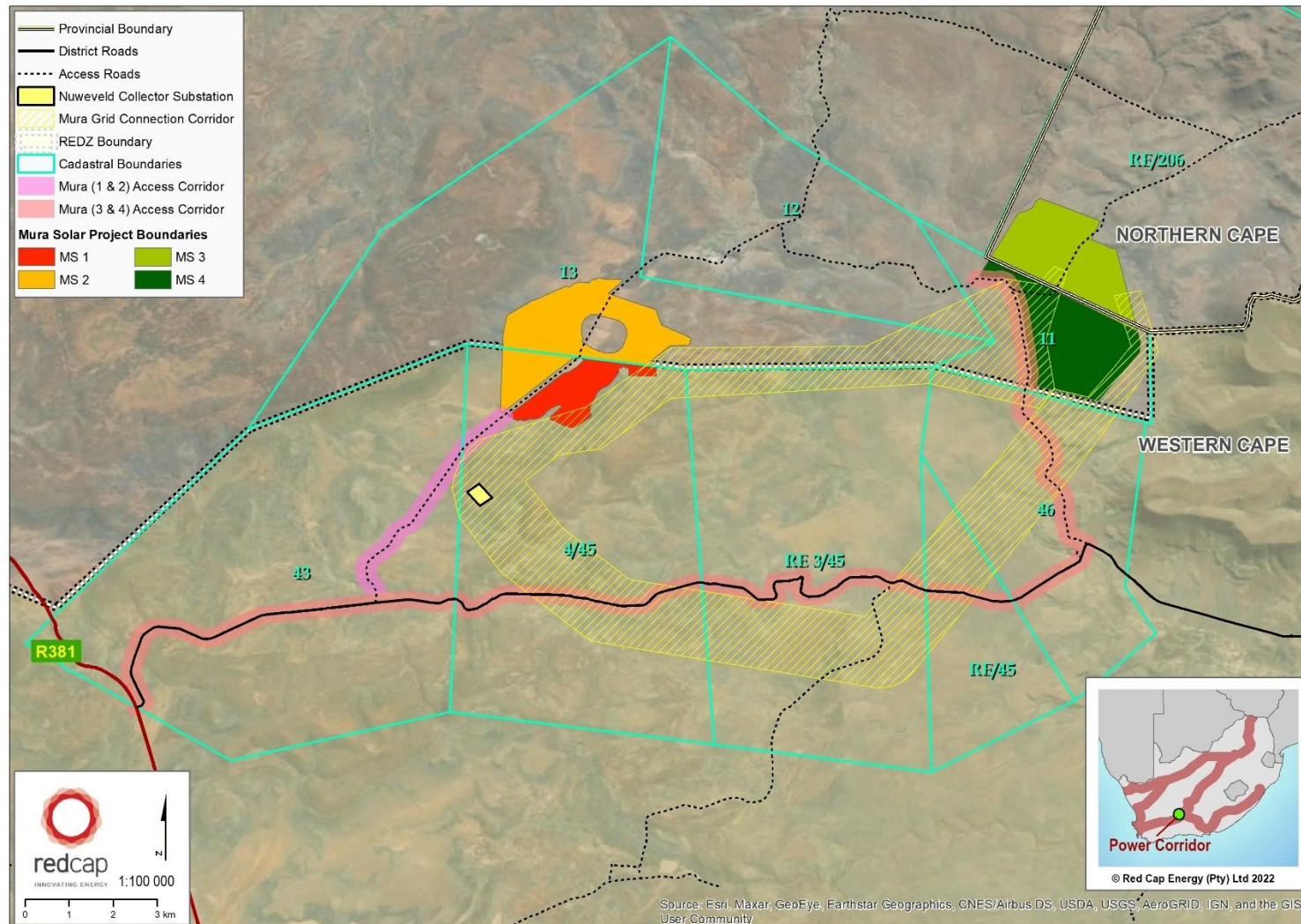


Figure 1-1 – Regional locality map of Mura Solar PV Development



**Figure 1-2 - Locality map of Mura Solar PV Development being assessed in the formal environmental impact assessment process**

## 1.3 DETAILS OF KEY ROLE PLAYERS

### 1.3.1 PROJECT PROPONENT

Mura 2 (Pty) Ltd is the project proponent (Applicant) with regards to this application for the construction and operation of the Mura 2 Solar PV Facility. **Table 1-1** provides the relevant details of the project proponent.

**Table 1-1 – Details of Project Proponent**

<b>Proponent:</b>	<b>Mura 2 (Pty) Ltd</b>
<b>Contact Person:</b>	Lance Blaine
<b>Postal Address</b>	Unit B2, Mainstream Centre, Main Road Hout Bay, Cape Town
<b>Telephone:</b>	021 790 1392
<b>Email:</b>	<a href="mailto:surina@red-cap.co.za">surina@red-cap.co.za</a>

### 1.3.2 COMPETENT AUTHORITY

Section 24C(2)(a) of NEMA stipulates that the Minister of Forestry, Fisheries and the Environment (“the Minister”) must be identified as the competent authority if the activity has implications for international environmental commitments or relations. GN 779 of 01 July 2016 identifies the Minister as the CA for the consideration and processing of environmental authorisations and amendments thereto for activities related to the Integrated Resource Plan (IRP) 2010 – 2030.

As the proposed Mura 2 Solar PV Development is related to the IRP, DFFE is the CA for the proposed project, in terms of S24C of NEMA. **Table 1-2** provides the relevant details of the competent authority on the Project.

**Table 1-2 – Competent Authority**

<b>Aspect</b>	<b>Competent Authority</b>	<b>Contact Details</b>
Competent Authority: Environmental Authorisation	Department of Forestry, Fisheries, and the Environment (DFFE)	Case Officer: Jay-Jay Mpelane Integrated Environmental Authorisations Email: <a href="mailto:JMPELANE@dffe.gov.za">JMPELANE@dffe.gov.za</a> Tel: 012 399 9404

### 1.3.3 COMMENTING AUTHORITY

The commenting authorities for the project include:

- Department of Water and Sanitation (DWS);
- Department of Mineral Resources and Energy (DMRE);
- Department of Agriculture, Land Reform and Rural Development (DALRRD);
- Department of Public Works;
- Department of Defence;



- National Department of Transport;
- South African National Roads Agency Limited (SANRAL);
- South African Heritage Resources Agency (SAHRA);
- South African Civil Aviation Authority (CAA);
- Square Kilometre Array (SKA);
- South African Weather Service (SAWS);
- Beaufort West Local Municipality;
- Central Karoo District Municipality;
- WC DEADP;
- Heritage Western Cape (HWC);
- BirdLife South Africa;
- CapeNature;
- Endangered Wildlife Trust; and
- South African National Parks.

Refer to the Stakeholder Engagement Report (SER) in **Appendix D** for a full list of commenting authorities.

#### 1.3.4 ENVIRONMENTAL ASSESSMENT PRACTITIONER

WSP was appointed in the role of Independent EAP to undertake the S&EIA process for the proposed project. The CV of the EAP is available in **Appendix A**. The EAP declaration of interest and undertaking is included in **Appendix B**. **Table 1-3** details the relevant contact details of the EAP.

**Table 1-3 – Details of the EAP**

<b>EAP:</b>	<b>WSP Group Africa (Pty) Ltd</b>
<b>Contact Person:</b>	Ashlea Strong
<b>Physical Address:</b>	Building C, Knightsbridge, 33 Sloane Street, Bryanston, Johannesburg
<b>Postal Address:</b>	P.O. Box 98867, Sloane Park 2151, Johannesburg
<b>Telephone:</b>	011 361 1392
<b>Fax:</b>	011 361 1301
<b>Email:</b>	<a href="mailto:Ashlea.Strong@wsp.com">Ashlea.Strong@wsp.com</a>
<b>EAP Qualifications:</b>	<ul style="list-style-type: none"> <li>■ Masters in Environmental Management, University of the Free State</li> <li>■ B Tech, Nature Conservation, Technikon SA</li> <li>■ National Diploma in Nature Conservation, Technikon SA</li> </ul>
<b>EAPASA Registration Number:</b>	EAPASA (2019/1005)

#### Statement of Independence

Neither WSP nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any business, financial, personal or other interest

that could be reasonably regarded as being capable of affecting their independence. WSP has no beneficial interest in the outcome of the assessment.

### 1.3.5 SPECIALISTS

Specialist input was required in support of this application for EA. The details of the specialists are provided in **Table 1-4** below. The specialist studies are attached in **Appendix G** and their declarations in **Appendix C**.

**Table 1-4 – Details of Specialists**

Assessment	Name of Specialist	Company	Sections in Report	Specialist Report attached as
Climate Change	Shantal Beharie	Promethium Carbon	<ul style="list-style-type: none"> <li>Section 6.1.1</li> <li>Section 8</li> <li>Section 9.1</li> </ul>	<b>Appendix G.1</b>
Agricultural Compliance Statement	Johann Lanz	Independent	<ul style="list-style-type: none"> <li>Section 2.7</li> <li>Section 6.1.2</li> <li>Section 7.1.1</li> <li>Section 8</li> <li>Section 9.1</li> </ul>	<b>Appendix G.2</b>
Terrestrial Biodiversity Compliance Statement	Simon Todd	3Foxes Biodiversity Solutions	<ul style="list-style-type: none"> <li>Section 2.7</li> <li>Section 6.2.1</li> <li>Section 7.1.2</li> <li>Section 9.3</li> </ul>	<b>Appendix G.3</b>
Aquatic Biodiversity Impact Assessment	Antonia (Toni) Belcher	BlueScience (Pty) Ltd	<ul style="list-style-type: none"> <li>Section 6.1.4</li> <li>Section 6.2.2</li> <li>Section 7.1.3</li> <li>Section 8</li> <li>Section 9.4</li> </ul>	<b>Appendix G.4</b>
Plant Species Compliance Statement	Simon Todd	3Foxes Biodiversity Solutions	<ul style="list-style-type: none"> <li>Section 2.7</li> <li>Section 6.2.3</li> <li>Section 7.1.4</li> <li>Section 9.3</li> </ul>	<b>Appendix G.5</b>
Animal Species Compliance Statement	Simon Todd	3Foxes Biodiversity Solutions	<ul style="list-style-type: none"> <li>Section 2.7</li> <li>Section 6.2.4</li> <li>Section 7.1.5</li> <li>Section 9.6</li> </ul>	<b>Appendix G.6</b>
Avifauna Impact Assessment	Jon Smallie	WildSkies Ecological Services (Pty) Ltd	<ul style="list-style-type: none"> <li>Section 2.7</li> <li>Section 6.2.5</li> <li>Section 7.1.4</li> <li>Section 8</li> <li>Section 9.3</li> </ul>	<b>Appendix G.7</b>

Assessment	Name of Specialist	Company	Sections in Report	Specialist Report attached as
Archaeological and Cultural Heritage Impact Assessment	Jayson Orton	Asha Consulting	<ul style="list-style-type: none"> <li>Section 6.3.1</li> <li>Section 7.1.7</li> <li>Section 8</li> <li>Section 9.8</li> </ul>	<b>Appendix G.8</b>
Palaeontology Impact Assessment	John E. Almond	Natura Viva cc	<ul style="list-style-type: none"> <li>Section 2.7</li> <li>Section 6.1.3</li> <li>Section 6.3.2</li> <li>Section 7.1.8</li> <li>Section 8</li> </ul>	<b>Appendix G.9</b>
Traffic Assessment	Athol Schwarz	Independent	<ul style="list-style-type: none"> <li>Section 2.7</li> <li>Section 6.3.3</li> <li>Section 8</li> <li>Section 9.8</li> </ul>	<b>Appendix G.10</b>
Visual Impact Assessment	Quinton Lawson Bernard Oberholzer	Independent	<ul style="list-style-type: none"> <li>Section 2.7</li> <li>Section 6.1.1</li> <li>Section 7.1.9</li> <li>Section 8</li> <li>Section 9.10</li> </ul>	<b>Appendix G.11</b>
Social Impact Assessment	James Kinghorn	Independent Economic Researchers	<ul style="list-style-type: none"> <li>Section 6.3.5</li> <li>Section 7.1.10</li> <li>Section 8</li> <li>Section 9.11</li> </ul>	<b>Appendix G.12</b>
Geohydrological Assessment	Shane Teek	GEOSS South Africa (Pty) Ltd	<ul style="list-style-type: none"> <li>Section 6.1.5</li> </ul>	<b>Appendix G.13</b>

## 1.4 SCOPING TERMS OF REFERENCE

The 2014 EIA Regulations (Government Notice Regulation (GNR) 982), as amended, identifies the proposed solar PV facility development as an activity being subject to an S&EIR process due to the applicability of the EIA Listing Notice 2 (GNR 984, as amended).

As defined in Appendix 2 of GNR 982, as amended, the objective of the scoping process is to, through a consultative process:

- Identify the relevant policies and legislation relevant to the activity;
- Motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- Identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
- Identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of



all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;

- Identify the key issues to be addressed in the assessment phase;
- Agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration, and probability of the impacts to inform the location of the development footprint within the preferred site; and
- Identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

Public participation is a requirement of scoping; it consists of a series of inclusive interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the S&EIA decision-making process. Effective public participation requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the Proposed Project. The objectives of the public participation process can be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the Proposed Project;
- Clearly outline the scope of the proposed Project, including the scale and nature of the existing and proposed activities;
- Identify viable proposed Project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the subsequent specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the Proposed Project, issues and solutions.

## 1.5 **FINAL SCOPING REPORT STRUCTURE**

As per the EIA Regulations 2014, as amended, Appendix 2 of GNR 982 identifies the legislated requirements that must be contained within a SR for the Competent Authority (CA) to consider and come to a decision on the application. **Table 1-5** below details where the required information is located within this report.

**Table 1-5 - Legislated Report Requirements as detailed in GNR 982**

Appendix 2 of GNR 982	Description	Relevant Report Section
(a)	Details of	
	the EAP who compiled the report; and	Section 1.3.4 and Appendix A
	the expertise of the EAP, including a Curriculum Vitae	Appendix A

Appendix 2 of GNR 982	Description	Relevant Report Section
(b)	The location of the activity, including-	
	The 21-digit Surveyor code for each cadastral land parcel;	Section 3.1
	Where available, the physical address and farm name	Section 3.1
	Where the required information in terms of (i) and (ii) is not available, the coordinates of the boundary of the property.	N/A
(c)	A plan which locates the proposed activities applied for at an appropriate scale, or, if it is-	
	A linear activity, a description of the corridor in which the proposed activity or activities is to be undertaken; or	N/A
	On land where the property has not been defined, the coordinates within which the activity is to be undertaken.	N/A
(d)	A description of the proposed activity, including	
	All listed and specified activities triggered;	Section 5.1
	A description of the activities to be undertaken, including associated structures and infrastructure;	Section 3
(e)	A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process;	Section 5
(f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section 3.6
(h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including-	
	Details of all the alternatives considered;	Section 4
	Details of the public participation undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 2.6 <b>Appendix D</b>
	a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	<b>Appendix D</b>
	the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 6 Section 10

Appendix 2 of GNR 982	Description	Relevant Report Section
	the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	Section 8
	the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Section 2.5
	positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 8
	the possible mitigation measures that could be applied and level of residual risk;	Section 8
	the outcome of the site selection matrix;	Section 4
	if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and	N/A
	a concluding statement indicating the preferred alternatives, including preferred location of the activity;	Section 4
(i)	A plan of study for undertaking the environmental impact assessment process to be undertaken, including-	
	a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity;	Section 4
	a description of the aspects to be assessed as part of the environmental impact assessment process;	Section 10.4
	aspects to be assessed by specialists;	Section 10.5
	a description of the proposed method of assessing the environmental aspects, including a description of the proposed method of assessing the environmental aspects including aspects to be assessed by specialists;	Section 10.6
	a description of the proposed method of assessing duration and significance;	Section 10.6
	an indication of the stages at which the competent authority will be consulted;	Section 10.8

Appendix 2 of GNR 982	Description	Relevant Report Section
	particulars of the public participation process that be conducted during the environmental impact assessment process; and	Section 2.6
	a description of the tasks that will be undertaken as part of the environmental impact assessment process;	Section 10
	identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.	Section 8.1 Section 10.7
(j)	An undertaking under oath or affirmation by the EAP in relation to-	Appendix B
	the correctness of the information provided in the report;	
	the inclusion of comments and inputs from stakeholders and interested and affected parties; and	
	any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	
(k)	An undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment;	Appendix B
(l)	Where applicable, any specific information required by the competent authority; and	N/A
(m)	Any other matter required in terms of section 24(4)(a) and (b) of the Act.	N/A

## 2 S&EIA PROCESS

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### 2.1 OBJECTIVES OF THE S&EIA PROCESS AS PER THE PROCEDURAL FRAMEWORK

The S&EIR process consists of various phases with associated timelines as defined in GNR 982. The process can generally be divided into four main phases, namely, (i) a Pre-application Phase, (ii) an Application and Scoping Phase (current phase), (iii) an Impact Assessment Phase and (iv) Authorisation and Appeal Phase.

The main objectives of the phases can be described as follows:

- Pre-Application Phase:
  - Undertake consultation meetings with the relevant authorities to confirm the required process, the general approach to be undertaken and to agree on the public participation plan;
  - Identify stakeholders, including neighbouring landowners/residents and relevant authorities;
- Application and Scoping Phase:
  - Compile and submit application forms to the CA and pay the relevant application fees;
  - Compile a DSR describing the affected environment and present an analysis of the potential environmental issues and benefits arising from the proposed project that may require further investigation in the Impact Assessment Phase;
  - Develop draft terms of reference for the specialist studies to be undertaken in the Impact Assessment Phase; and
  - Inform stakeholders of the proposed project, feasible alternatives and the S&EIR process and afford them the opportunity to register and participate in the process and identify any issues and concerns associated with the proposed project.
  - Incorporate comments received from stakeholders during the DSR comment period;
  - Should significant amendments be required, release the updated DSR for a 30-day comment period to provide stakeholders with the opportunity to review the amendments as well as provide additional input if required; and
  - Submit the FSR, following the consultation period, to the relevant authorities, in this case the DFFE, for acceptance/rejection.
- Impact Assessment Phase:
  - Continue to inform and obtain contributions from stakeholders, including relevant authorities, stakeholders, and the public and address their relevant issues and concerns;
  - Assess in detail the potential environmental and socio-economic impacts of the project as defined in the DSR;
  - Identify environmental and social mitigation measures to avoid and/or address the identified impacts;
  - Develop and/or amend environmental and social management plans based on the mitigation measures developed in the Environmental Impact Assessment Report (EIAR);
  - Submit the EIAR and the associated EMPr to the CA to undertake the decision making process;
  - Authorisation and Appeal Phase;

- The DFEE to provide written notification of the decision to either grant or refuse EA for the proposed project; and
- Notify all registered stakeholders of the decision and right to appeal.

## 2.2 DFFE WEB-BASED ENVIRONMENTAL SCREENING TOOL

DFFE has developed the National Web-based Environmental Screening Tool in order to flag areas of potential environmental sensitivity related to a site as well as a development footprint and produces the screening report required in terms of regulation 16 (1)(v) of the EIA Regulations (2014, as amended). *The Notice of the requirement to submit a report generated by the national web-based environmental screening tool in terms of section 24(5)(h) of the NEMA, 1998 (Act No 107 of 1998) and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended (GN 960 of July 2019)* states that the submission of a report generated from the national web-based environmental screening tool, as contemplated in Regulation 16(1)(b)(v) of the EIA Regulations, 2014, published under Government Notice No. R982 in Government Gazette No. 38282 of 4 December 2014, as amended, is compulsory when submitting an application for environmental authorisation in terms of regulation 19 and regulation 21 of the EIA Regulations, 2014 (as amended) as of 04 October 2019.

The Screening Report generated by the National Web-based Environmental Screening Tool contains a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development footprint as well as the most environmentally sensitive features on the footprint based on the footprint sensitivity screening results for the application classification that was selected.

A screening report for the proposed Mura 2 Solar PV Facility was generated on 22 September 2022 and is attached as **Appendix F**. The Screening Report for the project identified various sensitivities for the site. The report also generated a list of specialist assessments that should form part of the S&EIA based on the development type and the environmental sensitivity of the site. Assessment Protocols in the report provide minimum information to be included in a specialist report to facilitate decision-making.

**Table 2-1** below provides a summary of the sensitivities identified for the development footprint.

**Table 2-1 – Sensitivities identified in the DFFE Screening Report**

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Agriculture Theme		X		
Animal Species Theme		X		
Aquatic Biodiversity Theme				X
Archaeological and Cultural Heritage Theme				X
Avian Theme				X
Civil Aviation (Solar PV) Theme				X
Defence Theme				X

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Landscape (Solar) Theme	X			
Palaeontology Theme	X			
Plant Species Theme			X	
Radio Frequency Interference (RFI) Theme		X		
Terrestrial Biodiversity Theme	X			

Based on the selected classification, and the environmental sensitivities of the proposed development footprint, the following list of specialist assessments have been identified for inclusion in the assessment report as determined by the screening tool:

- Agricultural Impact Assessment;
- Landscape/Visual Impact Assessment;
- Archaeological and Cultural Heritage Impact Assessment ;
- Palaeontology Impact Assessment;
- Terrestrial Biodiversity Impact Assessment;
- Aquatic Biodiversity Impact Assessment;
- Civil Aviation Assessment;
- Defence Assessment;
- RFI Assessment;
- Geotechnical Assessment;
- Socio-Economic Assessment;
- Plant Species Assessment; and
- Animal Species Assessment.

## 2.2.1 MOTIVATION FOR SPECIALIST STUDIES

The report recognises that “it is the responsibility of the EAP to confirm this list and to motivate in the assessment report, the reason for not including any of the identified specialist study including the provision of photographic evidence of the footprint situation.” The specialist studies required for the proposed Mura 2 Solar PV Facility, as identified by the DFFE Screening Tool are included in **Table 2-2**. The table also identifies the specialist studies commissioned and provides motivation for specialist studies not commissioned.

**Table 2-2 - Specialist Studies identified by the DFFE Screening Tool**

Specialist Study Identified	Specialist Study Commissioned	Motivation
Agricultural Impact Assessment	Yes	N/A
Landscape/Visual Impact Assessment	Yes	N/A

Specialist Study Identified	Specialist Study Commissioned	Motivation
Archaeological and Cultural Heritage Impact Assessment	Yes	N/A
Palaeontology Impact Assessment	Yes	N/A
Terrestrial Biodiversity Impact Assessment	Yes	N/A
Aquatic Biodiversity Impact Assessment	Yes	N/A
Civil Aviation Assessment	No	<ul style="list-style-type: none"> <li>A formal Civil Aviation Assessment will not be undertaken as part of the S&amp;EIA Process. Nevertheless, the relevant Authorities have been included on the project stakeholder database. As of the 1st of May 2021, ATNS has been appointed as the new Obstacle application Service Provider for Windfarms and later Solar Plants. Their responsibility would pertain to the assessments, maintenance, and all other related matters in respect to Windfarms and in due time Power Plant assessments. Where required, an Application for the Approval of Obstacles will also be submitted to ATNS and the required permits will be obtained prior to the development of the project. The SACAA has been included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought. An Application for the Approval of Obstacles will also be submitted to SACAA by the Applicant.</li> <li>As this theme has been identified as a low sensitivity, no compliance statement is required</li> </ul>
Defense Assessment	No	<ul style="list-style-type: none"> <li>The Department of Defence has been included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought.</li> <li>As this theme has been identified as a low sensitivity, no compliance statement is required</li> </ul>
RFI Assessment	No	<ul style="list-style-type: none"> <li>An RFI Study will not be undertaken. The SAWS and relevant telecommunications stakeholders will be engaged with as part of the Public Participation Process</li> <li>As this theme has been identified as high, a compliance statement will be prepared by the EAP and included in the EIA Report</li> </ul>



Specialist Study Identified	Specialist Study Commissioned	Motivation
Geotechnical Assessment	No	<ul style="list-style-type: none"> <li>A detailed Geotechnical Assessment will not be undertaken as this will be undertaken during the design phase</li> </ul>
Socio-Economic Assessment	Yes	N/A
Plant Species Assessment	Yes	N/A
Animal Species Assessment	Yes	N/A

The following specialist studies have been commissioned in addition to those above:

- Avifauna Assessment;
- Traffic Assessment; and
- Climate Change Assessment.

The above specialist studies commissioned were presented to DFFE during the pre-application meeting that was held with on 22 September 2022. The specialist studies commissioned were accepted by the DFFE as per the meeting minutes included in the SER in **Appendix D**.

Specialist assessments were conducted in accordance with the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes, which were promulgated in Government Notice No. 320 of 20 March 2020 and in Government Notice No. 1150 of 30 October 2020 (i.e. “the Protocols”). The assessment protocols followed as well as the site sensitivity verification undertaken by the specialists are indicated in **Section 7**.

## 2.3 APPLICATION FOR ENVIRONMENTAL AUTHORISATION

The application phase consisted of a pre-application consultation with DFFE and subsequently completing the appropriate application form as well as the submission and registration of the application for EA with the DFFE. The pre-application meeting was held with DFFE on 22 September 2022 (meeting minutes included in the SER in **Appendix D**). The application form was submitted to the DFFE with the DSR on 03 March 2023. An updated application form will be submitted with the FSR. The DFFE Reference Number is 14/12/16/3/3/2/2323.

## 2.4 BASELINE ENVIRONMENTAL ASSESSMENT

The description of the environmental attributes of the Project area was compiled through a combination of desktop reviews and site investigations. Desktop reviews made use of available information including existing reports, aerial imagery, and mapping. The specialist teams undertook site investigations, between March and October 2022, to identify sensitive features on site that informed the sensitivity mapping (**Section 7.2**) for the Mura 2 Solar PV Facility.

## 2.5 IMPACT SCREENING METHODOLOGY

The potential impacts associated with the proposed development were determined at both a desktop level based on existing information, as well as field assessments. The following methodology was used:

- Identify potential sensitive environments and receptors that may be impacted on by the proposed development;
- Identify potential social receptors that may be impacted on by the proposed development;
- Identify the type of impacts that are most likely to occur (including cumulative impacts);
- Determine the nature and extent of the potential impacts during the various developmental phases, including, construction, operation and decommissioning;
- Identify potential No-Go areas; and
- Summarise the potential impacts that will be considered further in the Scoping & EIA phase through detailed specialist studies.

Appendix 2 of GNR 982, as amended, requires the identification of the significance of potential impacts during scoping. To this end, an impact screening tool has been used in the scoping phase. The screening tool is based on two criteria, namely probability; and consequence (**Table 2-3**), where the latter is based on general consideration to the intensity, extent, and duration.

The scales and descriptors used for scoring probability and consequence are detailed in **Table 2-4** and **Table 2-5** respectively.

**Table 2-3 – Significance Screening Tool**

	Consequence Scale				
Probability Scale		1	2	3	4
	1	Very Low	Very Low	Low	Medium
	2	Very Low	Low	Medium	Medium
	3	Low	Medium	Medium	High
	4	Medium	Medium	High	High

**Table 2-4 – Probability scores and descriptors**

Score	Descriptor
4	Definite: The impact will occur regardless of any prevention measures
3	Highly Probable: It is most likely that the impact will occur
2	Probable: There is a good possibility that the impact will occur
1	Improbable: The possibility of the impact occurring is very low

**Table 2-5 - Consequence Score Descriptions**

Score	Negative	Positive
4	Very severe: An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated.	Very beneficial: A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.
3	Severe: A long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial: A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
2	Moderately severe: A medium to long term impacts on the affected system(s) or party (ies) that could be mitigated.	Moderately beneficial: A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way.
1	Negligible: A short to medium term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	Negligible: A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.

The nature of the impact must be characterised as to whether the impact is deemed to be positive (+ve) (i.e. beneficial) or negative (-ve) (i.e. harmful) to the receiving environment/receptor. For ease of reference, a colour reference system (**Table 2-6**) has been applied according to the nature and significance of the identified impacts.

**Table 2-6 - Impact Significance Colour Reference System to Indicate the Nature of the Impact**

Negative Impacts (-ve)	Positive Impacts (+ve)
Negligible	Negligible
Very Low	Very Low
Low	Low
Medium	Medium
High	High

## 2.6 STAKEHOLDER ENGAGEMENT PROCESS

Stakeholder engagement (public participation) is a requirement of the S&EIA process. It consists of a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the S&EIA decision-making process. Effective engagement requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the proposed project. The objectives of the stakeholder engagement process can be summarised as follows:

- Identify relevant individuals, organisations and communities who may be interested in or affected by the proposed project;
- Clearly outline the scope of the proposed project, including the scale and nature of the existing and proposed activities;
- Identify viable proposed project alternatives that will assist the relevant authorities in making an informed decision;
- Identify shortcomings and gaps in existing information;
- Identify key concerns, raised by Stakeholders that should be addressed in the specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the proposed project, issues, and solutions.

A SER has been included in **Appendix D** detailing the project's compliance with Chapter 6 of the NEMA EIA Regulations 2014, as amended.

### 2.6.1 STAKEHOLDER IDENTIFICATION

Stakeholders were identified and will continue to be identified through several mechanisms. These include:

- Utilising existing databases from other projects in the area (specifically obtaining information from the stakeholder database for the adjacent Nuweveld Wind Farm Development stakeholder database);
- Advertising in the press;
- Placement of community notices;
- Completed comment sheets; and

- Attendance registers at meetings.

All Stakeholders identified to date have been registered on the project stakeholder database. The EAP endeavoured to ensure that individuals/organisations from referrals and networking were notified of the Proposed Project. Stakeholders were identified at the horizontal (geographical) and vertical extent (organisations level).

A list of stakeholders captured in the project database is included in the SER in **Appendix D**.

## 2.7 ASSUMPTIONS AND LIMITATIONS

### General assumptions and limitations:

- The EAP hereby confirms that they have undertaken to obtain project information from the client that is deemed to be accurate and representative of the project;
- Site visits have been undertaken to better understand the project and ensure that the information provided by the client is correct, based on site conditions observed;
- The EAP hereby confirms their independence and understands the responsibility they hold in ensuring all comments received are accurately replicated and responded to within the EIA documentation;
- The comments received in response to the public participation process, will be representative of comments from the broader community; and
- Based on the Pre-Application meeting and subsequent minutes, the CA would not require additional specialist input, in order to make a decision regarding the application.

### Climate Change Impact Assessment:

- The Mura Solar PV Project is still in the planning phase. Thus, there are some uncertainties regarding final design and implementation of the project. Therefore, the use of a 150 MW plant to do the assessment was done to create an idea of the impact and emissions. Such assessment can be adjusted according to the actual design and capacity of the plant later on. However, it is the opinion of the specialist that sufficient data was provided to cover all significant GHG emission sources.
- The average number of PV panels estimated to be used for the operations of the project were a total of 656 268. However, this equated to a capacity of the facility to be approximately 390MW. As a result of most of the activity data being recorded in terms of a 150MW facility, the number of PV panels were adjusted accordingly. This equated to about 250 000 panels being required for the operation of a 150MW facility and therefore used in the assessment. Noting that should the number of panels reduce, the contribution towards climate change (both the emissions, and the avoided emissions) would also subsequently reduce.
- The Climate Change Impact Assessment (CCIA) makes use of data obtained during a desktop review for the development of this GHG inventory and associated impact assessment. Certain assumptions were made to ensure the development of the most accurate and extensive GHG inventory and the associated impact assessment. These assumptions were made considering the framework required by the EA reporting requirements. It was assumed, based on the specialist's experience, that the following aspects of the Mura Solar PV will not contribute materially towards the GHG footprint of the project during the operational phase:
  - Mobile combustion of diesel and/or petrol fuels in onsite trucks or machinery;
  - Stationary combustion from backup generators;

- Quantity of construction and municipal waste generated;
- Purchase of capital goods, such as vehicles; and
- Business travel.

#### **Terrestrial Biodiversity Compliance Statement:**

- It is not possible to confirm the absence of a faunal species with 100% certainty. A species may be absent from an area during sampling but may move through the area occasionally or seasonally.
- Some species are rare or difficult to locate and it may be very difficult to confirm either the absence or presence of such species without long-term studies.
- The presence of such species is assessed in the current study based on observations of such species from the wider area in the various publicly available databases and citizen science websites (Virtual Museum & iNaturalist), as well as the habitat suitability, quality and condition as observed in the field.
- In terms of vegetation, conditions at the time of the initial survey were in a relatively favourable condition for the field assessment as there had been rain prior to sampling and the abundance of annuals and geophytes as relatively high, with many species growing or in flower. Although not all of the PV area could be searched given its' large extent, the footprint area is considered to have been well-covered and it is highly unlikely that there are any significant vegetation features present that would not have been observed during the study.

#### **Aquatic Impact Assessment:**

- Limitations and uncertainties often exist within the various techniques adopted to assess the condition of ecosystems. The methodologies and techniques used in this assessment have been developed nationally and are typically of a rapid nature, as is required for this freshwater impact assessment.
- Given the topography at the site, it was not possible to cover the site in a high level of detail, however, extrapolation of the areas ground-truthed to those not covered was thus done using the latest available aerial imagery for the site. No baseline long-term monitoring was undertaken as part of this assessment. In addition, there is very little existing information available for the aquatic features within the study area. Data was utilised for adjacent aquatic ecosystems, and where available, more detailed assessments were used for the aquatic features within the area.
- The nature of the proposed activities, however, also allows them to be placed some distance from any mapped aquatic features such that the significance of likely impacts would be very low. It is usually the associated infrastructure that has the potential to have a greater impact on the aquatic features. The impacts of access roads (assessed in this report) and overhead powerlines (assessed in a separate specialist report) on the aquatic features are, however, well understood and can be effectively mitigated to ensure the impacts remain low. The preferred mitigation measure is to limit the disturbance to aquatic features as far as possible by avoiding and minimising the number of crossings and providing adequate buffer areas. This will also ensure that the cumulative impacts will remain low.
- The level of aquatic assessment undertaken was considered to be adequate for this study. The assessment was undertaken in March 2022 however there had been recent rainfall in the area and sufficient water was present in the rivers at the time of the site visit to allow for the required level of assessment for this study. No further fieldwork will thus be required if the proposed project activities remain outside of the delineated aquatic features and the recommended buffers.

### **Plant Species Compliance Statement:**

- Conditions at the time of the initial survey were in a relatively favourable condition for the field assessment as there had been rain prior to sampling and the abundance of annuals and geophytes as relatively high, with many species growing or in flower.
- Although not all of the PV area could be searched given its' large extent, the footprint area is considered to have been well-covered and it is highly unlikely that there are any significant vegetation features present that would not have been observed during the study.
- Given the extent of the sample track and the relatively favourable conditions at the time of the site visit, there are few limitations and assumptions required with regards to the vegetation of the site and the presence of plant SCC within the PV development footprint.

### **Animal Species Compliance Statement:**

- It is not possible to confirm the absence of a species with 100% certainty. A species may be absent from an area during sampling but may move through the area occasionally or seasonally. This effect is however to a large degree mitigated through the use of the camera traps at the site which provide an effective characterisation of the medium sized and larger fauna of the site.
- Some species are rare or difficult to locate and it may be very difficult to confirm either the absence or presence of such species without long-term studies.
- The presence of such species is assessed in the current study based on observations of such species from the wider area in the various publicly available databases and citizen science websites (Virtual Museum & iNaturalist), as well as the habitat suitability, quality and condition as observed in the field.

### **Avifauna Impact Assessment:**

- Certain biases and challenges are inherent in the methods that have been employed to collect data in this programme. It is not possible to discuss all of them here, and some will only become evident with time and operational phase data, but the following are some of the key points:
  - The presence of the ornithologist on site is certain to have an effect on the birds itself. For example during walked transects, certain bird species will flush more easily than others (and therefore be detected), certain species may sit undetected, certain species may flee, and yet others may be inquisitive and approach the observers.

### **Heritage Impact Assessment:**

- The field study was carried out at the surface only and hence any completely buried archaeological sites would not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface.
- Cumulative impacts are difficult to assess due to the variable site conditions that would have been experienced in different areas and in different seasons. Survey quality is thus likely to be variable. As such, some assumptions need to be made in terms of what and how much heritage might be impacted by other developments in the broader area.

### **Traffic Impact Assessment:**

The compiling of this combined report for the proposed developments are based on the following assumptions:

- Project



- The report is a combined report that includes all four of the proposed developments.
  - The relevant Grid Connection will be included in the relevant proposed developments.
  - Each of the proposed developments shall include two Substations, BESS, Office, Ablution, and Operational and Maintenance facilities.
  - All proposed developments are to be constructed, simultaneously over a period of 24 months.
  - The final layout of each proposed development is pending specialist's recommendations, where applicable.
- Cumulative Effects
- As part of the Mura Solar Development, four Mura SEFs are proposed. In addition to the proposed developments, there are several other developments earmarked for construction in the area. Some developments will be implemented sooner than others, thus for the proposed development the following cumulative effects have been assumed to include:
    - The three Nuweveld WEFs; assumed to be in the operational phase.
    - The two Hoogland WEF Clusters (North and South); each cluster consisting of two WEFs and associated infrastructure, are assumed to be in the construction phase.
    - The Gamma Grid Connection is assumed to be its construction phase.
  - The construction schedule of the projects listed above together with the proposed developments is unknown, at this point in time. Thus, a conservative (unrealistic) assessment has been adopted in the report, which assumes that all known developments will be either in the operational phase or constructional phase (as defined above), and the traffic of all the projects peak at the same time, resulting in a worst-case scenario.
- Manpower
- The manpower complement, for each of the proposed developments (including grid connection) is provided below:
    - Mura 1 – 165 individuals.
    - Mura 2 – 435 individuals.
    - Mura 3 – 318 individuals.
    - Mura 4 – 354 individuals.
    - The total manpower complement for the four proposed developments, is in the order of 1 272 individuals.
  - The combined manpower complement, for the operation phase of the three Nuweveld WEF is expected to be in the order of 96 individuals.
  - The combined manpower complement, for the four Hoogland wind farms and associated infrastructure during peak construction phase is assumed to be in the order of 1 200 individuals.
  - The manpower complement for the proposed Gamma Grid Connections during peak construction phase is expected to be in the order of 60 individuals.
- Workforce Distribution
- No accommodation is provided on-site.



- The workforce for the proposed developments is drawn from various towns within a travel distance of 200 km, and include Beaufort West, Carnarvon, Fraserburg, Hutchinson, Loxton, Murraysburg, Nelspoort and Victoria West.
  - The distribution of the workforce is based on the working-age population in each town modified by the weighting factor relating to the distance the various towns are from the proposed developments.
  - The number of specialists deployed to the area for the proposed developments is assumed to be nominal and will not adversely affect the distribution as described above.
- **Traffic**
- Delivery routes of equipment and materials to the proposed developments from various commercial centres within South Africa will follow well-established road networks.
  - The commuting routes of personnel and delivery routes to the proposed development are subject to the limitations stipulated in the Traffic Management Plan for the project.
  - For analysis purposes the shortest route from the surrounding towns to the proposed developments will be adopted.
  - Construction equipment and materials (other than aggregates) for the proposed development will be transported from the various commercial centres within South Africa.
  - The supply of raw materials for the manufacture of concrete and road construction, as a worst-case scenario, will be sourced from commercial sources outside the proposed development.
  - The maximum payload of general-purpose vehicles used to transport equipment and material to the site is assumed to be in the order of 20 000 kg. However, the Molteno Pass on the TR 05801 and the De Jager's Pass on the DR 02311, shall not be used by vehicles with a gross mass of more than ten tonnes for the commuting of personnel and the transportation of construction equipment and materials.
  - The transportation of personnel shall be provided by either double cab bakkie (4 Pax), minibuses (16 Pax), or Buses (35, 45 and 55 Pax), all vehicles shall be retained on-site during the day.
  - All concrete is to be batched on-site (either within the solar PV areas or within the access road corridors), concrete mixing trucks will only be permitted on the public road network from the batching site (most likely the same sites used for Nuweveld East) to the solar sites.

#### **Visual Impact Assessment:**

- Internal access roads will mostly make use of widened existing roads. A panel height of 6m has been used to determine the viewshed of the solar PV facilities.
- Detailed design of these would only become available at a later stage.

#### **Social Impact Assessment:**

- The quantification of economic impacts in order to inform the assessment of the significance of impacts was not possible, nor considered necessary, for all impacts. Where possible, quantification focused on impacts considered to be most important in the overall assessment. Assessments of impact significance made without quantification (and based on a consideration of the likely magnitudes of impacts and/or expert judgements) are, however, considered adequate unless otherwise specified.
- All impacts are assessed individually and then as a whole to the degree possible and appropriate. An overall assessment and discussion of net impacts (i.e. whether overall benefits exceed costs)

was undertaken to the degree thought appropriate and justifiable combining quantifiable and unquantifiable impacts. Given uncertainties and the potentially subjective nature of comparisons between impact categories, the emphasis in the report is on presenting assessments of impact categories with less emphasis on trying to reconcile them in an overall assessment of net effects. To a large degree this role of comparing and weighing up different (and hard to reconcile) impacts is the ambit of the relevant decision-making authorities.

- The findings of the assessment reflect the best professional assessment of the author drawing on relevant and available information within the constraints of time and resources thought appropriate and made available for the assessment. See Appendix B for the disclaimer associated with this report.
- The assessment only considers the impacts of the proposed projects and the no-go alternative. It does not make comparisons with other wind energy projects which may or may not be more desirable. The Department of Mineral Resources and Energy (DMRE) is primarily responsible for making the necessary comparisons between projects as part of the process of awarding contracts to aspirant competing renewable energy developers, should these projects be bid in a Renewable Energy Independent Procurement Producer Programme (REIPPPP) bidding round.

## 3 PROJECT DESCRIPTION

This section provides a description of the location of the project area and the site location alternatives considered for the project. The descriptions encompass the activities to be undertaken during the construction and operational phases as well as the consideration for site accessibility, water demand, supply, storage, and site waste management. This section also considers the need and desirability of the project in accordance with Appendix 1 of GNR 326.


### 3.1 LOCATION OF THE PROPOSED PROJECT

The proposed Mura 2 Solar PV Facility which includes its access road is located between Loxton and Beaufort West in the Beaufort West Local Municipality and the Central Karoo District Municipality in the Western Cape Province. The proposed Mura 2 Facility will be developed within a project area of approximately 484 hectares (ha), excluding the access road corridor. The site will be accessed via the R381, DR02317 and existing access roads (**Figure 3-1**). The four solar PV facilities of the Mura Solar Development are located adjacent to each other and as such, the overall locality of the Mura Solar PV Development is included in **Figure 1-2**. The details of the property associated with the proposed Mura 2 PV Facility, including the 21-digit Surveyor General (SG) codes for the cadastral land parcels are outlined in **Table 3-1**. The co-ordinates of the cadastral land parcels are included in **Table 3-2**. The coordinates of the centre and outer corner points of the development area of the Mura 2 Solar PV Facility are provided in **Table 3-3** and the access road corridor provided in **Table 3-5** below. The on-site substations, switching stations and BESS will be located within the development area. The coordinates for the on-site substations and switching stations are provided in **Table 3-4**. The BESS will be located within the project area, adjacent to the substations. The final position has not been confirmed as yet, however the specialists have assessed the entire project area and have no objections to the BESS being placed within the project area apart from the No-Go areas as indicated in **Figure 7-18**.

**Table 3-1 – Mura 2 Solar PV Facility Affected Farm Portions**

Farm Name	21 Digit Surveyor General Code of Each Cadastral Land Parcel
Leeuwkloof Farm 43	C00900000000004300000
Portion 4 of Duiker Kranse Farm 45	C00900000000004500004
Bultfontein Farm 13	C00900000000001300000

**Table 3-2 – Coordinate Points of the Cadastral Land Parcel**

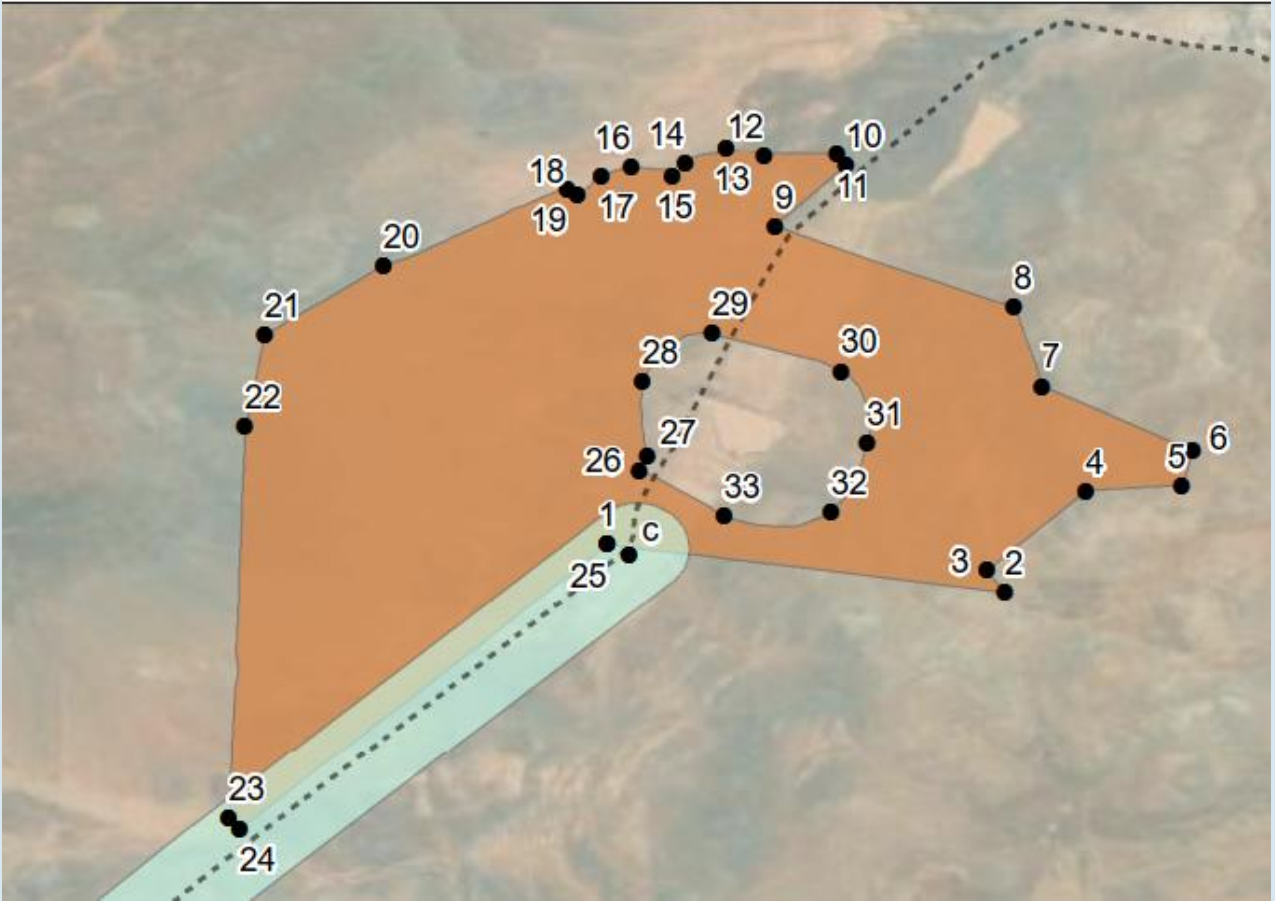
Point	Longitude	Latitude
		
AF	22° 25' 30.549" E	31° 54' 31.383" S
AG	22° 23' 38.105" E	31° 53' 27.670" S
AH	22° 23' 27.895" E	31° 53' 24.545" S
AI	22° 22' 59.281" E	31° 53' 5.869" S
AJ	22° 23' 21.151" E	31° 52' 39.727" S
J	22° 25' 42.416" E	31° 50' 28.752" S
I	22° 27' 20.290" E	31° 48' 2.516" S
H	22° 30' 52.013" E	31° 45' 41.134" S
G	22° 30' 29.801" E	31° 48' 36.745" S

Point	Longitude	Latitude
F	22° 34' 49.580" E	31° 49' 24.474" S
E	22° 34' 4.048" E	31° 49' 43.201" S
B	22° 31' 2.626" E	31° 49' 45.289" S
C	22° 31' 24.038" E	31° 54' 19.973" S
D	22° 28' 9.966" E	31° 53' 55.928" S
A	22° 28' 23.070" E	31° 49' 26.137" S
AH	22° 23' 27.895" E	31° 53' 24.545" S
AI	22° 22' 59.281" E	31° 53' 5.869" S
AJ	22° 23' 21.151" E	31° 52' 39.727" S
J	22° 25' 42.416" E	31° 50' 28.752" S
I	22° 27' 20.290" E	31° 48' 2.516" S
H	22° 30' 52.013" E	31° 45' 41.134" S
G	22° 30' 29.801" E	31° 48' 36.745" S
F	22° 34' 49.580" E	31° 49' 24.474" S
E	22° 34' 4.048" E	31° 49' 43.201" S
B	22° 31' 2.626" E	31° 49' 45.289" S
C	22° 31' 24.038" E	31° 54' 19.973" S
D	22° 28' 9.966" E	31° 53' 55.928" S
A	22° 28' 23.070" E	31° 49' 26.137" S



**Table 3-3 – Mura 2 Solar PV Facility Coordinates**

Point	Longitude	Latitude
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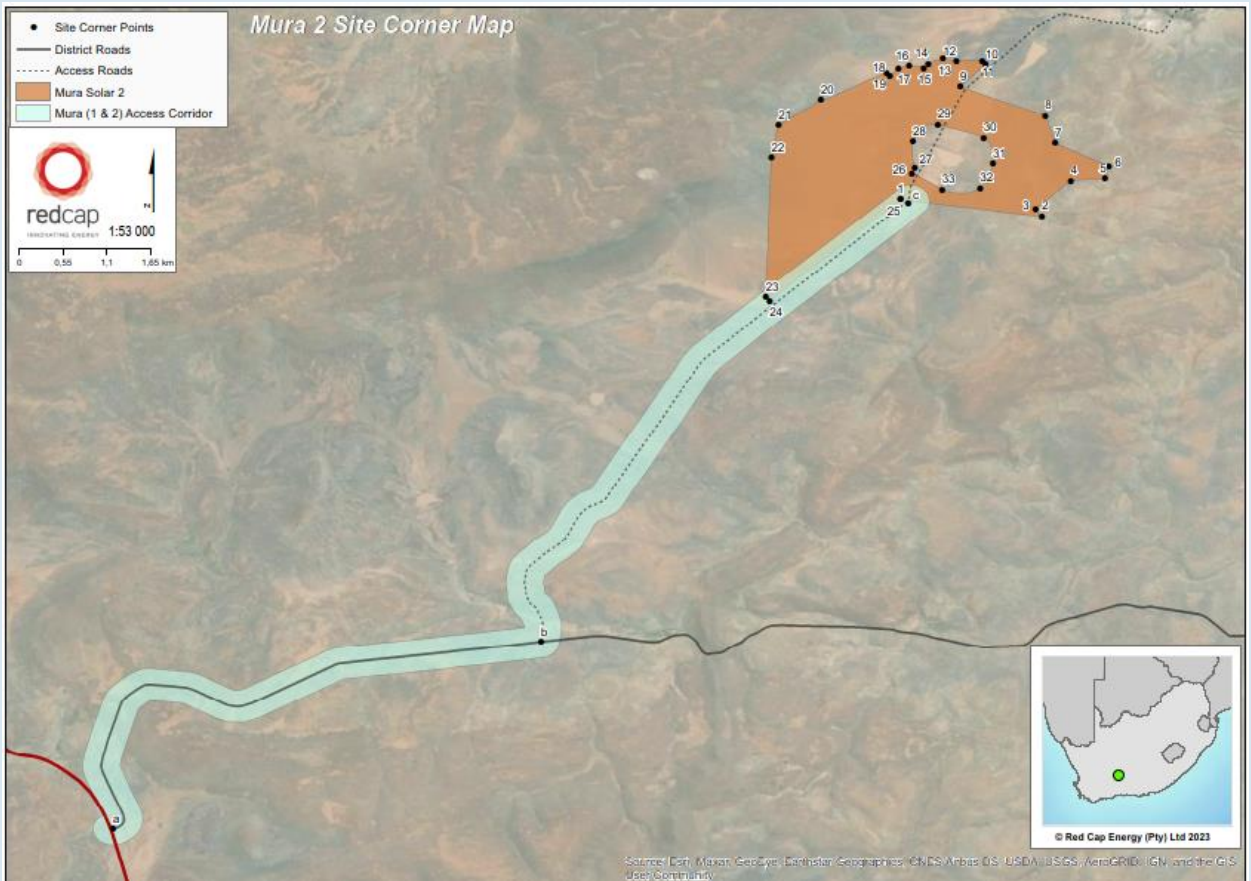
PV Development Area		
Centre Point	22°29'41.74"E	31°49'32.68"S
1	22° 29' 41.874" E	31° 49' 35.634" S
2	22° 30' 39.665" E	31° 49' 42.532" S
3	22° 30' 37.037" E	31° 49' 39.356" S
4	22° 30' 51.415" E	31° 49' 27.912" S
5	22° 31' 5.398" E	31° 49' 27.192" S
6	22° 31' 6.985" E	31° 49' 21.961" S
7	22° 30' 45.140" E	31° 49' 12.612" S
8	22° 30' 41.054" E	31° 49' 1.214" S
9	22° 30' 6.286" E	31° 48' 49.522" S

Point	Longitude	Latitude
10	22° 30' 16.607" E	31° 48' 40.493" S
11	22° 30' 15.257" E	31° 48' 38.999" S
12	22° 30' 4.709" E	31° 48' 39.125" S
13	22° 29' 59.266" E	31° 48' 38.045" S
14	22° 29' 53.218" E	31° 48' 40.129" S
15	22° 29' 51.313" E	31° 48' 42.077" S
16	22° 29' 45.420" E	31° 48' 40.838" S
17	22° 29' 41.057" E	31° 48' 42.217" S
18	22° 29' 37.626" E	31° 48' 44.935" S
19	22° 29' 36.096" E	31° 48' 43.992" S
20	22° 29' 9.445" E	31° 48' 55.069" S
21	22° 28' 52.093" E	31° 49' 5.297" S
22	22° 28' 49.228" E	31° 49' 18.437" S
23	22° 28' 46.934" E	31° 50' 15.230" S
24	22° 28' 48.518" E	31° 50' 16.840" S
25	22° 29' 41.874" E	31° 49' 35.634" S
26	22° 29' 46.558" E	31° 49' 24.888" S
27	22° 29' 47.774" E	31° 49' 22.822" S
28	22° 29' 46.986" E	31° 49' 11.917" S
29	22° 29' 57.127" E	31° 49' 4.876" S
30	22° 30' 15.970" E	31° 49' 10.427" S
31	22° 30' 19.624" E	31° 49' 20.939" S
32	22° 30' 14.432" E	31° 49' 30.886" S
33	22° 29' 58.898" E	31° 49' 31.544" S

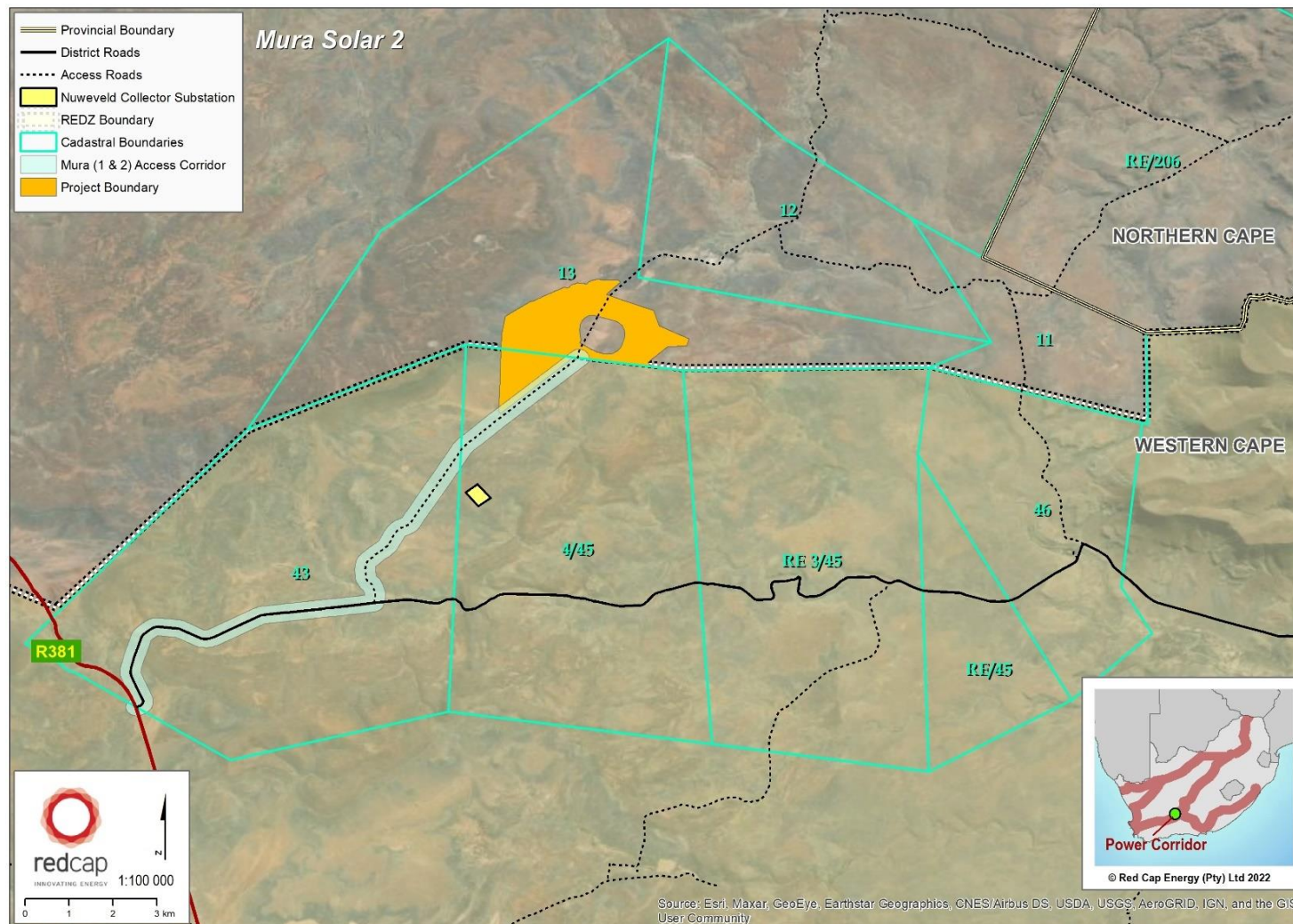
**Table 3-4 – Mura 2 On-Site Substation and Switching Station Coordinates**

<u>Point</u>	<u>Longitude</u>	<u>Latitude</u>
<u>Mura 2 Substation A</u>	<u>22° 28' 59.574" E</u>	<u>31° 49' 13.566" S</u>
<u>Mura 2 Substation B</u>	<u>22° 29' 31.096" E</u>	<u>31° 49' 38.532" S</u>
<u>Mura 2 Switching Station A</u>	<u>22° 28' 56.780" E</u>	<u>31° 49' 12.716" S</u>
<u>Mura 2 Switching Station B</u>	<u>22° 29' 32.971" E</u>	<u>31° 49' 40.119" S</u>

**Table 3-5 – Mura 1 and 2 Access Road Coordinates**

<u>Point</u>	<u>Longitude</u>	<u>Latitude</u>
		
a (Start)	22° 24' 20.311" E	31° 53' 52.717" S
b (Middle)	22° 27' 15.092" E	31° 52' 36.273" S
c (End)	22° 29' 45.190" E	31° 49' 37.042" S





**Figure 3-1 – Mura 2 Solar PV Facility – Locality Map**

## 3.2 SOLAR PV GENERATION PROCESS

South Africa experiences some of the highest levels of solar radiation in the world between 4.5 and 6.5kWh/m<sup>2</sup>/day) and therefore, possesses considerable solar resource potential for solar power generation.

In terms of large-scale grid connected applications the most commonly used technology utilised in South Africa is PV installations and is described in some detail in the following section.

It must be noted that this project is specific to solar power generation through the use of solar PV technology only.

### 3.2.1 PV AND MOUNTING SYSTEM

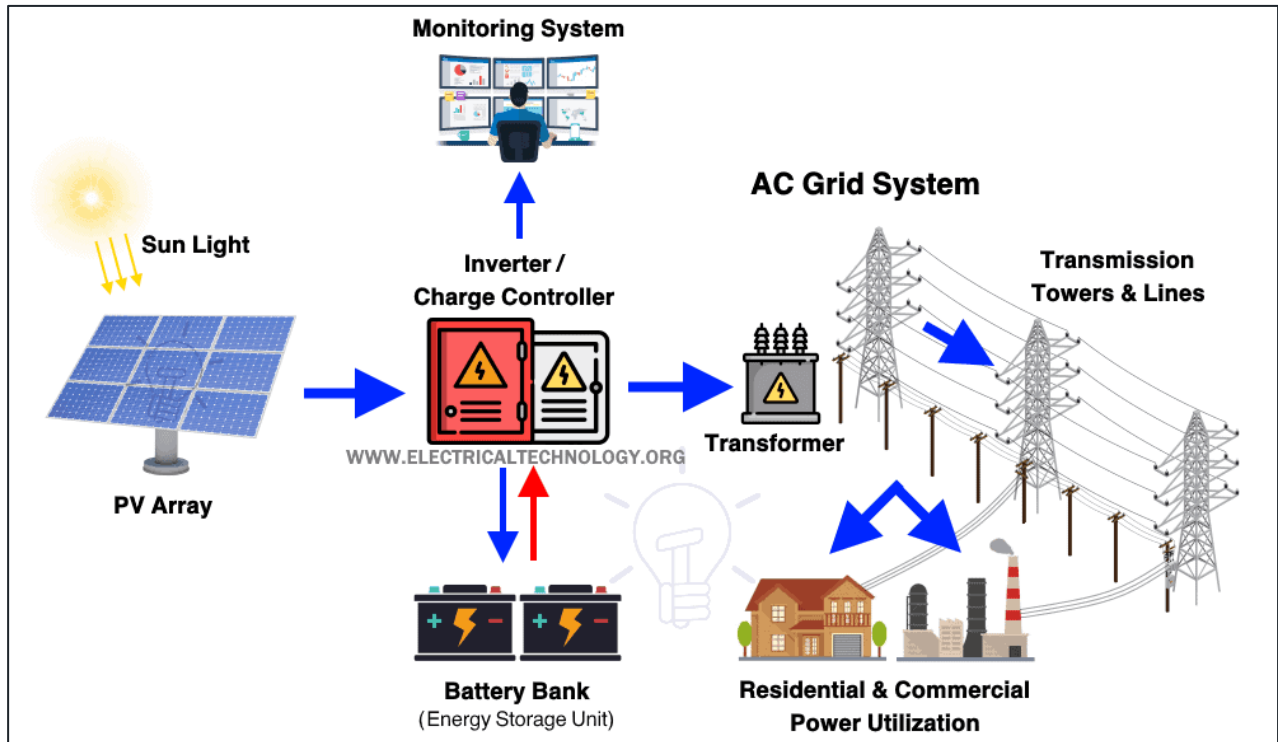
Internationally, solar PV is the fastest-growing power generation technology. Approximately 139 GW was added to the installed capacity globally in 2020, increasing the installed capacity by 18% from the previous year. The total capacity from PVs was 760 GW globally, producing approximately 3% of the world's electricity. In South Africa the solar PV installed capacity in 2020 grew by 37% compared to the previous year's value. As much as 3.6 GW of PV is planned to be installed by 2026, with approximately 1.48 GW already installed as recorded in 2019.

Large-scale or utility-scale PV systems are designed for the supply of commercial power into the electricity grid. Large-scale PV plants differ from the smaller units and other decentralised solar power applications because they supply power at the utility level, rather than to local users.

PV cells are made from semi-conductor materials that are able to release electrons when exposed to solar radiation. This is called the photo-electric effect. Several PV cells are grouped together through conductors to make up one module. Modules can be connected together to produce power in large quantities. In PV technology, the power conversion source is via PV modules that convert light directly to electricity.

Solar panels produce direct current (DC) electricity; therefore, PV systems require conversion equipment to convert this power to alternating current (AC), that can be fed into the electricity grid. This conversion is done by inverters. **Figure 3-2** provides an illustration of the main components of a solar PV power plant.

The solar PV panels can be mounted in various ways to ensure the maximum exposure to sunlight. The two main mounting systems that form part of a PV facility are either single axis tracking or fixed axis mounting structures. In the fixed axis mounting structures, the panels are installed and set to face north and does not move to follow the sun. With tracking systems, the panels track the sun and thereby ensure maximum exposure to the sunlight. Both mounting systems are considered for this project.



**Figure 3-2 - Main components of a Solar PV Plant**

Source: [www.electricaltechnology.org/2021/07/solar-power-plant.html](http://www.electricaltechnology.org/2021/07/solar-power-plant.html)

### 3.3 BESS TECHNOLOGY

The Mura Solar facility proposal includes the development of a Battery Energy Storage System (BESS). There is a growing need for renewable energy technologies, such as solar and wind, to be able to supply a reliable source of electricity to the grid. Since solar and wind technology depend on whether the sun is shining or the wind is blowing, respectively, these technologies are only efficient when these sources are available. Battery storage systems allow for fluctuating renewable energy sources to be as stable as conventional systems and also provide a means to decouple generation of electricity from its use (i.e. provide electricity to the grid during peak demand) and therefore minimising supply and demand related issues.

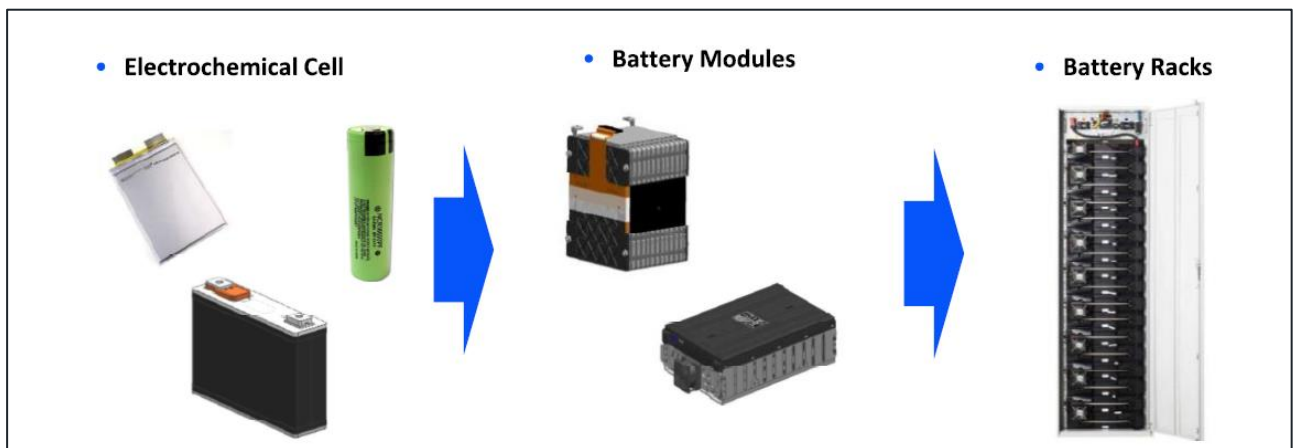
Given the ongoing improvement in battery storage technology and the significant advantages of combining battery storage with wind farms, it makes sense to include a battery facility with the solar facility. The BESS is proposed adjacent or slightly removed from the solar facility's substations, within the solar facility's development envelope.

#### 3.3.1 BATTERY TYPE

The BESS will be made up of Lithium-Ion batteries or similar solid-state technology due to them being a mature and safe technology with regard to potential impacts on the environment in a solar facility, modular and easy to install and due to their technical characteristics, will work well as energy storage systems for solar facilities, as well as supporting grid stability.

### 3.3.2 PHYSICAL DESIGN OF THE BATTERY FACILITY

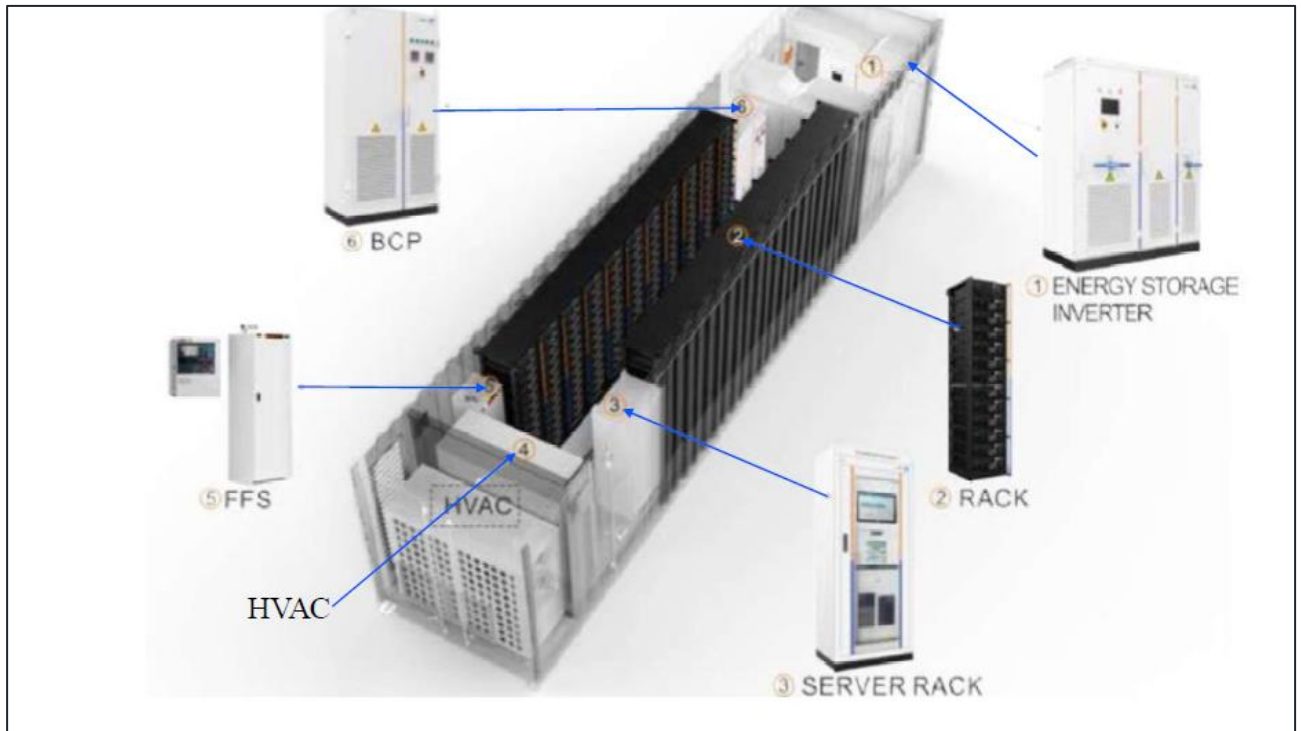
The battery's smallest component is the "battery cell" which is similar to the batteries that we all use in our appliances. See the diagram below for an overview of the battery make up. These cells have only a very small proportion of their mass made up by liquid, which is the electrolyte and accounts for no more than about 6% of the total mass of the batteries. These cells are completely sealed in the factories when they are manufactured, and no electrolytic liquids are thus handled on site. Furthermore, the small amount of electrolytic liquid within each cell is also almost all absorbed into the solid components in the cell thus making any significant spillage of liquid almost impossible. A number of cells are combined together into "battery modules" in the factories where they are manufactured which again are sealed systems giving secondary containment of any potential minor liquid leak of electrolyte. The modules are then combined into metal "battery racks" and the racks are installed in closed containers further reducing the risk of spillage of any liquid into the environment as the liquid has now been contained three times even though most of it is absorbed within the battery cell.



**Figure 3-3 – Basics of utility scale batteries**

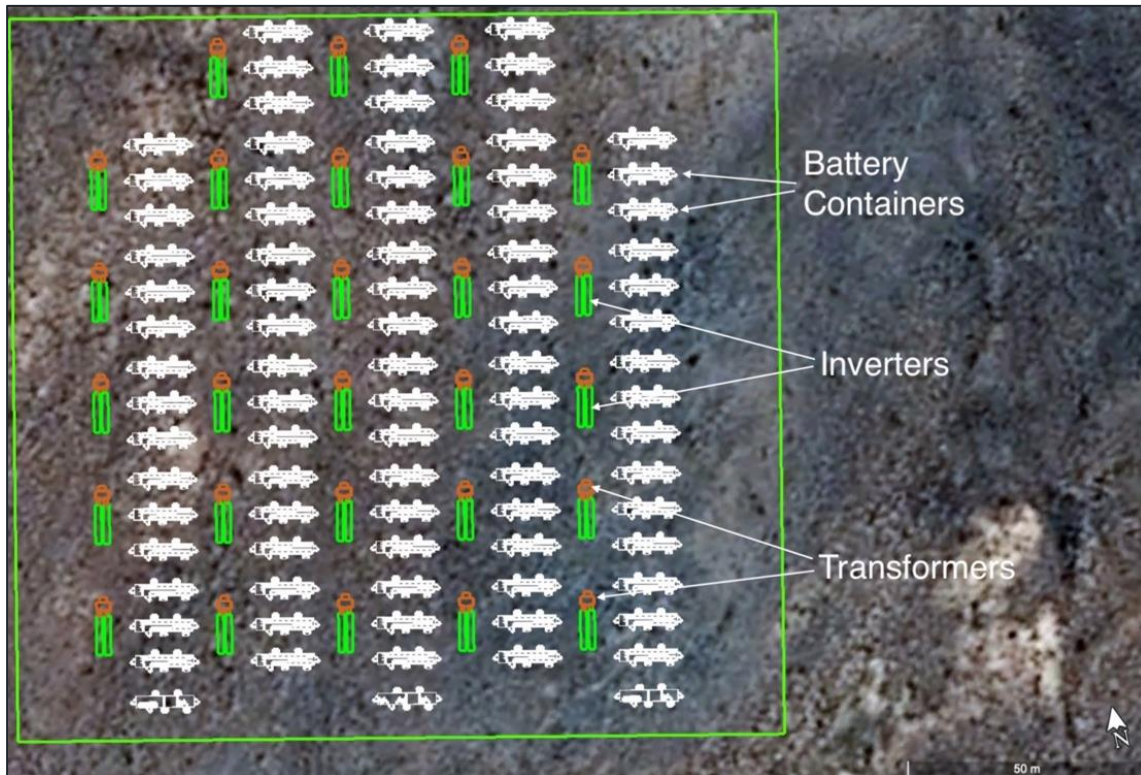
Each container will therefore contain many battery racks, an automated Heating, Ventilation and Air Conditioning (HVAC) system, a fire detection and suppression system (that uses inert gas), battery management system and other electrical components required to manage the batteries. The containers are standard size shipping containers of 12m long x2.5m wide x2.7m high. The addition of the HVAC systems may protrude outside the containers making them a bit longer or higher (but not higher than 4.5m and thus lower than the tallest buildings in the substation). See **Figure 3-4** below that shows a typical layout of one of these containers.





**Figure 3-4 – Indicative layout of battery**

The size of the battery facility will be a 240 MWac system and will be located in a 4 ha area within the solar facility's development envelope. See **Figure 3-5** below giving an indicative layout of one of these proposed battery facilities.



**Figure 3-5 - Indicative layout of the BESS**

The battery facilities will be located in close proximity to the solar facility's substations and will be linked to the substation via up to 132kV (or less) underground cables and will not have any additional office/ operation/ maintenance infrastructure as those of the substation. In effect, the battery facilities are extensions of the substation infrastructure and, as per the substations, will be contained within a security fence.

The HVAC system that each container has is composed of a number of air conditioning units and a ventilation system to provide both heating and cooling to maintain the internal conditions as per equipment requirements.

### 3.3.3 COMPLIANCE WITH LOCAL AND INTERNATIONAL STANDARDS

The cells, modules, racks and the complete facility will be compliant with all local laws and regulations and health and safety requirements governing such battery facilities. Over and above that they will comply with international standards such as UN 38.3 (Transportation Testing for Lithium Batteries), UL 1642 (Standard for Safety – Lithium-ion Batteries) and IEC 62619 (Secondary cells and batteries containing alkaline or other non-acid electrolytes Safety requirements for secondary lithium cells and batteries, for use in industrial applications). Furthermore, the battery facility will also comply with standards such as UL 1973 (Batteries for Use in Stationary Applications) and IEC 62619-2017 including thermal runaway non-propagation and safety zone region operation limits and a failure mode analysis. The design will be compliant with UL 9540 (Energy Storage Systems and Equipment): this standard defines the safety requirements for battery installation in industrial and grid connected applications.

## **3.4 PROJECT INFRASTRUCTURE**

The following are proposed as part of the project. The total project area is 506 ha and should be assumed to be wholly transformed. The project footprint will contain the following:

- Solar Field;
- Solar Farm Substations;
- BESS and BESS substation;;
- Building Infrastructure;
- Other Infrastructure located within the solar area footprint; and
- Associated Infrastructure (outside the solar area footprint).

These items are discussed in more detail below.

### **3.4.1 SOLAR FIELD**

The total development envelope for project installation is approximately 484 ha to allow for the construction of a PV facility with capacity up to 400 MW. Solar PV modules which convert solar radiation directly into electricity, will have a maximum height of 6m. The solar PV modules will be elevated above the ground and will be located on either single axis tracking structures or fixed tilt mounting structures or similar.

### **3.4.2 SOLAR FARM SUBSTATIONS**

Each solar facility will connect to the Eskom grid via new 132 kV overhead lines (assessed in separate processes to the PV facilities) connecting the up to two on-site solar substations via an adjacent Eskom switching stations to the approved Nuweveld Collector substation.

The substations will have a maximum height of 12m and will include a high voltage gantry within a 150 m x 75 m substation yard

### **3.4.3 BESS AND BESS SUBSTATION**

Each solar farm will have an area up to 4 ha for a 240 MWac BESS. The BESS will be Lithium-ion or similar solid-state technology. The BESS will have a substation with the same specifications as the Solar Farm substations. The BESS will be connected to the solar farm sub/switching stations via an underground high voltage cable.

### **3.4.4 BUILDING INFRASTRUCTURE**

Building infrastructure of up to a maximum height of 8m will be located within the project area. The infrastructure includes:

- Offices;
- Operational and maintenance (O&M)/ control centre;
- Warehouse/workshop;
- Ablution facilities; and
- Converter/inverter stations.

### **3.4.5 OTHER INFRASTRUCTURE**

Other Infrastructure located within the solar area footprint includes:

- Internal underground cables of up to 132 kV;



- Internal gravel roads;
- Fencing (between 2 – 3 m high) around the PV Facility;
- Panel maintenance and cleaning area;
- Storm water management system; and
- Site camps.

### 3.4.6 ASSOCIATED INFRASTRUCTURE

There will be additional associated Infrastructure outside the solar area footprint but part of the solar project. This includes:

- Internal access gravel roads with a footprint of 17 ha:
  - Up to 4 m wide driving surface and may require side drains on one or both sides.
  - During construction the roads may be up to 12 m wide, but this will be a temporary impact and rehabilitated following the construction phase.
- Site camps:
  - Up to two 2.2 ha site camps within the access road corridor.

## 3.5 PROPOSED PROJECT DEVELOPMENT ACTIVITIES

### 3.5.1 CONSTRUCTION PHASE

The construction process will follow industry standard methods and techniques. Key activities associated with the construction phase are described in **Table 3-6**.

**Table 3-6 – Construction activities**

Activity	Description
Establishment of access and internal roads	Access to the proposed Mura 2 Solar PV facility will be via the R381, DR02317 and existing access roads. Internal gravel roads will be developed. The roads will be up to 4 m wide, but during construction the roads may be up to 12 m wide, however this will be a temporary impact and rehabilitated following the construction phase
Site preparation and establishment	Site establishment will include clearing of vegetation and any bulk earthworks that may be required.
Transport of components and equipment to site	All construction material (i.e. PV support structure materials), machinery and equipment (i.e. graders, excavators, trucks, cement mixers etc.) will be transported to site utilising the national, regional and local road network. Large components (such as substation transformers) may be defined as abnormal loads in terms of the Road Traffic Act (No. 29 of 1989). In such cases a permit may be required for the transportation of these loads on public roads.
Establishment of a laydown area on site	Construction materials, machinery and equipment will be kept at relevant laydown and/or storage areas. Laydown areas (site camps) of approximately up to 2.2ha each have been proposed for this project. The laydown areas will also be utilised for the assembly of the PV panels. The laydown area will limit potential environmental impacts associated with the construction phase by limiting the extent of the activities to one designated area.

Activity	Description
Erection of PV Panels	The PV panels will be arranged in arrays. The frames will be fixed onto vertical posts that will be driven into the ground utilising the relevant foundation method identified during the geotechnical studies, including potentially employing concrete foundations for the panel frames. PV panels will have a maximum height of 6m.
Construction of substation and inverters	The facility output voltage will be stepped up from medium voltage to high voltage in the transformer. The medium voltage cables will be run underground within the facility to a common point before being fed to the onsite substation.
Establishment of ancillary infrastructure	Ancillary infrastructure will include a workshop, storage areas, office, and a temporary laydown area for contractor's equipment.
Rehabilitation	Once all construction is completed on site and all equipment and machinery has been removed from the site, the site will be rehabilitated.

### 3.5.2 OPERATIONAL PHASE

During operation the key activities will include inspection and maintenance of the solar panels, substations, BESS, and other associated infrastructure.

### 3.5.3 DECOMMISSIONING PHASE

The decommissioning phase will include activities similar to that of the construction phase as indicated in **Table 3-6**.

## 3.6 NEED AND DESIRABILITY OF THE PROJECT

South Africa is faced with significant increases in electricity demand and a shortage in electricity supply. South Africa is the seventh highest coal producer in the world, with approximately 77% of the country's electricity generated from coal. This large dependence on coal and its use has also resulted in a variety of negative impacts on the environment, including the contribution to climate change. South Africa is also the highest emitter of greenhouse gases in Africa; attributed to the country's energy-intensive economy that largely relies on coal-based electricity generation.

Renewable energy development is regarded as an important contribution to meeting international and national targets of reducing reliance on fossil fuels, such as coal, which contribute towards greenhouse gas emissions and resultant climate change. The need and desirability of proposed Mura 2 Solar PV Facility has been considered from an international and national perspective.

### 3.6.1 INTERNATIONAL PERSPECTIVE

The proposed project will align with internationally recognised and adopted agreements, protocols, and conventions. This includes the Kyoto Protocol (1997) which calls for countries internationally to reduce their greenhouse gas emissions through cutting down on their reliance on fossil fuels and investing in renewable energy technologies for electricity generation. The proposed project will therefore add capacity to the energy sector and generate electricity without greenhouse gas emissions and meet international requirements in this regard.

South Africa is also signatory to the United Nations' Development Programmes' (UNDP) Sustainable Development Goals (SDGs), particularly SGD 7 relating to affordable and clean energy. The

proposed project qualifies as a clean technology that will generate up to 400MW of affordable energy to contribute to South Africa's energy mix.

The project will also greatly contribute to the countries' efforts to reduce their carbon emissions and play their role as part of the Paris Climate Accord. The Paris Agreement is a legally binding international treaty signed by 196 countries at the COP 21 in Paris, on the 12th of December 2015 to combat climate change. The goal of the Paris Accord is to limit global warming to well below 2 degrees Celsius, compared to industrial levels to avoid catastrophic natural disasters which are driven by the global temperature increase. Therefore, to achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate-neutral world by 2050.

At COP27 President Sameh Shoukry announced the *Sharm el-Sheikh Adaptation Agenda*<sup>1</sup>, enhancing resilience for people living in the most climate-vulnerable communities by 2030. The cover decision, known as the Sharm el-Sheikh Implementation Plan, highlights that a global transformation to a low-carbon economy is expected to require investments of at least USD 4-6 trillion a year. The Sharm el-Sheikh Implementation Plan emphasises the urgent need for reduced global greenhouse gas emissions through the use of renewable energy, just energy transition partnerships and other cooperative actions. The Plan further highlights that this is a critical decade of action that requires rapid transformation towards renewable energy.

This renewable energy project aligns with the goals of the Sharm el-Sheikh Implementation Plan and the need to reduce greenhouse gas emissions and rapidly transform towards renewable energy.

### 3.6.2 NATIONAL PERSPECTIVE

The South African Government, through the IRP, has set a target to secure 17 800 MW of renewable energy by 2030. This is an effort to diversify the country's energy mix in response to the growing electricity demand and promote access to clean sources of energy.

The National Development Plan (NDP) is aimed at reducing and eliminating poverty in South Africa by 2030. The NDP also outlines the need to increase electricity production by 2030, with 20 000 MW of electricity capacity generated from renewable sources in order to move to less carbon-intensive electricity production. The Plan also envisages that South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates, while supporting economic growth through job creation.

The authorisation of the Mura 2 Solar PV Facility will further align with South Africa's National Climate Response White Paper which outlines the countries efforts to manage the impacts of climate change and to contribute to the global efforts to stabilize the greenhouse gases concentrations in the atmosphere.

The proposed Mura 2 Solar Facility will also aid in overcoming the power shortages that are currently faced in the country. In 2022, South Africa witnessed its longest recorded hours of load

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<sup>1</sup> <https://unfccc.int/news/cop27-reaches-breakthrough-agreement-on-new-loss-and-damage-fund-for-vulnerable-countries>

shedding, with the power being off for 1 949 hours between January and September 2022 as shown in **Figure 3-6**. The South African Government has taken strides to try reducing these power cuts through the implementation of bid Windows in Renewable Independent Power Producer Programme (REIPPP) , but it is still expected that the country will undergo more load shedding. Over the years the construction of Solar and Wind facilities has become cheaper, and less time-consuming. Thus, acting as a faster and more efficient method of meeting the ever-growing demand for electricity in the country. Renewable energy is a key factor in the national energy mix and will assist in ensuring that load shedding is reduced in South Africa.

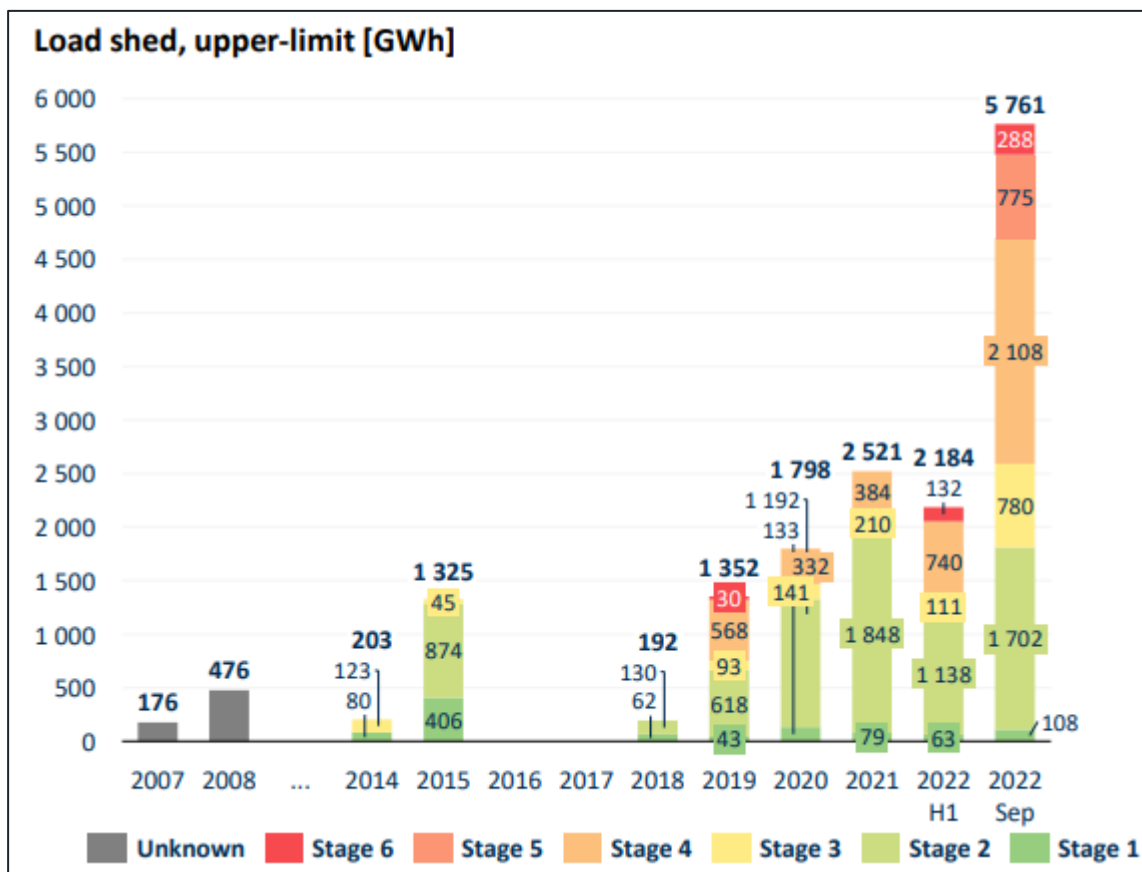
On 16 February 2018, the DFFE gazetted the REDZ and STC and Procedures for the Assessment of Large-scale Wind and Solar Photovoltaic Energy Development Activities (GN 114) and Grid Infrastructure (GN 113). Subsequently, on 26 February 2021 a further three REDZ were gazetted (GN 142).

REDZ are geographical areas where wind and solar PV development can occur in concentrated zones, creating priority areas for investment in the electricity grid and thereby increasing South Africa's green energy map by enabling higher levels of renewable power penetration (Greeneconomy Media, 2019).

The procedure allows for wind and solar PV activities within the eight REDZs and electricity grid expansion within the five power corridors to be subjected to a BA and not a full S&EIA process. In addition, the timeframes associated with the decision on the application is reduced from 107 days to 57 days.

The REDZs support the responsible implementation of the 2019 IRP that was gazetted by the Minister of Mineral Resources and Energy on 17 October 2019. Renewable energy projects that could be developed in these new REDZ have the potential to make significant contributions to mine rehabilitation and to support a just energy transition in the specified areas including where 12 GW of existing coal power stations are planned to be decommissioned by 2030 (CSIR, 2019).

The Mura 2 Solar PV facility does not fall within the Beaufort West REDZ. The Mura EGI Corridor falls within the Central CST Corridor and predominantly within the REDZ.



**Figure 3-6 - Load shedding hours over the years in South Africa**

Source: CSIR (2022)

## 4 PROJECT ALTERNATIVES

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The EIA Regulations of 2014 (as amended) require that the S&EIA process must identify and describe alternatives to the proposed activity that were considered, or motivation for not considering alternatives. Different types or categories of alternatives could be considered including different locations, technology types, and project layouts. At the scoping level the evaluation of alternatives is provided at a high level in the absence of detailed environmental comparators for each alternative; due to the two-staged nature of the S& EIA process it is more suitable to identify and describe the potential alternatives on a high-level basis within scoping, and to perform a more detailed analysis of alternatives (with environmental comparators) in the EIA phase of the project. As such, the S&EIA will holistically assess the impacts and risks of each alternative comparatively, as suggested by Appendix 2 of the EIA Regulations of 2014 (as amended).

All alternatives outlined below are considered both feasible and reasonable with no apparent advantages or disadvantages at this stage of the project. All alternatives will be described and assessed in more detail during the EIA Phase.

Extensive consideration of alternatives and avoidance of impacts took place in the screening/design phase. This is discussed in detail in the section below.

### 4.1 SITE ALTERNATIVES

The selection of the Mura Solar PV Development is the outcome of a feasibility assessment by the proponent, which inter alia served to identify site options that would be optimal for energy production and grid interconnection.

#### 4.1.1 SITE SELECTION PROCESS

Red Cap Energy has a wealth of experience in renewable wind energy development in the Beaufort West area and good relationships with the local landowners due to the approved Nuweveld Wind Farm Development and the Hoogland Wind Farm clusters. Generation from the Nuweveld and Hoogland Wind Farms will be connected to the national grid via either an approved 400kV connection from the Nuweveld Collector Substation (approved) to Droërivier (existing Eskom Substation) and/or via a 400kV connection (currently being assessed as part of a separate BA process) to Gamma substation (existing Eskom substation). Red Cap is proposing both these grid connections. The approved Collector Substation is proposed as the connection point for the Mura Solar Development.

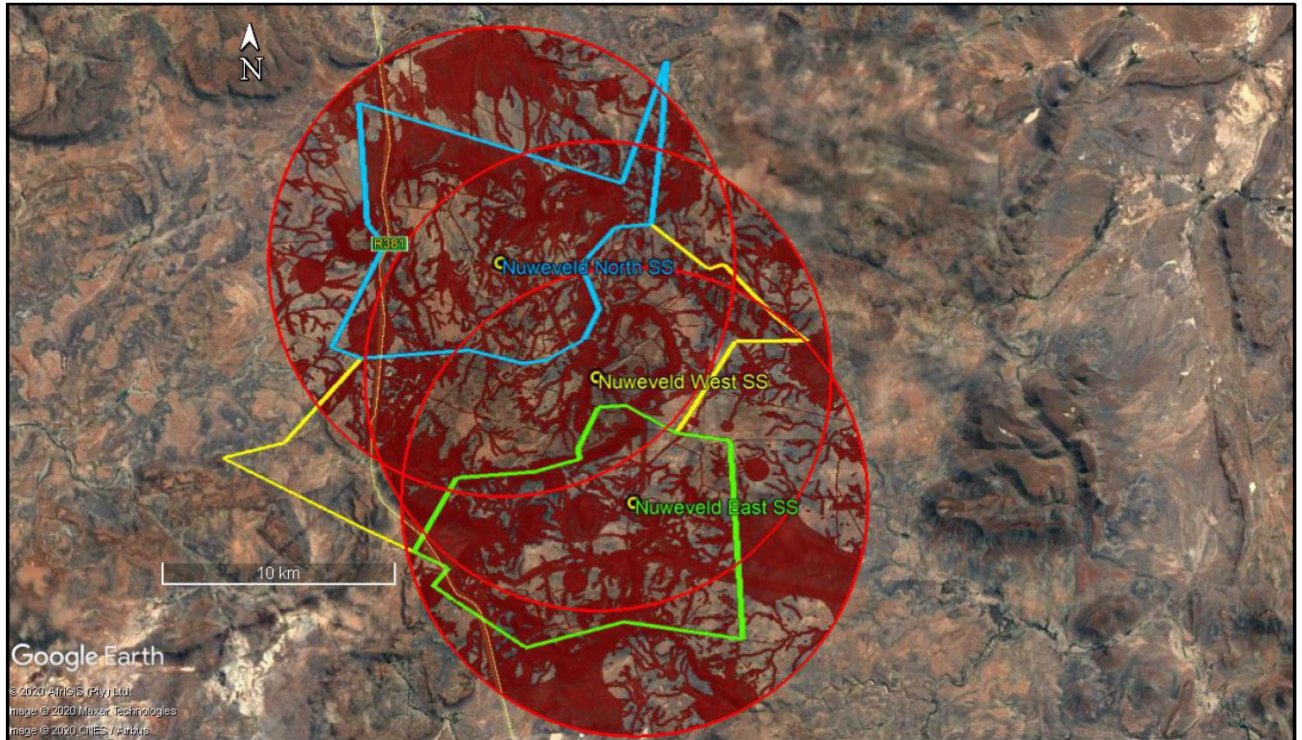
Taking technical constraints, resource availability and grid capacity into account, Red Cap identified that up to four solar PV facilities can connect to the approved Collector Substation and subsequently undertook a site selection process to identify where these four facilities can be located.

As part of the initial desktop screening exercise, an area within or adjacent to the Nuweveld Wind Cluster within relative proximity to each of the Nuweveld wind farm switching stations were investigated by applying a 10 km radial buffer to each of the two approved Nuweveld North and West switching stations and Nuweveld Collector Substation.

Based on Red Cap's knowledge of the area and detailed input from specialists that undertook assessments for the Nuweveld Wind Farm Development and Hoogland Cluster, solar constraints were identified within the three initial broad focus areas and used to develop no-go layers. The



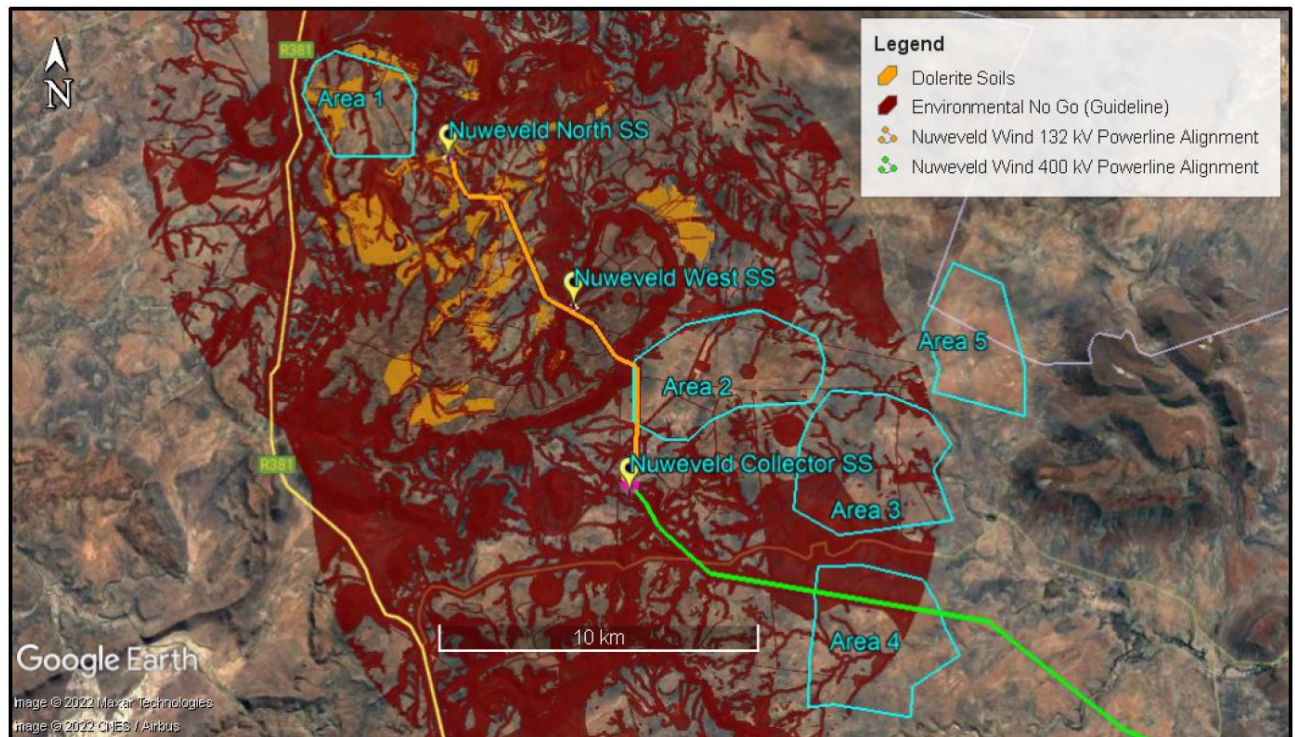
factors considered in developing the no-go layers were: Critical Biodiversity & Protected Areas, Avifauna (buffers around nests), Bat habitat (rocky crevices only), Ecology (specifically Riverine Rabbit habitat and vegetation), Transmission lines, Airfields (none in the proposed area), Heritage (including palaeontology), Aquatic features including wetlands, dams and rivers. **Figure 4-1** shows a map indicating the no-go layers that were identified by the abovementioned constraints.



**Figure 4-1 - Screening no-go layers from the identified constraints for the potential solar area**

These areas were then assessed from a technical perspective by considering specifically slope, aspect, undulation, and access. Taking this into account, five areas with adequate development area (**Table 4-1**) were identified to take forward to a formal screening process (**Figure 4-2**). One of the areas (Area 5) was outside of the initial broad screening areas buffer but was also identified to be suitable for development.





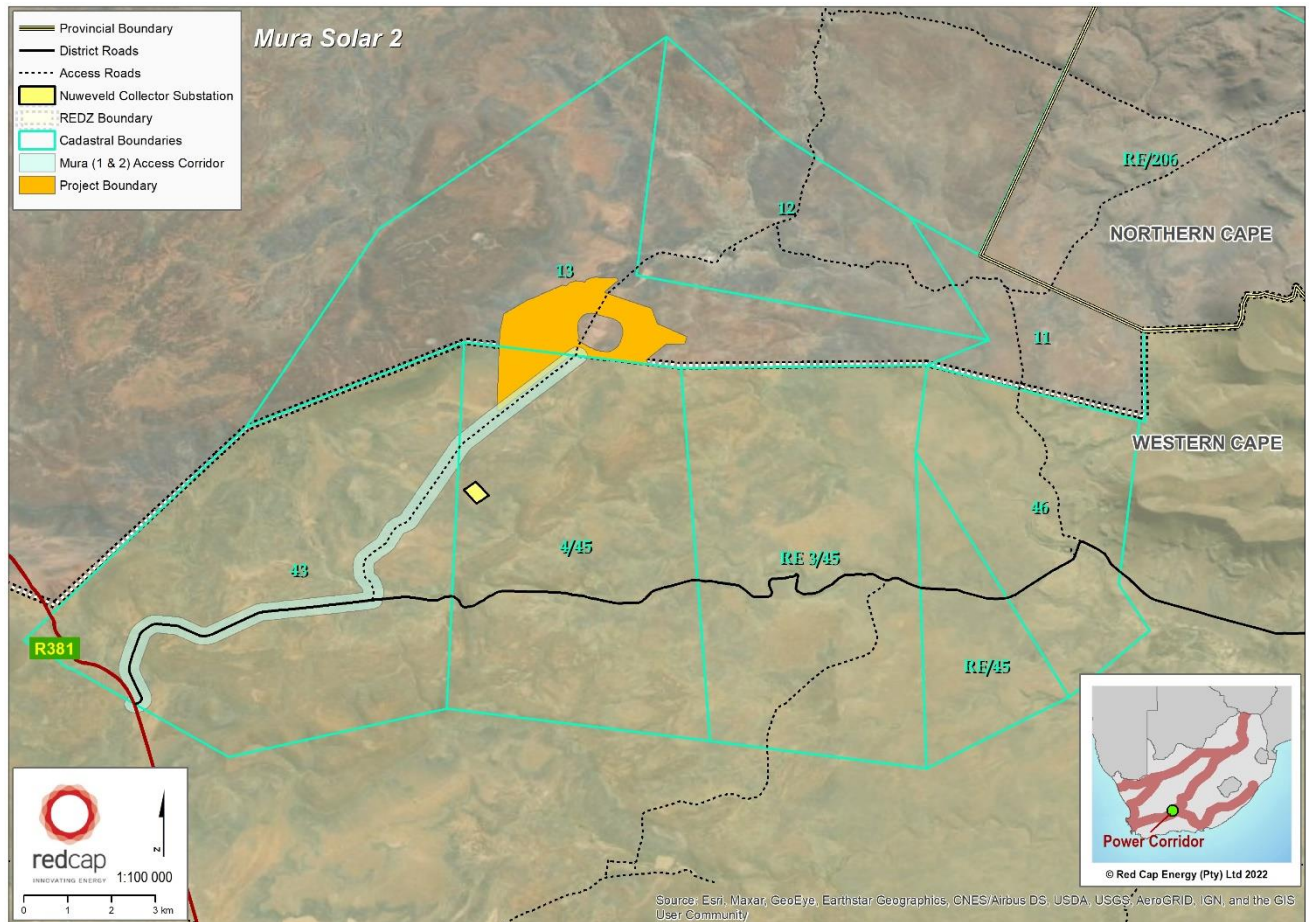
**Figure 4-2 - Five potential Mura PV areas**

These five areas were then screened from a more detailed technical and environmental perspective. Technical considerations included high-level solar design and the appointed environmental specialists undertook further desk and fieldwork work to provide a more detailed assessment of the environmental features present within these areas. Following this, Areas 1, 3 and 4 were screened out due to several constraints which made development within those areas unfeasible.

The remaining two areas (Areas 2 and 5) available for development were further reduced in size to avoid environmental and technical sensitivities but was determined to still have sufficient remaining development area available to each support two solar PV facilities which then became Mura 1, Mura 2, Mura 3, and Mura 4 (**Table 4-1**). These project sites (see **Figure 4-2**) have been taken forward for further detailed assessment by the appointed specialists and these site boundaries were used as the boundaries presented within the respective specialist's assessments. The assessment footprint of the specialist assessments, specifically for Mura PV 2 is shown below (**Figure 4-3**).

**Table 4-1 – Solar PV areas**

	Area 1	Area 2		Area 3	Area 4	Area 5	
Screening Phase	1022 Ha	1718 Ha		1779 Ha	1605 Ha	1093 Ha	
Assessment Phase	n/a	176 Ha	484 Ha	n/a	n/a	395 Ha	425 Ha



**Figure 4-3 - Mura 2 Solar PV Facility and proposed access road corridor**

## 4.2 TECHNOLOGY ALTERNATIVES

### 4.2.1 SOLAR PV TECHNOLOGY

The Mura 2 Solar PV Facility will utilise solar PV technology to generate power. Therefore, no other technology alternatives are being considered for this project.

### 4.2.2 BESS TECHNOLOGY

The BESS will be made up of Lithium-Ion batteries or similar solid-state technology due to them being a mature and safe technology with regard to potential impacts on the environment in a solar facility farm, modular and easy to install and due to their technical characteristics, will work well as energy storage systems for solar facilities, as well as supporting grid stability. Please refer to Section 3.4.3 for a detailed description of the BESS. No other BESS technology is being considered for this project..

## 4.3 LAYOUT ALTERNATIVES

The process undertaken for this project is an iterative design process whereby through various assessment phases and iteratively updating the site sensitivities to avoid environmental features (as outlined within Section 4.1.1) the site boundaries were determined and further assessed by the specialists to determine the Development Envelope for the facility. The Development Envelope



would avoid all the no-go areas identified by the specialists but any layout within the Development Envelope (and associated restrictions/exceptions) would be seen as acceptable. Therefore, no layout alternatives are being considered for this project.

## 4.4 NO-GO ALTERNATIVE

In the “no project” alternative, the Mura 2 Solar PV Facility project will not be developed. In this scenario, there could be a missed opportunity to address the need for increase in renewable energy generation in an effort to mitigate against concerns of climate change and exploitation of non-renewable resources. The no-go alternative would not assist in responding to the growing electricity demand in South Africa and would not contribute to the reliability of electricity supply at a national scale. Conversely, negative environmental impacts of the project (as outlined in Section 8) associated with the development of the Mura 2 Solar PV Facility would be avoided.

Specialists have considered the no-go alternative and the following has been concluded:

- Agriculture:
  - The one identified potential impact is that due to irregular rainfall in the area, which is likely to be exacerbated by climate change, agriculture in the area will come under increased pressure in terms of economic viability.
  - The development offers an alternative income source to agriculture, but it restricts agricultural use of the site.
  - Therefore, even though the excluded land has low agricultural production potential, the negative agricultural impact of the development is more significant than that of the no-go alternative, and so, purely from an agricultural impact perspective, the no-go alternative is the preferred alternative between the development and the no-go.
  - However, the no-go option would prevent the proposed development from contributing to the environmental, social and economic benefits associated with the development of renewable energy in South Africa.
- Aquatic
  - Potential very low-significance impacts on aquatic ecology would be avoided should the No-Go alternative be selected.
  - The impacts assessed in this report would be applicable to any layout alternative that avoided high-sensitivity areas (with the exception of the widening of existing roads and the construction of underground cables) identified in the aquatic biodiversity report and limited the placement of infrastructure in areas of medium aquatic sensitivity as far as reasonably possible, provided that the mitigation specified in the aquatic biodiversity report and in the EMPr are implemented.
- Animal and Plant:
  - Under the no-go alternative, the current landuse consisting of extensive livestock grazing would continue. When applied correctly, such livestock grazing is considered to be largely compatible with long-term biodiversity conservation, although in practice there are some negative effects associated with such landuse such as predator control and negative impacts on habitat availability for the larger ungulates that would historically have utilised the area. Under the current circumstances, the no-go alternative is considered to represent a low long-

term negative impact on the environment but has less impact than the loss of habitat resulting from the construction of the PV facility.

■ Avifauna:

- The No-Go alternative or status quo would not impact on avifauna in any new way. Farming does have its' own impacts on birds, but they have evolved into co-existing for the large part, and most of the site is not intensively farmed (it being mostly livestock grazing).

■ Heritage

- If the project were not implemented, the site would stay as it currently is (impact significance of neutral). Although the heritage impacts with implementation would be greater than the existing impacts, the loss of socio-economic benefits is more significant and suggests that the No-Go option is less desirable in heritage terms.

■ Traffic

- If the proposed development does not materialise, the increase in the traffic volume will not transpire, resulting in the following impacts:
  - Road Degradation: Less traffic on the roads means that the rate of degradation to the roads will be less. However, the maintenance of the roads will not be augmented by the proposed development. Improved maintenance of the roads will improve the quality of life for the road users and could increase the economic opportunities in the area. The status quo is therefore rated as of low negative significance.
  - Road Safety: Less traffic on the roads means less probability of an incident, reducing the likelihood of a fatality. Therefore, the impact is neutral.
  - Statement: The improved road maintenance counteracts the negative impacts on the road network due to the development and economic prospects the development will bring to the local community and the impact the development has on a national scale.

■ Visual

- The No-Go alternative would result in no visual impacts and thus the status quo would remain.

## 5 GOVERNANCE FRAMEWORK

### 5.1 NATIONAL LEGAL AND REGULATORY FRAMEWORK

The South African regulatory framework establishes well-defined requirements and standards for environmental and social management of industrial and civil infrastructure developments. Different authorities at both national and regional levels carry out environmental protection functions. The applicable legislation and policies are shown in **Table 5-1**.

**Table 5-1 – Applicable National Legislation<sup>2</sup>**

Legislation	Description of Legislation and Applicability
The Constitution of South Africa (No. 108 of 1996)	The Constitution cannot manage environmental resources as a stand-alone piece of legislation hence additional legislation has been promulgated in order to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations are designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld in an on-going basis throughout the country. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.
National Environmental Management Act (No. 107 of 1998)	<p>In terms of Section 24(2) of the NEMA, the Minister may identify activities, which may not commence without prior authorisation. The Minister thus published GNR 983 (as amended) (Listing Notice 1), GNR 984 (as amended) (Listing Notice 2) and GNR 985 (as amended) (Listing Notice 3) listing activities that may not commence prior to authorisation.</p> <p>The regulations outlining the procedures required for authorisation are published in the EIA Regulations of 2014 (GNR 982) (as amended). Listing Notice 1 identifies activities that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 2 identifies activities that require an S&amp;EIR process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 3 identifies activities within specific areas that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity.</p> <p>WSP undertook a legal review of the listed activities according to the proposed project description to conclude that the activities listed in in this section are considered applicable to the development: A S&amp;EIR process must be followed. An EA is required and will be applied for with the DFFE.</p>
Listing Notice 1: GNR 983	<b>Activity 11</b>

<sup>2</sup> It should be noted that all dimensions outlined in relation to Listing Notice 1, 2 and 3 are provisional and are subject to final design.

Legislation	Description of Legislation and Applicability
	<p><i>The development 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 33 but less than 275 kilovolts</i></p> <p><b>Description:</b></p> <p>The site is currently zoned as agricultural land and falls outside the urban area. The Mura 2 Solar PV Facility will include up to two solar farm substations, and one BESS substation, of up to 132 kV each and internal underground cables of up to 132 kV.</p>
	<p><b>Activity 12</b></p> <p><i>The development of—</i></p> <p><i>(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs—</i></p> <p><i>(a) within a watercourse; or</i></p> <p><i>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse</i></p> <p><b>Description:</b></p> <p>The Mura 2 Solar PV Facility will have internal underground cables and internal gravel roads that will have an up to 4m wide driving surface and may require side drains on one or both sides. During construction the access roads may be up to 12m wide but this will be a temporary impact and rehabilitated following the construction phase. The internal underground cables, internal gravel roads and access roads may require a total construction area of more than 100m<sup>2</sup> within 32 m of a watercourse.</p>
	<p><b>Activity 14</b></p> <p><i>The development and related operation 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 80 but not exceeding 500 cubic metres</i></p> <p><b>Description:</b></p> <p>The solar facility would erect temporary fuel (and lubricants) and powder cement storage facilities during the construction phase. The combined storage capacity of all of the above facilities/infrastructure will exceed 80m<sup>3</sup> but will be below 500m<sup>3</sup>.</p>
	<p><b>Activity 19</b></p> <p><i>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.</i></p>

Legislation	Description of Legislation and Applicability
	<p><b>Description:</b></p> <p>Internal underground cables, internal gravel roads and the access roads, including stormwater control infrastructure, will collectively require the excavation, infilling or removal of soil exceeding 10m<sup>3</sup> from delineated watercourses on site.</p>
	<p><b>Activity 28</b></p> <p><i>Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:</i></p> <p><i>(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 ha;</i></p> <p><b>Description:</b></p> <p>The proposed site is zoned as agricultural land and will continue to be used for agricultural purposes should the proposed project receive environmental authorisation. The project extent of Mura 2 Solar PV Facility is 506 ha. This area will be fully transformed with solar panels or other supporting infrastructure (including the substations, BESS, building infrastructure, internal underground cables, internal gravel access roads, fencing, panel maintenance and cleaning area, stormwater management system and construction work area or the access roads).</p>
	<p><b>Activity 56</b></p> <p><i>The widening of a road by more than 6 m, or lengthening of a road by more than 1 km –</i></p> <p><i>(ii) where no reserve exists, where the existing road is wider than 8 metres;</i></p> <p><b>Description:</b></p> <p>Existing roads may require widening of up to 12 m during construction accommodate the movement of heavy vehicles.</p>
Listing Notice 2: GNR 984	<p><b>Activity 1</b></p> <p><i>The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs:</i></p> <p><i>(a) within an urban area; or</i></p> <p><i>(b) on existing infrastructure.</i></p> <p><b>Description:</b></p> <p>The Mura 2 Solar PV Facility will generate up to 400 MW of electricity output from a renewable resource.</p>



Legislation	Description of Legislation and Applicability
	<p><b>Activity 15</b></p> <p><i>The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for—</i></p> <p><i>(i) the undertaking of a linear activity; or</i></p> <p><i>(ii) maintenance purposes undertaken in accordance with a maintenance management plan</i></p> <p><b>Description:</b></p> <p>The project extent of Mura 2 Solar PV Facility is 506 ha. This area will be fully transformed. It is likely that at least 20 ha of indigenous vegetation will be removed.</p>
Listing Notice 3: GNR 985	<p><b>Activity 4</b></p> <p><i>The development of a road wider than 4 metres with a reserve less than 13,5 metres.</i></p> <p><i>In i. Western Cape:</i></p> <p><i>ii. Areas outside urban areas</i></p> <p><i>(aa) Areas containing indigenous vegetation</i></p> <p><b>Description:</b></p> <p>The Mura 2 Solar PV Facility will have internal gravel roads that will have an up to 4 m wide driving surface and may require side drains on one or both sides. During construction, the access roads may be up to 12 m wide but this will be a temporary impact and rehabilitated following the construction phase.</p> <p><b>Activity 18:</b></p> <p><i>The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.</i></p> <p><i>In i. Western Cape:</i></p> <p><i>ii. All areas outside urban areas:</i></p> <p><i>(aa) Areas containing indigenous vegetation</i></p> <p><b>Description:</b></p> <p>Existing roads may require widening of up to 12 m during construction, to accommodate the movement of heavy vehicles, this will be a temporary impact. The widening of the roads may take place in areas containing indigenous vegetation.</p>
Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes (GNR 320, 20	<p>The protocols provide the criteria for specialist assessment and minimum report content requirements for impacts for various environmental themes for activities requiring environmental authorisation. The protocols replace the requirements of Appendix 6 of the EIA Regulations, 2014, as amended. The assessment and reporting requirements of the protocols are associated</p>

Legislation	Description of Legislation and Applicability
March 2020 and GNR 1150, 30 October 2020)	<p>with a level of environmental sensitivity identified by the national web based environmental screening tool (screening tool).</p> <p>The following environmental themes were applicable to the Mura 2 Solar PV Facility:</p> <ul style="list-style-type: none"> <li>■ Agriculture Theme</li> <li>■ Animal Species Theme</li> <li>■ Aquatic Biodiversity Theme</li> <li>■ Archaeological and Cultural Heritage Theme</li> <li>■ Avian Theme</li> <li>■ Civil Aviation (Solar PV) Theme</li> <li>■ Defence Theme</li> <li>■ Landscape (Solar) Theme</li> <li>■ Palaeontology Theme</li> <li>■ Plant Species Theme</li> <li>■ Radio Frequency Interference (RFI) Theme</li> <li>■ Terrestrial Biodiversity Theme</li> </ul>
Renewable Energy Development Zones and Strategic Transmission Corridors	<p>On 16 February 2018, the DFFE gazetted the Renewable Energy Development Zones (REDZs) and Strategic Transmission Corridors and Procedures for the Assessment of Large-scale Wind and Solar Photovoltaic Energy Development Activities (GN 114) and Grid Infrastructure (GN 113). Subsequently, on 26 February 2021 a further three REDZ were gazetted (GN 142).</p> <p>The procedure allows for wind and solar PV activities within the eight REDZs and electricity grid development within the five power corridors to be subjected to a BA and not a full S&amp;EIA process. In addition, the timeframes associated with the decision on the application is reduced from 107 days to 57 days.</p> <p><b>The Mura 2 Solar PV Facility is not located within a REDZ but is located within the Central Strategic Corridor.</b></p>
National Environmental Management: Waste Act (59 of 2008) (NEM:WA)	<p>This Act provides for regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation. The Act also provides for the licensing and control of waste management activities through GNR. 921 (2013): List of Waste Management Activities that Have, or are Likely to Have, a Detrimental Effect on the Environment.</p> <p>The proposed project does not constitute a Listed Activity requiring a Waste Management Licence (WML) as defined in GNR 921.</p> <p>However, the contents of this Scoping Report will include reasonable measures for the prevention of pollution and good international industry practice (GIIP).</p>
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	<p>The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) was promulgated in June 2004 within the framework of NEMA to provide for the management and conservation of national biodiversity. The NEMBA's primary aims are for the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources. In</p>

Legislation	Description of Legislation and Applicability
	<p>addition, the NEMBA provides for the establishment and functions of a South African National Biodiversity Institute (SANBI).</p> <p>SANBI was established by the NEMBA with the primary purpose of reporting on the status of the country's biodiversity and conservation status of all listed threatened or protected species and ecosystems.</p> <p>The terrestrial biodiversity assessment (<b>Appendix G.3</b>) identifies an isolated CBA in the corner of the Mura 2 footprint area. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives.</p> <p>The Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) Regulations with regards to alien and invasive species have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014. Specific management measures for the control of alien and invasive plants will be included in the Environmental Management Programme (EMPr).</p>
National Environmental Management Protected Areas Act (No. 57 of 2003)	<p>The purpose of the National Environmental Management Protected Areas Act (No. 57 of 2003) (NEMPAA) is to, <i>inter alia</i>, provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. To this end, it provides for the declaration and management of various types of protected areas.</p> <p>Section 50(5) of NEMPAA states that “no development, construction or farming may be permitted in a nature reserve or world heritage site without the prior written approval of the management authority.”</p> <p>According to the National Parks Area Expansion Strategy (NPAES), there are no areas within the study area that have been identified as priority areas for inclusion in future protected areas. The study area is therefore outside the NPAES focus area.</p>
The National Water Act (No. 36 Of 1998)	<p>The National Water Act, 1998 (Act No. 36 of 1998) (NWA) provides the framework to protect water resources against over exploitation and to ensure that there is water for social and economic development, human needs and to meet the needs of the aquatic environment.</p> <p>The Act defines water source to include watercourses, surface water, estuary or aquifer. A watercourse is defined in the Act as a river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which or from which water flows, and any collection of water that the Minister may declare a watercourse.</p> <p>Section 21 of the Act outlines a number of categories that require a water user to apply for a Water Use License (WUL) and Section 22 requires water users to apply for a General Authorisation (GA) with the Department of Water and Sanitation (DWS) if they are under certain thresholds or meet certain criteria. The list of water uses applicable to the proposed Project include:</p> <ul style="list-style-type: none"> <li>a) Taking water from a water resource;</li> <li>c) Impeding or diverting the flow of water in a watercourse;</li> </ul>

Legislation	Description of Legislation and Applicability
	<p>g) Disposing of waste in a manner which may detrimentally impact on a water resource;</p> <p>i) Altering the bed, banks, course or characteristics of a watercourse;</p> <p>The DWS will make the final decision on water uses that are applicable to the project through a pre-application meeting after which a Water Use Authorisation Application (WUA) as determined by the risk assessment will be undertaken in compliance with procedural regulations published by the DWS within General Notice 267 (GN267). These regulations specify required information per water use and the reporting structure of required supporting technical information.</p>
<p>The National Heritage Resources Act (No. 25 Of 1999)</p>	<p>The National Heritage Resource Act (Act No. 25 of 1999) (NHRA) serves to protect national and provincial heritage resources across South Africa. The NHRA provides for the protection of all archaeological and palaeontological sites, the conservation and care of cemeteries and graves by the South African Heritage Resources Agency (SAHRA) and lists activities that require any person who intends to undertake to notify the responsible heritage resources agency and furnish details regarding the location, nature, and extent of the proposed development.</p> <p>Part 2 of the NHRA details specific activities that require a Heritage Impact Assessment (HIA) that will need to be approved by SAHRA. Parts of Section 35, 36 and 38 apply to the proposed project, principally:</p> <ul style="list-style-type: none"> <li>■ Section 35 (4) - No person may, without a permit issued by the responsible heritage resources authority- <ul style="list-style-type: none"> <li>• destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;</li> <li>• destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite.</li> </ul> </li> <li>■ Section 38 (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as- <ul style="list-style-type: none"> <li>• any development or other activity which will change the character of a site— (i) exceeding 5 000 m<sup>2</sup> in extent, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.</li> </ul> </li> </ul> <p>In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the proposed Mura 2 Solar PV Facility, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668).</p> <p>A Heritage Report (<b>Appendix G.8</b>) has been carried out by a suitably qualified specialist, revealing:</p>

Legislation	Description of Legislation and Applicability
	<ul style="list-style-type: none"> <li>Line of planted stones within the Mura 2 study area, which relate to earlier farming activities in the area.</li> </ul> <p>The proposed project will be loaded onto the SAHRIS portal for comment by SAHRA and HWC.</p>
<p>Noise Control Regulations in terms of the Environmental Conservation, 1989 (Act 73 of 1989)</p>	<p>In South Africa, environmental noise control has been in place for three decades, beginning in the 1980s with codes of practice issued by the South African National Standards (formerly the South African Bureau of Standards, SABS) to address noise pollution in various sectors of the country. Under the previous generation of environmental legislation, specifically the Environmental Conservation Act 73 of 1989 (ECA), provisions were made to control noise from a National level in the form of the Noise Control Regulations (GNR 154 of January 1992). In later years, the ECA was replaced by the National Environmental Management Act 107 of 1998 (NEMA) as amended. The National Environmental Management: Air Quality Act 39 of 2004 (NEMAQA) was published in line with NEMA and contains noise control provisions under Section 34:</p> <p>(1) The minister may prescribe essential national standards –</p> <p>(a) for the control of noise, either in general or by specific machinery or activities or in specified places or areas; or</p> <p>(b) for determining –</p> <p>(i) a definition of noise; and</p> <p>(ii) the maximum levels of noise.</p> <p>(2) When controlling noise, the provincial and local spheres of government are bound by any prescribed national standards.</p> <p>Under NEMAQA, the Noise Control Regulations were updated and are to be applied to all provinces in South Africa. The Noise Control Regulations give all the responsibilities of enforcement to the Local Provincial Authority, where location specific by-laws can be created and applied to the locations with approval of Provincial Government. Where province-specific regulations have not been promulgated, acoustic impact assessments must follow the Noise Control Regulations.</p> <p>Furthermore, NEMAQA prescribes that the Minister must publish maximum allowable noise levels for different districts and national noise standards. These have not yet been accomplished and as a result all monitoring and assessments are done in accordance with the South African National Standards (SANS) 10103:2008 and 10328:2008.</p>
<p>National Environment Management Air Quality Act (No. 39 of 2004)</p>	<p>The National Environment Management: Air Quality Act (No. 39 of 2004) (NEMAQA) came into effect on 11 September 2005. Persons undertaking such activities listed under GNR 893, as amended, are required to possess an Atmospheric Emissions License (AEL).</p> <p>The National Dust Control Regulations (GNR 827) were promulgated in terms of Section 32 of NEMAQA, which aim at prescribing general measures for the control of dust in both residential and non-residential areas.</p> <p>Although no AEL will be required for the construction and operation of the Mura 2 Solar PV Facility, the dust control regulations will be applicable during construction.</p>

Legislation	Description of Legislation and Applicability
Conservation of Agricultural Resources Act (No. 43 of 1983)	<p>The Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) provides for the implementation of control measures for soil conservation works as well as alien and invasive plant species in and outside of urban areas.</p> <p>In terms of the amendments to the regulations under the CARA, landowners are legally responsible for the control of alien species on their properties. Various Acts administered by the DFFE and the DWS, as well as other laws (including local by-laws), spell out the fines, terms of imprisonment and other penalties for contravening the law. Although no fines have yet been placed against landowners who do not remove invasive species, the authorities may clear their land of invasive alien plants and other alien species entirely at the landowners' cost and risk.</p> <p>The CARA Regulations with regards to alien and invasive species have been superseded by NEMBA Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014.</p>
Civil Aviation Act (No. 13 of 2009)	<p>Civil aviation in South Africa is governed by the Civil Aviation Act (Act 13 of 2009). This Act provides for the establishment of a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. This mandate is fulfilled by South African Civil Aviation Authority (SACAA) as an agency of the Department of Transport (DoT). SACAA achieves the objectives set out in the Act by complying with the Standards and Recommended Practices (SARPs) of the International Civil Aviation Organisation (ICAO), while considering the local context when issuing the South African Civil Aviation Regulations (SA CARs).</p> <p>As of the 1st of May 2021, Air Traffic and Navigation Services (ATNS) has been appointed as the new Obstacle application Service Provider for Windfarms and later Solar Plants. Their responsibility would pertain to the assessments, maintenance, and all other related matters in respect to Windfarms and in due time Power Plant assessments.</p> <p>The DFFE Screening Tool Report identified Civil Aviation as having low sensitivity for the proposed Mura 2 Solar PV Facility, and no major or other types of civil aviation aerodromes.</p> <p>ATNS and SACAA will be included on the project stakeholder database. They will be informed of the proposed Project, and comment will be sought from these authorities as applicable.</p>
Occupational Health and Safety Act (No. 85 of 1993)	<p>The National Occupational Health and Safety Act (No. 85 of 1993) (OHSA) and the relevant regulations under the Act are applicable to the proposed project. This includes the Construction Regulations promulgated in 2014 under Section 43 of the Act. Adherence to South Africa's OHSA and its relevant Regulations is essential.</p>
National Energy Act (No. 34 of 2008)	<p>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.</p>



Legislation	Description of Legislation and Applicability
	<p>The main objectives of the Act are to:</p> <ul style="list-style-type: none"> <li>■ Ensure uninterrupted supply of energy to the Republic;</li> <li>■ Promote diversity of supply of energy and its sources;</li> <li>■ Facilitate effective management of energy demand and its conservation;</li> <li>■ Promote energy research;</li> <li>■ Promote appropriate standards and specifications for the equipment, systems and processes used for producing, supplying and consuming energy;</li> <li>■ Ensure collection of data and information relating to energy supply, transportation and demand;</li> <li>■ Provide for optimal supply, transformation, transportation, storage and demand of energy that are planned, organised and implemented in accordance with a balanced consideration of security of supply, economics, consumer protection and a sustainable development;</li> <li>■ Provide for certain safety, health and environment matters that pertain to energy;</li> <li>■ Facilitate energy access for improvement of the quality of life of the people of Republic;</li> <li>■ Commercialise energy-related technologies;</li> <li>■ Ensure effective planning for energy supply, transportation, and consumption; and</li> <li>■ Contribute to sustainable development of South Africa's economy.</li> </ul> <p>In terms of the act, the Minister of Energy is mandated to develop and, on an annual basis, review and publish the Integrated Energy Plan (IEP) in the Government Gazette. The IEP analyses current energy consumption trends within different sectors of the economy (i.e. agriculture, commerce, industry, residential and transport) and uses this to project future energy requirements, based on different scenarios. The IEP and the Integrated Resource Plan are intended to be updated periodically to remain relevant. The framework is intended to create a balance between energy demand and resource availability so as to provide low-cost electricity for social and economic development, while taking into account health, safety and environmental parameters.</p>
Electricity Regulation Act (No. 4 of 2006)	<p>The Electricity Regulation Act (No. 4 of 2006) (ERA) aims to:</p> <ul style="list-style-type: none"> <li>■ Achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa;</li> <li>■ Ensure that the interests and needs of present and future electricity customers and end users are safeguarded and met, having regard to the governance, efficiency, effectiveness and long-term sustainability of the electricity supply industry within the broader context of economic energy regulation in the Republic;</li> <li>■ Facilitate investment in the electricity supply industry;</li> <li>■ Facilitate universal access to electricity;</li> <li>■ Promote the use of diverse energy sources and energy efficiency;</li> <li>■ Promote competitiveness and customer and end user choice; and</li> <li>■ Facilitate a fair balance between the interests of customers and end users, licensees, investors in the electricity supply industry and the public.</li> </ul> <p>The Act establishes a National Energy Regulator as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licenses and registration as the manner in which generation,</p>



Legislation	Description of Legislation and Applicability
	transmission, distribution, trading and the import and export of electricity are regulated.

## 5.2 POLICIES AND PLANS

**Table 5-2** summarised key policies and plans as an outline of the governance framework for the project.

**Table 5-2 – Applicable Regional Policies and Plans**

Applicable Policy	Description of Policy
National Development Plan	<p>The National Development Plan aims to eliminate poverty and reduce inequality by 2030. The NDP identifies a number of enabling milestones. Of relevance to the proposed development the NDP refers to the need to produce sufficient energy to support industry at competitive prices and ensure access for poor households, while reducing carbon emissions per unit of power by about one-third. In this regard the infrastructure is not just essential for faster economic growth and higher employment. It also promotes inclusive growth, providing citizens with the means to improve their own lives and boost their incomes. Infrastructure is essential to development.</p> <p>Chapter 3, Economy and Employment, identifies some of the structural challenges specific to South Africa, including an energy constraint that will act as a cap on growth and on options for industrialisation. The NDP notes that from an environmental perspective South Africa faces several related challenges. The reduction of greenhouse gas emissions and shift to a green low-carbon economy, is one of these challenges.</p> <p>In terms of implementation the NDP identifies three phases. The first two are of specific relevance to the proposed project. The first phase (2012–2017) notes that ensuring the supply of energy and water is reliable and sufficient for a growing economy. The second phase (2018–2023) involves building on the first phase to lay the foundations for more intensive improvements in productivity. The provision of affordable and reliable energy is a key requirement for this to take place.</p> <p>Chapter 4, Economic infrastructure, notes that economic infrastructure provides the foundation for social and economic development. In this regard South Africa must invest in a strong network of economic infrastructure designed to support the country's medium- and long-term economic and social objectives. The plan envisages that, by 2030, South Africa will have an energy sector that promotes:</p> <ul style="list-style-type: none"> <li>■ Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation.</li> <li>■ Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change. More specifically, South Africa should have adequate supply security in electricity and in liquid fuels, such that economic activity, transport, and welfare are not disrupted.</li> </ul>

Applicable Policy	Description of Policy
	<p>The plan sets out steps that aim to ensure that, in 20 years, South Africa's energy system looks very different to the current situation. In this regard coal will contribute proportionately less to primary-energy needs, while gas and renewable energy resources, will play a much larger role.</p>
Integrated Resource Plan 2010 – 2030	<p>The IRP is an electricity capacity plan which aims to provide an indication of the country's electricity demand, how this demand will be supplied and what it will cost. On 6 May 2011, the then Department of Energy (DoE) released the Integrated Resource Plan 2010-2030 (IRP 2010) in respect of South Africa's forecast energy demand for the 20-year period from 2010 to 2030. The promulgated IRP 2010–2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development.</p> <p>The IRP recognises that solar PV, wind and CSP with storage present an opportunity to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Renewable technologies also present huge potential for the creation of new industries, job creation and localisation across the value chain.</p>
New Growth Path	<p>Government released the New Economic Growth Path Framework on 23 November 2010. The aim of the framework is to enhance growth, employment creation and equity. The policy's principal target is to create five million jobs over the next 10 years and reflects government's commitment to prioritising employment creation in all economic policies. The framework identifies strategies that will enable South Africa to grow in a more equitable and inclusive manner while attaining South Africa's developmental agenda. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. In this regard the framework identifies investments in five key areas namely: energy, transport, communication, water, and housing.</p>
National Infrastructure Plan	<p>The South African Government adopted a National Infrastructure Plan (NIP) in 2012. The NIP aims to transform the South African economic landscape while simultaneously creating significant numbers of new jobs and strengthening the delivery of basic services. It outlines the challenges and enablers which needs to be addressed in the building and developing of infrastructure. The Presidential Infrastructure Coordinating Commission (PICC) was established by the Cabinet to integrate and coordinate the long-term infrastructure build.</p> <p>The plan also supports the integration of African economies. In terms of the plan Government will invest R827 billion over the next three years to build new and upgrade existing infrastructure. The aim of the investments is to improve access by South Africans to healthcare facilities, schools, water, sanitation, housing and electrification. The plan also notes that investment in the construction of ports, roads, railway systems, electricity plants, hospitals, schools and dams will contribute to improved economic growth.</p>
Integrated Energy Plan	<p>The development of a National IEP was envisaged in the White Paper on the Energy Policy of the Republic of South Africa of 1998 and, in terms of the National Energy Act, 2008 (Act No. 34 of 2008), the Minister of Energy is mandated to develop and, on an annual basis, review and publish the IEP in the Government Gazette. The purpose of the IEP is to provide a</p>

Applicable Policy	Description of Policy
	<p>roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development.</p> <p>The IEP notes that South Africa needs to grow its energy supply to support economic expansion and in so doing, alleviate supply bottlenecks and supply-demand deficits. In addition, it is essential that all citizens are provided with clean and modern forms of energy at an affordable price. As part of the Integrated Energy Planning process, eight key objectives are identified, namely:</p> <ul style="list-style-type: none"> <li>■ Objective 1: Ensure security of supply.</li> <li>■ Objective 2: Minimise the cost of energy.</li> <li>■ Objective 3: Promote the creation of jobs and localisation.</li> <li>■ Objective 4: Minimise negative environmental impacts from the energy sector.</li> <li>■ Objective 5: Promote the conservation of water.</li> <li>■ Objective 6: Diversify supply sources and primary sources of energy.</li> <li>■ Objective 7: Promote energy efficiency in the economy.</li> <li>■ Objective 8: Increase access to modern energy.</li> </ul> <p>The IEP provides an assessment of current energy consumption trends within different sectors of the economy (i.e., agriculture, commerce, industry, residential and transport) and uses this information to identify future energy requirements, based on different scenarios. The scenarios are informed by different assumptions on economic development and the structure of the economy and also take into account the impact of key policies such as environmental policies, energy efficiency policies, transport policies and industrial policies, amongst others.</p> <p>Based on this information the IEP then determines the optimal mix of energy sources and technologies to meet those energy needs in the most cost-effective manner for each of the scenarios. The associated environmental impacts, socio-economic benefits and macroeconomic impacts are also analysed. The IEP is therefore focused on determining the long-term energy pathway for South Africa, taking into account a multitude of factors which are embedded in the eight objectives.</p> <p>As part of the analysis four key scenarios were developed, namely the Base Case, Environmental Awareness, Resource Constrained and Green Shoots scenarios:</p> <ul style="list-style-type: none"> <li>■ The Base Case Scenario assumes that existing policies are implemented and will continue to shape the energy sector landscape going forward. It assumes moderate economic growth in the medium to long term.</li> <li>■ The Environmental Awareness Scenario is characterised by more stringent emission limits and a more environmentally aware society, where a higher cost is placed on externalities caused by the supply of energy.</li> <li>■ The Resource Constrained Scenario in which global energy commodity prices (i.e. coal, crude oil and natural gas) are high due to limited supply.</li> <li>■ The Green Shoots Scenario describes an economy in which the targets for high economic growth and structural changes to the economy, as set out in the National Development Plan (NDP), are met.</li> </ul> <p>The IEP notes that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources. In terms of existing electricity generation capacity, the IEP</p>

Applicable Policy	Description of Policy
	<p>indicates that existing capacity starts to decline notably from 2025, with significant plant retirement occurring in 2031, 2041 and 2048. By 2050 only 20% of the current electricity generation capacity remains. As a result, large investments are required in the electricity sector in order to maintain an adequate supply in support of economic growth.</p> <p>By 2020, various import options become available, and some new coal capacity is added along with new wind, solar and gas capacity. The mix of generation capacity technologies by 2050 is considerably more diverse than the current energy mix, across all scenarios. The main differentiating factors between the scenarios are the level of demand, constraints on emission limits and the carbon dioxide externality costs. In all scenarios the energy mix for electricity generation becomes more diverse over the period to 2050, with coal reducing its share from about 85% in 2015 to 15–20% in 2050 (depending on the scenario). Solar, wind, nuclear, gas and electricity imports increase their share. The Environmental Awareness and Green Shoots scenarios take on higher levels of renewable energy.</p> <p>An assessment of each scenario against the eight objectives with reference to renewable energy notes while all scenarios seek to ensure that costs are minimised within the constraints and parameters of each scenario, the Base Case Scenario presents the least cost followed by the Environmental Awareness, Resource Constrained and Green Shoots scenarios respectively when total energy system costs are considered. In terms of promoting job creation and localisation potential the Base Case Scenario presents the greatest job creation potential, followed by the Resource Constrained, Environmental Awareness and Green Shoots scenarios respectively. In all scenarios, approximately 85% of total jobs are localisable. For electricity generation, most jobs result from solar technologies followed by nuclear and wind, with natural gas and coal making a smaller contribution. The Environmental Awareness Scenario, due to its stringent emission constraints, shows the lowest level of total emissions over the planning horizon. This is followed by the Green Shoots, Resource Constrained and Base Case scenarios. These trends are similar when emissions are considered cumulatively and individually by type.</p>
National Protected Area Expansion Strategy, 2010	<p>The National Protected Area Expansion Strategy 2010 (NPAES) areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2010). According to the NPAES, there are no areas within the study area that have been identified as priority areas for inclusion in future protected areas. The study area is therefore outside the NPAES focus area.</p>

## 5.3 PROVINCIAL AND MUNICIPAL LEGAL AND REGULATORY FRAMEWORK

**Table 5-3 – Provincial Plans**

Applicable Plan	Description of Plan
<b>Western Cape Nature Conservation Laws Amendment Act (Act No 3 of 2000):</b>	<p>This Act lists Protected species, requiring permits for removal (CapeNature) relating to The Nature and Environmental Conservation Ordinance, 1974.</p>
<b>Western Cape Spatial Development Framework (2014)</b>	<p>The Western Cape Provincial Spatial Development Framework, 2014 (PSDF) is an approved structure plan in terms of the Spatial Planning and Land Use Management Act (Act 16 of 2013) (SPLUMA) and the Land Use Planning Act (Act 3 of 2014) (LUPA) and aims to give spatial expression to the NDP and One Cape 2040 initiatives. It provides guidelines for district, metropolitan and local municipal spatial initiatives such as Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs).</p> <p>The PSDF is a broad-based document and does not control development or land use proposals at a micro-scale (e.g. individual properties). It is, however, relevant in setting out overarching planning policy guidelines adopted by the Provincial Government, and major development applications need to take guidance from and be evaluated in terms of these policy guidelines.</p> <p>The Western Cape PSDF is underpinned by three interrelated themes, namely:</p> <ul style="list-style-type: none"> <li>■ Sustainable use of the Western Cape's spatial assets (resources);</li> <li>■ Opening up opportunities in the Provincial space-economy (space economy); and</li> <li>■ Developing integrated and sustainable settlements (settlement).</li> </ul> <p>The WCPSPDF also includes the following spatial agenda:</p> <ul style="list-style-type: none"> <li>■ Grow the Province's economy in partnership with the private sector, non-government and community based organisations;</li> <li>■ Use infrastructure investment as the primary lever to ensure urban and rural spatial transitions; and</li> <li>■ Improve the sustainable use of the Province's spatial assets and resources.</li> </ul> <p>Key spatial challenges are outlined in Chapter 2 of the PSDF. Energy security and climate change response are identified as key high-level future risk factors. With regard to energy use, the PSDF notes that the Cape Metro (albeit the province's most efficient user) and West Coast regions are the Province's main energy users. It further notes that the Western Cape's electricity is primarily drawn from the national grid, which is dominated by coal-based power stations, and that the province currently has a small emergent renewable energy sector in the form of wind and solar generation facilities located in its more rural, sparsely populated areas. With regard to renewable energy, the following policy provisions are of relevance:</p> <ul style="list-style-type: none"> <li>■ Policy R.4.6: Pursue energy diversification and energy efficiency in order for the Western Cape to transition to a low carbon, sustainable energy future, and delink economic growth from energy use.</li> <li>■ R.4.7: Support emergent Independent Power Producers (IPPs) and sustainable energy producers (wind, solar, biomass and waste conversion initiatives) in suitable rural locations (as per recommendations of the Strategic Environmental Assessments for wind energy (DEA&amp;DP) and renewable energy (DFFE).</li> </ul> <p>Water scarcity is identified as probably the key risk associated with climate change. Policy provisions are made with regard to climate change</p>

Applicable Plan	Description of Plan
	<p>adaptation and mitigation. Concerning renewable energy, the following is of relevance:</p> <ul style="list-style-type: none"> <li>■ R.4.16: Encourage and support renewable energy generation at scale.</li> </ul>
<b>Western Cape Infrastructure Framework (2013)</b>	<p>The Western Cape Infrastructure Framework (WCIF) (2013) was developed by the WCP Provincial Department of Transport and Public Works in terms of the Provincial Government's mandate to coordinate provincial planning under Schedule 5A of the Constitution. The objective of the WCIF is to align the planning, delivery and management of infrastructure to the strategic agenda and vision for the province, as outlined in the 2009-2014 Draft Provincial Strategic Plan. The One Cape 2040 and 2013 Green is Smart strategy were other key informants.</p> <p>The document notes that given the status quo of infrastructure in the province, and the changing and uncertain world facing the Western Cape over the 2-3 decades a new approach to infrastructure is needed. Namely one that satisfies current needs and backlogs, maintains the existing infrastructure, and plans proactively for a desired future outcome. The 2040 vision requires a number of transitions to shift fundamentally the way in which infrastructure is provided and the type of infrastructure provided in WCP.</p> <p>The WCIF addresses new infrastructure development under five major 'systems' (themes), and outlines priorities for each. Energy is one of the 'systems' identified. The document notes that a provincial demand increase of 3% per year is anticipated for the period 2012-2040. Key priorities are in matching energy generation/ sourcing with the demand needed for WCP economic growth. Additionally, the energy focus should be on lowering the provincial carbon footprint, with an emphasis on renewable and locally generated energy.</p> <p>Three key transitions are identified for the WCP Energy 'system' infrastructure, namely:</p> <ul style="list-style-type: none"> <li>■ Shifting transport patterns to reduce reliance on liquid fuels.</li> <li>■ Promoting natural gas as a transition fuel by introducing gas processing and transport infrastructure.</li> <li>■ Promoting the development of renewable energy plants in the province and associated manufacturing capacity</li> </ul>
<b>Central Karoo District Municipality IDP 2017-2022, 2nd Review 2021–2022</b>	<p>At the district level, the IDP highlights the following projects, identified in the District LED Strategy:</p> <ul style="list-style-type: none"> <li>■ Infrastructure development to increase access for businesses and households;</li> <li>■ Business support programmes to retain existing businesses and encourage start-up or relocating businesses to enter the area;</li> <li>■ Spatial planning to promote land acquisition and property development for businesses and households;</li> <li>■ Skills programmes to respond to business and government for greater productivity and efficiency; and</li> <li>■ Social development programmes to increase participation in the local economy and build better lifestyles for the community.</li> </ul>



Applicable Plan	Description of Plan
	The CKDM IDP goes on to mention the importance of establishing an LED unit to coordinate activities, as well as the Economic Recovery Plan being drafted to respond to the economic impact of the COVID-19 pandemic.
<b>Beaufort West Local Municipality 2021-2022 review of the 2017-2022 IDP</b>	<p>In terms of future economic development goals, the 2021-2022 review of the 2017-2022 IDP is most instructive. According to this plan, the Municipal Strategic Programme is aligned to 5 Key Performance Areas:</p> <ul style="list-style-type: none"> <li>■ KPA 1: Basic service delivery and infrastructure development</li> <li>■ KPA 2: Economic development</li> <li>■ KPA 3: Institutional development and municipal transformation</li> <li>■ KPA 4: Financial viability and management</li> <li>■ KPA 5: Good governance and community participation</li> </ul> <p>KPA 2 above (economic development) is linked to the following strategies:</p> <ul style="list-style-type: none"> <li>■ To use municipal and government funded projects as means to create jobs and reduce poverty</li> <li>■ To facilitate development and growth of SMME's</li> <li>■ To establish and strengthen LED Structures</li> <li>■ To facilitate Education and Skills Development for Cooperatives &amp; SMME's</li> <li>■ To provide SMME Support and Capacity building</li> </ul> <p>To manage and enhance the performance of the municipality</p>

## 5.4 INTERNATIONAL STANDARDS AND GUIDELINES

### 5.4.1 IFC PERFORMANCE STANDARDS

The International Finance Corporation (IFC) is an international financial institution that offers investment, advisory, and asset management services to encourage private sector development in developing countries. The IFC is a member of the World Bank Group (WBG) and is headquartered in Washington, D.C., United States. It was established in 1956 as the private sector arm of the WBG to advance economic development by investing in strictly for-profit and commercial projects that purport to reduce poverty and promote development.

The IFC's stated aim is to create opportunities for people to escape poverty and achieve better living standards by mobilizing financial resources for private enterprise, promoting accessible and competitive markets, supporting businesses and other private sector entities, and creating jobs and delivering necessary services to those who are poverty-stricken or otherwise vulnerable. Since 2009, the IFC has focused on a set of development goals that its projects are expected to target. Its goals are to increase sustainable agriculture opportunities, improve health and education, increase access to financing for microfinance and business clients, advance infrastructure, help small businesses grow revenues, and invest in climate health.

The IFC is owned and governed by its member countries but has its own executive leadership and staff that conduct its normal business operations. It is a corporation whose shareholders are member governments that provide paid-in capital and which have the right to vote on its matters. Originally more financially integrated with the WBG, the IFC was established separately and eventually became authorized to operate as a financially autonomous entity and make independent investment decisions. It offers an array of debt and equity financing services and helps companies

face their risk exposures, while refraining from participating in a management capacity. The corporation also offers advice to companies on making decisions, evaluating their impact on the environment and society, and being responsible. It advises governments on building infrastructure and partnerships to further support private sector development.

The IFC's Sustainability Framework articulates the Corporation's strategic commitment to sustainable development and is an integral part of IFC's approach to risk management. The Sustainability Framework comprises IFC's Policy and Performance Standards on Environmental and Social Sustainability, and IFC's Access to Information Policy. The Policy on Environmental and Social Sustainability describes IFC's commitments, roles, and responsibilities related to environmental and social sustainability. IFC's Access to Information Policy reflects IFC's commitment to transparency and good governance on its operations and outlines the Corporation's institutional disclosure obligations regarding its investment and advisory services. The Performance Standards (PSs) are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), IFC requires its clients to apply the PSs to manage environmental and social risks and impacts so that development opportunities are enhanced. IFC uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation to achieve its overall development objectives. The PSs may also be applied by other financial institutions (FIs).

The Project is considered a Category B project in terms of the IFC Policy on E&S Sustainability (2012), having the potential to cause limited adverse environmental or social risks and/or impacts that are few in number, generally site specific, largely reversible, and readily addressed through mitigation measures.

The objectives and applicability of the eight PSs are outlined in **Table 5-4**.

**Table 5-4 – Objectives and Applicability of the IFC Performance Standards**

Reference	Requirements	Project Specific Applicability
<b>Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts</b>		
<b>Overview</b>	Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders.	
<b>Objectives</b>	<ul style="list-style-type: none"> <li>■ To identify and evaluate environmental and social risks and impacts of the project.</li> <li>■ To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.</li> <li>■ To promote improved environmental and social performance of clients through the effective use of management systems.</li> </ul>	

Reference	Requirements		Project Specific Applicability
	<ul style="list-style-type: none"><li>■ To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately.</li><li>■ To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.</li></ul>		
Aspects	1.1	Policy	The IFC Standards state under PS 1 (Guidance Note 23) that “the breadth, depth and type of analysis included in an ESIA must be proportionate to the nature and scale of the proposed project’s potential impacts as identified during the course of the assessment process.” This document is the draft deliverable from the S&EIA process undertaken for the proposed Project. The impact assessment comprehensively assesses the key environmental and social impacts and complies with the requirements of the South African EIA Regulations. In addition, an EMPr will be compiled during the EIA phase of the project.
	1.2	Identification of Risks and Impacts	
	1.3	Management Programmes	
	1.4	Organisational Capacity and Competency	
	1.5	Emergency Preparedness and Response	
	1.6	Monitoring and Review	
	1.7	Stakeholder Engagement	
	1.8	External Communication and Grievance Mechanism	
	1.9	Ongoing Reporting to Affected Communities	
Performance Standard 2: Labour and Working Conditions;			
Overview	Performance Standard 2 recognises that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers.		
Objectives	<ul style="list-style-type: none"><li>■ To promote the fair treatment, non-discrimination, and equal opportunity of workers.</li><li>■ To establish, maintain, and improve the worker-management relationship.</li><li>■ To promote compliance with national employment and labour laws.</li><li>■ To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client’s supply chain.</li><li>■ To promote safe and healthy working conditions, and the health of workers.</li><li>■ To avoid the use of forced labour.</li></ul>		
Aspects	2.1	<ul style="list-style-type: none"><li>■ Working Conditions and Management of Worker Relationship</li><li>■ Human Resources Policy and Management</li><li>■ Working Conditions and terms of Engagement</li><li>■ Workers organisation</li></ul>	Even though the nature and scale of the project is considered to be small, PS2 is considered applicable as a contractor will be appointed to undertake the required scope of work.  Whilst PS2 will be applicable to the Project, it is not intended to be addressed in detail at the EIA stage. Recommendations are provided concerning development of a detailed Human Resources (HR) and Occupational Health and Safety (OHS) system by the developer and its partners as the Project moves towards implementation. In

Reference	Requirements		Project Specific Applicability
		<ul style="list-style-type: none"><li>■ Non- Discrimination and Equal Opportunity</li><li>■ Retrenchment</li><li>■ Grievance Mechanism</li></ul>	addition, measures to address the Interim Advice for IFC Clients on Supporting Workers in the Context of COVID-19 are referenced.  The EMPr will incorporate the requirements for compliance with local and international Labour and Working legislation and good practice on the part of the contractors.
	2.2	<ul style="list-style-type: none"><li>■ Protecting the Workforce</li><li>■ Child Labour</li><li>■ Forced Labour</li></ul>	
	2.3	Occupational health and Safety	
	2.4	Workers Engaged by Third Parties	
	2.5	Supply Chain	
Performance Standard 3: Resource Efficiency and Pollution Prevention			
Overview	Performance Standard 3 recognises that increased economic activity and urbanisation often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world.		
Objectives	<ul style="list-style-type: none"><li>■ To avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities.</li><li>■ To promote more sustainable use of resources, including energy and water.</li><li>■ To reduce project related GHG emissions.</li></ul>		
Aspects	3.1	<ul style="list-style-type: none"><li>■ Policy Resource Efficiency</li><li>■ Greenhouse Gases</li><li>■ Water Consumption</li></ul>	PS3-related impacts, such as the management of construction waste, hazardous substances, and stormwater are assessed in <b>Section 8</b> of this report.  There are no material resource efficiency issues associated with the Project. The EMPr will include general resource efficiency measures.  The project is not GHG emissions intensive however a Climate Change Assessment has been undertaken and is included in <b>Appendix G.1</b> . The Mura 2 PV Facility seeks to facilitate resource efficiency and pollution prevention by contributing to the South African green economy.  Dust air pollution in the construction phase will be addressed in the EMPr.  The Project will not result in the release of industrial effluents.
	3.2	<ul style="list-style-type: none"><li>■ Pollution Prevention</li><li>■ Air Emissions</li><li>■ Stormwater</li><li>■ Waste Management</li><li>■ Hazardous Materials Management</li><li>■ Pesticide use and Management</li></ul>	

Reference	Requirements		Project Specific Applicability
			<p>Potential pollution associated with sanitary wastewater is low and mitigation measures will be included in the EMPr.</p> <p>Land contamination of the site from historical land use (i.e. low intensity agricultural / grazing) is not considered to be a cause for concern.</p> <p>The waste generation profile of the project is not complex. Waste mitigation and management measures will be included in EMPr.</p> <p>Hazardous materials are not a key issue; small quantities of construction materials (oil, grease, diesel fuel etc.) are the only wastes expected to be associated with the project. The EMPr will take these anticipated hazardous materials into account and recommend relevant mitigation and management measures.</p>
Performance Standard 4: Community Health, Safety, and Security			
Overview	Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts.		
Objectives	<ul style="list-style-type: none"><li>■ To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.</li><li>■ To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities</li></ul>		
Aspects	4.1	<ul style="list-style-type: none"><li>■ Community Health and Safety</li><li>■ Infrastructure and Equipment Design and Safety</li><li>■ Hazardous Materials Management and Safety</li><li>■ Ecosystem Services</li><li>■ Community Exposure to Disease</li><li>■ Emergency Preparedness and Response</li></ul>	<p>The requirements included in PS 4 will be addressed in the EIA process and the development of the EMPr.</p> <p>During the construction phase there will be an increase in vehicular traffic along public roads, largely due to the need for importation of construction material. Pedestrian and road safety risks will be qualitatively evaluated in the EIA process and the clients' standard safety and security measures, as well as potential additional measures recommended by WSP, will be detailed in the EMPr.</p>
	4.2	Security Personnel	
Performance Standard 5: Land Acquisition and Involuntary Resettlement			
Overview	Performance Standard 5 recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.		

Reference	Requirements		Project Specific Applicability
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To avoid, and when avoidance is not possible, minimise displacement by exploring alternative project designs.</li> <li>To avoid forced eviction.</li> <li>To anticipate and avoid, or where avoidance is not possible, minimise adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.</li> <li>To improve, or restore, the livelihoods and standards of living of displaced persons.</li> <li>To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.</li> </ul>		
<b>Aspects</b>	5.1	<ul style="list-style-type: none"> <li>Displacement</li> <li>Physical Displacement</li> <li>Economic Displacement</li> <li>Private Sector Responsibilities under Government Managed Resettlement</li> </ul>	<p>PS5 is not applicable to the proposed Mura 2 Solar PV Facility as no physical or economic displacement or livelihood restoration will be required.</p> <p>The proposed Mura 2 Solar PV Facility is located on privately owned land that is utilised for agriculture by the landowners. The significance of all potential agricultural impacts is kept low by the very small proportion of the land that is impacted. An Agricultural Potential Assessment has been undertaken and is included in <b>Appendix G.2</b>.</p>
<b>Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources</b>			
<b>Overview</b>	Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.		
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To protect and conserve biodiversity.</li> <li>To maintain the benefits from ecosystem services.</li> <li>To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.</li> </ul>		
<b>Aspects</b>	6.1	Protection and Conservation of Biodiversity	<p>The Mura 2 PV Facility overlaps with a small isolated CBA in the Eastern Corner of the footprint. A Terrestrial Biodiversity Compliance Statement as well as an Avifaunal Impact Assessment and Aquatic Biodiversity Impact Assessment have been included in the proposed scope.</p> <p>The methodologies for the specialist assessments include a combination of literature review, in-field surveys and sensitivity mapping. This substantively complies with the PS 6 general requirements for scoping and baseline assessment for determination of biodiversity and ecosystem services issues. The determination of habitat sensitivity was undertaken within the legal and best practice reference framework for South Africa.</p> <p>The prevalence of invasive alien species will be determined, and mitigation and management measures will be included in the EMP.</p>



Reference	Requirements	Project Specific Applicability	
Performance Standard 7: Indigenous People			
Overview	Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded.		
Objectives	<ul style="list-style-type: none"><li>■ To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.</li><li>■ To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.</li><li>■ To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.</li><li>■ To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle.</li><li>■ To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.</li><li>■ To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.</li></ul>		
Aspects	7.1	<div>General<ul style="list-style-type: none"><li>■ Avoidance of Adverse Impacts</li><li>■ Participation and Consent</li></ul></div>	As per the international instruments under the United Nations (UN) Human Rights Conventions, no indigenous peoples are present within the study area.
	7.2	<div>Circumstances Requiring Free, Prior, and Informed Consent<ul style="list-style-type: none"><li>■ Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use</li><li>■ Critical Cultural Heritage</li><li>■ Relocation of Indigenous Peoples from Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use</li></ul></div>	
	7.3	<div>Mitigation and Development Benefits</div>	

Reference	Requirements		Project Specific Applicability
	7.4	Private Sector Responsibilities Where Government is Responsible for Managing Indigenous Peoples Issues	
<b>Performance Standard 8: Cultural Heritage</b>			
<b>Overview</b>	Performance Standard 8 recognizes the importance of cultural heritage for current and future generations.		
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To protect cultural heritage from the adverse impacts of project activities and support its preservation.</li> <li>To promote the equitable sharing of benefits from the use of cultural heritage.</li> </ul>		
<b>Aspects</b>	8.1	Protection of Cultural Heritage in Project Design and Execution	<p>A Heritage Assessment (<b>Appendix G.8</b>) has been carried out by a suitably qualified specialist.</p> <p>A Chance Find Procedure will be included in the EMP during the EIA phase of the project.</p>

#### 5.4.2 WORLD BANK GROUP ENVIRONMENTAL HEALTH AND SAFETY GUIDELINES

In support of the Performance Standards, the World Bank Group (WBG) has published a number of Environmental Health and Safety (EHS) Guidelines. The EHS Guidelines are technical reference documents that address IFC's expectations regarding the industrial pollution management performance of its projects. They are designed to assist managers and decision makers with relevant industry background and technical information. This information supports actions aimed at avoiding, minimising, and controlling EHS impacts during the construction, operation, and decommissioning phase of a project or facility. The EHS Guidelines serve as a technical reference source to support the implementation of the IFC Performance Standards, particularly in those aspects related to PS3: Pollution Prevention and Abatement, as well as certain aspects of occupational and community health and safety.

Where host country regulations differ from the levels and measures presented in the EHS Guidelines, projects seeking international funding may be expected to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, a full and detailed justification for any proposed alternatives is required.

The following IFC / WBG EHS Guidelines have been generally consulted during the preparation of the EIA in order to aid the identification of EHS aspects applicable to the project:

- Electric Power Transmission and Distribution (2007) - information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas
- General EHS Guidelines – this includes a section on a range of environmental, occupational health and safety, community health and safety, and construction activities that would apply to the project. The guideline also contains recommended guidelines adopted from the World

Health Organisation (WHO) for ambient air and water quality, which are referred to in the relevant impact assessment sections in the ESIA report.

### 5.4.3 EQUATOR PRINCIPALS

The Equator Principles (EPs) is a risk management framework, adopted by financial institutions, for determining, assessing, and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making.

The EPs apply globally to all industry sectors and to five financial products 1) Project Finance Advisory Services, 2) Project Finance, 3) Project-Related Corporate Loans, 4) Bridge Loans and 5) Project-Related Refinance and Project-Related Acquisition Finance. The relevant thresholds and criteria for application is described in detail in the Scope section of the EP. Currently 125 Equator Principles Financial Institutions (EPFIs) in 37 countries have officially adopted the EPs, covering the majority of international project finance debt within developed and emerging markets. EPFIs commit to implementing the EPs in their internal environmental and social policies, procedures and standards for financing projects and will not provide Project Finance or Project-Related Corporate Loans to projects where the client will not, or is unable to, comply with the EPs.

While the EPs are not intended to be applied retroactively, EPFIs apply them to the expansion or upgrade of an existing project where changes in scale or scope may create significant environmental and social risks and impacts, or significantly change the nature or degree of an existing impact. The EPs have greatly increased the attention and focus on social/community standards and responsibility, including robust standards for indigenous peoples, labour standards, and consultation with locally affected communities within the Project Finance market.

The EPs have also helped spur the development of other responsible environmental and social management practices in the financial sector and banking industry and have supported member banks in developing their own Environmental and Social Risk Management Systems.

The requirements and applicability of the EPs are outlined in **Table 5-5**.

It should be noted that Principles 8 and 10 relate to a borrower's code of conduct and are therefore not considered relevant to the S&EIA process and have not been included in this discussion.

**Table 5-5 - Requirements and Applicability of the Equator Principles**

Requirement		Project Specific Applicability
<b>Principle 1: Review and Categorisation</b>		
<b>Overview</b>	<p>When a project is proposed for financing, the EPFI will, as part of its internal social and environmental review and due diligence, categorise such project based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the IFC.</p> <p>Using categorisation, the EPFI's environmental and social due diligence is commensurate with the nature, scale, and</p>	<p>Based upon the significance and scale of the Project's environmental and social impacts, the proposed project is regarded as a Category B project i.e. a project with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily</p>

Requirement		Project Specific Applicability
	<p>stage of the Project, and with the level of environmental and social risks and impacts.</p> <p>The categories are:</p> <ul style="list-style-type: none"> <li>Category A: Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented;</li> <li>Category B: Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and</li> <li>Category C: Projects with minimal or no adverse environmental and social risks and/or impacts.</li> </ul>	<p>addressed through mitigation measures.</p>
<b>Principle 2: Environmental and Social Assessment</b>		
<b>Overview</b>	<p>For all Category A and Category B Projects, the EPFI will require the client to conduct an appropriate Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and scale of impacts of the proposed Project (which may include the illustrative list of issues found in Exhibit II). The Assessment Documentation should propose measures to minimise, mitigate, and where residual impacts remain, to compensate/offset/remedy for risks and impacts to Workers, Affected Communities, and the environment, in a manner relevant and appropriate to the nature and scale of the proposed Project.</p> <p>The Assessment Documentation will be an adequate, accurate and objective evaluation and presentation of the environmental and social risks and impacts, whether prepared by the client, consultants or external experts. For Category A, and as appropriate, Category B Projects, the Assessment Documentation includes an Environmental and Social Impact Assessment (ESIA). One or more specialised studies may also need to be undertaken. For other Category B and potentially C Projects, a limited or focused environmental or social assessment may be appropriate, applying applicable risk management standards relevant to the</p>	<p>This document is the first deliverable (i.e. Draft Scoping Report) from the S&amp;EIA process undertaken for the proposed Project.</p> <p>The impact assessment will be undertaken during the next phase of the S&amp;EIA process. The assessment will comprehensively assess the key environmental and social impacts and complies with the requirements of the South African EIA Regulations. In addition, an EMPr will also be compiled.</p>

Requirement		Project Specific Applicability
	risks or impacts identified during the categorisation process.	
<b>Principle 3: Applicable Environmental and Social Standards</b>		
<b>Overview</b>	<p>The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues.</p> <p>The EPFI's due diligence will include, for all Category A and Category B Projects globally, review and confirmation by the EPFI of how the Project and transaction meet each of the Principles.</p> <p>For Projects located in Non-Designated Countries, the Assessment process evaluates compliance with the then applicable IFC PS and WBG EHS Guidelines. For Projects located in Designated Countries, compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues.</p>	<p>As South Africa has been identified as a non-designated country, the reference framework for environmental and social assessment is based on the IFC PS. In addition, this S&amp;EIA process has been undertaken in accordance with NEMA (the host country's relevant legislation).</p>
<b>Principle 4: Environmental and Social Management System and Equator Principles Action Plan</b>		
<b>Overview</b>	<p>For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS).</p> <p>Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree on an Equator Principles Action Plan (EPAP). The EPAP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards.</p>	<p>A formal project specific ESMS will be compiled in the event that the project is developed in the future.</p> <p>Management and monitoring plans outlines in the EMPr will serve as the basis for an ESMS for the proposed Project.</p>
<b>Principle 5: Stakeholder Engagement</b>		
<b>Overview</b>	<p>EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities Workers and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on</p>	<p>The S&amp;EIA process includes an extensive stakeholder engagement process which complies with the South African EIA Regulations. The process includes consultations with local communities, nearby businesses,</p>

Requirement		Project Specific Applicability
	<p>Affected Communities, the client will conduct an Informed Consultation and Participation process.</p> <p>To accomplish this, the appropriate assessment documentation, or non-technical summaries thereof, will be made available to the public by the borrower for a reasonable minimum period in the relevant local language and in a culturally appropriate manner. The borrower will take account of and document the process and results of the consultation, including any actions agreed resulting from the consultation.</p> <p>Disclosure of environmental or social risks and adverse impacts should occur early in the Assessment process, in any event before the Project construction commences, and on an ongoing basis.</p>	<p>and a range of government sector stakeholders (state owned enterprises, national, provincial and local departments).</p> <p>The stakeholder engagement process solicits interest from potentially interested parties through the placement of site notices and newspaper advertisements as well as written and telephonic communication.</p> <p>The stakeholder engagement process is detailed in <b>Section 2.6</b>.</p>
<b>Principle 6: Grievance Mechanism</b>		
<b>Overview</b>	<p>For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the ESMS, to establish effective grievance mechanisms which are designed for use by Affected Communities and Workers, as appropriate, to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance.</p> <p>The borrower will inform the Affected Communities and Workers about the grievance mechanism in the course of the stakeholder engagement process and ensure that the mechanism addresses concerns promptly and transparently, in a culturally appropriate manner, and is readily accessible, at no cost, and without retribution to the party that originates the issue or concern.</p>	<p>The EMP will include a Grievance Mechanism Process for Public Complaints and Issues. This procedure effectively allows for external communications with members of the public to be undertaken in a transparent and structured manner.</p>
<b>Principle 7: Independent Review</b>		
<b>Overview</b>	<p>For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance.</p>	<p>This principle will only become applicable in the event that the project is developed in the future.</p>



Requirement	Project Specific Applicability
<b>Principle 9: Independent Monitoring and Reporting</b>	
<b>Overview</b>	<p>To assess Project compliance with the Equator Principles after Financial Close and over the life of the loan, the EPFI will require independent monitoring and reporting for all Category A, and as appropriate, Category B projects. Monitoring and reporting should be provided by an Independent Environmental and Social Consultant; alternatively, the EPFI will require that the client retain qualified and experienced external experts to verify its monitoring information, which will be shared with the EPFI in accordance with the frequency required.</p> <p>This principle will only become applicable in the event that the project is developed in the future.</p>

## 5.5 OTHER GUIDELINES AND BEST PRACTICE RECOMMENDATIONS

### 5.5.1 GENERIC EMPR RELEVANT TO AN APPLICATION FOR SUBSTATION AND OVERHEAD ELECTRICITY TRANSMISSION AND DISTRIBUTION INFRASTRUCTURE

NEMA requires that an EMPr be submitted where an EIA has been identified as the environmental instrument to be utilised as the basis for a decision on an application for environmental authorisation. The content of an EMPr must either contain the information set out in Appendix 4 of the EIA Regulations, 2014, as amended, or must be a generic EMPr relevant to an application as identified and gazetted by the Minister in a government notice. Once the Minister has identified, through a government notice, that a generic EMPr is relevant to an application for EA, that generic EMPr must be applied by all parties involved in the EA process, including, but not limited to, the applicant and the CA.

GN 435 of 22 March 2019 identified a generic EMPr relevant to applications for substations and overhead electricity transmission and distribution infrastructure which require authorisation in terms of Section 42(2) of NEMA. Applications for overhead electricity transmission and distribution infrastructure that trigger Activity 11 of Listing Notice 1 or Activity 9 of Listing Notice 2 and any other listed or specified activities must use the generic EMPr.

The objective of the generic EMPr is “*to prescribe and pre-approve generally accepted impact management outcomes and impact management actions, which can commonly and repeatedly be used for the avoidance, management and mitigation of impacts and risks associated with the development or expansion of overhead electricity transmission and distribution infrastructure. The use of a generic EMPr is intended to reduce the need to prepare and review individual EMPrs for applications of a similar nature.*”<sup>3</sup>

<sup>3</sup> DEA (2019) Appendix 1: Generic Environmental Management Programme (EMPr) for the Development and Expansion for Overhead Electricity Transmission and Distribution Infrastructure

The generic EMPr (for Substations) will be included in the Site-Specific EMPr to be generated in the EIA Phase.

## 5.6 ADDITIONAL PERMITS AND AUTHORISATIONS

**Table 5-6** outlines the additional permits and authorisations required for the proposed development, as well as the relevant Competent Authorities responsible.

**Table 5-6 – Additional Permits and Authorisations required for the proposed development**

Permits / Authorisation	Legislation	Relevant Authority	Status
Notification Of Intent To Develop (NID) Section 38 (1) and Section 38 (8)	Section 38 (1) & (8) of the NHRA	HWC and SAHRA	Submitted
Subdivision of Agricultural Land Act (SALA) Consent / Change of Land Use (re-zoning)	Subdivision of Agricultural Land Act (Act No. 70 of 1970) / Spatial Planning and Land Use Management Act (Act No. 16 of 2013) (SPLUMA)	DALRRD	An application will be submitted following the PPP of the Scoping Report
Water Use Licence / General	National Water Act (Act No. 36 of 1998)	Department of Water and Sanitation	An application will be submitted during or following the conclusion of the EIA process
Obstacle Permit	Civil Aviation Act (Act 13 of 2009)	Air Traffic and Navigation Services / Civil Aviation Authority	An application will be submitted during or following the conclusion of the EIA process
Section 53 Approval	Minerals and Petroleum Resources Development Act (No. 28 of 2002)	Department of Mineral Resources and Energy	An application will be submitted during or following the conclusion of the EIA process
Permits for removal or destruction of Threatened or Protected Species (TOPs)	NEM:BA (ToPS), Northern Cape Nature Conservation Act (Act no. 9 of 2009) and Western Cape Nature Conservation Laws Amendment Act (Act No 3 of 2000):	Cape Nature	Permits will be obtained prior to the commencement of construction.

## 6 BASELINE ENVIRONMENT

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The following chapter presents an overview of the biophysical and socio-economic environment in which the proposed Project is located. It is important to gain an understanding of the Project area and its surroundings, as it will provide for a better understanding of the receiving environment in which the Project is being considered.

The description of the baseline environment is essential in that it represents the conditions of the environment before the construction of the proposed Project (i.e. the current, or status quo, environment) against which environmental impacts of the proposed Project can be assessed and future changes monitored.

The area has previously been studied to some extent and is recorded in various sources. Consequently, some components of the baseline have been generated based on literature review. However, where appropriate, baseline information has been supplemented or generated by specialists appointed to undertake baseline and impact assessments for the proposed Project.

### 6.1 PHYSICAL ENVIRONMENT

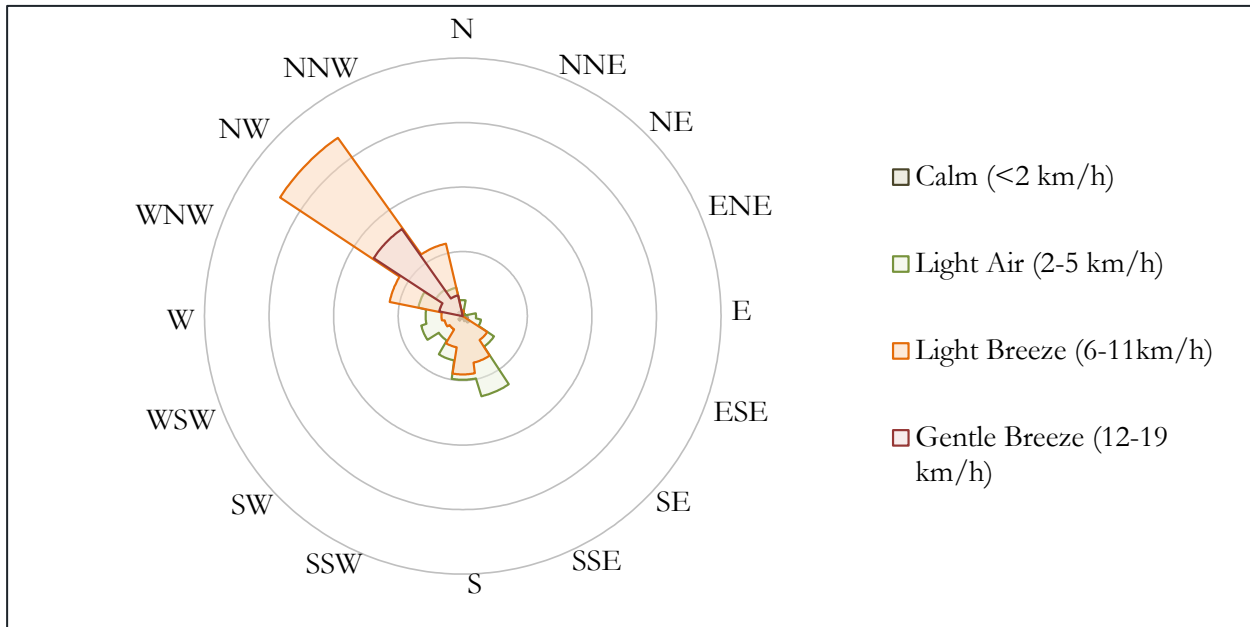
#### 6.1.1 CLIMATE

*The following is extracted from the Climate Change Assessment compiled by Promethium Carbon and included as **Appendix G.1**.*

The proposed Project falls within the arid, desert, cold climate zone. The area experiences warm to hot summers and cool, dry winters. The near-historical (since 1980) Mean annual temperature is  $15.2 \pm 0.6^{\circ}\text{C}$ . Mean maximum temperatures range from around  $27^{\circ}\text{C}$  in summer (January and February) to  $12^{\circ}\text{C}$  in winter (June and July). Temperatures occasionally exceed  $35^{\circ}\text{C}$  but rarely beyond  $40^{\circ}\text{C}$  in summer. during the recent historical period (since ca. 1980) there have been an average of 8 very hot days ( $> 35^{\circ}\text{C}$ ) per annum. Two years in the last decade had over 20 very hot days (2015 and 2016; both also intense drought years). Mean minimum temperatures range from  $0^{\circ}\text{C}$  in July to  $13^{\circ}\text{C}$  in February. Freezing nights (below  $0^{\circ}$ ) occur regularly between May and October.

Mean annual rainfall is  $274 \pm 80$  mm/year. Rainfall peaks in March with a mean of 35 mm and there is less than 15 mm of rainfall per month from July to September. Extreme rainfall days ( $> 20$  mm) are rare with 1.7 days. yr<sup>-1</sup> since 1980.

Mean wind speed is approximately 6.5 km/h peaking in spring (October and November) and lowest in autumn (March and April). Mean wind speed has been relatively constant over the last four decades. The vast majority of wind is from north-westerly direction (**Figure 6-1**).

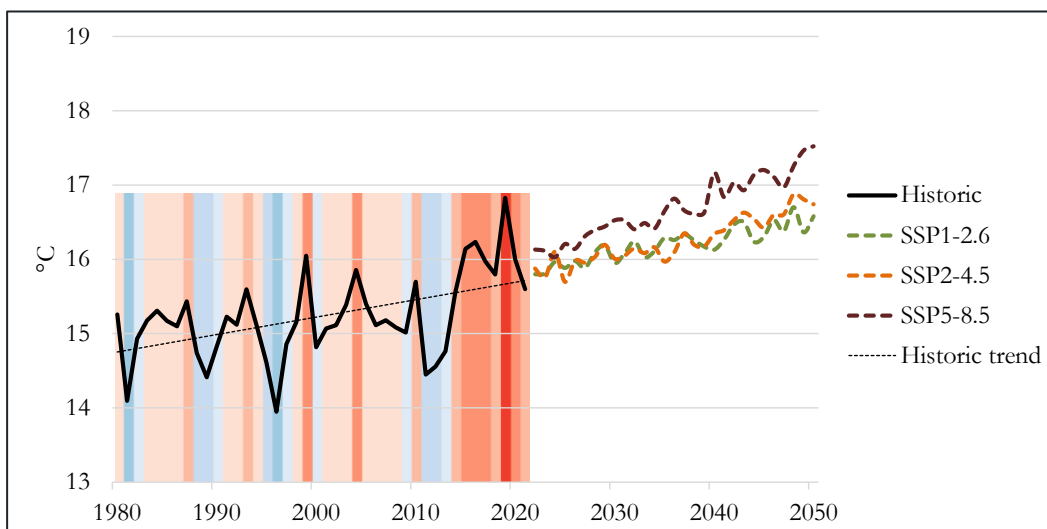


**Figure 6-1 - Wind rose based on mean monthly wind speed and direction since 1980 near the Mura Solar PV site**

#### 6.1.1.1 Climate trends and projected climate change

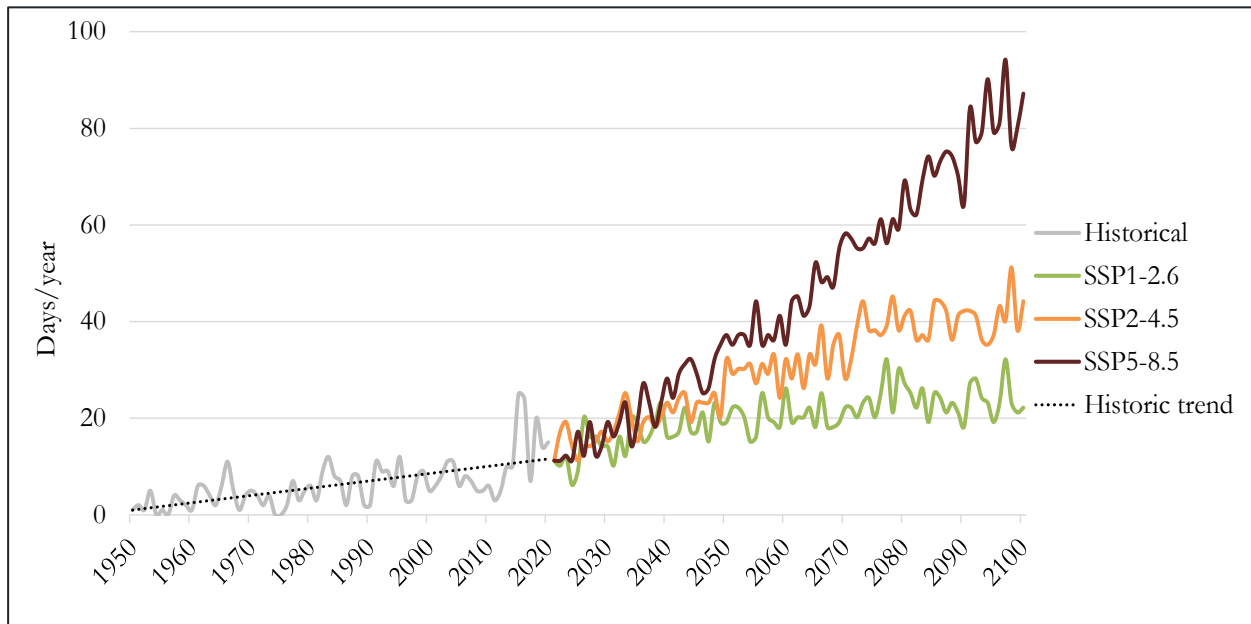
##### Temperature

Mean annual temperature around the Project area has increased by approximately 1.0°C since the early 1980s thus showing an increasing trend of approximately 0.025°C per year. Temperatures are predicted to continue to rise under all SSPs. By 2050 median temperatures could increase from the current (last five years) mean ( $\pm 16.0^{\circ}\text{C}$ ) to  $\pm 16.5^{\circ}\text{C}$  under SSP1 through to  $\pm 17.4^{\circ}\text{C}$  as under SSP5 (Figure 6-2).



**Figure 6-2 - Near-historical and projected mean annual temperature for the Mura Solar PV Project area**

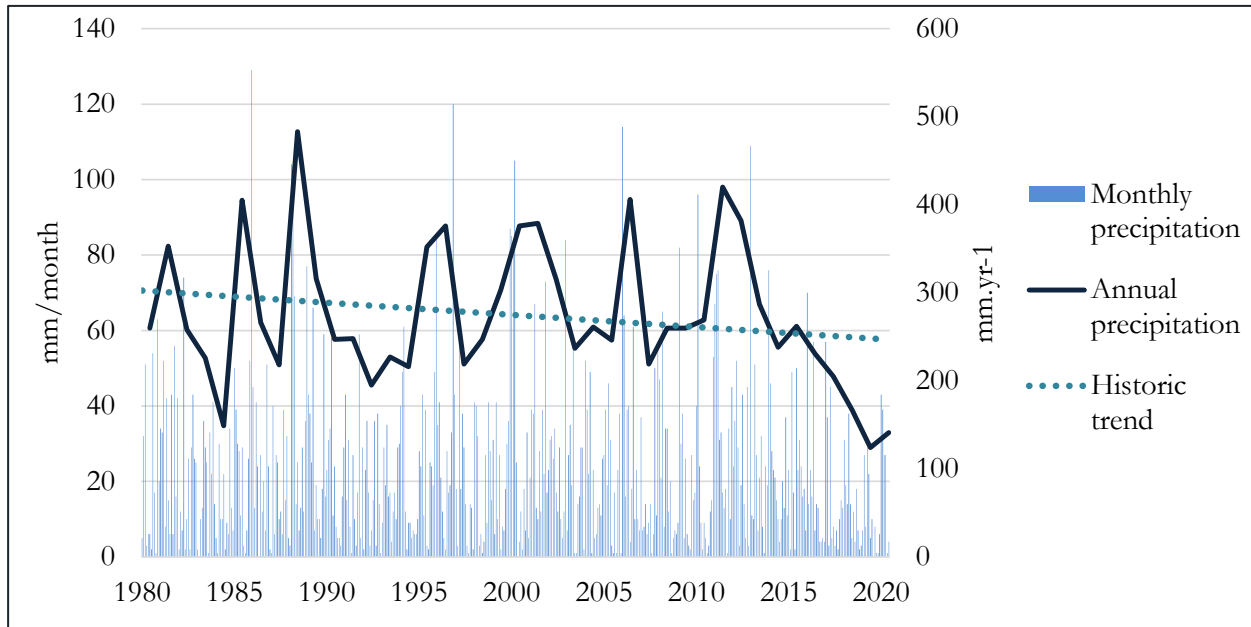
The near historical trend in very hot days shows a gradual increase with a sharper increase since ca. 2013; 2015 and 2016, both years during which an intense drought persisted, had over 20 very hot days each. The last decade has seen an average of 13.3 very hot days per year. A significant increase in the number of very hot days is projected under all three SSPs (**Figure 6-3**). The trend is particularly strong under SSP5. By 2050, the number of very hot days per annum is projected to range from  $\pm 21$  days under SSP1 to  $\pm 27$  days under SSP5; thus, more than doubling from the current number. By 2100, the number of very hot days could exceed 90 per annum under SSP5, 50 days per annum under SSP2 and 30 days per annum under SSP1.



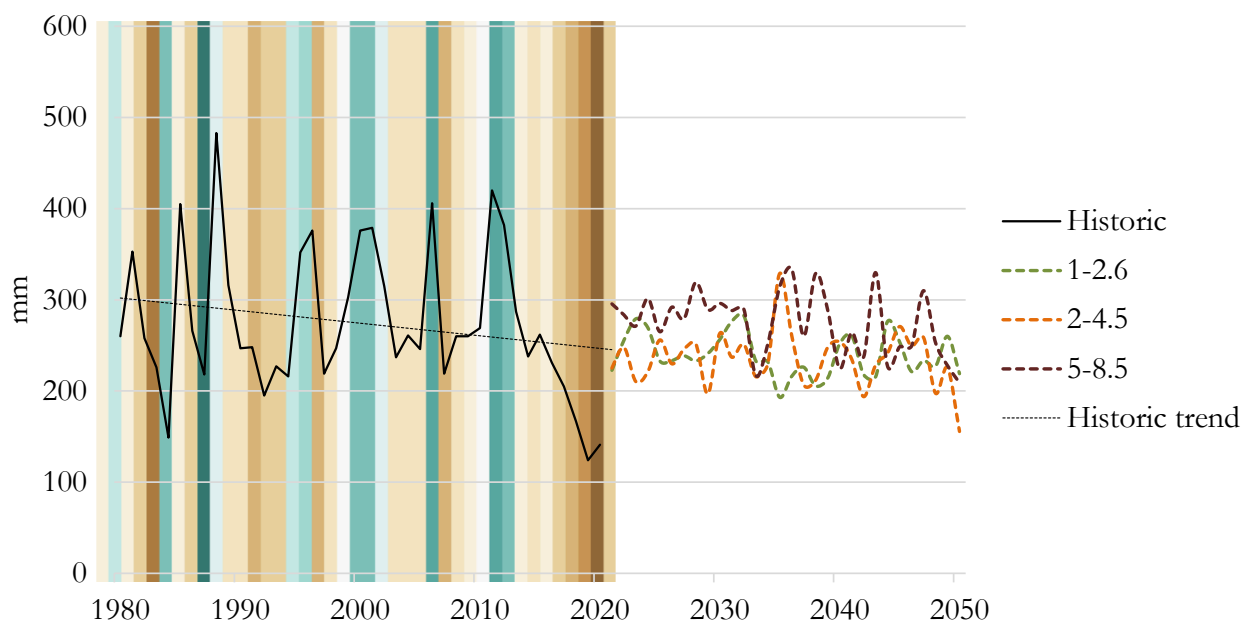
**Figure 6-3 - Number of very hot days per annum between 1950 and 2020 and the projected number of very hot days up to 2100 under three SSP trajectories for the Mura Solar PV Project area**

### Precipitation

Near historical (since 1980) mean annual precipitation around the Project site shows a decreasing trend. There has been a strong recent decline; the last five consecutive years have had less than 250 mm per year with the lowest rainfall experience in 2019 (**Figure 6-4**). Projected annual precipitation shows a continued but weaker decreasing trend under the three SSP trajectories. Annual rainfall is likely to be between 150-250 mm by 2050; slightly higher than recent amounts but lower than the historical long-term average (**Figure 6-2**).



**Figure 6-4 - Mean monthly precipitation and mean annual precipitation for the Mura Solar PV Project area**

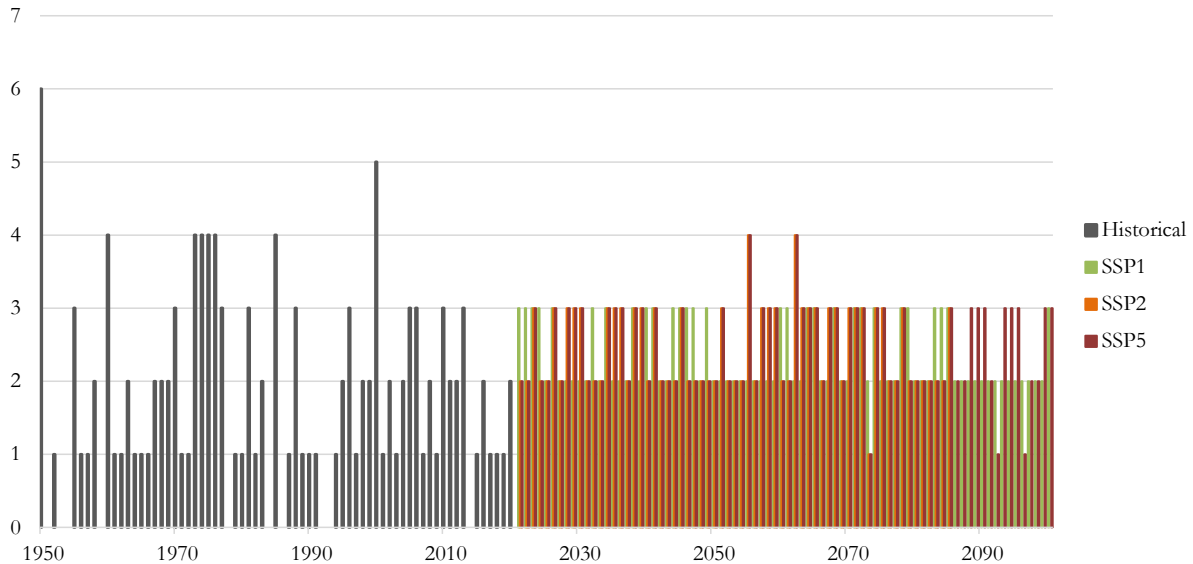


**Figure 6-5 - Near historical mean annual precipitation and projected trends in precipitation under three SSP trajectories for the Mura Solar PV Project area**

Because mean annual precipitation is so variable (**Figure 6-4**) and modelling precipitation is more challenging than temperature (due to several factors including topographic influence, isolated occurrence and non-linear interaction), it is useful to assess extreme rainfall events. Since the Project areas site is in an arid area with an average of < 2mm of precipitation a day, the number of days with 20 mm of rain becomes a good indicator of heavy rainfall days.



The Project area has experienced an average of 1.7 heavy rainfall days per annum since 1980, with five heavy rainfall days occurring during 2000. The number of heavy rainfall days up until 2050 is projected to be around 2-3 days per annum under the three SSPs assessed, and thus a slight increase from the current number (**Figure 6-6**). It can be concluded that rainfall is likely to decline slightly overall but may be more concentrated during storm events.



**Figure 6-6 - Near-historical and projected number of heavy rainfall days per annum at the Mura Solar PV Project area. Copernicus Climate Change Service (C3S) and CMIP6**

### 6.1.2 AGRICULTURAL POTENTIAL

*The following is extracted from the Agricultural Compliance Statement compiled by Johann Lanz and included as **Appendix G.2**.*

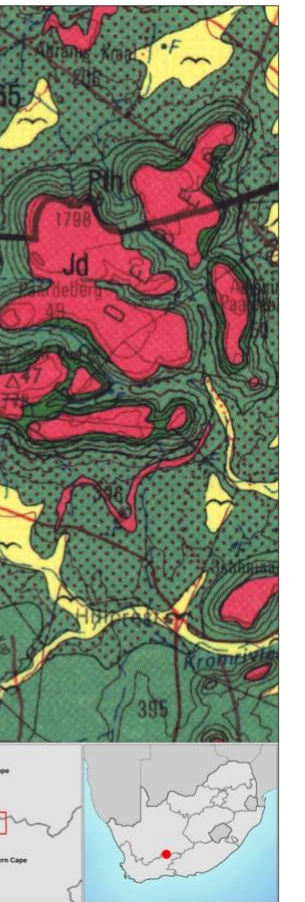
The arid climate (low rainfall of between 171 and 212 mm per annum and high evaporation of between 1,274 and 1,312 mm per annum) (Schulze, 2009) is the limiting factor for land capability, regardless of the soil capability and terrain. Moisture availability is very limiting to any kind of agricultural production. Moisture availability is insufficient for crop production without irrigation and the potential agricultural land use of the site is therefore limited to grazing. The land has a low long term grazing capacity of 28 hectares per large stock unit.

The land type data shows the dominant soils to be shallow on underlying rock and hardpan carbonate. A low agricultural sensitivity is entirely appropriate for the site, which is unsuitable for crop production.

### 6.1.3 GEOLOGICAL CONTEXT

*The following is extracted from the Palaeontological Study compiled by Natura Viva cc and included as **Appendix G.9**.*

The geology of the project area is outlined on 1: 250 000 geological sheet 3122 Victoria West (Council for Geoscience, Pretoria) (**Figure 6-7**). Illustrated accounts of portions of the combined project area have already been provided in previous PIA reports by the author for the Nuweveld Cluster WEFs and Nuweveld Gamma Grid Connection (Almond 2020a, 2020b, Almond 2022c).



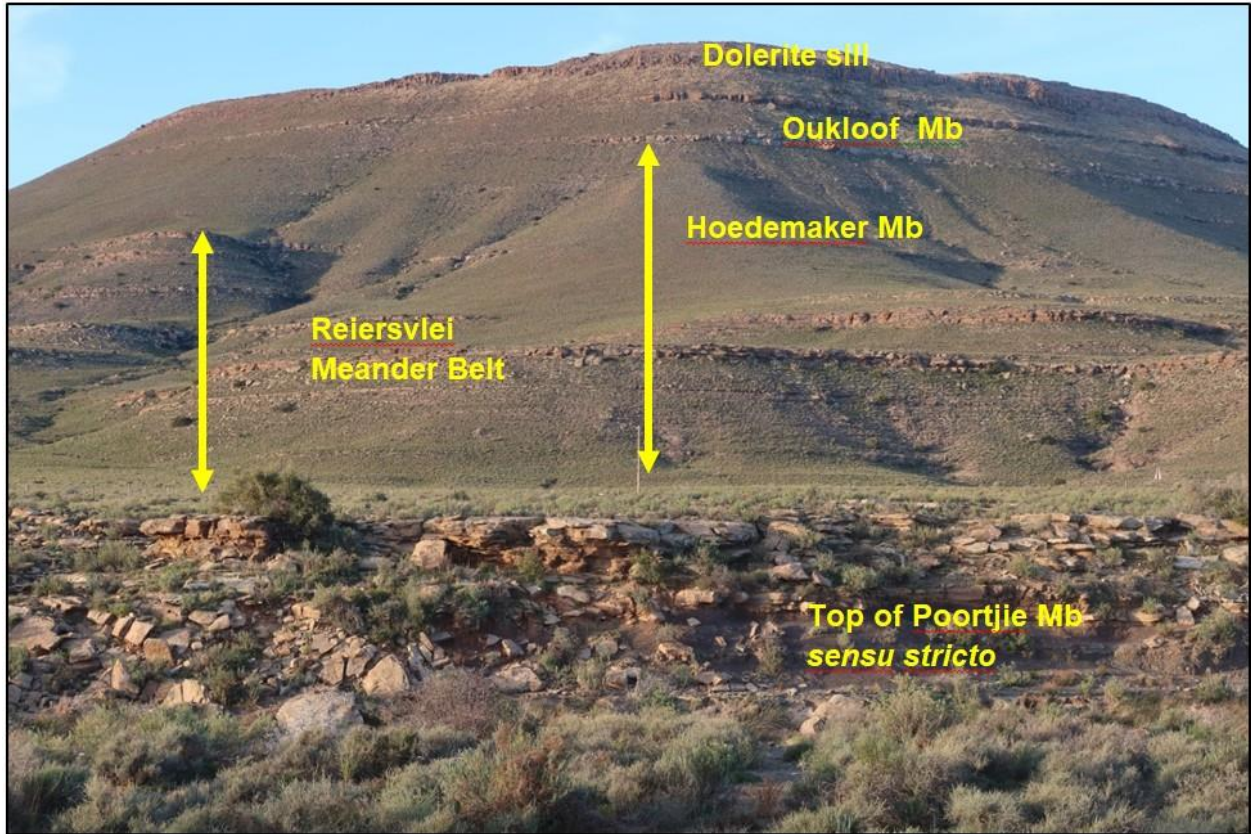
## Following the project

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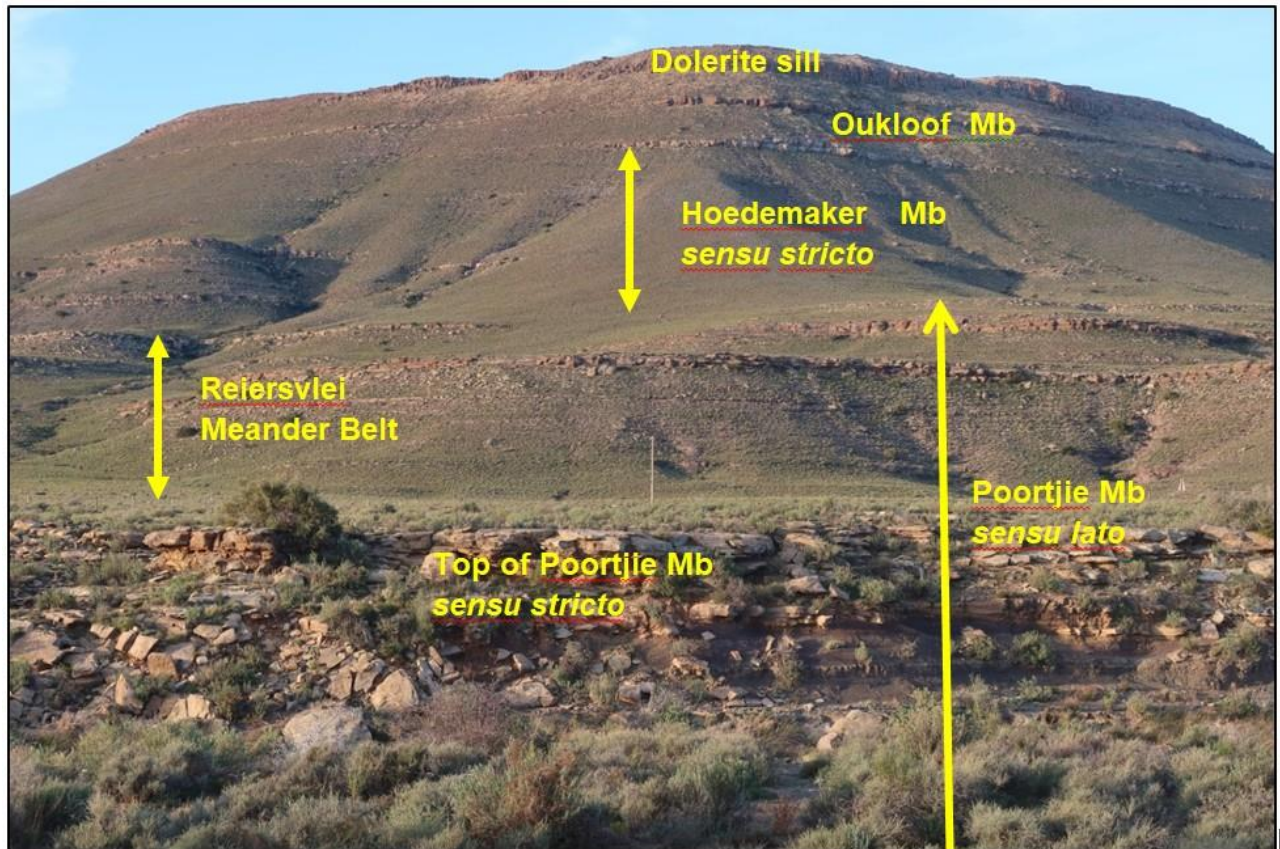
It is noted that the member-scale lithostratigraphy and associated biostratigraphical zonation of the Lower Beaufort Group succession in this sector of the Main Karoo Basin - including the long-distance correlation of the main channel sandstone packages such as the Poortjie Member - remains unresolved (cf Day & Rubidge 2020a, Almond 2022c). The diachronous contact between the Poortjie and Hoedemaker Members in the western sector of the study area is transitional over an interval some 25-30 m. It is marked here by the Reiersvlei Meanderbelt package identified by Smith (1987, 2021) and is of considerable palaeontological as well as palaeoenvironmental interest. The precise level of the contact is arbitrary to an extent and has been variously interpreted in maps and scientific literature. On the 1: 250 000 geological map (**Figure 6-7**) the entire Reiersvlei Meander Belt seems to have been incorporated within the upper Poortjie Member which extends well up the lower slopes of Perdeberg. Smith and Keyser (1995) place the contact at the top of the last thick, multistorey channel sandstone of the Poortjie Member (excluding the Reiersvlei package). The stratigraphic column in Maharaj et al. (2019) appears to place the contact at the incoming of thick reddish mudrock packages above Reiersvlei Meanderbelt 2, while the column in Smith et al. (2021) places it lower down within a red bed succession at the level of Meanderbelt 1 of the Reiersvlei package. Given these ambiguities, the stratigraphic position of the geological and fossil sites mentioned in this report provisionally follows that shown on the published 1: 250 000 geological map.

The Poortjie – Hoedemaker transition zone characterised by a succession of thin, single-storey channel sandstones and intervening, predominantly reddish-brown mudrocks (Smith & Keyser 1995, Paiva 2015, Maharaj et al. 2019, Smith et al. 2021). This stratigraphic interval records the transition from thick, multi-storey channel sandstones dominated by downstream accretion process typical of the Poortjie Member to laterally accreting, meandering river systems of the Hoedemaker Member (**Figure 6-8**). The transition is accompanied by more frequent development of crevasse splay deposits and calcareous palaeosols on the floodplain driven by increased aridification in the Karoo Basin and aggradation of the Reiersvlei Meanderbelt sedimentary prism (Maharaj et al. 2019, Smith et al. 2021). In contrast, a subsidence-driven transition is favoured by Paiva (2015).





**Figure 6-8 - South-western slopes of Perdeberg near Booiskraal homestead showing one possible interpretation of the main lithostratigraphic subunits of the lower Teekloof Formation that are represented in the broader project area**



**Figure 6-9 - Alternative stratigraphic subdivision of the Lower Beaufort Group succession on Perdeberg.**

The Permian sediments and Jurassic intrusions within the combined project area are extensively mantled by a range of Late Caenozoic superficial deposits, limiting exposure levels of fresh (unweathered), potentially fossiliferous Permian sediments, especially in low-relief lowlands and on upland plateaux where the PV solar sites will be located. In addition to thick, consolidated (calcretised) to unconsolidated, gravelly to silty alluvial sediments along major active or defunct drainage lines (e.g. Kromrivier, Soutrivier and their various tributaries), these younger cover sediments include pan deposits (e.g. shallow brak-kolle), colluvial (slope) and eluvial (downwasted) surface gravels, pedocretes (e.g. calcrete), spring deposits and a spectrum of mainly sandy to gravelly soils. Coarse older alluvial deposits ("High Level Gravels") are not separately mapped within the project area at 1: 250 000 scale but elevated terrace gravels of Pleistocene and younger age are present along major drainage lines such as along the deeply-incised valley of the Kromrivier.

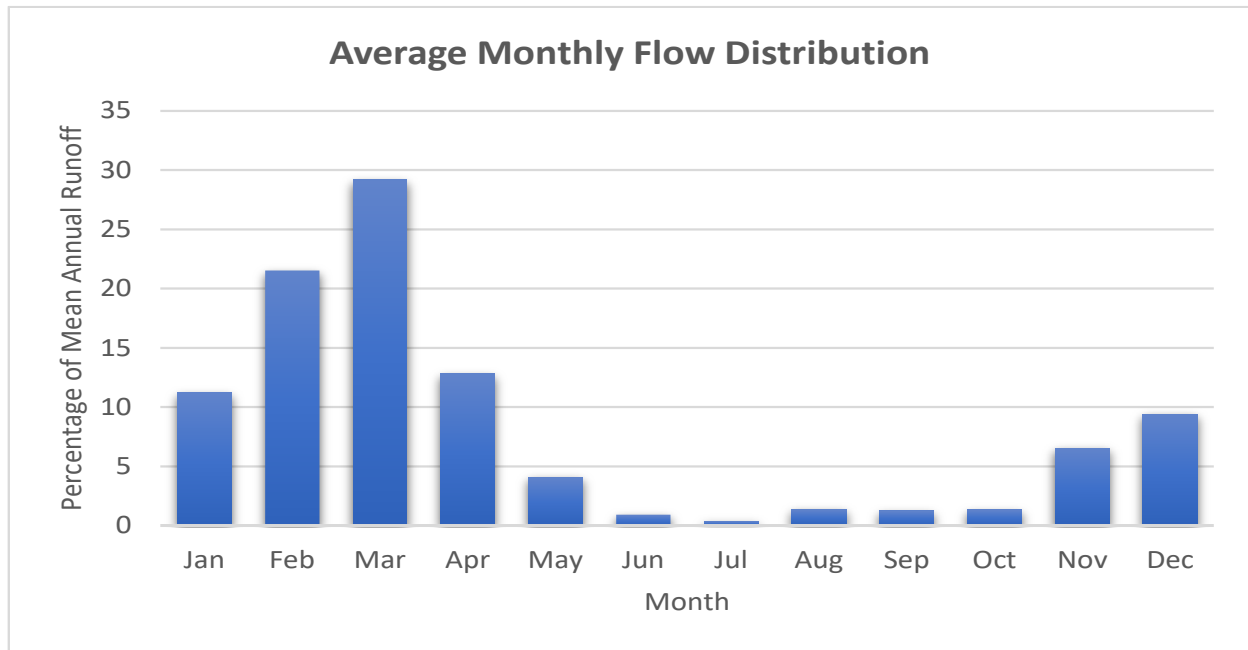
#### 6.1.4 SURFACE WATER

*The following is extracted from the Aquatic Biodiversity Assessment compiled by BlueScience (Pty) Ltd and included as **Appendix G.4**.*

The study area is mostly drained by smaller seasonal streams that feed into the larger Krom River. The rivers flow in a southeasterly direction towards the Sout River, a tributary of the Kariega River in the Groot/Gamtoos River System. The Krom River is a larger watercourse with some instream wetland habitat that tends to contain water for longer periods. The rivers are still in a natural ecological condition with little to no disturbance except for farm roads along the river.



Flow in the smaller tributaries in the upper catchment tends to be episodic (**Figure 6-10**), with very little to no flow in the rivers for much of the year. Flow typically only occurs for a short period following localised rainfall. These rainfall events tend to mostly occur in the higher rainfall months in late summer and into autumn. When flow occurs in the watercourses, it occurs as a high-flow event. This flow pattern is unlikely to change significantly due to longer-term climatic changes. The flow nature does, however, make erosion control measures in the watercourses, particularly on the slopes, essential mitigation.



**Figure 6-10 - Monthly flow distribution within the rivers in the study area, with the month flow shown as a percentage of the natural mean annual runoff (nMAR) for the catchment**

## 6.1.5 HYDROGEOLOGY

*The following is extracted from the Geohydrological Assessment compiled by GEOSS South Africa (Pty) Ltd and included as **Appendix G.13**.*

The Mura Solar Development is shown to be underlain by two aquifers. The larger of the two aquifers is classified by the Department of Water Affairs and Forestry (DWAf, 2002) as a fractured aquifer. The subordinate, more localised aquifer, is classified by DWAf as an intergranular and fractured aquifer. An intergranular aquifer describes an aquifer in which groundwater flows in openings and void space between grains or weathered rock. A fractured aquifer refers to an aquifer in which groundwater flows in joints, fissures, cracks and fractures within the rock. The larger fractured aquifer is classified as having average yield potential of 0.5 – 2.0 litres per second (L/s), whereas the smaller intergranular & fractured aquifer is classified as having an average yield potential 0.1 – 0.5 L/s. Based on the DWAf (2002) mapping of the regional groundwater quality, the electrical conductivity (EC) of the groundwater in the area generally ranges between 70 and 300 milli-Siemens per metre (mS/m). This is considered “moderate” groundwater quality, with respect to drinking water standards. The quality improves towards the east with an indicated electrical conductivity of 0 – 70 mS/m, which is considered “good” in terms of drinking water standards.



Both these classifications are based on regional datasets, and therefore, only provide an indication of the possible/likely conditions. Groundwater in the area is generally considered as being of marginal quality and boreholes have a low yield. The water requirements for each of the proposed Mura Solar Facilities are as follows:

- Construction phase: 48 000 m<sup>3</sup>/a (1.52 L/s)
- Operational phase: 28 000 m<sup>3</sup>/a (0.89 L/s)

The volumes of water required for the development should be readily available and could be supplied by groundwater in the region.

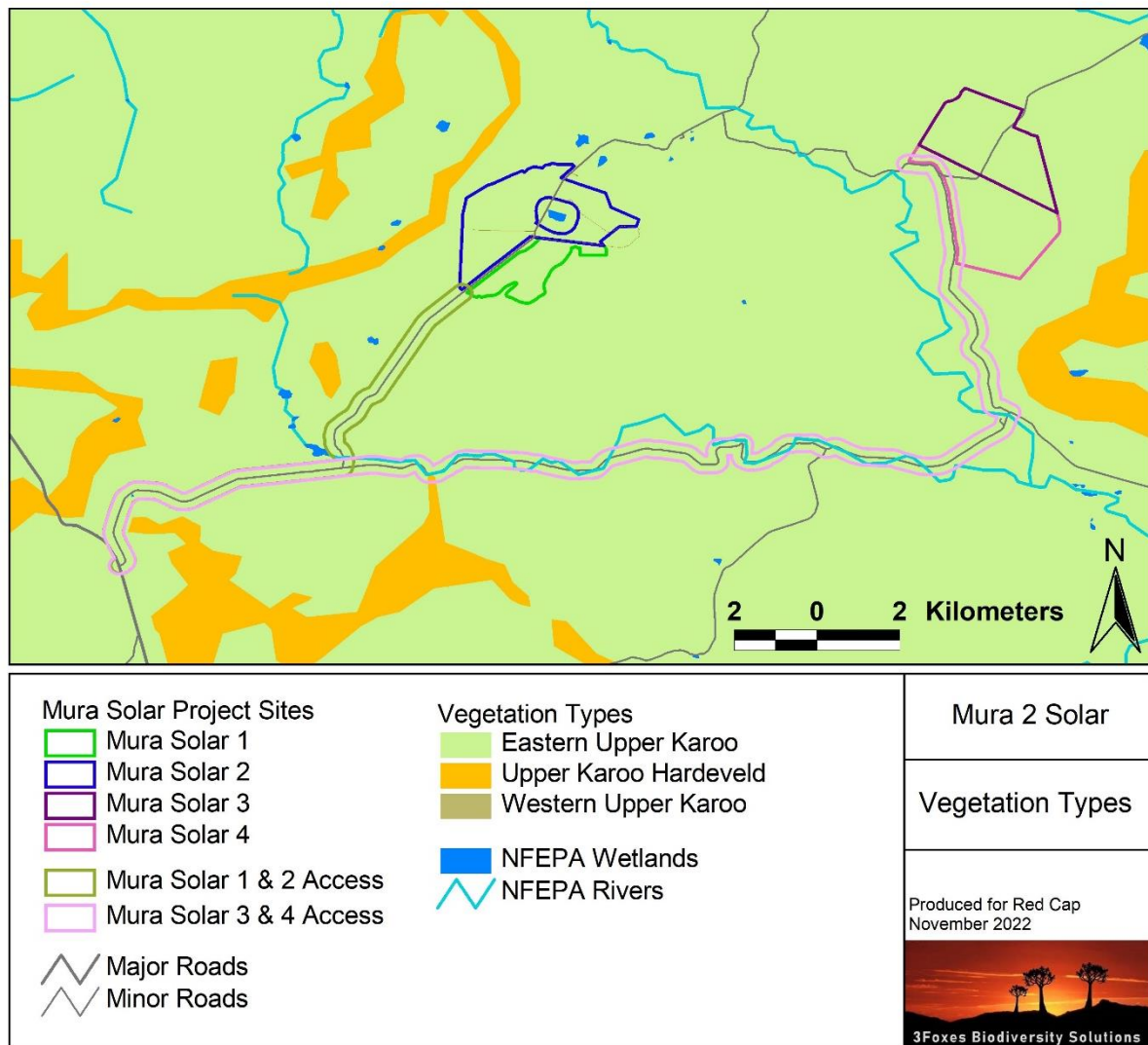
## 6.2 BIOLOGICAL ENVIRONMENT

### 6.2.1 TERRESTRIAL BIODIVERSITY

*The following is extracted from the Terrestrial Biodiversity Compliance Statement compiled by 3Foxes Biodiversity Solutions and included as **Appendix G.3**.*

#### 6.2.1.1 Vegetation

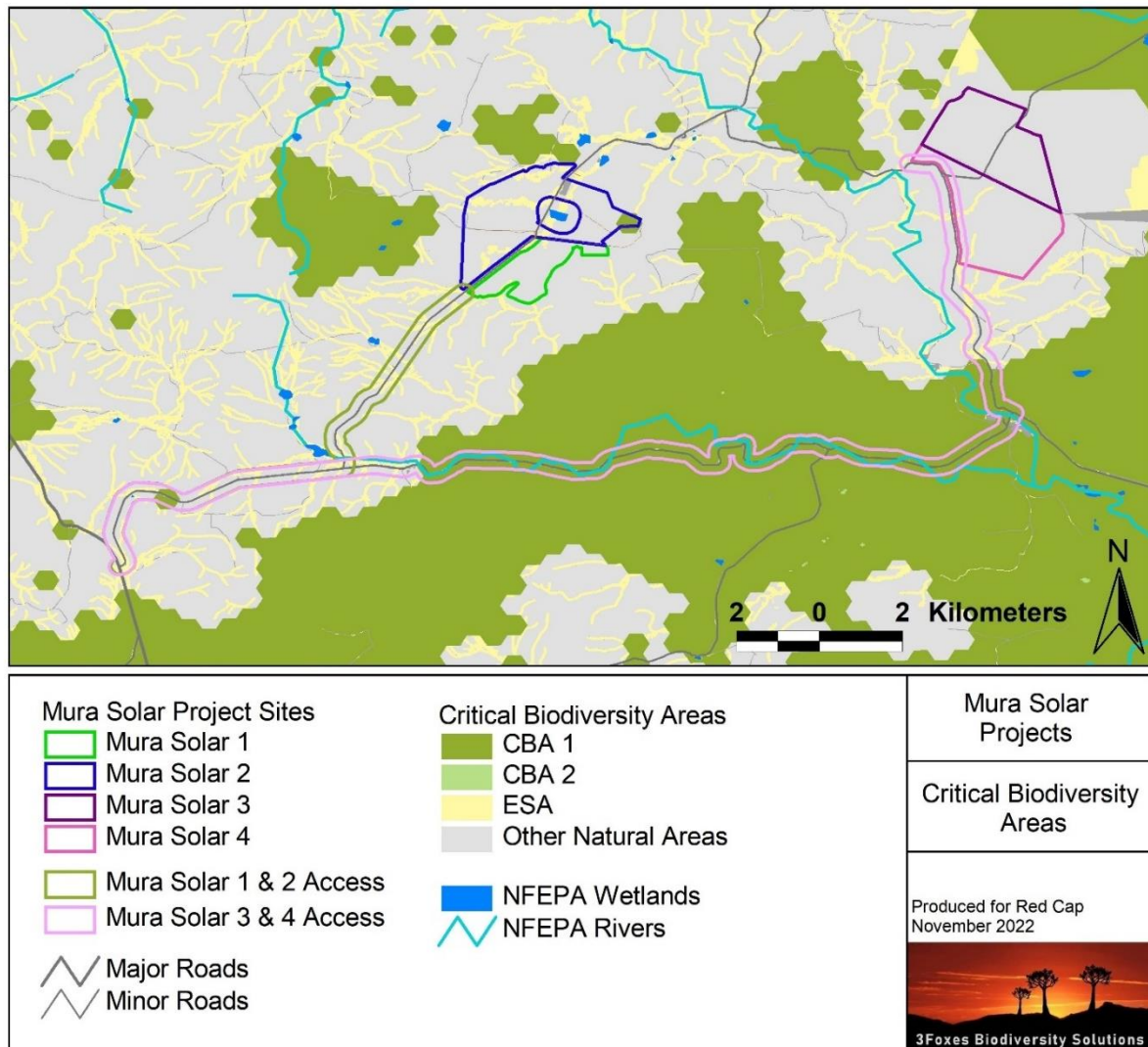
The Mura 2 Solar footprint falls entirely within the Eastern Upper Karoo vegetation type (**Figure 6-11**). Eastern Upper Karoo has an extent of 49 821 km<sup>2</sup> and is the most extensive vegetation type in South Africa and forms a large proportion of the central and eastern Nama Karoo Biome. This vegetation type is classified as Least Threatened, and about 2% of the original extent has been transformed largely for intensive agriculture. Eastern Upper Karoo is however poorly protected and less than 1% of the 21% target has been formally conserved. Mucina & Rutherford (2006) list eight endemic species for this vegetation type, which considering that it is the most extensive unit in the country, is not very high. As a result, this is not considered to represent a sensitive vegetation type. Within the study area, the vegetation is relatively homogenous, although there is some variation in which species are dominant depending on soil depth and the degree of rockiness.



**Figure 6-11 – Vegetation map of the broader Mura Solar Project Area**

#### 6.2.1.2 Critical Biodiversity Areas & Broad-Scale Processes

The CBA and ESA map for the broader project area is indicated below in **Figure 6-12** and indicates that there is an isolated CBA in the eastern corner of the Mura 2 footprint area. There are also a few small ESAs within the site associated with the minor drainage features that occur within the site, as well as mistaken ESAs which have mapped the access road to the site as a drainage feature. The lookup layer associated with the CBA layer indicates that the CBA in the east is associated with an area mapped as Very High Sensitivity under the Shale Gas SEA. There are no other details for this CBA, with the result that there is no clear information as to why this area was identified as Very High Sensitivity under the Shale Gas SEA and the subsequent Western Cape CBA map.



**Figure 6-12 - Critical Biodiversity Areas and ESAs for the wider Mura project area, which is a combination of the Western Cape Biodiversity Spatial Plan for the Beaufort West municipality and the Northern Cape CBA map**

## 6.2.2 AQUATIC BIODIVERSITY

*The following is extracted from the Aquatic Biodiversity Assessment compiled by BlueScience (Pty) Ltd and included as **Appendix G.4**.*

The larger Krom River corridor is mapped as aquatic CBA, with the smaller tributaries mapped as aquatic ESAs (**Figure 6-13**). The only mapped natural FEPA Wetlands and National Wetland Map areas are downstream of the study area in the larger Krom River.





**Figure 6-13 - Google Earth image with the mapped aquatic features shown as well as the proposed project locations**

#### 6.2.2.1 Classification of aquatic features

To assess the condition and ecological importance and sensitivity of the watercourses, it is necessary to understand how they might have appeared under unimpacted conditions. This is achieved by classifying the rivers according to their ecological characteristics, so that they can be compared to ecologically similar rivers.

River typing or classification involves the hierarchical grouping of rivers into ecologically similar units so that inter- and intra-river variation in factors that influence water chemistry, channel type, substratum composition and hydrology are best accounted for. Any comparative assessment of river conditions should only be done between rivers that share similar physical and biological characteristics under natural conditions. Thus, the classification of rivers provides the basis for assessing river conditions to allow comparison between similar river types. The primary classification of rivers is a division into Ecoregions. Rivers within an ecoregion are further divided into sub-regions.

Ecoregions: groups of rivers within South Africa which share similar physiography, climate, geology, soils and potential natural vegetation. For this study, the ecoregional classification presented in DWAF (1999), which divides the country's rivers into ecoregions, was used. The study area falls within the Great Karoo Ecoregion (**Table 6-1**).

**Table 6-1 - Characteristics of the Great Karoo Ecoregion**

Main Attributes	Characteristics
Terrain Morphology:	Plains: Moderate to Low Relief Lowlands; Hills and Mountains: Moderate and High Relief Open Hills, Lowlands; Mountains: Moderate to High Relief Closed Hills; Mountains: Moderate and High Relief; Table-Lands: Moderate and High Relief
Vegetation types	Valley Thicket; Spekboom Succulent Thicket (limited); Central Nama Karoo; Eastern Mixed Nama Karoo; Great Nama Karoo; Upper Nama Karoo; Bushmanland Nama Karoo (limited), Lowland Succulent Karoo; Upland Succulent Karoo; and Escarpment Mountain Renosterveld
Altitude	300-1700m; 1700-1900m (limited occurrence)
MAP	0 to 500m
Rainfall seasonality	Very late summer to winter
Mean annual temp.	10 to 20 °C
Median annual simulated runoff	<5 to 60 mm for quaternary catchment

Sub-regions: sub-regions (or geomorphological zones) are groups of rivers, or segments of rivers, within an ecoregion, which share similar geomorphological features, of which gradient is the most important. The use of geomorphological features is based on the assumption that this is a major factor in the determination of the distribution of the biota. **Table 6-2** provides the geomorphological and physical features of the rivers within the study area. From the Site Characterisation assessment, the geomorphological and physical characteristics of the channels can be classified as follows:

**Table 6-2 - Geomorphological and physical features of the watercourses on site**

Main Attributes	Characteristics	
River	Krom River	Minor unnamed tributaries & drainage features
Geomorph Zone	Lower Foothill Zone	
Lateral mobility	Semi-Confined by topography	
Channel form	Single to multiple channels	Simple single channel
Channel pattern	Braided channel with moderate sinuosity	Single channel, moderate to low sinuosity
Channel type	Bedrock, alluvial and gravel	
Channel modification	Channel is fairly natural with some flow and habitat modification	Natural with very small disturbances
Hydrological type	Seasonal to episodic	Episodic

Main Attributes	Characteristics
Ecoregion	Great Karoo
DWA catchment	L11A and L11D
Vegetation type	Eastern Upper Karoo
Rainfall region	Very late summer to autumn

Wetlands can be broadly classified according to their flow and geomorphic characteristics. The wetlands are associated with the lower Krom River in the study area and are classified as channelled valley bottom wetlands. Flow into and out of the wetland areas is mostly associated with the watercourses within the study area as opposed to sub-surface flow.

**Table 6-3 – Classification of wetland areas within study area**

Main Attributes	Characteristics
Name	Valley bottom wetlands
System	Inland
Ecoregion	Great Karoo
Landscape setting	Channeled valley floor
Longitudinal zonation	Lower foothill
Drainage	With channel in- and outflow
Seasonality	Seasonally inundated
Modification	Largely natural to Moderately modified
Geology	Shale and siltstone of the Ecca Group; Karoo Sequence
Vegetation	Eastern Upper Karoo
Substrate	Bedrock, gravel and alluvium
Salinity	Fresh to brackish

#### 6.2.2.2 Present Ecological Condition

##### Habitat Integrity of the Watercourses

The evaluation of Habitat Integrity provides a measure of the degree to which a river has been modified from its natural state. The methodology (DWA, 1999) involves a qualitative assessment of the number and severity of anthropogenic perturbations on a river and the damage they potentially inflict upon the system. These disturbances include both abiotic and biotic factors, which are regarded as the primary causes of the degradation of a river. The severity of each impact is ranked using a six-point scale from 0 (no impact) to 25 (critical impact). The Habitat Integrity Assessment is based on an assessment of the impacts of two components of the river, the riparian zone and the



instream habitat. The total scores for the instream and riparian zone components are then used to place the habitat integrity of both in a specific habitat category (**Table 6-4**).

**Table 6-4 - Instream Habitat Integrity assessment for the watercourses within the study area**

<b>Instream Criteria</b>	<b>Unnamed tributaries</b>	<b>Krom River</b>	<b>Riparian Category</b>	<b>Unnamed tributaries</b>	<b>Krom River</b>
Water Abstraction	2	8	Vegetation Removal	2	6
Flow Modification	3	9	Exotic Vegetation	2	6
Bed Modification	3	8	Bank Erosion	3	5
Channel Modification	3	4	Channel Modification	2	5
Water Quality	2	5	Water Abstraction	2	6
Inundation	3	6	Inundation	3	5
Exotic Macrophytes	0	0	Flow Modification	3	7
Exotic Fauna	0	0	Water Quality	2	5
Rubbish Dumping	0	2			
<b>Instream Integrity Class</b>	<b>A</b>	<b>B/C</b>	<b>Riparian Integrity Category</b>	<b>A/B</b>	<b>B/C</b>

The habitat integrity assessment was divided into the smaller watercourses that have few modifications and the larger Krom River within the study area. The rivers within the study area are still in a natural ecological condition in their upper reaches with few modifications. The Krom River is more impacted by surrounding land use activities and is in a largely natural to moderately modified ecological condition.

**Table 6-5 - Habitat Integrity categories (From DWAF, 1999)**

<b>Category</b>	<b>Description</b>	<b>Score (%)</b>
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	80-90

Category	Description	Score (%)
C	Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.	60-79
D	Largely modified. Large loss of natural habitat, biota and ecosystem function has occurred.	40-59
E	The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota.	0

### Wetland Habitat Integrity

The Wetland PES Method (DWAF 2005) was used to establish the integrity of the wetlands in the study area and was based on the modified HI approach developed by Kleynhans (DWAF, 1999; Dickens et al, 2003). **Table 6-7** displays the criteria and results from the assessment of the habitat integrity of the wetlands within the study area. These criteria were selected based on the assumption that anthropogenic modification of the criteria and attributes listed under each selected criterion can generally be regarded as the primary causes of the ecological integrity of a wetland. The valley bottom wetlands have been slightly modified but are still in a largely natural ecological condition (Category B).

The WET-Health method was then used to determine the overall PES for the wetlands. PES scores were determined for geomorphology, hydrology, water quality and vegetation to generate the overall score and ecological category (**Table 6-8**). Modification to the indigenous vegetation being the most impacted component of the wetlands as a result of direct disturbances of adjacent land use activities (i.e. agriculture / grazing) and infrastructure (road) development.

**Table 6-6 - Habitat integrity assessment and criteria for palustrine wetlands (assessment (score of 0=critically modified to 5=unmodified))**

Criteria	Relevance	Wetlands
<b>Hydrologic</b>		
Flow Modification	Abstraction, impoundments or increased runoff from developed areas. Change in flow regime, volume, velocity & inundation of habitats resulting in floristic changes or incorrect cues to biota.	3.4
Permanent Inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.	3.7
<b>Water Quality</b>		
Water Quality Modification	From point or diffuse sources such as upstream agriculture, human settlements and industry. Aggravated by volumetric decrease in flow delivered to the wetland.	3.8

Criteria	Relevance	Wetlands
Sediment Load Modification	Reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rate of erosion, accretion, infilling of wetlands & habitat change.	3.2
<b>Hydraulic/Geomorphic</b>		
Canalisation	Desiccation or change to inundation of wetland and change in habitat	3.8
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities that reduce or change wetland habitat	3.6
<b>Biota</b>		
Terrestrial Encroachment	Desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat	3.9
Indigenous Vegetation Removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.	3.8
Invasive Plants	Affects habitat characteristics through changes in community structure and water quality changes	4.5
Alien Fauna	Presence of alien fauna affecting faunal community structure.	3.5
Biota Over use	Overgrazing, over fishing, etc.	4.5
<b>Category</b>		<b>B</b>

**Table 6-7 - Relation between scores given and ecological categories**

Scoring Guidelines	Interpretation of Scores: Rating of Present Ecological Status Category (PESC)
Natural, unmodified – score=5.	CATEGORY A >4; Unmodified, or approximates natural condition.
Largely natural – score=4.	CATEGORY B >3 and <4; Largely natural with few modifications, with some loss of natural habitat.
Moderately modified – score=3.	CATEGORY C >2 and <3; moderately modified, but with some loss of natural habitats.
Largely modified – score=2.	CATEGORY D <2; largely modified. Large loss of natural habitat & basic ecosystem function OUTSIDE GENERALLY ACCEPTABLE RANGE

Scoring Guidelines	Interpretation of Scores: Rating of Present Ecological Status Category (PESC)
Seriously modified – rating=1.	CATEGORY E >0 and <2; seriously modified. Extensive loss of natural habitat & basic ecosystem function.
Critically modified – rating=0.	CLASS F 0; critically modified. Modification reached critical levels with system completely modified.

**Table 6-8 - WET-Health assessment of valley bottom wetland areas in the study area**

Components	Method used for assessment	PES% Score	Ecological Category
Hydrology PES	WET-Health Hydro Module	85 %	B
Geomorphology PES	WET-Health Geomorph Module	88 %	A/B
Water quality PES	Landuse-WQ Model	91 %	A/B
Vegetation PES	WET-Health Veg Module	83 %	B
Overall Wetland PES	WET-Health default weightings	86 %	B

### 6.2.2.3 Ecological Importance and Sensitivity

The Ecological Importance and Ecological Sensitivity (EI&ES) assessment for both watercourses and wetlands consider several biotic and habitat determinants surmised to indicate either importance or sensitivity. The determinants are rated according to a four-point scale (**Table 6-9**).

**Table 6-9 - Scale used to indicate either ecological importance or sensitivity**

Scale	Definition
1	One species/taxon judged as rare or endangered at a local scale.
2	More than one species/taxon judged to be rare or endangered on a local scale.
3	One or more species/taxon judged to be rare or endangered on a Provincial/regional scale.
4	One or more species/taxon judged as rare or endangered on a National scale

The median of the resultant score is calculated to derive the EI&ES category (**Table 6-11**). The results of the EIS assessment are shown in **Table 6-12**. The EI&ES have been determined for the larger watercourses and the smaller unnamed tributaries separately.

**Table 6-10 - Ecological importance and sensitivity categories (DWAF, 1999)**

EISC	General description	Median
Very high	Quaternaries/delineations unique on a national and international level based on unique biodiversity. These rivers are usually very sensitive and have no or only a small capacity for use.	>3-4
High	Quaternaries/delineations unique on a national scale based on biodiversity. These rivers may be sensitive to flow modifications and may have substantial capacity for use.	>2-≤3
Moderate	Quaternaries/delineations unique on a provincial/ local scale due to biodiversity. These rivers are not very sensitive to flow modification and have substantial capacity for use.	>1-≤2
Low/ marginal	Quaternaries/delineations not unique on any scale. These rivers are generally not very sensitive to flow modifications and usually have substantial capacity for use.	≤1

**Table 6-11 - Results of the EI&ES assessment of the watercourses in the study area**

Biotic and Aquatic Habitat Determinants	Krom River	Smaller tributaries
Rare and endangered biota	1.5	2
Unique biota	2	1
Intolerant biota	2	2
Species/taxon richness	1.5	1.5
Diversity of aquatic habitat types or features	2.5	2
Refuge value of habitat type	2.5	2
Sensitivity of habitat to flow changes	2.5	3
Sensitivity of flow related water quality changes	2	2.5
Migration route/corridor for instream & riparian biota	2.5	1
National parks, wilderness areas, Nature Reserves & areas, PNEs	1.5	1.5
EIS CATEGORY	High	Moderate

The Krom River in the study area is deemed to be of a high ecological importance and sensitivity. This is due to the importance of larger river in providing a diversity of habitats and being important refugia for biota as well as corridors for the movement within the landscape. The smaller tributaries are of moderate ecological importance and sensitivity and tend to be more sensitive to flow and water quality changes. Indigenous fish and amphibian diversity in the rivers are likely to be relatively low. Potential fish and amphibian populations that may occur in the wetter Krom River are listed in Section 3.6 of the report (**Appendix G.4**).

The results from the wetland EIS assessment are provided in **Table 6-12**. The assessment of the ecosystem services supplied by the wetland areas (divided into Hydrological Functional Importance and Direct Human Benefits) is included in the table and was conducted according to the guidelines as described by Kotze et al (2005).

**Table 6-12 - Results of the EIS assessment for the wetland areas**

<b>Ecological Importance</b>	<b>Valley bottom wetlands</b>
Biodiversity support	2.17
Presence of Red Data species	1
Populations of unique species	2
Migration/breeding/feeding sites	3.5
Landscape scale	1.40
Protection status of the wetland	1
Protection status of the vegetation type	1
Regional context of the ecological integrity	2
Size and rarity of the wetland type/s present	1
Diversity of habitat types	2
Sensitivity of the wetland	1.93
Sensitivity to changes in floods	2.8
Sensitivity to changes in low flows/dry season	2
Sensitivity to changes in water quality	1
<b>ECOLOGICAL IMPORTANCE &amp; SENSITIVITY</b>	<b>2.17</b>
Flood attenuation	3
Streamflow regulation	1
Sediment trapping	2.5
Phosphate assimilation	1
Nitrate assimilation	1.5
Toxicant assimilation	1
Erosion control	2
Carbon storage	1



Ecological Importance	Valley bottom wetlands
<b>HYDROLOGICAL/FUNCTIONAL IMPORTANCE</b>	<b>1.63</b>
Water for human use	1.5
Harvestable resources	1.5
Cultivated foods	0
Cultural heritage	0
Tourism and recreation	2
Education and research	1
<b>IMPORTANCE OF DIRECT HUMAN BENEFITS</b>	<b>1.00</b>
<b>OVERALL IMPORTANCE (highest score of ecological, hydrological and direct human benefits)</b>	<b>2.17</b>

The wetland features within the study area are considered of moderate ecological importance and sensitivity as they are closely associated with the larger Krom River, providing habitat and ecological corridors for the movement of biota.

#### 6.2.2.4 Recommended Ecological Condition of Aquatic Ecosystems

Considering the moderately modified to largely natural ecological condition of the aquatic ecosystems within the study area and their moderate to high ecological importance and ecological sensitivities, the recommended ecological condition (REC) of these features would be that they remain in their current condition or be improved where possible. These rivers should not be allowed to degrade further. The proposed PV Facilities are mostly located outside of the aquatic features and are unlikely to result in any significant degradation of aquatic ecosystem integrity if the recommended mitigation measures are implemented.

#### 6.2.2.5 Aquatic Habitat and Species of Concern

The watercourses in the study area are non-perennial, however, some rock pools and dams are likely to contain water for most of the year. As a result, no indigenous fishes occur for most of the river systems, with some indigenous fish, such as smallscale redfin *Psuedobarbus asper* (vulnerable), moggel *Labeobarbus umbratus* (least concern) and chubbyhead barb *Barbus anoplus* (least concern), occurring in the larger rivers where there are deep pools that contain water through the dry season.

The amphibian diversity within the study area is also likely to be relatively low. No species of conservation concern are thus known to occur in the study area from an aquatic perspective. The amphibian species likely to be present are quite widespread and of low conservation concern. These include the Karoo Dainty Frog *Cacosternum karooicum* (Data Deficient), Poynton's River Frog *Amietia poyntoni*, the Cape Sand Frog, *Tomopterna delalandii*, Pygmy Toad *Poyntonophrynus vertebralis* and the Karoo Toad, *Vandijkophrynus gariepensis*. The latter two amphibian species are listed as "Not Threatened".

A faunal species potentially in the area and associated with the watercourses in the landscape is the Riverine Rabbit, which is listed as Critically Endangered. The habitat preference of Riverine Rabbits is alluvial seasonal watercourses, browsing on *Pteronia erythrochaetha*, *Kochia pubescens*, *Salsola glabrescens* and *Mesembryanthemaceae*. They are unable to survive in heavily overgrazed or agriculturally transformed habitats (the presence of the Riverine Rabbit and suitable habitat is discussed within Section 6.2.4 below).

### 6.2.3 PLANT SPECIES

*The following is extracted from the Plant Species Compliance Statement compiled by 3Foxes Biodiversity Solutions and included as **Appendix G.5**.*

The Mura 2 Solar footprint falls entirely within the Eastern Upper Karoo vegetation type (**Figure 6-11** and **Figure 6-14**). Eastern Upper Karoo has an extent of 49 821 km<sup>2</sup> and is the most extensive vegetation type in South Africa and forms a large proportion of the central and eastern Nama Karoo Biome. This vegetation type is classified as Least Threatened, and about 2% of the original extent has been transformed largely for intensive agriculture. Eastern Upper Karoo is however poorly protected and less than 1% of the 21% target has been formally conserved. Mucina & Rutherford (2006) list eight endemic species for this vegetation type, which considering that it is the most extensive unit in the country, is not very high. As a result, this is not considered to represent a sensitive vegetation type. Within the study area, the vegetation is relatively homogenous, although there is some variation in which species are dominant depending on soil depth and the degree of rockiness (**Figure 6-15**). Dominant and characteristic species observed at the site include low woody shrubs such as *Pentzia incana*, *Pentzia globosa*, *Plinthus karoicus*, *Pteronia adenocarpa*, *Pteronia glomerata*, *Ruschia spinosa*, *Tetragonia arbuscula*, *Salsola rabieana*, *Asparagus glaucus*, *Asparagus capensis*, *Euryops lateriflorus*, *Eriocephalus ericoides*, *Eriocephalus spinescens*, *Lycium cinereum*; forbs such as *Arctotis leiocarpa*, *Aptosimum indivisum*, *Nemesia fruticans*, *Heliophila suavissima* and *Chenopodium album*; grasses such as *Aristida adscensionis*, *Aristida diffusa*, *Enneapogon desvauxii*, *Eragrostis lehmanniana*, *Eragrostis obtusa*, *Stipagrostis obtusa* and *Tragus berteronianus*. A total of 82 plant species were recorded within the Mura 1 and Mura 2 Solar footprint area during the walk-through survey.





**Figure 6-14 - Typical open plains within the southern half of Mura 2 Solar project area**



**Figure 6-15 - Eastern part of the Mura 2 Solar project area**

## 6.2.4 ANIMAL SPECIES

The following is extracted from the Animal Species Compliance Statement compiled by 3Foxes Biodiversity Solutions and included as **Appendix G.6**.

In terms of the fauna that potentially occur at the site, the potential diversity is considered to be moderate and numbers approximately 38 mammals, 28 reptiles and about 6 frog and toads. Mammals observed at the site directly, indirectly or through the camera trapping include Springbok, Steenbok, Aardvark, Cape Hare, Cape Porcupine, Suricate, African Wildcat, African Polecat, Bat-eared Fox, Cape Fox, Cape Mongoose, Yellow Mongoose, Common Genet, Aardwolf and Black-backed Jackal as well as some introduced species such as Sable Antelope, Eland, Blesbok and Black Wildebeest. Reptiles and amphibians observed on the site or in the immediate environment include Leopard Tortoise, Southern Tent Tortoise, Karoo Girdled Lizard, Spotted Sand Lizard, Southern Rock Agama, Cape Thick-toed Gecko, Variegated Skink, Ground Agama and Karoo Toad. Although the DFFE Screening Tool identified only the Karoo Dwarf Tortoise and Riverine Rabbit as being of potential concern at the site, there are several other fauna species of concern that occur in the wider area (**Table 6-13**). However, interrogation of these also suggests that none of these are likely to occur within the site as they all occur in habitats that are not represented within the PV footprint area.

In terms of the two species identified by the Screening Tool, the Karoo Dwarf Tortoise and the Riverine Rabbit, there is no suitable habitat for either species within the development footprint. The Riverine Rabbit is associated with well-vegetated alluvial floodplains of the ephemeral rivers of the central and upper Karoo and in the Upper Karoo at least, do not tend to stray far from this habitat. Since there is no alluvial floodplain habitat within the site, it can be confirmed that the site can be considered low sensitivity for this species. Although there is a dam within the Mura 2 study area, the drainage leading into the dam is not well-developed and there is no riparian vegetation or actual clearly defined channel.

The Karoo Dwarf Tortoise *Chersobius boulengeri* occurs in association with dolerite ridges and rocky outcrops of the southern Succulent and Nama Karoo biomes, and peripherally in the Albany Thicket biome in the southeast, at altitudes of approximately 800 to 1,500 m. The vegetation usually consists of dwarf shrubland that often contains succulent and grassy elements. The tortoises usually take shelter under rocks in vegetated areas or in rock crevices. However, these are quite specific in terms of their requirements with the result that suitable retreats for the species are not common. Due to their strong habitat association, populations are isolated on rocky outcrops with specialized vegetation (Hofmeyr et al. 2018). The typical dolerite outcrops associated with this species do not occur within the PV footprint areas and there are no other significant rocky outcrops present within the PV areas that would be likely to offer shelter for this species. As such, it is concluded that the Mura 2 Solar PV area can be considered low sensitivity for this species.

**Table 6-13 - Faunal species conservation concern known from the broad area, and their likely presence within the site**

Species	Wider area	PV footprint
Vaal Rhebok (NT)	Present on higher ground, especially the Nuweveld mountains.	Not observed with the camera traps on the site or on the adjacent Harpuisberg which was



Species	Wider area	PV footprint
		extensively camera trapped for the Nuweveld series of wind farms.
Black-footed Cat (VU)	Previously recorded from within the Karoo National Park, but no recent records.	No recent records from the area. The habitat within the site is also considered sub-optimal for this species as the cover is very low and there are very few burrow refuge sites available.
Leopard (VU)	This species is generally confined to protected areas or mountainous terrain and may be present in the wider area.	The terrain within and near the site is highly unlikely to be attractive for this species which prefers rugged terrain with more cover than the site offers.
Riverine Rabbit (CR)	There are records from the Krom River and some of the larger tributaries.	There is no habitat within the site for this species and it is not present.
Littledale's Whistling Rat (NT)	Occurs in the wider area and the arid parts of the Nama and Succulent Karoo and Namibia.	This species is associated with sandy soils and makes characteristic burrows that are easily observed. There is no habitat for this species within the site.
Karoo Dwarf Tortoise (NT)	Occasional records from the broad area. Associated with dolerite outcrops.	There is no habitat considered suitable for this species within the PV development footprint.

## 6.2.5 AVIFAUNA

*The following is extracted from the Avifaunal Impact Assessment compiled by WildSkies Ecological Services (Pty) Ltd and included as **Appendix G.7**. This assessment has been based on a 6 month avifaunal monitoring undertaken for the project.*

### 6.2.5.1 Vegetation description

Functionally in avifaunal terms, the site can be classified as Karoo shrubland. Often more important than vegetation type in determining avifaunal diversity and abundance, are the micro habitats available for birds. Micro habitats are determined by multiple factors, including but not limited to vegetation type. Anthropogenic factors such as land use, construction of dams etc. are a significant factor. At the proposed site the micro habitats available to birds are: dams, Karoo shrubland, exotic trees (mostly at homesteads), rivers, ridge/cliff lines. These micro habitats are pictured in **Figure 6-16**.



**Figure 6-16 - Photographs of micro habitats on and near site**

#### 6.2.5.2 Avifaunal community on site

##### **Southern African Bird Atlas Project data**

Up to approximately 220 species were recorded in the broader area by the first and second Southern Africa Bird Atlas Projects ([www.sabap2.adu.org.za](http://www.sabap2.adu.org.za)). These birds were not necessarily recorded on the Mura site itself but are an indication of which species could occur on site if conditions and habitats are right. Of the 220 species approximately 71 were classified in the top 200 at risk species by Retief et al (2014). Four species are regionally Endangered (Ludwig's Bustard, Black Harrier *Circus maurus*, Martial Eagle *Polemaetus bellicosus* & Yellow-billed Stork *Mycteria ibis*), five are Vulnerable, and 6 are Near-threatened. Two species (Ground Woodpecker *Geocolaptes olivaceus* & Curlew Sandpiper *Calidris ferruginea*) are Least Concern regionally but Near-threatened globally (IUCN 2022).

##### **Pre-construction bird monitoring data**

Whereas the atlas data described above shows which species could occur on the site since they have been recorded in the broader area, our own monitoring data confirms those species definitely occurring on the site. The species diversity on the proposed site itself is lower, due to its smaller size and lower habitat diversity.

A total of 88 bird species were recorded on site by all our pre-construction bird monitoring methods (Appendix 1 of the Avifauna Report in **Appendix G.7**). Five of these 88 species are regionally Red Listed: Ludwig's Bustard is Endangered; Verreaux's Eagle is Vulnerable; and Karoo Korhaan



Eupodotis vigorsii, Blue Crane Grus paradisea and Sclater's Lark Spizocorys sclateri are Near-threatened (Taylor et al, 2015).

#### Small Passerine Bird Data (walked transects)

**Table 6-14** presents a summary (full programme of 6 months) results for those species for which > 10 individuals recorded) of the bird data collected by walked transects during the monitoring period (see Appendix 2 of the Avifauna Report in **Appendix G.7** for the full dataset). A total of 37 bird species were recorded by this method. One of the 37 species is regionally Red Listed, the Sclater's Lark (Near-threatened, Taylor et al, 2015). One record of a pair of these larks was made in spring on Area 2 (Mura 1 and Mura 2). The most abundant species was Black-headed Canary Serinus alario, followed by Namaqua Sandgrouse Pterocles Namaqua and Sickie-winged Chat Cercomela sinuata. Overall, this is a rather unremarkable bird species diversity, reflecting the relatively uniform nature of the habitat on site.

#### Large terrestrial and raptor data (driven transects)

**Table 6-15** summarises the findings from driven transects on site across the 6 months (the full dataset can be seen in Appendix 3 of the Avifauna Report in **Appendix G.7**). In total, 9 species were recorded in the period. Three regionally Red Listed species are included: Karoo Korhaan (Near-threatened), Blue Crane (Near-threatened) and Ludwig's Bustard (Endangered). The most abundant species was Karoo Korhaan, which was predominantly recorded in pairs.

#### Incidental observations

Incidental records of priority bird species were made during both site visits and comprised a total of 13 species (**Table 6-16**) (Appendix 4 of the Avifaunal Impact Assessment (**Appendix G.7**) shows the full dataset). Five of the recorded species are regionally Red Listed (Taylor et al, 2015): Ludwig's Bustard is Endangered; Verreaux's Eagle is Vulnerable; and Karoo Korhaan, Blue Crane and Sclater's Lark are Near-threatened. These incidental data are not used formally as they are not the product of systematic sampling. They do however assist in assessing how frequently various species are seen, and in what abundance.

#### Focal sites

The two most important Focal Sites monitored by this programme are a Martial Eagle nest and a Verreaux's Eagle nest (both some distance off the proposed project sites now that certain areas have been screened out). The Martial Eagle nest became irrelevant when PV Area 1 was dropped from the project design as it is too far from the proposed areas to be relevant. The Verreaux's Eagle nest also became less relevant to the study once the PV Areas 3 and 4 closest to it were excluded from the project. The nest was active in 2021 according to farm workers but does not seem to have had successful breeding in the 2022 breeding season. The results are summarised in **Table 6-17**.

**Table 6-14 - Summary data from walked transects on site**

Species	Birds	Records	Birds/km
Black-headed Canary	760	104	18.10
Namaqua Sandgrouse	209	46	4.98
Sickle-winged Chat	157	96	3.74

Species	Birds	Records	Birds/km
Lark-like Bunting	119	38	2.83
Spike-heeled Lark	98	27	2.33
Rufous-eared Warbler	70	43	1.67
Capped Wheatear	51	41	1.21
Karoo Eremomela	51	24	1.21
Grey-backed Sparrow-Lark	47	6	1.12
Large-billed Lark	44	28	1.05
White-necked Raven	40	16	0.95
Karoo Long-billed Lark	33	29	0.79
Bokmakierie	29	21	0.69
Karoo Chat	28	23	0.67
Speckled Pigeon	28	7	0.67
Red-capped Lark	27	11	0.64
Pied Crow	23	10	0.55
Cape Bunting	22	9	0.52
Cape Sparrow	22	7	0.52
Mountain Wheatear	20	14	0.48
South African Shelduck	18	9	0.43
African Pipit	17	12	0.40
Yellow-bellied Eremomela	17	9	0.40
Karoo Scrub Robin	16	9	0.38
White-throated Canary	16	11	0.38
Black-eared Sparrow-Lark	12	1	0.29
Cape Turtle Dove	11	8	0.26
Namaqua Dove	10	5	0.24

**Table 6-15 - Summary data from driven transects on site**

<b>Transect length (km)</b>	<b>Birds</b>	<b>Records</b>	<b>Birds/km</b>
Karoo Korhaan	30	12	0.61
Blue Crane	10	3	0.20
Double-banded Courser	6	3	0.12
Ludwig's Bustard	4	3	0.08
Jackal Buzzard	2	2	0.04
Pied Crow	2	2	0.04
Temminck's Courser	2	1	0.04
African Harrier-Hawk	1	1	0.02
Rock Kestrel	1	1	0.02
<b>Transect length (km)</b>	<b>49</b>		

**Table 6-16 - Summary of incidental observations recorded on site**

<b>Species</b>	<b>Birds</b>	<b>Records</b>
Karoo Korhaan	104	46
Grey-winged Francolin	12	6
Ludwig's Bustard	12	10
Blue Crane	10	3
Double-banded Courser	6	3
Jackal Buzzard	3	3
Sclater's Lark	3	2
Verreaux's Eagle	2	2
Rock Kestrel	2	2
Spotted Eagle-Owl	1	1
Pale Chanting Goshawk	1	1
African Harrier-Hawk	1	1
Temminck's Courser	1	1
<b># Species</b>	<b>13</b>	

**Table 6-17 - Summary of Focal Site findings**

Focal site	Type	Season 1	Season 2
1	Dam	Nothing seen	n/a
2	Dam	Egyptian Goose, Blacksmith Lapwing	n/a
3	Martial Eagle nest	Nothing seen	No records
4	Medium size nests	Nothing seen	No records
5	Dam	Egyptian Goose, SA Shelduck	2 Pied Avocet
6	Dam	SA Shelduck	4 Pied Avocet, 4 SA Shelduck
7	Dam	Egyptian Goose, Blacksmith Lapwing, SA Shelduck	Cape Teal x 2
8	Dam	Nothing seen	Nothing, dam dry
9	Cliff	Verreaux's Eagle occupied nest, Hamerkop nest	Inactive
10	Cliff & river	SA Shelduck, African Spoonbill, Blacksmith Lapwing, Egyptian Goose, African Black Duck	Jackal Buzzard nest active
11	Cliff	Nothing seen	No records
12	Cliff	Nothing seen	No records

### Important Bird & Biodiversity Area (IBA) data

The closest Important Bird and Biodiversity Area (IBA - Marnewick et al, 2015) is approximately 35 kilometres south of the study area at its closest point, the Karoo National Park IBA. Although this is geographically quite distant, the avifaunal community is believed to be fairly similar and is discussed further below.

The Karoo National Park is in the semi-arid central Karoo and is approximately 90 000 hectares in size. The IBA contains the Nuweveld escarpment with peaks over 1900 metres above sea level and plains at 900m.a.s.l. The climate is one of extremes, with very hot summers and very cold winters, particularly on top of the escarpment. Average annual rainfall is 260mm p.a. Up to 231 bird species have been recorded in the IBA, which is extremely important for Namib-Karoo biome restricted species such as Black-headed Canary, Sweet Waxbill *Coccothraustes melanotis*, Cape Rockjumper *Chaetops frenatus*, Protea Seedeater *Crithagra leucoptera*, Cape Siskin *Crithagra totta*, Victorin's Warbler *Cryptillas victorini* and Hottentot Buttonquail *Turnix hottentottus*. The plains are particularly good for Ludwig's Bustard, Karoo Korhaan, Spike-heeled Lark, Karoo Lark *Calendulauda albescens*, Grey-backed Sparrow-lark *Eremopterix verticalis*, Tractrac Chat *Emarginata tractrac*, Karoo Chat

*Emarginata schlegelii*, Karoo Eremomela *Eremomela gregalis*, Rufous-eared Warbler *Malcorus pectoralis*, and Black-headed Canary. The riverine woodland along drainage lines holds Namaqua Warbler *Phragmacia substriata* and other species. The cliffs hold Verreaux's Eagle, Booted Eagle *Hieraaetus pennatus* and Black Stork *Ciconia nigra*.

IBA trigger species include: Martial Eagle, Blue Crane, Black Harrier, Secretarybird *Sagittarius serpentarius*, Kori Bustard *Ardeotis kori* and Ludwig's Bustard. Regionally threatened species are Verreaux's Eagle, Lanner Falcon *Falco biarmicus*, Black Stork, Karoo Korhaan and African Rock Pipit *Anthus crenatus*. Biome-restricted species that are common in the IBA include Karoo Long-billed Lark *Certhilauda semitorquata*, Karoo Chat, Namaqua Warbler, Pale-winged Starling *Onychognathus nabouroup*, Black-headed Canary, Layard's Tit-Babbler *Curruca layardi* and the locally common Karoo Korhaan. Uncommon species in this category include Ludwig's Bustard, Karoo Lark, Sclater's Lark, Black-eared Sparrow-lark *Eremopterix australis*, Tractrac Chat, Sickie-winged Chat, Karoo Eremomela and Cinnamon-breasted Warbler *Curruca subcoerulea*. The Beaufort West sewage works (within this IBA) is important for water birds particularly in dry times when little other surface water is present in the landscape. Greater Flamingo, Lesser Flamingo, South African Shelduck *Tadorna cana*, and Cape Shoveler *Spatula smithii* are regularly recorded here. Interestingly the town of Beaufort West itself is included in the IBA because there is a Lesser Kestrel *Falco naumanii* roost in trees in town.

### Coordinated Avifaunal Roadcount (CAR) project

CAR counts are a census of birds (focussed on large terrestrial species) performed twice annually (in winter and summer) by volunteer birdwatchers driving set routes. The purpose is to provide population data for use in science, especially conservation biology, by determining findings about the natural habitats and the birds that use them. The closest CAR routes to the proposed site are approximately 51km south, below the escarpment. These data are too far from site to be of use.

### Coordinated Waterbird Count (CWAC) project

There is one Coordinated Waterbird Count (CWAC) site approximately 16km north of the site (Slangfontein Dam) (Taylor et al, 1999). Bird species counted at this dam include all the usual waterfowl species such as Yellow-billed Duck *Anas undulata*, Egyptian Goose *Alopochen aegyptiaca*, South African Shelduck *Tadorna cana*, Cape Shoveler *Anas smithii*, and Red-billed Teal *Anas erythrorhynchos* (**Table 6-18**). None of these species were recorded in remarkable numbers. No flamingos were recorded at this dam to date, which is positive as flamingos would be susceptible to power line collision. **Table 6-18** summarises these data.

**Table 6-18 - CWAC data from Slangfontein Dam**

Common name	Taxonomic name	Min	Avg	Max
Duck, Yellow-billed	<i>Anas undulata</i>	44	44	44
Goose, Egyptian	<i>Alopochen aegyptiacus</i>	10	10	10
Greenshank, Common	<i>Tringa nebularia</i>	8	8	8
Heron, Black-headed	<i>Ardea melanocephala</i>	1	1	1
Heron, Grey	<i>Ardea cinerea</i>	1	1	1



Common name	Taxonomic name	Min	Avg	Max
Ibis, African Sacred	<i>Threskiornis aethiopicus</i>	10	10	10
Ibis, Hadedra	<i>Bostrychia hagedash</i>	1	1	1
Lapwing, Blacksmith	<i>Vanellus armatus</i>	9	9	9
Plover, Kittlitz's	<i>Charadrius pecuarius</i>	15	15	15
Plover, Three-banded	<i>Charadrius tricollaris</i>	3	3	3
Ruff, Ruff	<i>Philomachus pugnax</i>	8	8	8
Sandpiper, Curlew	<i>Calidris ferruginea</i>	14	14	14
Shelduck, South African	<i>Tadorna cana</i>	11	11	11
Shoveler, Cape	<i>Anas smithii</i>	2	2	2
Teal, Red-billed	<i>Anas erythrorhyncha</i>	55	55	55
Wagtail, Cape	<i>Motacilla capensis</i>	18	18	18

### 6.2.5.3 Description of Species of Conservation Concern for this site

Given the large number of species within the broader study area, it is necessary to prioritise the species most relevant to the proposed development to streamline the impact assessment process. Relevant to this study, Species of Conservation Concern (SCC) include regionally and globally Red Listed species (Taylor, 2015; IUCN, 2022) and endemic species, especially those that may be susceptible to solar energy impacts.

Taking the above data sources described in Section 4.2 into account, the SCC species were identified and are presented in **Table 6-19**. **Table 6-19** provides an annotated list of the identified species. The likelihood of each of these species occurring on the proposed site, the likely importance of the site for each species, and potential impacts of the proposed facility were also rated in the table. The ratings are all the same for all four PV sites, since the species involved were recorded in the broader area and are mobile, so are considered to occur on all the sites.

**Table 6-19 - Identified Species of Conservation Concern (SCC) for the proposed projects**

Common name	Taxonomic name	Taylor et al 2015, IUCN 2022	Endemic /near	Likelihood of occurring on site	Relative importance of the site for species	Possible impacts	Overall risk
Ludwig's Bustard	<i>Neotis ludwigii</i>	EN, EN		Confirmed, likely forages on site frequently when conditions are right	Medium	Habitat destruction, Disturbance	High

Common name	Taxonomic name	Taylor et al 2015, IUCN 2022	Endemic /near	Likelihood of occurring on site	Relative importance of the site for species	Possible impacts	Overall risk
Verreaux's Eagle	<i>Aquila verreauxii</i>	VU, LC		Confirmed, resident several kilometres off site and likely forages on site occasionally	High	Habitat destruction, Disturbance	Medium
Karoo Korhaan	<i>Eupodotis vigorsii</i>	NT, LC		Confirmed, multiple pairs resident on site	Medium	Habitat destruction, Disturbance	High
Sclater's Lark	<i>Spizocorys sclateri</i>	NT, NT	1	Confirmed, one pair seen on site, likely occasional visitor	Medium	Habitat destruction, Disturbance	Medium
Sclater's Lark	<i>Spizocorys sclateri</i>	NT, NT	1	Confirmed, one pair seen on site, likely occasional visitor	Medium	Habitat destruction, Disturbance	Medium
Blue Crane	<i>Grus paradisea</i>	NT, VU	1	Confirmed, likely resident in broader area	Low	Habitat destruction, Disturbance	Low

'1' denotes presence, not abundance; EN – Endangered; VU – Vulnerable; NT – Near-threatened; LC - Least Concern; RD (Regional, Global) – Regional Red List – Taylor et al, 2015; Global Red List – IUCN 2022.

### Ludwig's Bustard (High risk)

The Ludwig's Bustard is classified as regionally Endangered by Taylor et al (2015). This physically large species is highly vulnerable to collision with overhead power (although not the scope of this report, still relevant as the proposed PV projects will give rise to new overhead power lines) and is also likely to be affected by disturbance and habitat destruction. This species was listed as globally Endangered in 2010 because of potentially unsustainable power line collision mortality, exacerbated by the current lack of proven mitigation and the rapidly expanding power grid (Jenkins et al. 2011). Ludwig's Bustard is a wide-ranging bird endemic to the south-western region of Africa (Hockey et al. 2005). Ludwig's Bustards are both partially nomadic and migratory (Allan 1994, Shaw 2013, Shaw et al, 2015), with a large proportion of the population moving west in the winter months to the Succulent Karoo. In the arid and semi-arid Karoo environment, bustards are also thought to move in response to rainfall, so the presence and abundance of bustards in any one area are not predictable.

Ludwig's Bustard is likely to be susceptible to two possible impacts associated with a solar PV facility: habitat destruction, and disturbance. We recorded Ludwig's Bustard on the proposed sites in both seasons. Most records were of 1 or 2 individual birds. We believe that small influxes of Ludwig's Bustards onto site could occur at times when conditions are right on site. Based on the species' conservation status, we consider this species to be at High risk at this site.

### **Verreaux's Eagle (Medium risk)**

The Verreaux's Eagle has recently been up-listed in regional conservation status to Vulnerable (Taylor et al. 2015) in recognition of the threats it is facing. This species tends to occupy remote mountainous areas largely unaffected by development (until the advent of wind energy in SA). A pair can typically use several alternate nests in different seasons, varying from a few metres to 2.5km apart (in Steyn, 1989). Approximately 400 – 2 000 pairs exist in the Western and Northern Cape (Hockey et al. 2005). These eagles can exist at quite high density compared to other eagle species, with some territories as small as 10km<sup>2</sup> in the Karoo (Davies, 2010 – [www.africanraptors.org](http://www.africanraptors.org) – work done on Nuweveld Escarpment) and 10.3km<sup>2</sup> in the Matopos in Zimbabwe (Steyn, 1989). Davies found a range of territory size from 10 to 50km<sup>2</sup>, with an average size of 24km<sup>2</sup> in the Karoo of South Africa, and nests were approximately 2 kilometres apart on average.

At the proposed sites we have recorded a Verreaux's Eagle nest within the broader area (5.2km south-west of Mura 4). We categorised a 2km radius around this nest as No-Go for new development. This resulted in the impact avoidance measures taken by the developer in excluding the closest PV area from development.

This species is likely to be susceptible to two possible impacts at a solar PV facility: habitat destruction, and disturbance. Based on our data collected on site to date, we conclude that this species is at Medium risk. This risk would have been High if avoidance had not already been applied through the application of the no-go buffers around the nest.

### **Karoo Korhaan (High risk)**

Karoo Korhaan is classified as Near-threatened regionally (Taylor et al, 2015). This species is suspected to have undergone a reduction in population and range (Taylor et al, 2015). Karoo Korhaan could be susceptible to two possible impacts at a solar PV facility: habitat destruction, and disturbance. We have recorded this species consistently on the proposed sites through all site visits, mostly in pairs and small family units. Based on these data we judge the species to be at High risk at the proposed site, primarily through habitat destruction and disturbance.

### **Sclater's Lark (Medium risk)**

The Sclater's Lark is Near Threatened regionally and globally (Taylor et al, 2015, IUCN, 2022). This is an uncommon, localised, species that is found in the Karoo. There is currently no population estimate for the species', mostly due to incomplete survey data due to its remote habitats and inconspicuous nature. We recorded a single pair of Sclater's Lark once on Mura PV 3 and 4 in spring through walked transects. Two incidental records of the species were also made on Mura PV 3 and 4 in spring, a single bird, and a pair. This species could be susceptible to habitat destruction, disturbance, and possibly direct mortality at solar PV facilities. Given our current understanding of direct mortality at PV facilities (and information from Visser et al, 2019) and the Sclater's Lark we believe that direct mortality is not likely to be significant.

### Blue Crane (Low risk)

The Blue Crane is classed as Near-threatened regionally by Taylor et al (2015) and Vulnerable globally (IUCN, 2021). It is almost endemic to South Africa (a small population exists in Namibia) and is the South African national bird. It has the most restricted range of any of the 15 crane species worldwide. The population is estimated at a minimum of 25 000 birds (Taylor et al, 2015). The 2015 Red Data book on birds downgraded the species conservation status from Vulnerable (Barnes, 2000) to Near-threatened (Taylor et al, 2015). Globally the status remained the same at Vulnerable (IUCN, 2022). The species population is divided into three sub-populations: the eastern grasslands (2600 cranes), the Karoo (10 800 cranes) (within which the site is located); and the Western Cape (12 100 cranes). Of these the Western Cape population appears to have shown growth in recent decades, whilst the eastern grasslands population has declined or at best been stable, and the Karoo population has been stable.

At the proposed sites we have recorded the species several times, in pairs or small family units. Overall, we conclude that Blue Crane is at Low risk at the site, since no large flocks or congregation areas were recorded.

## 6.3 SOCIAL AND ECONOMIC ENVIRONMENT

### 6.3.1 ARCHAEOLOGICAL AND CULTURAL HERITAGE

*The following is extracted from the Heritage Impact Assessment compiled by ASHA Consulting (Pty) Ltd and included as **Appendix G.8**.*

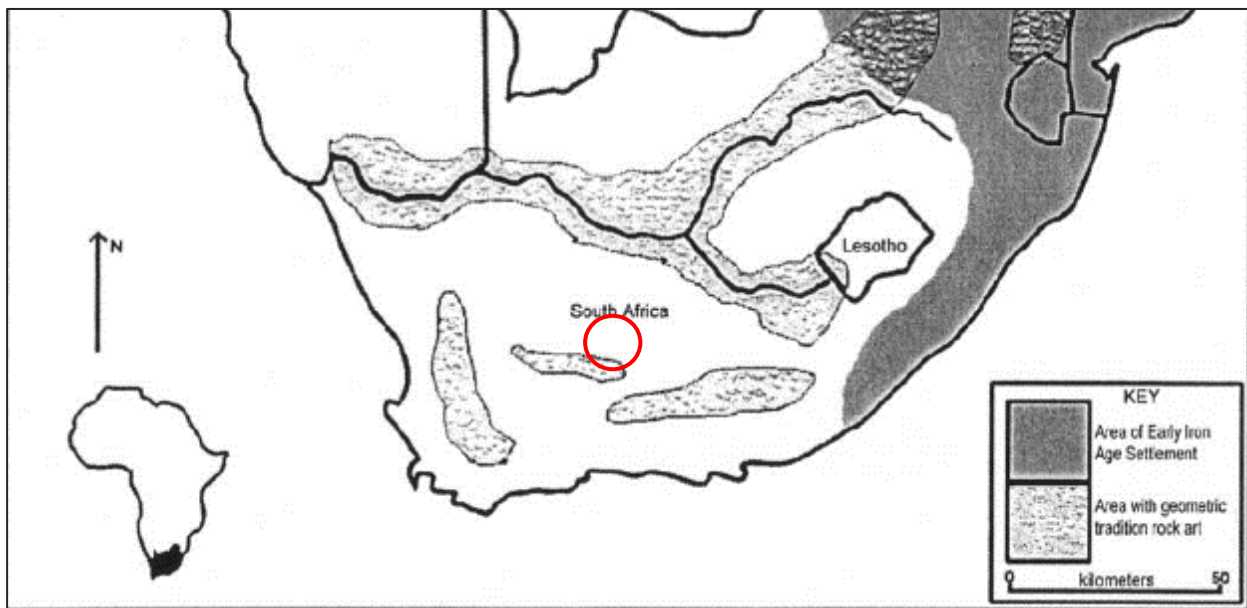
The broader Karoo region generally contains sparse archaeological traces from the Early (ESA), Middle (MSA) and Later Stone Ages (LSA). The vast majority of material tends to be what is referred to as background scatter. This can be defined as “widespread isolated artefacts whose distribution results from either primary or secondary causes” (Orton 2016:121).

ESA and MSA materials were found to be very rare in this mountain environment, but not absent (Orton 2022a). In this dry landscape, LSA archaeological sites are well-known to be focused most strongly on water sources. Where dolerite outcrops are close to water sources then these are strongly favoured for occupation. This pattern was well demonstrated locally by Orton (2021a, 2021b, 2021c, 2021d, 2022a, 2022b), but the density of sites found was quite low. These sites are usually scatters of stone artefacts (strongly dominated by hornfels with other materials being rare), often accompanied by ostrich eggshell fragments and sometimes pottery, but may also include fragments of bone and even archaeological deposits (the latter are unknown from the Nuweveld area though). Ostrich eggshell beads and lower grindstone are also rarely seen. Occasionally, the scatters were very dense and those sites must have either been occupied for a long period of time, or on many occasions. The flat plains that lack landscape features tend to also lack significant archaeological heritage resources. Webley and Hart (2010) examined a site to the east of Loxton and located just two flakes that they considered to be of MSA origin. Two WEF projects have been assessed to the north and northeast of the Mura study areas, but these projects do not appear on SAHRIS and their reports could thus not be consulted.

An interesting aspect of Karoo archaeology is rock gongs. These are (usually) dolerite rocks that are naturally perched in such a way that when struck they release a ringing musical note. The gongs are identified by heavily worn patches where they have been repeatedly struck. Parkington et al. (2008) have studied a number of gongs from Nelspoort and Vosburg, some 55 km to the southeast and 140

km to the north-northeast of the present study area respectively, but Orton (2021b) recorded two further examples in the Nuweveld within about 15 km to the west of the Mura study area, both of which were surrounded by extensive stone artefact scatters indicating occupation of the area.

Rock art sites occur in low density through the wider area, with three painted ‘geometric tradition’ sites and several engraved ‘fine line’ tradition sites on record from the Nuweveld (Orton 2021a, 2021b, 2021c, 2021d, 2022a, 2022b). Geometric tradition art is thought to have been produced by the Khoekhoen and the new records expand the known distribution of this tradition in the area (Figure 6-17). Parkington et al. (2008) have documented many engravings in the Karoo region. They do not map their work but do provide a historical map of engraving distribution which shows the densest concentration being to the northeast around the Kimberley region.



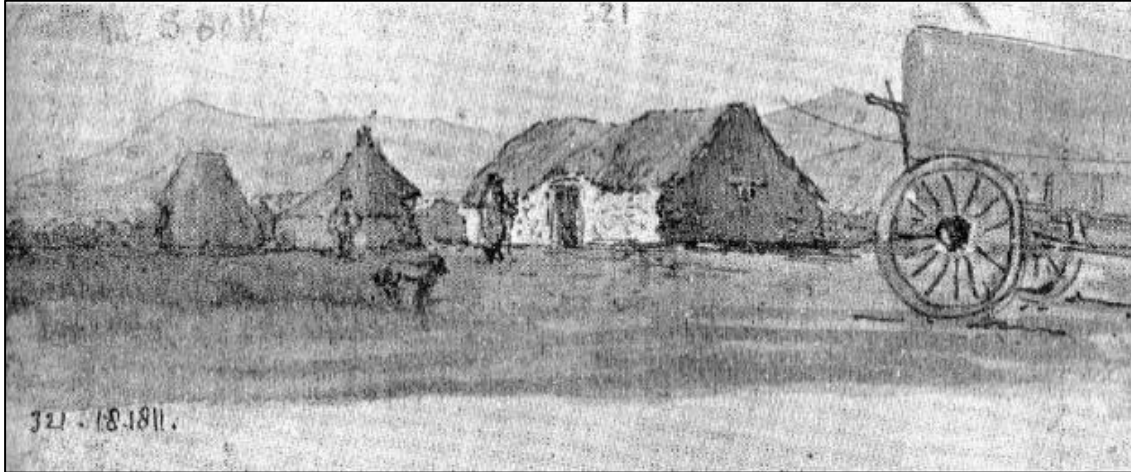
**Figure 6-17 - Extract from a map showing the distribution of geometric tradition rock art.**  
**Source: Smith & Ouzman (2004: fig. 9)**

Until Orton’s (2021a, 2021b, 2021c, 2021d) recent surveys in the area, historical archaeological resources, too, were little known from the Nuweveld area. These surveys showed that 19th century occupation of the area was widespread with many small abandoned and ruined stone-walled farmsteads scattered along the water courses of the area. The structures included houses (both formal rectangular flat roofed houses and lobed dwellings that might have had temporary roofs), kraals, and various small outbuildings of unknown function but likely including storage spaces and chicken coops. At the southern end of the Nuweveld Mountains, in the Karoo National Park (KNP), Kaplan (2005, 2006) recorded several small, ruined stone structures which were said to be kraals, a homestead and shepherd’s huts. One of them had a small scatter of late 19th to early 20th century historical artefacts associated with it. A stone-built lime kiln and some animal traps are also on record there (SANParks 2017). Other stone walled ruins are known from the KNP and, according to Anonymous (2016) some were demolished in order to reuse the stone to build the Klipspringer Pass. This pass was built from 1986 to 1992 (Goetze 1993).

These early packed stone structures are invariably collapsed reducing them to archaeological sites in terms of the NHRA definitions. While some with taller walls may have had a formal or informal and/or temporary roof over them, others may have been hartebeeshuise with A-frame-type roofs



made of branches and reeds placed above low stone or mud walls. Governor van Plettenberg, during his travels east to inspect the Colony, noted near the Sneeuwberg Mountains that the houses of the colonists consisted only of one room structures with low walls and straw roofs (Theal 1896-1911 cited in Böeseken 1975). In 1811 William Burchell illustrated a trekboer farmhouse (Van Zyl 1975), while Schoeman (2013) shows an image of such a historical stone dwelling still in use in the early 20th century (**Figure 6-18** and **Figure 6-19**).



**Figure 6-18 - Drawing of an early 19th century trekboer farmhouse by William Burchell.**  
Source: Van Zyl (1975:103)



**Figure 6-19 - A shepherd's hut photographed near Beaufort West in the early 20th century.**  
Note the low, narrow doorway and informal roof structure. Source: Schoeman (2013:48)



The engraving tradition in the Karoo continued beyond the Stone Age as testified to by the many recent ‘scratched’ engravings that are known to occur. Horses are an extremely common subject in these recent engravings. Morris (1988) has reviewed the engravings of the Karoo and notes that they have been attributed by Battiss (1948) to Europeans and Griquas and by Fock (1979) to ‘Hottentots’. Morris (1988) suggests that some were almost certainly made by early Baster and Trekboer immigrants and that the tradition continued into the 20th century. He also notes the inclusion of wagons and human figures in western clothing. Recent work in the Nuweveld has revealed a scattering of such images but with a very dense concentration located 43 km west-southwest of the Mura study area (Orton 2022a, 2022b). Notably, subject matter in the latter area included many Nine Men’s Morris boards, a Morris Minor car and dates of 1924 and 1934 (the latter written as 30.7.34 but assumed to be 20th century). While some of these engravings are clearly less than 100 years old and not legally archaeological, they demonstrate a continuity of the engraving tradition, and the sites can thus be considered as places associated with living heritage.

The Karoo has been a highly contested landscape at various times in the past. The Khoekhoen first migrated into South Africa about 2000 years ago. That they lived in the Karoo in precolonial times is testified to by the presence of geometric tradition rock art and precolonial kraals, while many historical records of their presence also exist. The only study to attempt to date the Khoekhoe occupation was by Sampson (2010) in an area about 160 km northeast of the Mura study area. Through dating potsherds associated with kraals he determined that the kraals – and by implication herding – dated to between about AD 1000 and AD 1750, shortly before the arrival of the Trekboers. Sampson (2010:847) suggests that there would have been tension between the indigenous San and the incoming Khoekhoen but considers that their interactions resulted in “a millennium of (probably uneasy) space-sharing with the locals.”

Stone Age materials were generally found to be rare. The only finds made were ephemeral scatters of artefacts.

Historical archaeological sites were somewhat more common than Stone Age sites. The smallest sites were small clusters of rocks. These may have been cairns but otherwise their functions could not be determined. None seemed like graves and one of them had a wine bottle base located alongside it (**Figure 6-20** and Figure 6-21).



**Figure 6-20 - Small stone cairn/feature at waypoint 1396 within the Mura 2 study area**



**Figure 6-21 - The base of a black glass wine bottle from waypoint 1396**

A number of stone-walled sites were found. These included a small livestock and some small house ruins (**Figure 6-22** and **Figure 6-23**). These sites relate early European occupation of the area. Very few artefacts were found with them.



**Figure 6-22 - Stone-walled ruin at waypoint 1328. It is likely a livestock enclosure. This site is 120 m outside the Mura 2 study area**





**Figure 6-23 - Stone-walled ruin at waypoint 1329. This site is 150 m outside the Mura 2 study area**

The Nuweveld surveys revealed a number of archaeological sites along the access roads. These were mostly historical ruins and associated features. The majority are unlikely to be affected by any upgrades of the road since the road is generally already wide enough to accommodate the required vehicles.

#### **6.3.1.1 Graves**

No graves were seen in any of the study areas and given the often hard substrate and general lack of occupation debris, none are expected to occur.

#### **6.3.1.2 Historical aspects and the Built environment**

Historical buildings occur widely across the Karoo with most dating to the 19th century. Orton et al. (2016:15-8) noted the following:

*“In the harsh, resource-scarce Karoo environment with its restricted range of materials, necessity often was the mother of invention when it came to constructing shelter, resulting in a unique regional vernacular building tradition that displays the creative and technical achievement required to fashion an existence there. This relied on both traditional and conventional artisanal skills since buildings were hand-crafted from sun-baked bricks, locally occurring timber and quarried or collected stone. The result was a variety of local styles that we refer to collectively as Karoo vernacular.”*

This varied architecture is evident not only in the towns but also in remote areas. Two building traditions are unique to the Karoo. Corbelled buildings, which mainly occur to the north and west of the present study area and date between about 1813 and 1870, evolved from the need to build roofs without wooden beams (Kramer 2012). Isolated examples are mapped to the west and southwest of the present study area. The second tradition is known as Karoostyle and has been described by

Marincowitz (2006). These buildings are typically simple rectangular structures with flat roofs and parapets. Flat roofs were often of the type referred to as 'brakdak' which consists of beams overlaid by sticks, reeds and then mud mixed with other materials such as manure or vegetation (Fagan 2008).

In rural areas buildings tend to be clustered into farm complexes with relatively few isolated structures. The complexes can include a variety of styles, while isolated structures are often small Karoostyle labourer's cottages. Due to the consolidation of farms into larger holdings in order to increase commercial viability, there are far fewer occupied farmsteads today than would have been the case in the past. Archaeological farm complexes generally outnumber historical ones showing that further back in time there were many more farming units.

Some farmsteads occur in the area but all are more than 1.5 km from the Mura PV footprints. None were studied in detail as they will not be affected but it is noted that they include various historical structures, kraals, arable lands and clusters or lines of trees. Two farmsteads lie along the access roads and should be mentioned, although, again, impacts should not occur. These are the Leeukloof farmstead in the south and Booiskraal in the southeast. **Figure 6-24 to Figure 6-26** show examples of some of the structures at these complexes.



**Figure 6-24 - Structure in the Leeukloof Farm complex at Waypoint 1850**



**Figure 6-25 - Structure in the Leeukloof Farm complex at Waypoint 1850**





**Figure 6-26 - A structure built of stone, sun-dried mud bricks and fired clay bricks at Waypoint 1993**

The only historical feature close to the PV footprints is the large dam in the centre of – but excluded from – the Mura 2 area. It is an earthen-walled dam but stones have been packed around the ends of the walls to prevent erosion when the dam overflows (**Figure 6-27**).



**Figure 6-27 - One end of the large earthen dam with stone-packed ends at waypoint 1324. This site is enclosed by, but excluded from, the development area**



### 6.3.1.3 Cultural landscapes and scenic routes

Cultural landscapes are the product of the interactions between humans and nature in a particular area. Sauer (1925) defined them thus: “The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural area is the medium, the cultural landscape the result”. The present PV study area is a largely natural landscape with minimal anthropogenic input. It is very remote and isolated with access only by the landowners. The earliest layers to the cultural landscape are the archaeological traces of pre-colonial occupation and early farming, but these are very light. Modern farming has only resulted in the addition of some jeep tracks and fences to the PV study area but these are not noticeable from a distance. Farm complexes are widely spaced with none located closer than 1.5 km from the PV footprints. The string of earthen dams in the Mura 1 and Mura 2 area are older than 60 years and also a part of the cultural landscape. With the exception of the dams, the landscape in the vicinity of the PV facilities is currently a largely natural one with its cultural significance being due to its scenic qualities. There are no public roads anywhere close to the PV study area and the footprints will not be visible from any public roads. The same applies to the proposed access roads, except that the roads pass through two farm complexes as noted above. This not an issue for this project because there will be no lasting changes to the landscape around these complexes.

### 6.3.2 PALAEOLOGY

*The following is extracted from the Palaeontological Study compiled by Natura Viva cc and included as **Appendix G.9**.*

The continental (fluvial / lacustrine) sediments of the Poortjie Member and Hoedemaker Member of the Teekloof Formation that are mapped within the Mura PV Solar and EGI project areas are associated with important fossil assemblages of latest Middle Permian to earliest Late Permian age. According the latest biostratigraphic zonation of the Main Karoo Basin by Smith et al. (2020) these assemblages are assigned to the *Endothiodon* Assemblage Zone (AZ) within the upper part of the Poortjie Member as well as most, if not all, of the Hoedemaker Member (Day & Smith 2020) (See biostratigraphic chart in Figure 28. N.B. It remains uncertain whether or not older fossil assemblages of the *Tapinocephalus* Assemblage Zone are represented here within the lower part of the Poortjie Member - see discussion below). The *Endothiodon* AZ fossil assemblages include a wide range of vertebrates (bony fish, temnospondyl amphibians, true reptiles, several therapsid subgroups – especially dicynodonts), non-marine molluscs, invertebrate and vertebrate trace fossils (including tetrapod trackways and burrows) as well as petrified wood, palynomorphs and other plant remains of the Glossopteris Flora. The fossils are variously associated with channel sandstones (including basal breccio-conglomerates) as well as crevasse splay sandstones (e.g. rippled palaeosurfaces) and - especially - overbank mudrock facies with calcretised palaeosol horizons. They have been reviewed in the publications listed above as well as by Smith et al. (2012), supplemented by recent PIA reports by the present author for the Red Cap Nuweveld and Hoogland WEFs and grid connections (See References).

Lower *Endothiodon* AZ (*Lycosuchus* – *Eunotosaurus* Subzone) assemblages are associated with the upper Poortjie Member beds while the *Tropidostoma* – *Gorgonops* Subzone is represented within the overlying Hoedemaker Member. The Reiersvlei Meanderbelt transition zone has yielded good material of *Endothiodon* low down (Maharaj et al. 2019) and probably belongs, at least in part, within the lower part of the *Endothiodon* AZ where this genus of sizeable dicynodont tends to be most abundant.

Mapping of Beaufort Group vertebrate fossil sites by Nicolas (2007) (**Figure 6-29**) shows a high concentration of fossil sites to the SE of Loxton reflecting, in part, fieldwork by the Council for Geoscience in the Booiskraal – Perdeberg area (Dr Colin MacRae, late 1900s) as well as the long history of palaeontological recording by Professor R. Smith from the Hoedemaker Member at sites like Dunedin (Quaggafontein 82) and Leeukloof 43 (cf Smith 1993). Historical fossil sites are not indicated within the present project area on the 1: 250 000 Victoria West geology sheet, apart from a single *Pristerognathus* AZ site (now *Endothiodon* AZ) from the Poortjie Member to the SW of Perdeberg.

A key skull specimen of the large therocephalian *Pristerognathus* studied by J. van den Heever (1987) was collected from the Poortjie Member on the lower slopes of Perdeberg (R. Smith, pers. comm., 2022). Rich assemblages of small dicynodonts (especially *Diictodon*) within the Hoedemaker Member on the Farm Leeukloof 43, within the Nuweveld East Wind Farm project area just west of the present project area, are the subject of on-going benchmark taphonomic studies on Beaufort Group tetrapods by Dr Smith of Wits University (e.g. Smith 1993). A few additional sites with skulls and postcrania of small- to large-bodied dicynodonts, including *Diictodon* and probable *Endothiodon*, tetrapod burrow casts, plant stem casts and invertebrate trace fossil assemblages have been recorded from the Hoedemaker Member beds close to or within the western end of the Gamma Gridline Corridor during recent PIAs for the Red Cap Nuweveld East Wind Farm and Grid Connection (Almond 2020a, 2020b, 2022c).

Fossil material recorded during the recent site visit to the combined Mura PV Solar and EGI project areas is tabulated in Appendix 1 of the Paleontological Study (**Appendix G.9**), together with GPS locality data, a provisional Field Rating and any recommended mitigation.

The main fossil groups recorded from the upper Poortjie Member – lower Hoedemaker Member beds within the Mura project areas include:

- Several skulls and partially-articulated postcrania of small-bodied dicynodonts, most or all of which are probably *Diictodon* (by far the commonest taxon within the stratigraphic units represented here);
- Highly fragmentary, and mostly unidentifiable, reworked bones within channel breccia lenses;
- Rare isolated bones (mostly fragmentary) of medium- to large tetrapods whose identity is currently equivocal; options include dinocephalian or therocephalian therapsids, pareiasaur parareptiles or large-bodied dicynodonts such as *Endothiodon* (see further discussion below);
- Straight, inclined to helical (or combined) tetrapod burrow casts;
- Low-diversity invertebrate trace fossil assemblages (*Scoyenia* Ichnofacies), often associated with wave-rippled surfaces and microbial mat textures (microbially-induced sedimentary structures or MISS) associated with damp or wet depositional settings. These may occasionally occur with possible (but unconfirmed) temnospondyl amphibian finger probes.
- Rare occurrences of carbonaceous plant stem or leaf compressions within both mudrock and sandstone facies as well as reedy plant stem casts in sandstones.

In general, fossils are very sparsely distributed within both the Poortjie Member and Hoedemaker Member outcrops within the present project areas and the great majority of the material is of modest scientific or conservation value. No fossils have been recorded within the Late Caenozoic superficial sediments here. Recorded Lower Beaufort Group fossil sites are mainly concentrated in scattered areas of good mudrock exposure which are mostly found along major drainage lines and on gullied hillslopes. The PV solar project areas are generally flat with very low levels of bedrock exposure due

to the pervasive blanket of superficial deposits (eluvial gravels, soils) found here. No fossil sites are recorded within the Mura project areas.

Tapinocephalid dinocephalians are an essentially Middle Permian group of therapsid megaherbivores that have only been recorded hitherto as high up as the lower Poortjie Member within the Lower Beaufort succession (Day et al. 2015a, 2015b, Day & Rubidge 2020). The fragmentary new Abrams Kraal 206 fossil material is recorded at an elevation of c.1440 m amsl. which probably corresponds to the upper part of the Poortjie Member (at least as mapped by the Council for Geoscience) on the western and southern slopes of Perdeberg. This assumes that the Teekloof Formation beds around Perdeberg are more-or-less flat-lying, as appears to be the case in the field, and there are no intervening major dolerite intrusions or faults influencing bedrock elevation. The Poortjie Member sensu lato succession on the western slopes of Perdeberg near Booiskraal homestead is at least 130 m thick (c.1360-1390m amsl.) (cf Le Roux & Keyser 1988 who record Poortjie Member thicknesses on sheet 3122 Victoria West of 130 m in the west thinning to c. 80m in the east). The upper Poortjie Member elsewhere is characterised by faunas of the lower *Endothiodon* Assemblage Zone (*Lycosuchus* – *Eunotosaurus* Subzone) which extends into the earliest Late Permian and is not known to include dinocephalians (Day & Smith 2020).

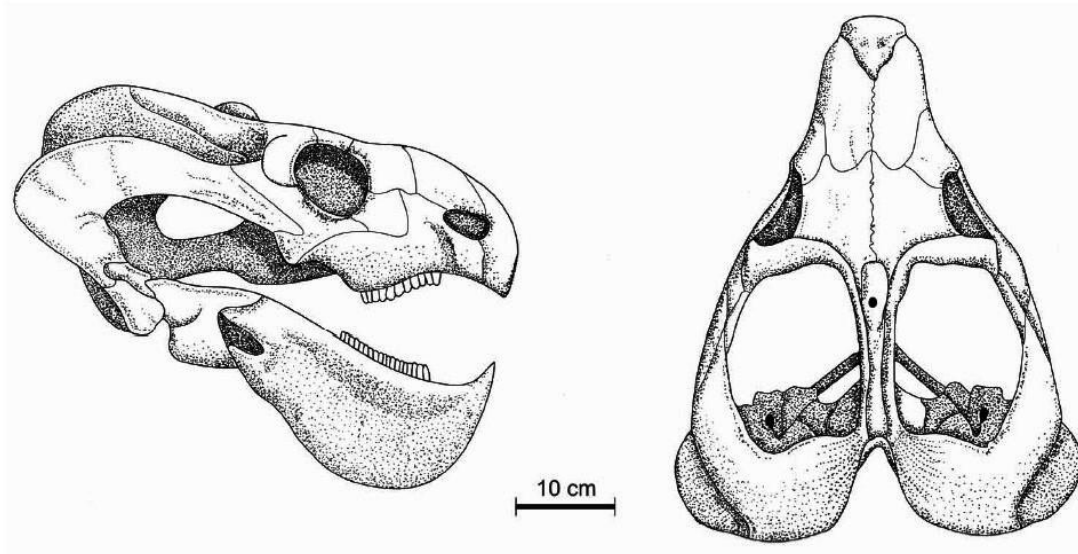
Age	Gp	West of 24° E	East of 24° E	Free State / KwaZulu-Natal	Vertebrate Assemblage Zones	Vertebrate Subzones	Radiometric dates
JURASSIC	STORMBERG		Drakensberg Gp	Drakensberg Gp			← 183.0 Ma (A)
			Clarens Fm	Clarens Fm			← <187.5 Ma (B)
			upper Elliot Fm	upper Elliot Fm	<i>Massospondylus</i>		← <191.9 Ma (B)
			lower Elliot Fm	lower Elliot Fm	<i>Scalenodontoides</i>		← <199.9 Ma (B)
TRIASSIC	Tarkastad Subgp		Molteno Fm	Molteno Fm			← <204 Ma (B)
			Burgersdorp Fm	Driekoppen Fm	<i>Cynognathus</i>	<i>Cricodon-Ufudocyclops</i> <i>Trirachodon-Kannemeyeria</i> <i>Langbergia-Gargainia</i>	← <219 Ma (B)
			Katberg Fm	Verkyerskop Fm	<i>Lystrosaurus declivis</i>		← 252.24 Ma (G)
			Palingkloof M.	Harrismith M.			← 251.7 Ma (C)
PERMIAN	BEAUFORT	Adelaide Subgp	Balfour Fm	Normandem Fm		<i>Lystrosaurus maccaigi-Moschorhinus</i>	← 253.02 Ma (D)
			Elandsberg M.	Schoondraai M.	<i>Daptocephalus</i>		
			Ripplemead M.	Rooinekke M.		<i>Dicynodon-Therapsid</i>	
			Daggaboersnek M.	Frankfort M.			← 255.2 Ma (E)
			Oudeberg M.		<i>Cistecephalus</i>		← 256.247 Ma (E)
			Teekloof Fm				
			Steenkampsvlaakte M.				
			Oukloof M.				
			Hoedemaker M.				← 259.262 Ma (E)
			Poortjie M.		<i>Endothiodon</i>	<i>Tropidostoma-Gorgonops</i> <i>Lycosuchus-Eunotosaurus</i>	← 260.259 Ma (F)
ECCA			Abrahamskraal Fm	Koonap Fm	<i>Tapinocephalus</i>	<i>Diictodon-Styracocephalus</i> <i>Eosimops-Glanosuchus</i>	← 260.407 Ma (E)
			Waterford Fm	Waterford Fm	<i>Eodicynodon</i>		← 261.241 Ma (E)
			Tierberg/Fort Brown	Fort Brown			

**Figure 6-28 - Chart showing the latest, revised fossil biozonation of the Lower Beaufort Group of the Main Karoo Basin (abstracted from Smith et al. 2020).**



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**Figure 6-31 - Skull of the medium-sized dicynodont therapsid *Endothiodon* which occurs especially abundantly within the lower part of the *Endothiodon* Assemblage Zone**

### 6.3.3 TRAFFIC

*The following is extracted from the Traffic Impact Assessment compiled by Athol Schwarz and included as **Appendix G.10**.*

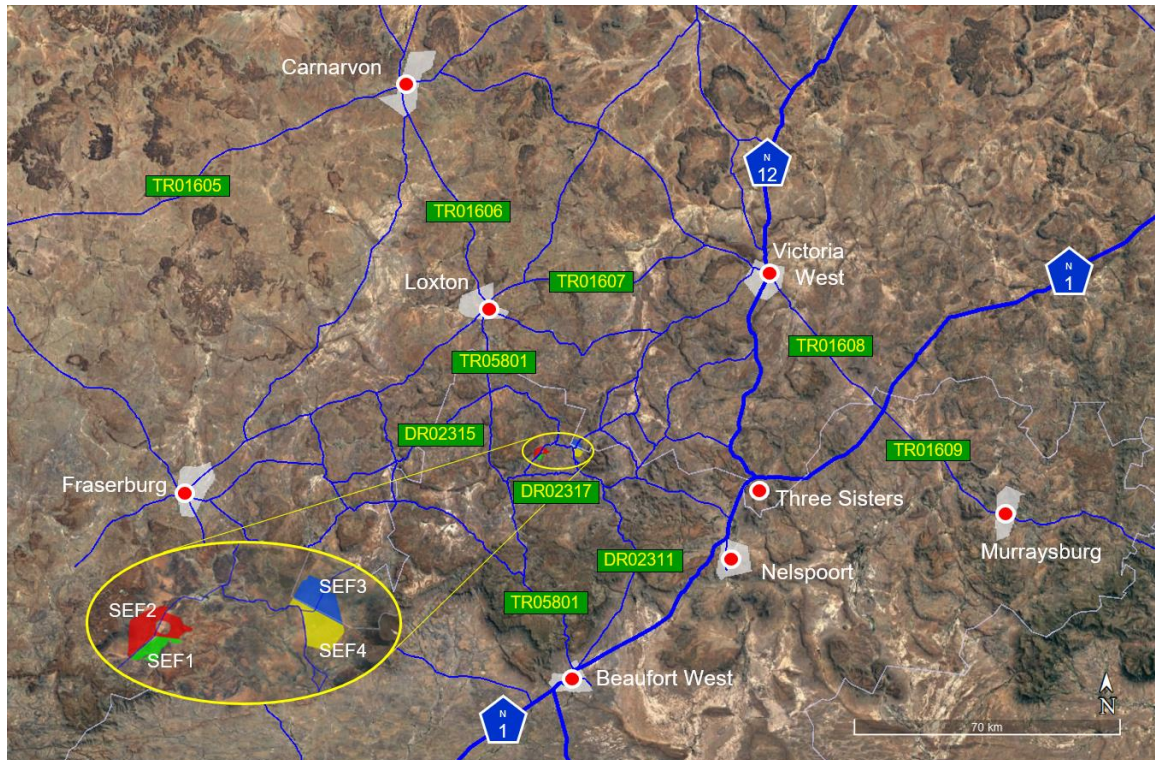
#### 6.3.3.1 Road Network

The existing road network adjacent to the proposed developments is well established. Consisting predominantly of the lower order gravel roads, which provides access to the local towns and the major commercial centres within South Africa.

The most relevant roads within the study area, which provide access to the proposed developments from the surrounding towns, are shown in **Figure 6-32** are delineated below.

The main roads utilised to access the site are summarised below.





**Figure 6-32 – Road Network**

TR 05801 (R381)

The TR 05801 starts at the N1, north of Beaufort West (Western Cape) and ends at TR 01607 in Loxton (Northern Cape).

According to the Western Cape Road Information System, the Functional Classification of this road is a Class 2. The road is situated in a 20 m wide servitude, sections of the road are paved, the surfacing and width details of this road are provided in **Table 6-20**.

**Table 6-20 - TR05801 - Road Details**

Start km	End km	Surface Type	Width	Shoulder Width	Shoulder Type
0	10.07	Surfaced	7.20	2.00	Unsurfaced
10.07	13.28	Surfaced	8.60	2.00	Unsurfaced
13.28	23.80	Gravel	7.00		
23.80	32.96	Surfaced	7.20	0.9	Unsurfaced
32.96	38.20	Surfaced	6.80	0.9	Unsurfaced
38.20	95.75	Gravel	8.50		
95.75	111.00	Gravel			



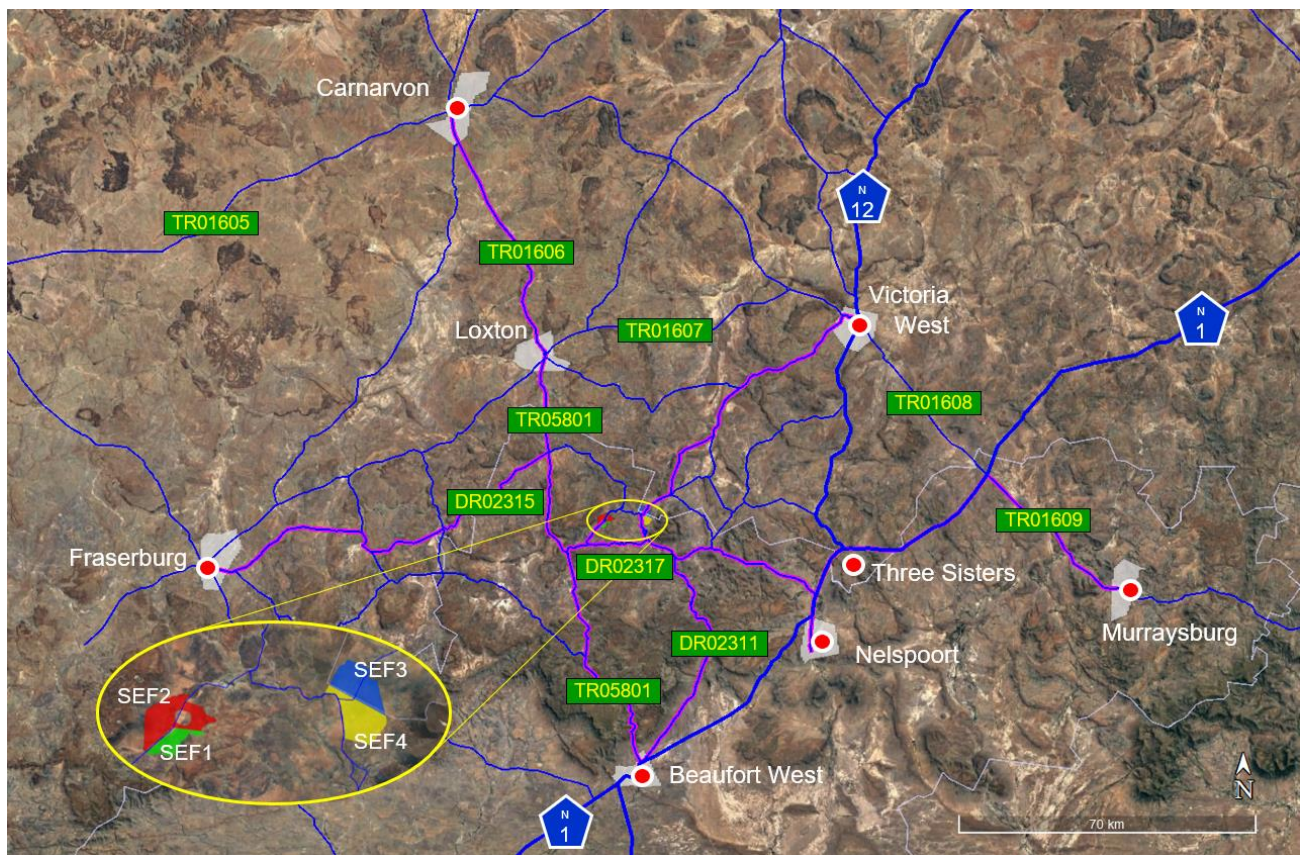
### OP 08881

The OP 08881 is 36.9 km long, starting at the DR 02317 before ending at the farm Slangfontein. This road will be used to access Mura 3 and Mura 4. This road was not included in the site inspection. Thus, the author cannot comment on the condition or the viability of using this route.

### 6.3.3.2 Transportation Routes

#### Commuter Routes

The towns in this part of the country are few and far between. There are several towns within a 200 km radius of the proposed development from which the workforce is to be drawn. These include Beaufort West, Carnarvon, Fraserburg, Hutchinson, Loxton, Murraysburg, Nelspoort and Victoria West. The anticipated commuting routes to the proposed development from the surrounding towns are highlighted in magenta, as shown in **Figure 6-33**.



**Figure 6-33 - Surrounding Towns**

The proportionality of the workforce on the proposed developments from the surrounding towns, are based on the 'working-age' population in the town, modified by a 'weighting factor' which is calculated based on the distance travelled to the proposed development from the relevant town. The expected proportion of the workforce from the surrounding communities is depicted in **Table 6-21**.

**Table 6-21 - Distribution of the Workforce**

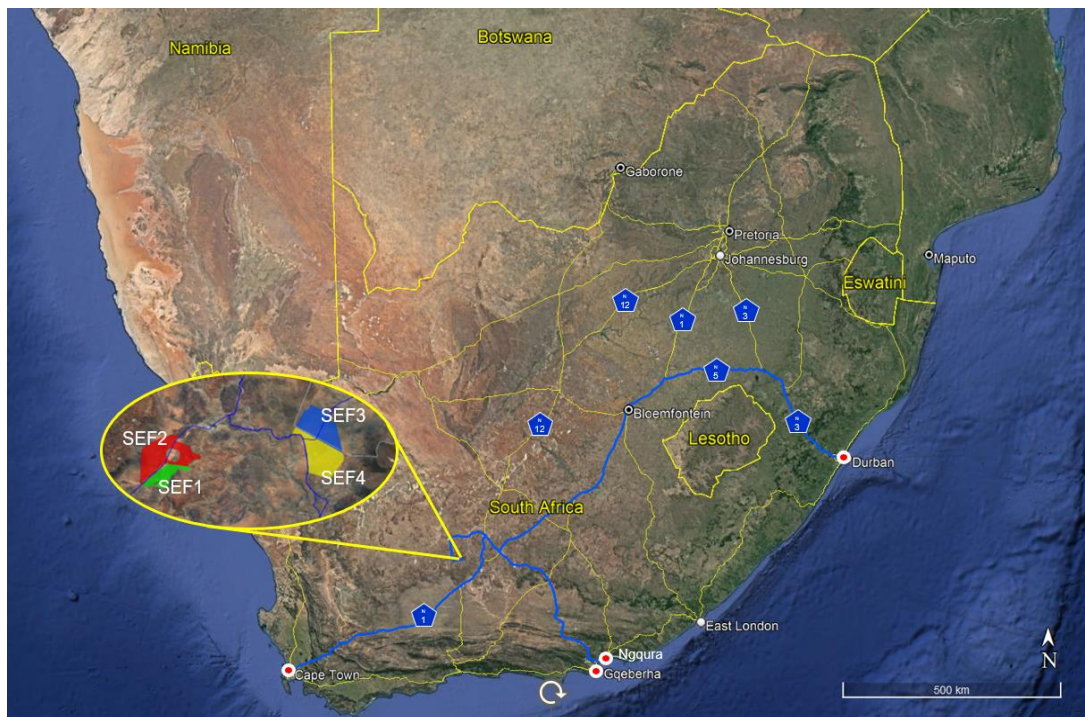
Town	Population	Travel Distance	Proportion (%)
Beaufort West	21376	78 km	67%
Carnarvon	4107	128 km	8%
Fraserburg	1854	139 km	3%
Loxton	604	65 km	2%
Murraysburg	2814	165 km	4%
Nelspoort	1212	83 km	4%
Victoria West	4978	106 km	11%

It should be noted that the town of Hutchinson, was excluded from the table as the proportionality was extremely low, less than 0.25%.

## Freight Routes

### Container Terminals

Transnet Port Terminals operates container terminals at Durban, Ngqura, Gqeberha and Cape Town. Thus, all the imported solar panels entering South Africa will be via one of these terminals. The container terminal and the most likely routes to the proposed developments will be via Victoria West and Loxton, as shown in **Figure 6-34**.



**Figure 6-34 - Freight Routes from Container Terminals**



The potential transportation routes from the various Container Terminals in South Africa to the proposed developments, are detailed in **Table 6-22**.

**Table 6-22 – Distance – Port Terminals**

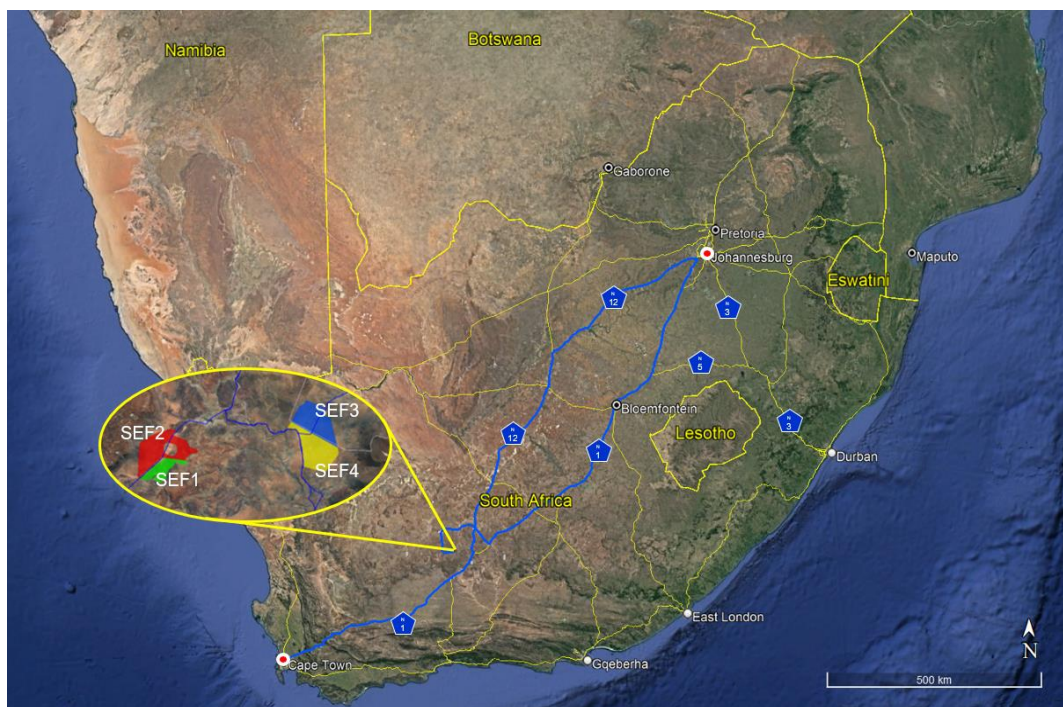
Container Terminals	Distance
Cape Town	742 km
Durban	1265 km
Gqeberha	581 km
Ngqura	592 km

The closest container terminal to the proposed developments are the Ports at Gqeberha and Ngqura.

However, the preferred transportation route would ultimately be identified by the logistic company appointed to transport the components from the port of entry to the proposed development.

#### Commercial Centres

The most likely transportation routes for domestically supplied and manufactured components from the major commercial centres to the proposed developments are either Cape Town or Johannesburg (or any supplier along these routes), as shown in **Figure 6-35**.



**Figure 6-35 - Freight Routes from Commercial Centres**

The distances from the proposed developments to selected commercial centres in South Africa are shown in **Table 6-23**.

**Table 6-23 – Distance – Major Commercial Centres**

Commercial Centres	Distance
Cape Town	742 km
Johannesburg (via N1)	1006 km
Johannesburg (via N12)	964 km

Although the closest major commercial centre to the proposed developments is located in the Cape Town area, many components will be fabricated in Johannesburg and transported to the proposed development.

### 6.3.4 VISUAL

*The following is extracted from the Visual Impact Assessment compiled by Quinton Lawson and Bernard Oberholzer and included as **Appendix G.11**.*

#### 6.3.4.1 Landscape setting

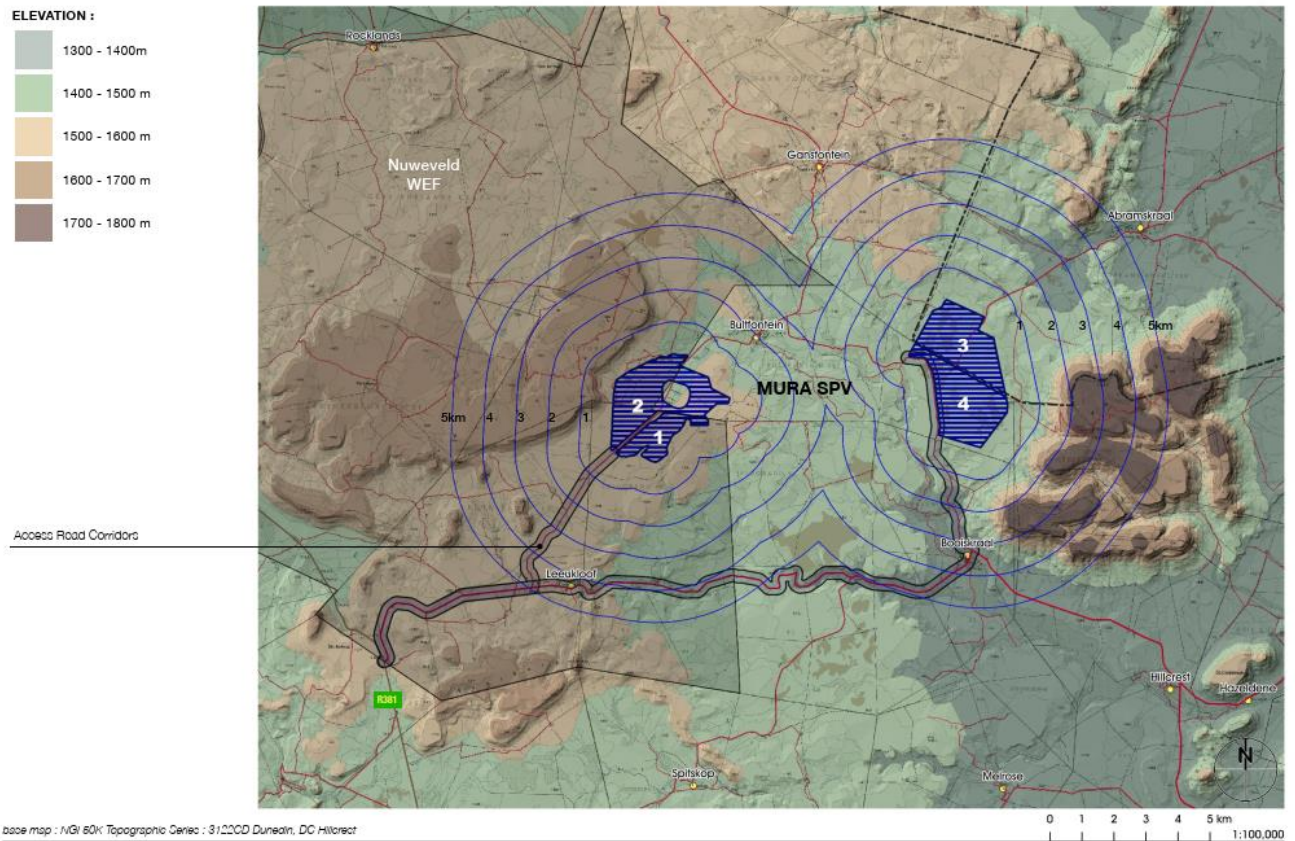
The landscape and scenic features of the study area are similar to those for the Nuweveld wind farms. The 4 solar project areas lie within an expansive semi-arid landscape, with widely scattered farmsteads usually nestled among tree copses. The large farms mainly support merino sheep, and occasionally dorper sheep, goats and horses, as well as game, such as small antelope.

#### 6.3.4.2 Geology and landforms

The landscape in this part of the Great Karoo has been eroded over time, the once deeply buried Beaufort Group mudstones and sandstones and the dolerite intrusions having been exposed to form the present-day Karoo landscape.

The regional plateau is characterised by horizontal sills and dykes of erosion-resistant dolerite forming steep slopes in places, boulder-strewn mesas and flat-topped koppies that are the main scenic features of the study area. The gentler, lower hillslopes and plains consist of more easily weathered mudstone, with occasional narrow ledges of harder sandstone. The flattish plains, where the solar projects are located, are at around 1400-1500m elevation, and the surrounding dolerite ridges and mesas around 1600-1700m elevation (**Figure 6-36**).





**Figure 6-36 – Layout and Physiography**

#### 6.3.4.3 Land use

There are a few scattered farmsteads in the surroundings, within the viewshed, which form green oases in the semi-arid landscape. The farmsteads are on average 5 to 10km+ apart, linked by narrow gravel roads. The farms are generally extensive in area and support mainly sheep farming and game.

#### 6.3.4.4 Sense of place

The flat-topped hills and dolerite ridges are a characteristic feature of the Great Karoo in an otherwise fairly featureless, parched landscape, an area noted mainly for its empty, uncluttered landscapes, stillness, red sunsets, dark nights and starry skies.

The most scenic areas tend to be the dolerite koppies and the river courses, particularly in the vicinity of Leeukloof and Booiskraal (**Figure 6-37**, **Figure 6-38** and **Figure 6-39**).





**Figure 6-37 - Typical mesas and plains with succulent shrub vegetation of the study area**



**Figure 6-38 - Bultfontein farmstead about 2km north-east of Mura Solar Project 2**





**Figure 6-39 - Existing access road between Leeukloof and Booiskraal**

### 6.3.5 SOCIAL

*The following is extracted from the Socio-Economic Impact Assessment compiled by Independent Economic Researchers and included as **Appendix G.12**.*

Most of the overall area proposed for the development of solar energy facilities is within Ward 7 of the BWLM, in the CKDM of the Western Cape Province. Note however that Ward 7 covers a particularly large area of 8,175 square kilometres and extends as far as the town of Merweville which is over 100km from the proposed Solar Facilities. The nearest major towns include Beaufort West in the Western Cape (50km) and Victoria West in the Northern Cape (65km). Smaller towns nearby include Loxton (27km) and Nelspoort (46km). Towns and settlements in the wider area include Carnarvon, Hutchinson, Fraserberg, Leeu-Gamka, Merweville, Murraysburg and Riebtion, all located between 60–130km from the project site. Some of these towns are relatively less accessible given the condition of minor provincial roads.

#### 6.3.5.1 Current land uses

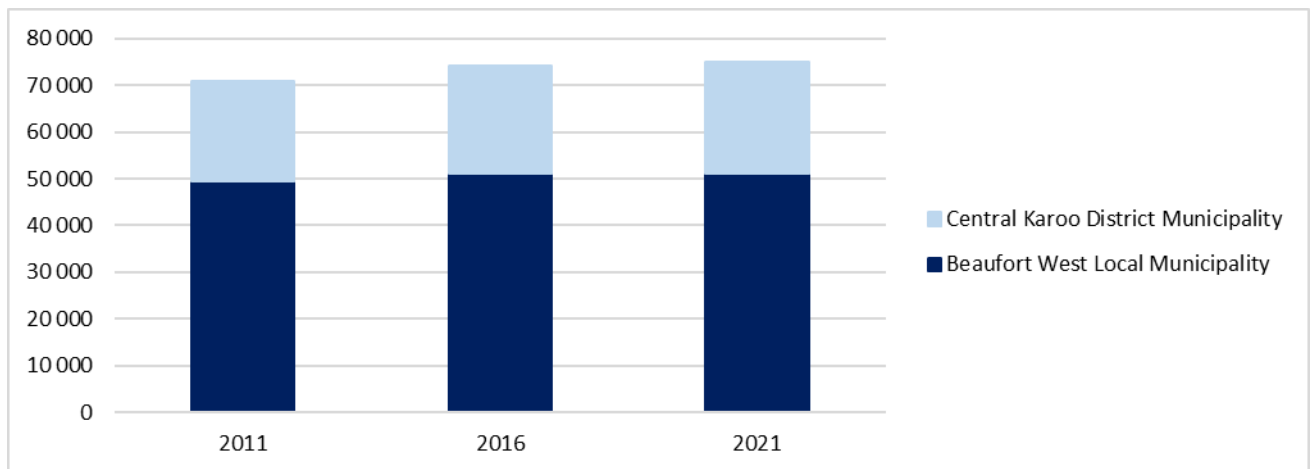
Current land uses in the wider rural area, where the solar facilities would be located, are focused on extensive agriculture with small stock primarily in the form of sheep, game farming, some tourism and conservation primarily in the form of the Karoo National Park. The farms are large and homesteads are few and far between to maintain economically viable farm units. Small communities are housed on the farms and work as farm labourers or in associated tourism ventures. Away from the towns there are few other sources of enterprise or employment.

Drought has been experienced to varying degrees in different parts of the study area, with many of the farms surrounding Loxton and Beaufort West are currently in the initial stages of recovery from a severe drought. During the drought, farming became unviable for those without access to a

permanent source of groundwater. Consequently, many farmers sold their livestock or moved them to other parts of the region or country. This reduction in agricultural activity resulted in retrenchments which have been particularly disruptive to affected communities given that farm labourers typically reside on-farm in this area. This resulted in an influx of job seeker, particularly in Beaufort West. In 2021, many farmers experienced their first rainfall in several years. This has resulted in increased agricultural activity and renewed demand for farm labour in the area.

### 6.3.5.2 Demographics

BWLM had a population of 51 177 in 2021, up from 49 586 in 2011, which translates to a population growth rate of around 0.3% per annum over the ten-year period (**Figure 6-40**). This is lower than the annual growth rate for the CKDM, which was 0.6% over the same period. BWLM had an average household size of 3.9 in 2021.



**Figure 6-40 - Population trends in the CKDM and BWLM**

Around 53.1% of BWLM's population are female. According to statistics published by the Western Cape Government, this proportion is similar to that of the CKDM's population – 52.8%.

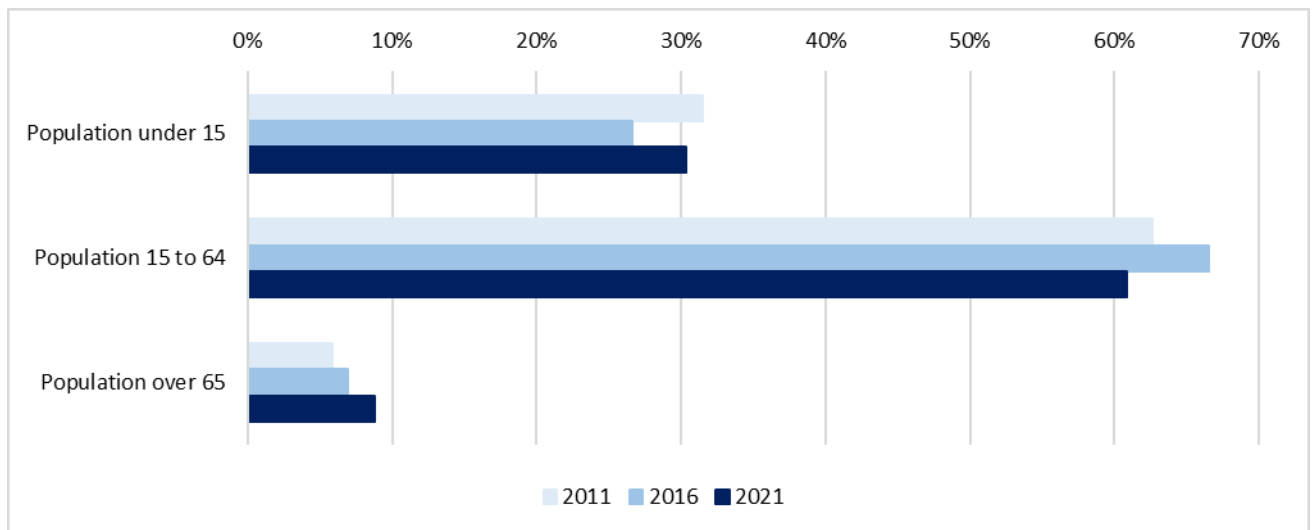
Recent population estimates are not available at the settlement level, but the 2011 census gives some indication of the towns nearby the study site, as outlined in **Table 6-24**. Beaufort West had a population of 20,053 in 2011, while Loxton had a population of 1,044, Fraserburg 3,029 and Nelspoort 1,696.

**Table 6-24 - Population groups in the towns surrounding the study site, 2011**

Population Group	Beaufort West	Loxton	Fraserburg	Nelspoort
Black African	1 452	28	145	288
Coloured	15 624	895	2 569	1 375
Indian or Asian	107	3	18	14
White	2 741	113	288	13
Other	129	5	9	6

Total	20 053	1 044	3 029	1 696
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Between 2011 and 2016, BWLM's dependency ratio showed a decreasing trend over time as an ever-larger proportion of the population was falling into the working age group (**Figure 6-41**). The dependency ratio decreased from 59.7 in 2011 to 56.7 in 2019. The Western Cape Provincial Government had previously projected that it would continue to reduce to 55.1 by 2024. However, more recent information suggests that this trend reversed between 2016 and 2019, with an increase in the dependency ratio to a high of 64.4% in 2021. Interviews with municipal representatives indicate that this could be due to higher than anticipated rates of in-migration over the period. As the net change in population has been negligible in recent years this would imply out-migration as well.

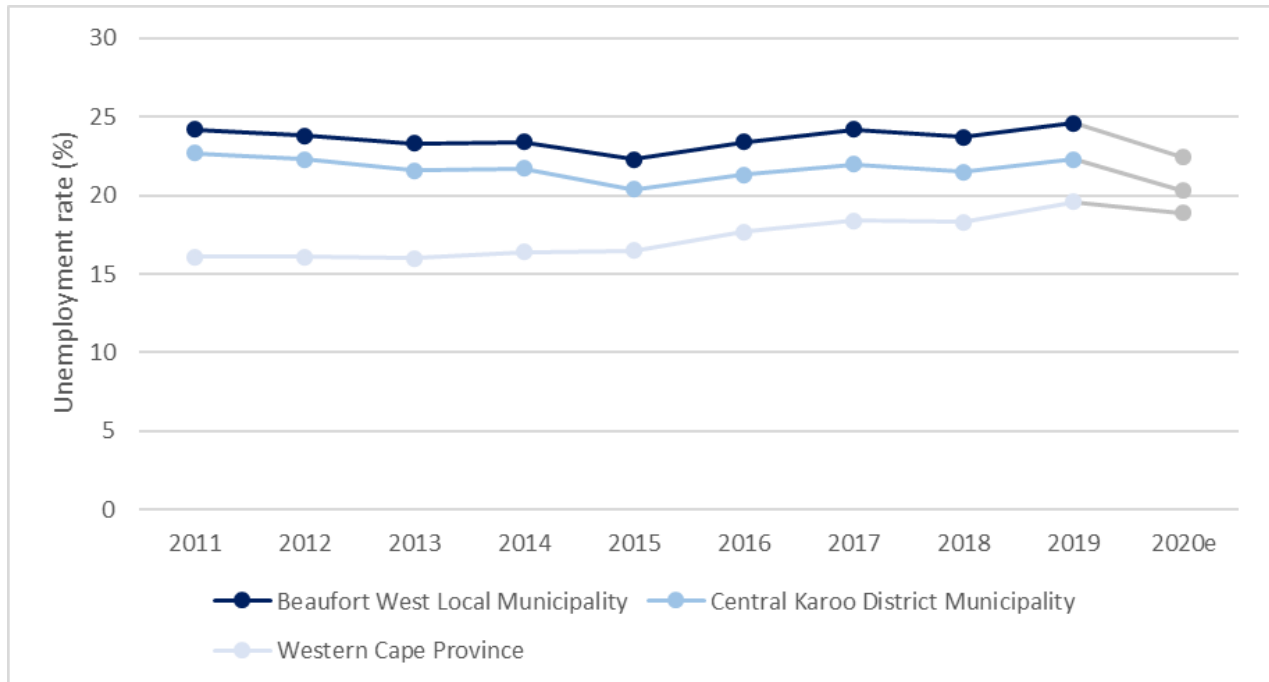


**Figure 6-41 - Age cohorts over time in the BWLM**

#### 6.3.5.3 Employment and sectors

BWLM's unemployment rate was around 24.2% in 2019, which is the highest unemployment rate in the CKD. The local municipality's trend has for the most part been consistent with that of the district municipality as well as that of the province at least since 2008 (**Figure 6-42**). Western Cape Treasury estimates that unemployment will fall to 22.4% in 2020 (WCPG, 2021a). Reducing unemployment in a year like 2020 seems challenging however, given that Quantec Research estimates that 725 jobs were lost in BWLM in 2020 (1,066 in the wider CKDM) (WCPG, 2021b).





**Figure 6-42 - The unemployment rate in BWLM and CKDM over time**

The sector which contributes most to employment in BWLM is wholesale and retail trade, catering and accommodation. This sector contributed 3,165 of the total of the area's 12,552 jobs in 2019, and 31 more jobs than in 2018. The second highest number of jobs was in agriculture, forestry and fisheries which employed 2,421 people in that year (the same number estimated in 2018). **Table 6-25** outlines each sector's employment numbers in 2019 and shows the change in job numbers between 2014 and 2018.

**Table 6-25 - Sectoral contribution to employment and net employment growth per sector in BWLM**

	GDP			Employment		
	R Million value 2019	Trend 2015 -2019	Real GDP growth 2020e	Number of jobs 2019	Ave ann. change 2015 - 2019	Net change 2020e
Primary Sector	225.3	-2.8	10.7	2 423	77	-73
Agriculture, forestry & fishing	223.7	-2.9	10.8	2 421	77	-73
Mining & quarrying	1.6	0.5	-17.6	2	0	0
Secondary sector	278.6	-0.3	-12.8	787	-11	-94

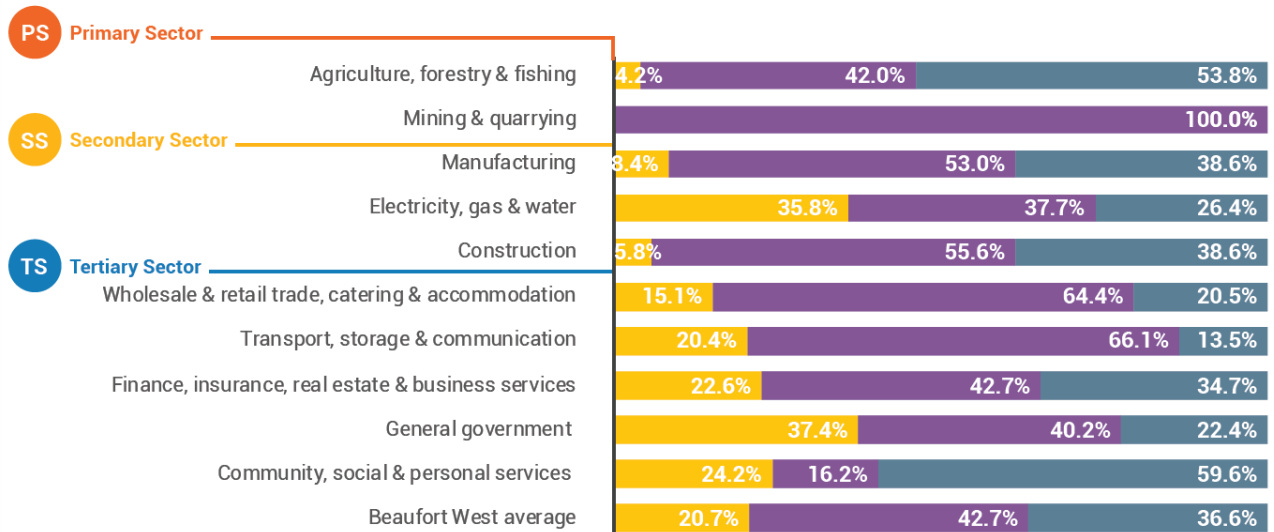
Manufacturing	67.4	0.4	-10.3	249	-2	-16
Electricity, gas & water	120.3	0.2	-6.2	65	0	-3
Construction	90.9	-1.3	-22.0	473	-9	-75
Tertiary sector	1 727.3	0.5	-6.3	9 342	70	-558
Wholesale & retail trade, catering & accommodation	346.4	-0.2	-11.3	3 165	41	-280
Transport, storage & communication	382.2	-1.2	-16.9	649	-1	-38
Finance, insurance, real estate & business services	287.9	2.2	-3.6	1 277	2	-86
General government	500.3	1.0	1.0	2 319	7	26
Community, social & personal services	210.5	0.7	-2.9	1 932	21	-180
Beaufort West	2 231.2	-0.1	-4.8	12 552	136	-725

Most jobs in BWLM fall into the semi-skilled (42.7%) and low-skilled (36.6%) categories with skilled jobs making up only 20.7% of jobs in the area (**Figure 6-43**). Higher-skill positions are concentrated in the electricity, gas and water sector, as well as in general government, finance and community services-related sectors.

## SKILL LEVELS PER SECTOR, Beaufort West, 2019 (%)



● Skilled  
● Semi-skilled  
● Low-skilled

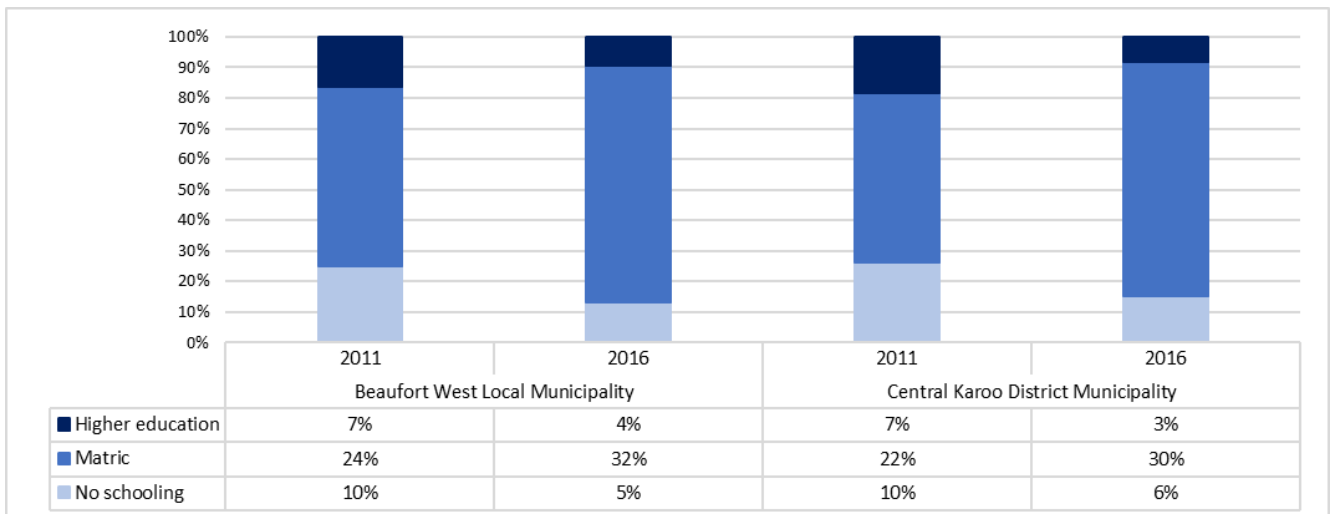


Source: Quantec Research, 2021

**Figure 6-43 - Sectoral contribution to employment and net employment growth per sector in BWLM**

### 6.3.5.4 Education levels

The proportion of people over the age of 20 years who have obtained a matric certificate increased in the 2011 to 2016 period at both the local and district municipality scales (**Figure 6-44**). This indicates that basic education levels have improved in the study area during this time. The proportion of people who have obtained some form of higher education has however decreased over the same period, at both the local and district municipality scales.



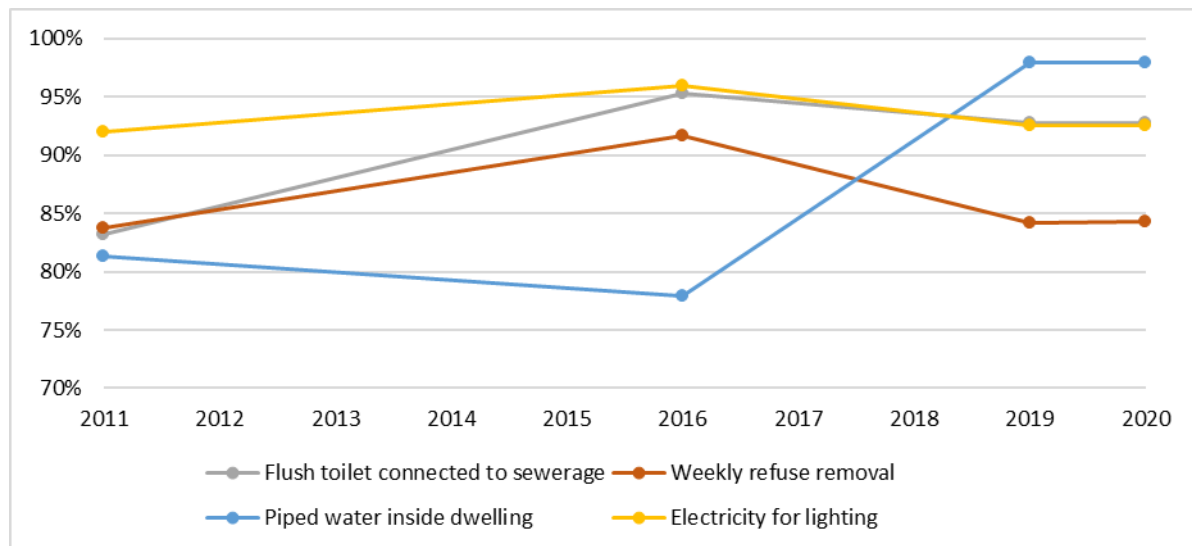
**Figure 6-44 - Education levels in those over 20 years old in BWLM and CKDM, 2011 and 2016**

Statistics published by the Western Cape Government indicate that both learner enrolment and learner retention have been increasing gradually in recent years (WCPG, 2021a). This is a promising trend. However, while the demand for education has risen, supply has decreased according to the measure of the number of public ordinary schools, which decreased by one per year over the 2018–2019 period. This combination of trends has resulted in higher learner-teacher ratios in the municipality, at 1:33.2 in 2019 (higher than the provincial average of 1:30.5 and the national average of 29.3). In 2020 the ratio reduced slightly to 1:31.

#### 6.3.5.5 Availability of municipal services

Access to basic services has fluctuated over time both at the local and district municipality levels, except in the case of water. The data in **Figure 6-45** was assembled based on statistics generated by StatsSA for 2011 and 2016, as well as 2019–2020 statistics generated by Quantec and reported in the Western Cape Treasury’s 2020 and 2021 socio-economic profiles for Beaufort West. According to this data, a greater proportion of households had access to a flush toilet connected to sewerage, weekly refuse removal and electricity and lighting in 2016 as compared to 2011 throughout the local and district municipalities. This improvement was somewhat reversed in the 2016–2019 period, with relatively more households not having access to electricity for lighting, flush toilets and weekly refuse removal in recent years.

The proportion of households with piped water inside their dwelling fell from 81% to 78% in BWLM and from 77% to 74% in CKDM between 2011 and 2016, but then saw an increased to 98% in 2019 for both BWLM and CKDM. Interviews with municipal representatives suggest that in-migration of poor families has led to the expansion of informal settlements where the provision of service delivery remains relatively low.



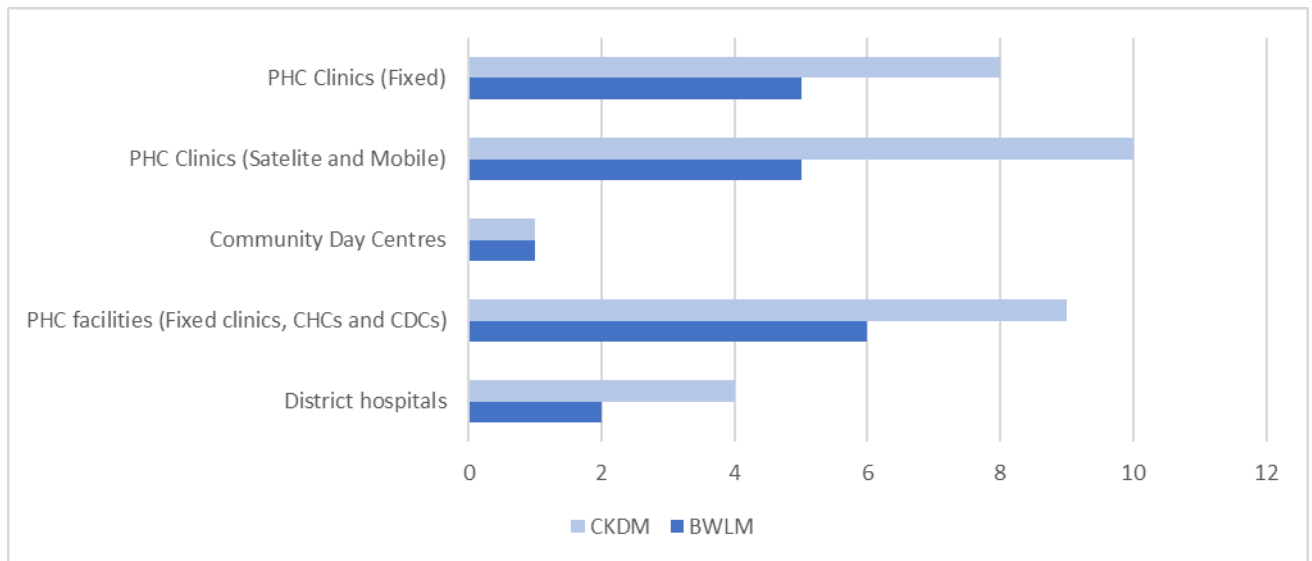
**Figure 6-45 - Access to key municipal services in BWLM and CKDM, 2011, 2016 and 2019**

According to the Western Cape Government, there are relatively few informal houses in either the BWLM or in the CKDM. In the BWLM, 97.9% of households live in formal dwellings, which is a slightly higher proportion of households than the CKDM with 97.0% (WCPG, 2021a).

### 6.3.5.6 Health

Assessing access to health services is key to understanding well-being and poverty. Chronic lower respiratory disease is the leading cause of death in the Central Karoo District (9.5% of deaths in 2018), followed by Tuberculosis (TB) (8.8%), Cerebrovascular disease (6.9%), Hyperintensive diseases (5.5%) and Diabetes melitus (5.5%) (WCPG, 2021b).

According to StatsSA, 75% of South Africans rely on public health services, while the remaining 25% make use of private facilities. The number and types of public healthcare facilities available in BWLM and CKDM are outlined in **Figure 6-46**.



**Figure 6-46 - Public healthcare facilities in the study area**

BWLM's latest IDP revision notes the importance of providing preventative care for HIV/AIDS and Tuberculosis (TB) to vulnerable communities. This preventative care is provided by government and consists primarily of condom distributions and campaigns to encourage the practice of safe sex. In terms of providing treatment, government provides antiretroviral therapy (ART) to people living with HIV. There were a total of 1,558 people receiving ART in BWLM in 2020/21, up from 1,524 in 2019/20. The total number in the CKDM was 2,037 in 2020/21, down from 2,050 in 2019/20. The CKDM socio-economic profile, published by the Western Cape Treasury, notes that the number of newly registered ART patients remained relatively stable at 142 in 2019/20 and 147 in 2020/21.

The following healthcare facilities provide treatment in the BWLM:

- Murraysburg Primary Healthcare Centre (PHC)
- Nelspoort PHC
- Nieuvelspark PHC
- Kwa Mandlenkosi PHC
- Hillside Clinic PHC (constructed in 2016/17)
- Merweville Satellite Clinic
- Beaufort West CDC
- Murraysburg Mobile Clinic
- Nelspoort Mobile Clinic
- Beaufort West Mobile Clinic

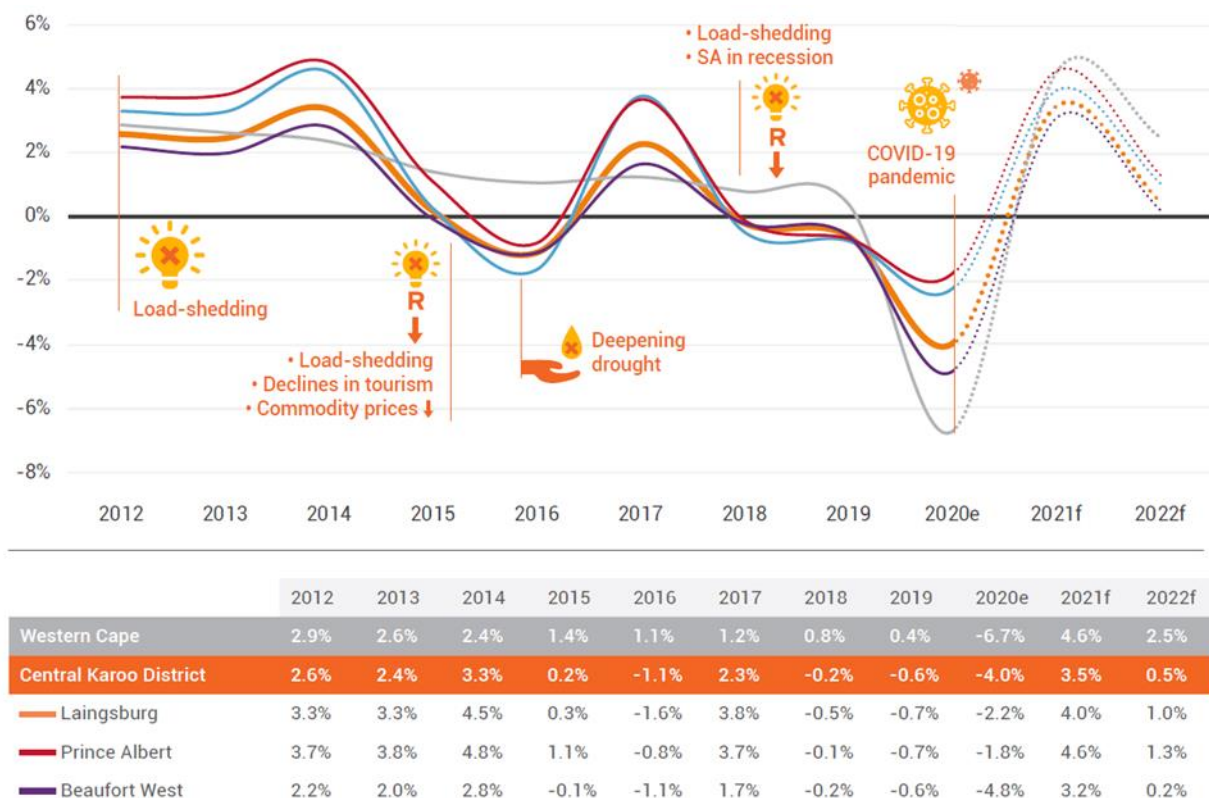


- Merweville Mobile Clinic
- Beaufort West District Hospital
- Murraysburg District Hospital
- Nelspoort Specialised Hospital

Municipalities continue to address health issues facing communities through the provision of health services and through the continued training of Community Health Workers. In addition to treating HIV/AIDS, facilities provide immunisation for children (CKDM's immunisation rate was 74.9% in 2016). Other challenges faced by communities include a higher than anticipated neo-natal mortality rate – 13.4 neonatal deaths per 1000 live births for CKDM in 2019, up from 14 in 2016 (the target had been set at 6 or less). The neonatal death rate for BWLM is lower, at 8.4 deaths per live birth.

### 6.3.5.7 Local and regional socio-economic growth and development plans/priorities

The Central Karoo District has experienced low levels of economic growth in recent years, with fluctuating GDP growth patterns seen since 2014 in the district economy and all local economies within. Quantec Research estimates that the BWLM experienced 4.8% decline in 2020, in line with the 4% decline in CKDM's GDP growth rate and a 6.7% decline in that of the Western Cape. Several reasons for this low and erratic growth are outlined in **Figure 6-47**. They include the COVID-19 pandemic, drought and load shedding.



Source: Quantec Research, 2021; Urban-Econ based on Quantec, SARb, Stats SA and BFAP, 2021 (e denotes estimate, f denotes forecast)

**Figure 6-47 - GDP growth in the local economies of the Central Karoo District**

In terms of future economic development goals, the 2021-2022 review of the 2017-2022 IDP of the BWLM is most instructive. According to this plan, the Municipal Strategic Programme is aligned to 5 Key Performance Areas:

- KPA 1: Basic service delivery and infrastructure development
- KPA 2: Economic development
- KPA 3: Institutional development and municipal transformation
- KPA 4: Financial viability and management
- KPA 5: Good governance and community participation

KPA 2 above (economic development) is linked to the following strategies:

- To use municipal and government funded projects as means to create jobs and reduce poverty
- To facilitate development and growth of SMME's
- To establish and strengthen LED Structures
- To facilitate Education and Skills Development for Cooperatives & SMME's
- To provide SMME Support and Capacity building
- To manage and enhance the performance of the municipality

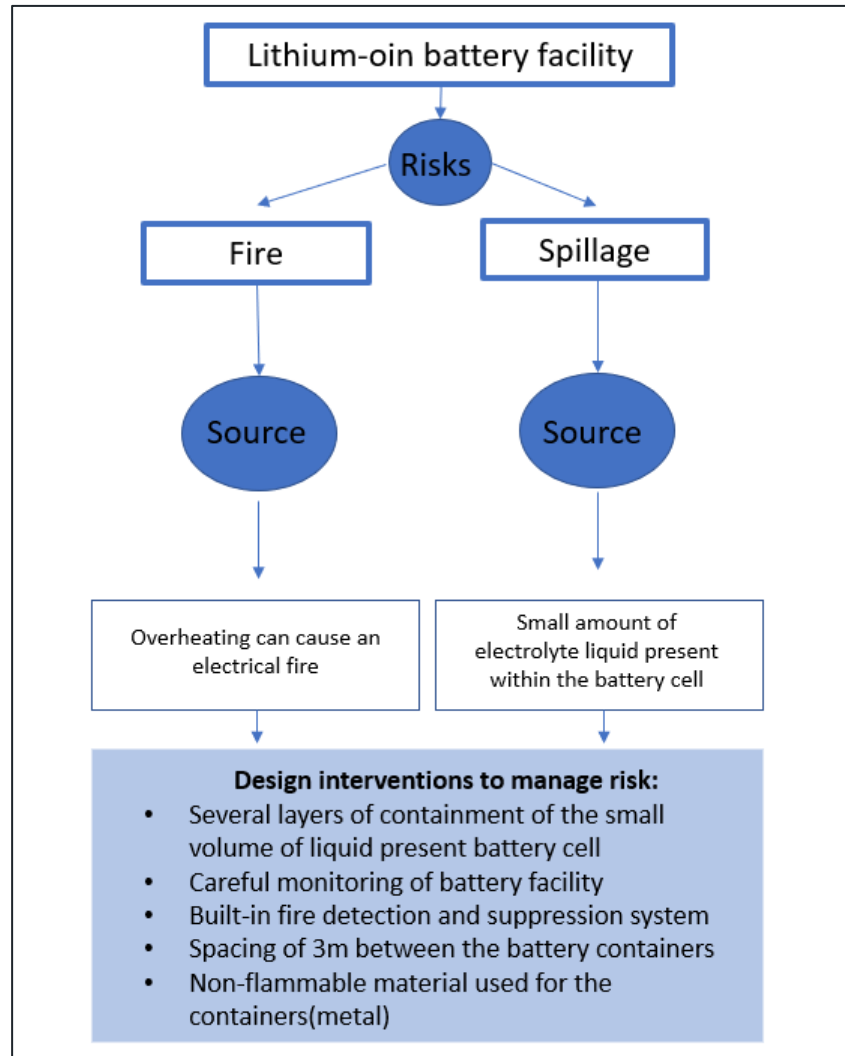
At the district level, the CKDM IDP 2017-2022, 2nd Review 2021–2022, highlights the following projects, identified in the District LED Strategy:

- Infrastructure development to increase access for businesses and households;
- Business support programmes to retain existing businesses and encourage start-up or relocating businesses to enter the area;
- Spatial planning to promote land acquisition and property development for businesses and households;
- Skills programmes to respond to business and government for greater productivity and efficiency; and
- Social development programmes to increase participation in the local economy and build better lifestyles for the community.

The CKDM IDP goes on to mention the importance of establishing an LED unit to coordinate activities, as well as the Economic Recovery Plan being drafted to respond to the economic impact of the COVID-19 pandemic.

## 6.4 RISK

The main risks to the environment, as a result of BESS installations, are fires and pollution arising from spillage of the liquid component of the cells by accident. The risk sources are shown schematically in **Figure 6-48** and discussed below. In terms of other environmental impacts such as the impact of the clearance of 4 ha of vegetation, the visual impact and increase traffic, these have been assessed within the respective specialist assessments (see **Section 8**).



**Figure 6-48 - Risk sources of the battery facility**

As has been noted above, there is a small volume of liquid within the cells (most of which is absorbed into the solid components of the battery) and this is sealed in a plastic housing at the cell level as well as at the module level and then these are housed in a container ensuring there are three levels of containment. This ensures that the risk of a spill of any liquid is unlikely to the extent that it does not warrant detailed assessment in the impact assessment phase and has been screened out.

Regarding the potential fire, the design of these battery systems will be undertaken in compliance with all the local and international standards that ensures that fire risk is minimal. The electrical nature of the facility is such that there is a risk of overheating of components that could lead to electrical fire. Due to the risk overheating batteries may have on human health (in terms of off-gassing) and implications for the performance of the batteries, the facility is carefully monitored to prevent this. Each container is equipped with a built-in fire detection and suppression system that in an unlikely event of a fire will suppress the fire using an inert gas. The nature of the vegetation of the site is also such that the risk of the facility being exposed to a significant wildfire leading to the ignition of the facility is also remote (assuming the facility is kept free of combustible materials).

Each container is also spaced about 3m apart ensuring the chance of a fire spreading between two containers (which are made of metal and thus not easily flammable) is also minimal. These design measures, the HVAC systems and the continuous monitoring of the battery cells for heat/fire are such that the likelihood of a fire spreading in the facility following ignition is very remote.

When the battery cells reach end of life they will be returned to a battery provider for recycling or disposal in accordance with the legal practices. Currently there are no Lithium-Ion Battery Recycling facilities in South Africa but EWASA are lobbying for one (Dataweek, 2019). Due to the value of these materials making up the batteries it is unlikely they will end up in landfill, and more likely be recycled by a future bespoke facility in South Africa or exported for recycling. In terms of air emissions from the battery facility during operations, this is not considered to be an issue and does not pose a risk during operation to the environment or staff.

Based on the technology used and the safety mechanisms forming part of the design of the facility, the likelihood of the construction and/or operation of the battery storage facility causing a fire/spill is considered to be low and therefore the risk of having the battery facility on site is considered to be negligible.

## 7 SITE SENSITIVITY AND VERIFICATION

Specialist assessments were conducted in accordance with the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes, which were promulgated in Government Notice No. 320 of 20 March 2020 and in Government Notice No. 1150 of 30 October 2020 (i.e. “the Protocols”), or Appendix 6 of the EIA Regulations, depending on which legislation apply to the assessment under consideration. A summary of the DFFE screening tool, the applicable legislation as well as the specialist sensitivity verification are detailed in **Table 7-1** below. The site verification process is discussed in **Section 7.1** below.

**Table 7-1 - Assessment Protocols and Site Sensitivity Verifications**

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
Agricultural Compliance Statement	<i>Protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources by onshore wind and/or solar photovoltaic energy generation facilities where the electricity output is 20 megawatts or more</i>	High Sensitivity	Low Sensitivity
Terrestrial Biodiversity Impact Assessment	<i>Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity</i>	Very High Sensitivity	Low Sensitivity
Aquatic Biodiversity Impact Assessment	<i>Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity</i>	Low Sensitivity	Low Sensitivity
Plant Species	<i>Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant Species</i>	Medium Sensitivity	Low Sensitivity
Animal Species	<i>Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species</i>	High Sensitivity	Low Sensitivity
Avifauna Impact Assessment	<i>Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species</i>	Low Sensitivity	Medium Sensitivity
Archaeological and Cultural Heritage Impact Assessment	<i>Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed</i>	Low Sensitivity	Medium Sensitivity



Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
Palaeontology Impact Assessment	<i>Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed</i>	Very High Sensitivity	Low Sensitivity
Visual (Landscape) Impact Assessment	<i>Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed</i>	Very High Sensitivity	Medium Sensitivity
Social Impact Assessment	<i>Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed</i>	No Sensitivity Identified	Low to medium sensitivity

## 7.1 ENVIRONMENTAL SENSITIVITIES

The Mura site boundary, as indicated in **Section 3.1**, was assessed by the specialists as part of desktop assessments and subsequent fieldwork. The specialists provided their sensitivity layers indicating the various sensitivities present on site in line with the mapping criteria detailed below. The site sensitivity verification was undertaken using the criteria in **Table 7-2** below as guidance.

**Table 7-2 - Mapping criteria utilised by the specialists for the assessment**

No-Go	Areas or features that are considered of such sensitivity or importance that any adverse effects upon them may be regarded as a fatal flaw.
High	Areas or features that are considered to have high sensitivity. Development in these areas must be limited and must remain within any acceptable limits of change as determined by the specialist. Development should also comply with any other restrictions or mitigation measures identified by the specialist.
Medium	Medium sensitivity areas are considered to be developable; however, the nature of the effects should remain within any acceptable limits of change as determined by the specialist. Development should also comply with any other restrictions or mitigation measures identified by the specialist.
Low	Low sensitivity areas that are considered to be developable however specialists may still wish to define acceptable limits of change should they deem this necessary.

### 7.1.1 SOILS AND AGRICULTURAL POTENTIAL

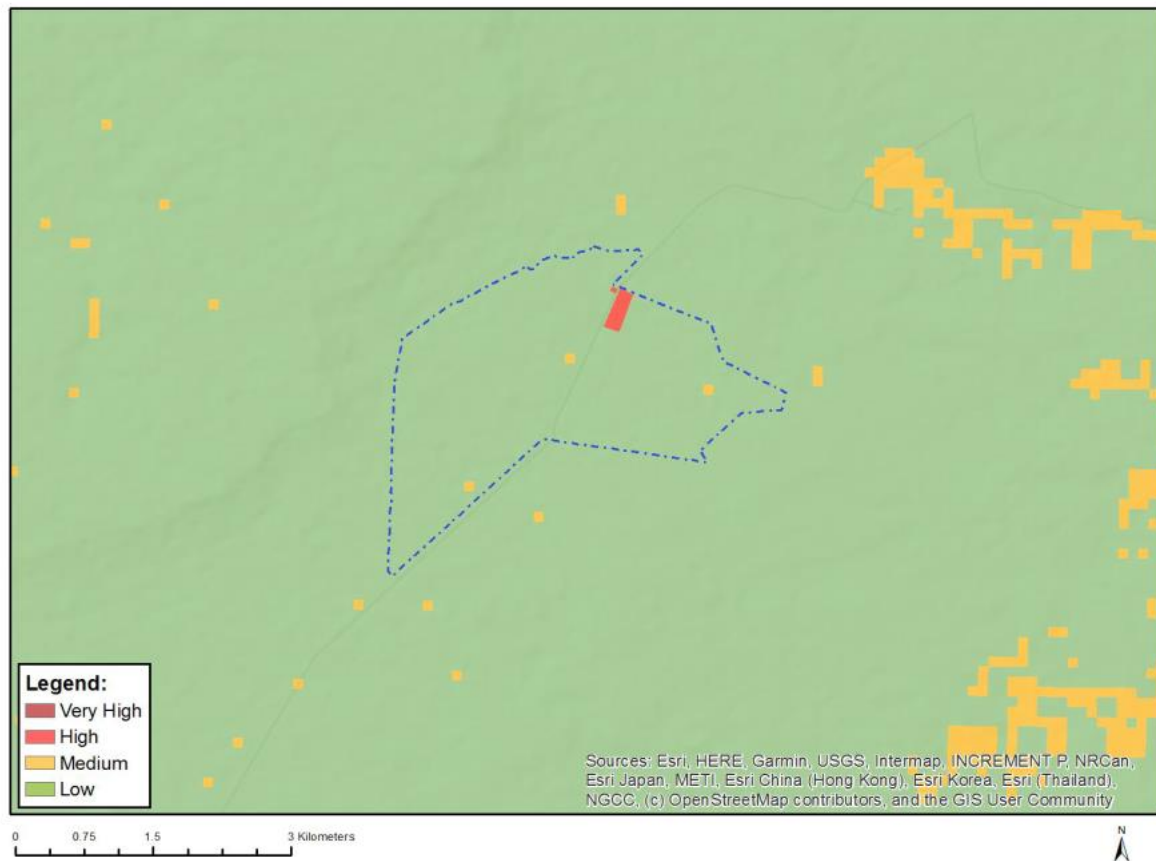
The purpose of including an agricultural component in the environmental assessment process is to ensure that South Africa balances the need for development against the need to ensure the conservation of the natural agricultural resources, including land, required for agricultural production and national food security. The different categories of agricultural sensitivity, used in the national web-based environmental screening tool, indicate the priority by which land should be conserved as agricultural production land.

Agricultural sensitivity is a direct function of the capability of the land for agricultural production. All arable land that can support viable crop production, is classified as high (or very high) sensitivity. This is because there is a scarcity of arable production land in South Africa and its conservation for agricultural use is therefore a priority. Land which cannot support viable crop production is much less of a priority to conserve for agricultural use and is rated as medium or low agricultural sensitivity.

The screening tool classifies agricultural sensitivity according to only two independent criteria – the land capability rating and whether the land is used for cropland or not. All cropland is classified as at least high sensitivity, based on the logic that if it is under crop production, it is indeed suitable for it, irrespective of its land capability rating.

The screening tool sensitivity categories in terms of land capability are based upon the Department of Agriculture's updated and refined, country-wide land capability mapping, released in 2016. The data is generated by GIS modelling. Land capability is defined as the combination of soil, climate, and terrain suitability factors for supporting rain fed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land, based on its soil, climate, and terrain. The higher land capability values ( $\geq 8$  to 15) are likely to be suitable as arable land for crop production, while lower values are only likely to be suitable as non-arable grazing land.

A map of the proposed Mura 2 development area overlaid on the screening tool sensitivity is given in **Figure 7-1**. The classification of the site as high agricultural sensitivity is because that land is classified as cropland in the data set used by the screening tool. However, that data set is outdated. That land is no longer used as cropland and has not been cropped in the last sixteen years according to the historical imagery available on Google Earth. Therefore, it should not still be classified as high agricultural sensitivity.



**Figure 7-1 - Map of Agriculture Sensitivity**

Source: DFFE Screening Report

The fact that previously cropped lands are no longer viable for cropping is because the suitability for cropping changes with a changing agricultural economy. Poorer soils or marginal climates that may have been cropped with economic viability in the past, are abandoned as cropland because they become too marginal for viable crop production in a more challenging agricultural economy with higher input costs. Climate change and changes in rainfall patterns have also led to poorer soils becoming more marginal.

The classified land capability of the sites is predominantly 4 and 5, but does range from 4 to 8. The small-scale differences in the modelled land capability across the project area are not very accurate or significant at this scale and are more a function of how the data is generated by modelling, than actual meaningful differences in agricultural potential on the ground.

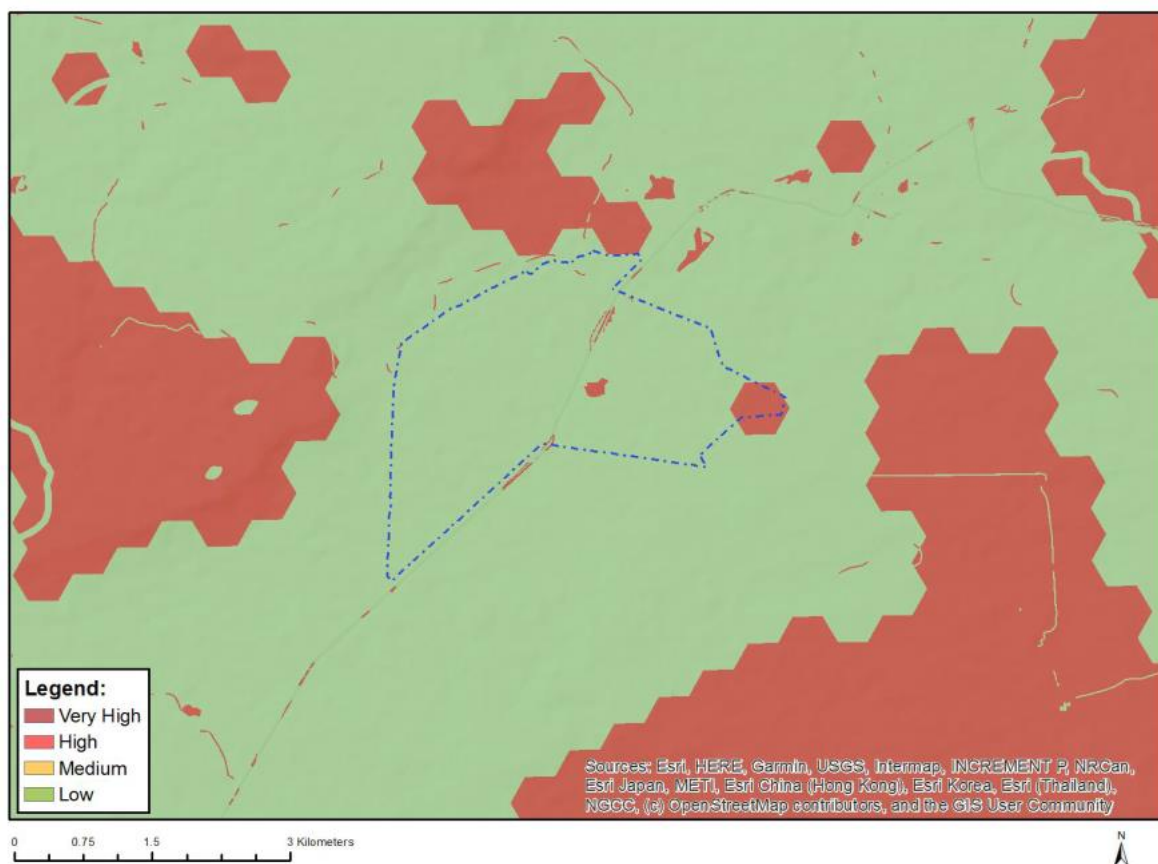
The DFFE screening tool identifies the agricultural sensitivity as high, however, the verified agricultural site sensitivity was low. The motivation for confirming the sensitivity is predominantly that the climate data (low rainfall of between 171 and 212 mm per annum and high evaporation of between 1,274 and 1,312 mm per annum) proves the area to be arid and therefore of limited land capability. Moisture availability is completely insufficient for viable rainfed crop production. In addition, the land type data shows the dominant soils to be shallow on underlying rock and hardpan carbonate. A low agricultural sensitivity is entirely appropriate for the site, which is unsuitable for crop production.

A land capability value of greater than or equal to 8 should indicate viability for crop production. However, moisture availability of the sites is totally insufficient for crop production without irrigation and therefore a land capability value of higher than 7 is not justified for the site.

This site sensitivity verification verifies the Mura 2 site as being of low agricultural sensitivity. With a land capability of 4 to 5. The required level of agricultural assessment is therefore confirmed as an Agricultural Compliance Statement.

### 7.1.2 TERRESTRIAL BIODIVERSITY

The output of the DFFE Screening Tool for the Terrestrial Biodiversity Theme is illustrated in **Figure 7-2** and indicates that Mura 2 site is classified as Very High Sensitivity due to being in a CBA 1 and ESA 2 area. There are no areas within the development footprint that have been classified as High sensitivity and it is restricted to low sensitivity areas with some restricted areas of habitat considered to represent medium sensitivity areas which are considered vulnerable to disturbance and should preferably be left free from PV development.



**Figure 7-2 - Map of Terrestrial Biodiversity Sensitivity**

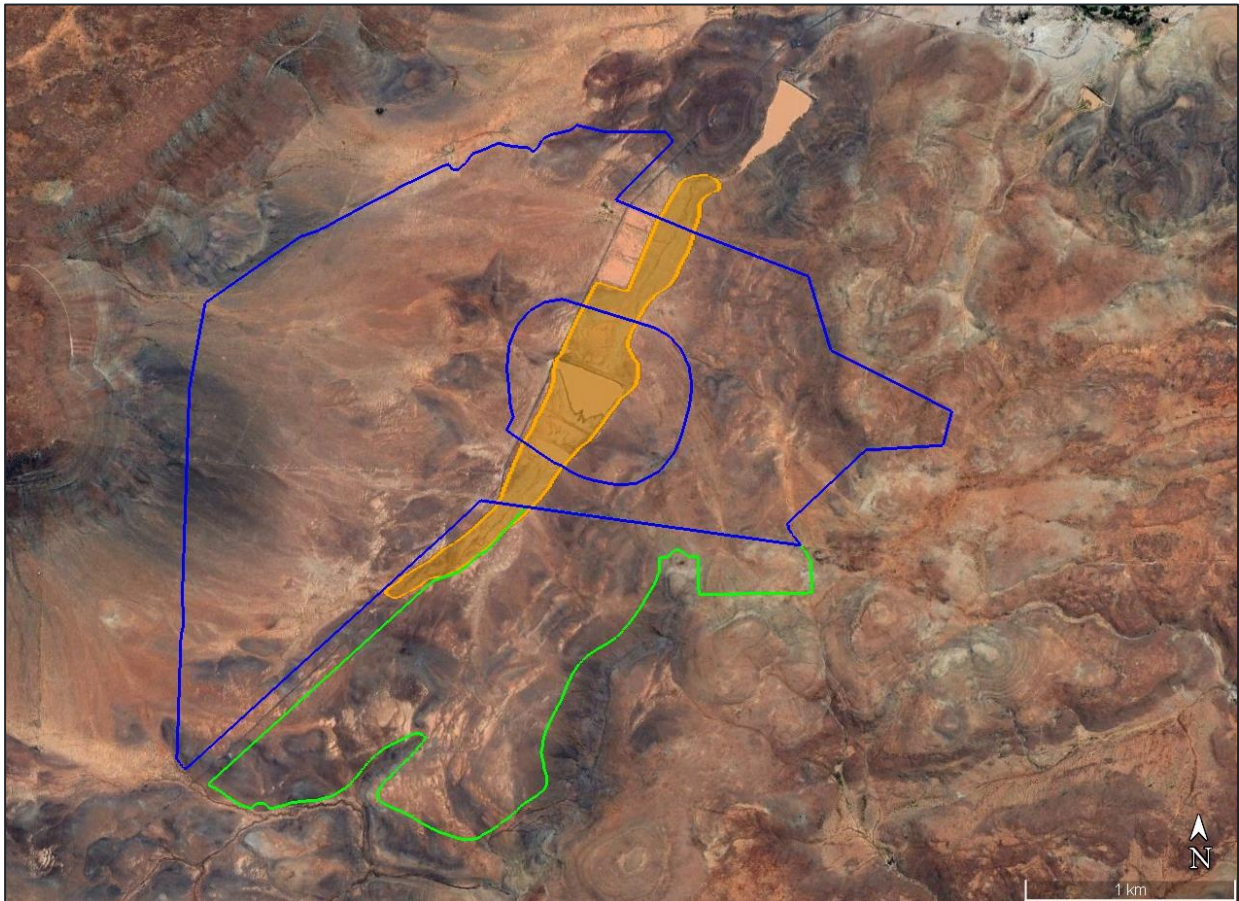
Source: DFFE Screening Report

The site was visited on 9th of June 2022 for the Site Verification. During the field assessment, the full site was investigated on foot and a full plant species checklist for the site was developed. Specific points of interest across the site were checked and included any rocky outcrops, drainage features, wetlands and any areas of quartz pebbles or gravel patches where present. The total track within the Mura 2 Solar project area was in excess of 9km long. In order to check the larger fauna of



the site, three camera traps were also put out on the site and the adjacent Mura 1 Solar site, during the site verification and recovered in October 2022.

Given the extent of the site and the relatively favourable conditions at the time of the site visit, there are few limitations and assumptions required with regards to the vegetation of the site. In terms of fauna, the habitats present within the site were well-investigated and it is unlikely that there are any features of concern present that have not been observed. **Figure 7-3** shows the terrestrial biodiversity sensitivity determined for the site.

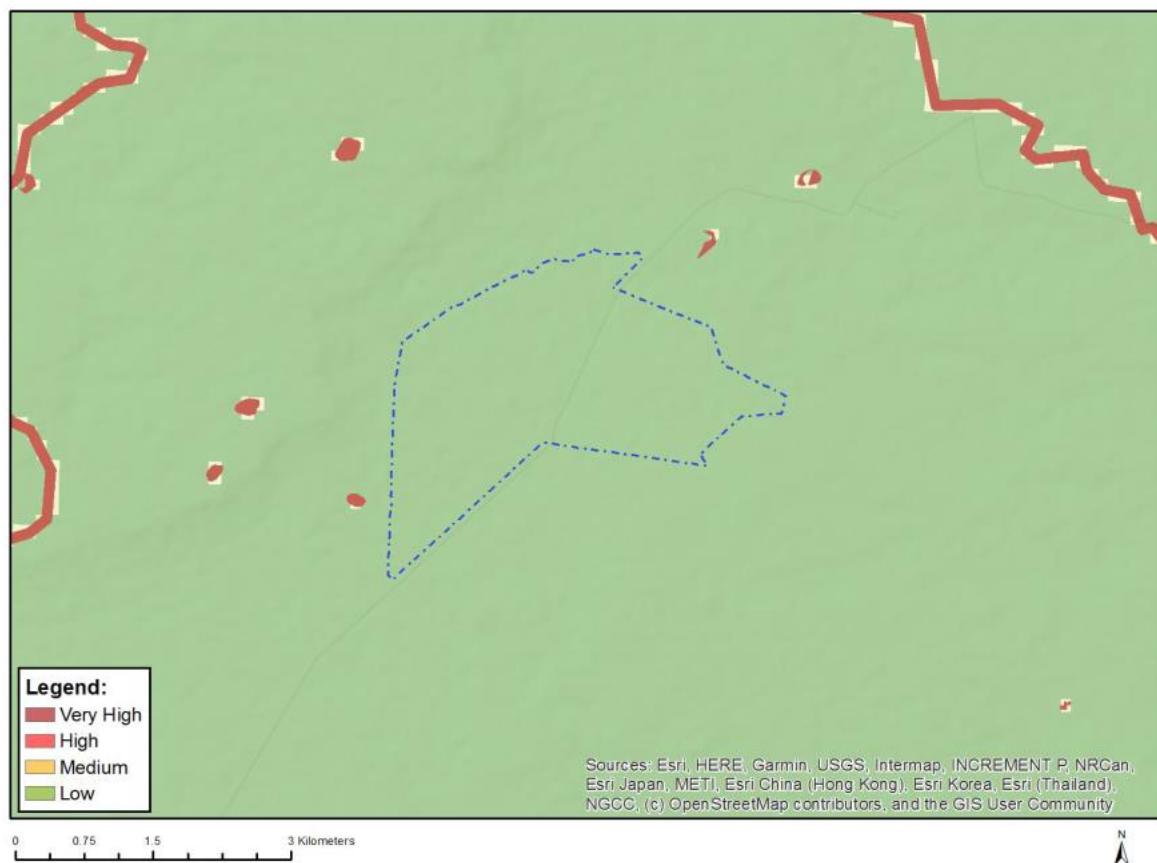


**Figure 7-3 - Sensitivity map for the Mura 1 and Mura 2 project areas, illustrating areas with habitats of higher sensitivity that should be avoided as much as possible by the development**

### 7.1.3 AQUATIC BIODIVERSITY

The DFFE Screening Tool map for the Aquatic Biodiversity at the Mura 2 (**Figure 7-4**) indicates the area to be of low sensitivity. The aquatic ecosystem assessment concurs with the Aquatic Biodiversity Sensitivity mapping, that the area is of low sensitivity.





**Figure 7-4 - Map of Aquatic Biodiversity Sensitivity**

Source: DFFE Screening Report

**Table 7-3** contains a summary of the aquatic ecological condition, ecological importance and sensitivity and recommended ecological category as well as the sensitivity and associated buffers for the aquatic features, based on the field assessment.

**Table 7-3 - Summary of condition, ecological importance and sensitivity of aquatic features together with recommended buffers**

Aquatic feature	PES	EIS	REC	Sensitivity	Recommended buffer
Krom River	B/C	High	B/C	High	35m and surrounding valley bottom and floodplain wetland and buffer
Small tributaries	A/B	Moderate	A/B	Medium	35
Valley bottom wetlands	B	Moderate	B	Medium	35

Based on the PES, EI&ES and REC above, aquatic sensitivity and recommended buffers have been mapped to protect these ecosystems. The recommended buffer area between the aquatic features and the project components is 35m from the centre of these streams or along the delineated edge of the wide associated floodplain area. The buffer areas are areas of protection recommended as a development setback for the PV Facilities that is intended to reduce the edge effect and direct

impacts on the integrity and functionality of the aquatic ecosystems. The projects sites have generally avoided the high sensitivity areas, following the input received as part of the screening assessment undertaken.

In terms of the proposed layout there are some minor watercourses that occur within each of the proposed PV Facilities. These watercourses are deemed of moderate sensitivity and the potential impact of the proposed activities is likely to be of low significance that they would not pose a constraint to the proposed development if mitigated. No infrastructure or panels may be placed within these watercourses but the underground cables and limited-service tracks may be constructed through these features. Similarly, the proposed widening of the access roads are along existing roads and the watercourse crossings can be adequately mitigated so that these aquatic ecosystems would not be a constraint to the required upgrade to the existing roads. Therefore, the proposed associated widening of existing roads, construction of underground cables and limited-service tracks can be undertaken within the aquatic features and buffers if adequately mitigated.

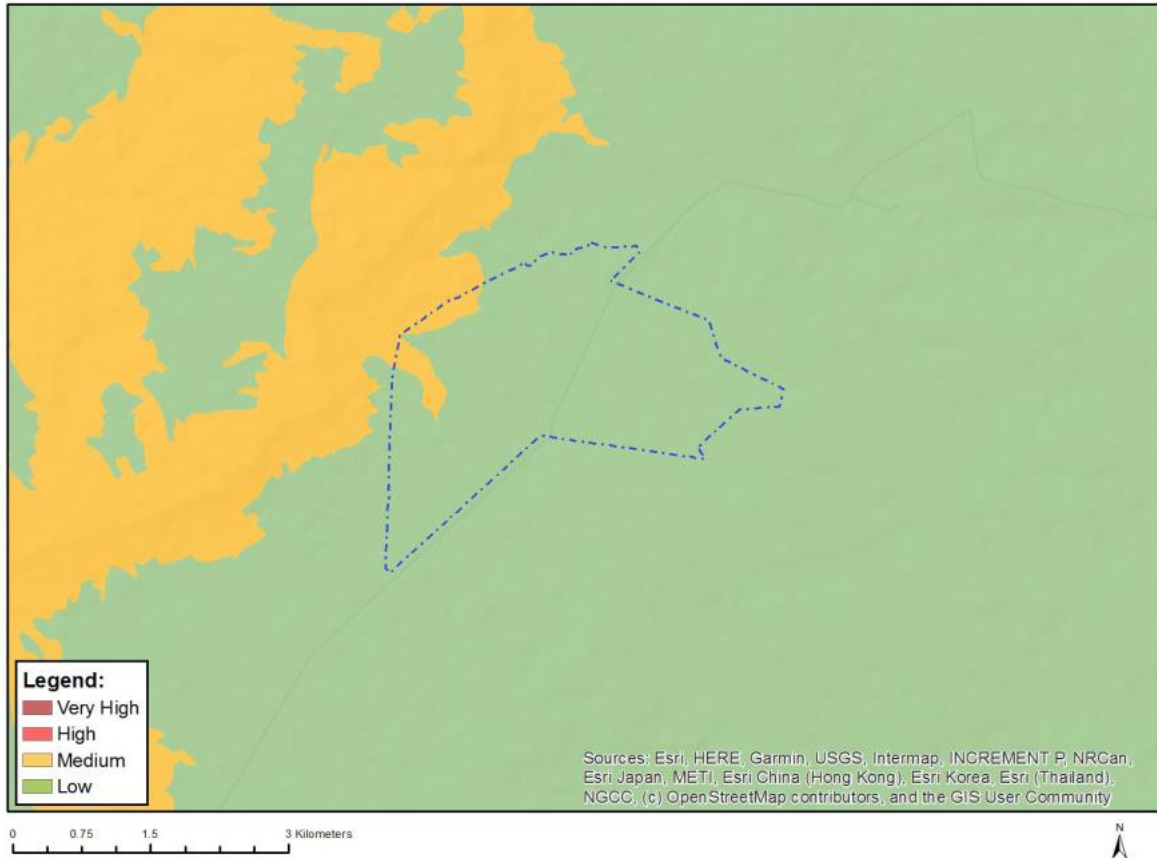
**Figure 7-5** indicates the aquatic sensitivity layers and their associated recommended buffers for the proposed projects. The no-go areas (red lines) are areas of high aquatic sensitivity that should be avoided for the PV facilities. The existing access roads that intersecting with the high sensitivity areas will be upgraded and is acceptable. The medium sensitivity (yellow areas) should be avoided where possible, or in the case of the new service tracks and underground cables, adequately mitigated.



**Figure 7-5 - Recommended aquatic buffer/setback areas and associated aquatic ecosystem sensitivity mapping**

#### 7.1.4 PLANT SPECIES

The DFFE Screening Tool indicates that the site has a medium sensitivity (**Figure 7-6**). The the site verification confirms that no plant SCC were observed on site and that the site can be considered low sensitivity.



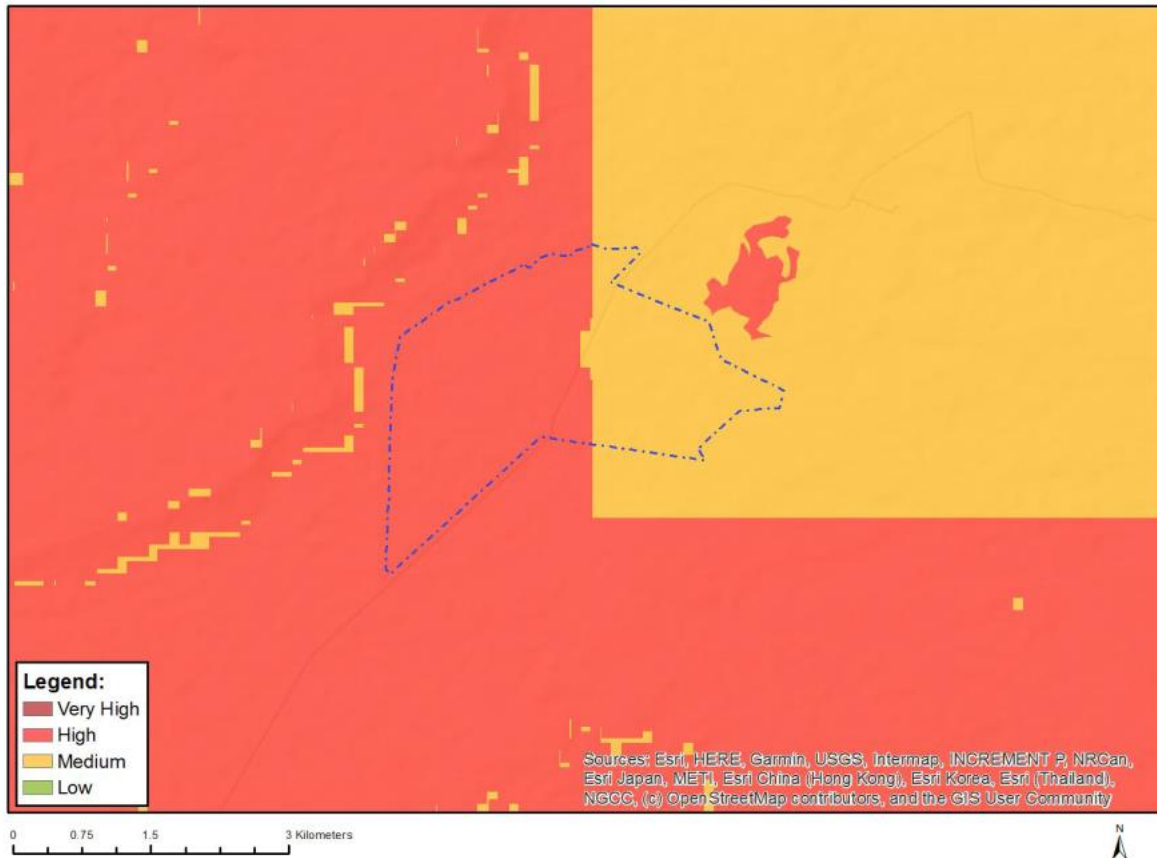
**Figure 7-6 - Map of Plant Species Sensitivity**

Source: DFFE Screening Report

The site was visited twice for the current project. An initial field assessment took place on the 9th of June 2022 and a follow-up field assessment on the 19th of October 2022. During the initial field assessment, a broad area covering the Mura 2 PV area was investigated and the primary aim was to survey the ecological features of the site to inform a sensitivity map of the whole project area that can be used to guide the final development footprint for the PV areas and grid connection. A full species list for the site was developed during the field sampling and attention was paid to the possible presence of any flora of concern within the development footprint. Sensitive species and habitats within the footprint were recorded where present and mapped with a GPS if necessary. The track that was walked through the Mura 2 Solar PV footprint area had a total length in excess of 9 km. This included some areas that are outside of the final development footprint as the initial area provided for assessment included areas that were later excluded on the grounds of being unsuitable for PV development based on the results of the initial field assessment. During the follow-up field assessment, the vegetation had dried significantly from the initial site visit and no additional species were observed.

### 7.1.5 ANIMAL SPECIES

The DFFE Screening Tool indicates that the site has a high sensitivity (**Figure 7-7**) due to the potential presence of the Karoo Dwarf Tortoise *Tortoise Chersobius boulengeri* (EN) and Riverine Rabbit *Bunolagus monticularis* (CR) within the project site. However, the site verification indicates that there is no suitable habitat for either species within the PV development footprint indicating that the site can be considered low sensitivity in terms of this species.



**Figure 7-7 - Map of Animal Species Sensitivity**

Source: DFFE Screening Report

An initial field assessment took place on the 9th of June 2022 and a follow-up field assessment on the 19th of October 2022. During the initial field assessment, a broad area was investigated in the field and the primary aim was to survey the ecological features of the site to inform a sensitivity map of the whole project area that has been used to guide the final development footprint for the PV areas and grid connection. During the initial field assessment, three camera traps were located across the Mura 1 and Mura 2 site and recovered during the second field assessment, giving rise to four months of camera trapping at the site. During the walked transects conducted across the site, all animal species directly or indirectly observed were recorded. Within habitats likely to harbour species of concern, active searches were conducted which included looking under rocks, within dense bushes and other shelter sites. In addition, specific attention to the presence of dead tortoise carapaces was paid as this is frequently the only sign of less common species that can readily be observed. If present, sensitive species locations and habitats within the footprint were recorded and



mapped with a GPS. The track that was walked through the different PV footprint areas has a total length in excess of 8km.

### 7.1.6 AVIFAUNA

A map of the proposed Mura 2 development area overlaid on the screening tool sensitivity is given in **Figure 7-8**. The DFFE Screening Tool rates the Avian Theme as Low Sensitivity.



**Figure 7-8 - Map of Avian Sensitivity**

Source: DFFE Screening Report

Based on a site verification survey, two seasons of pre-construction bird monitoring (in accordance with best practice), and extensive previous work in the area for the Nuweveld Wind Farms, WildSkies draw the following conclusions:

- The two listed species: Ludwig's Bustard; and Verreaux's Eagle do occur on the proposed site:
  - Ludwig's Bustard has been recorded as follows on site: twice on drive transects in spring (1 and 3 birds); four times as incidental records of single birds and pairs. The species can be expected to forage on site at times. However, no evidence of breeding was recorded.
  - Verreaux's Eagle has been recorded twice (both single birds) incidentally and has a nest approximately 5.2km south-west of south of Mura 3 and 4, which has been protected by a 2km No-Go buffer.

Based on the on-site work Wildskies confirms that the site is of Medium sensitivity for avifauna.



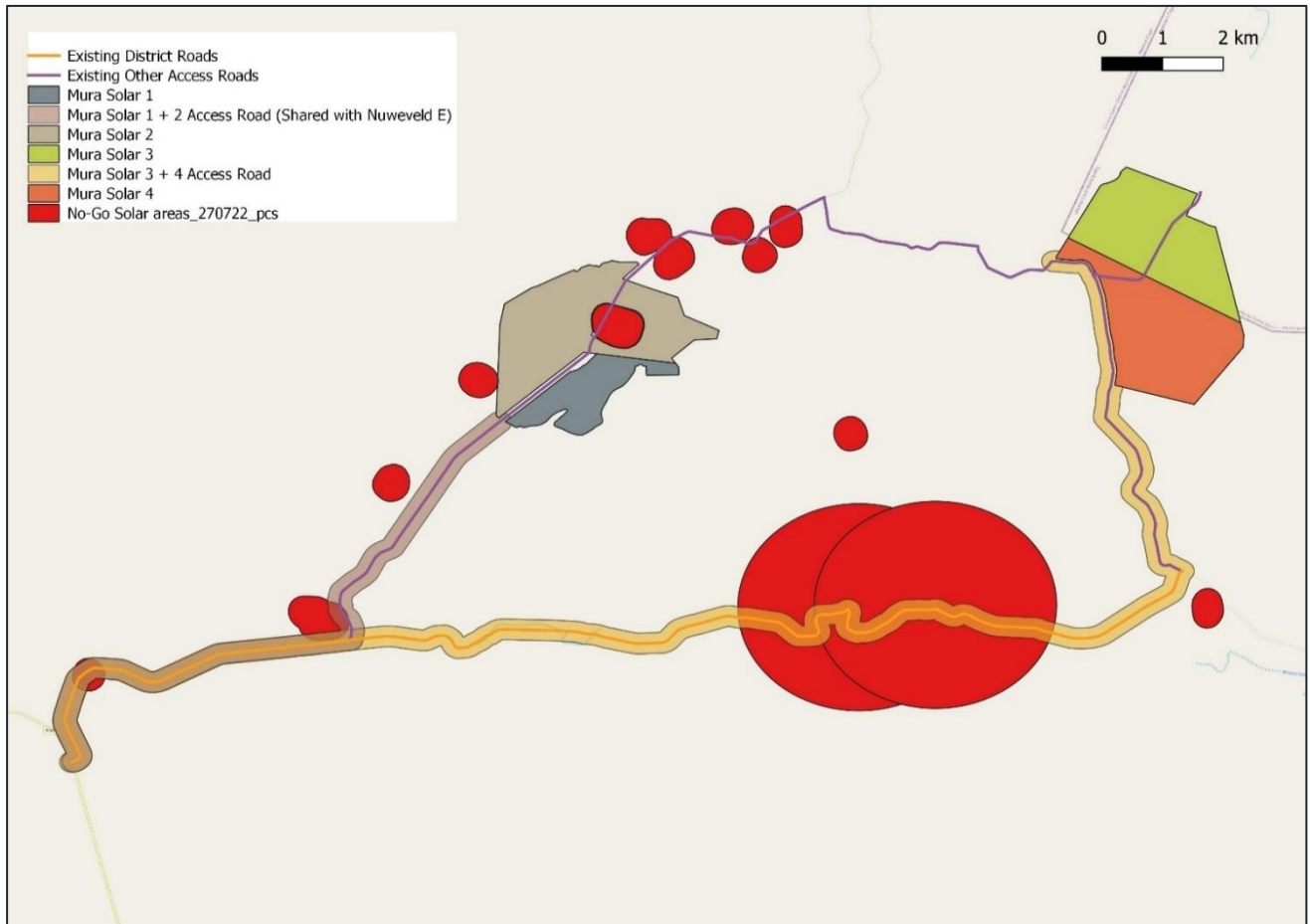
During the screening phase, the following sensitive areas on site for avifauna were identified. Two sensitive avifaunal feature categories were identified on the site:

- **Dams:** Dams provide an open source of surface water and attract birds to drink, wash, feed and roost. These areas should be avoided by the proposed infrastructure. We used the SANFEPA and NBA2018 shape files to identify dams on site, of which there are relatively few. A buffer of 250m was applied to these dams and the resulting areas are classified as No-Go for new PV or overhead line infrastructure and roads (**Table 7-4**). Use may be made of existing roads within these areas.
- **Bird nests:** Most of the sensitive nests in the broader area are sufficiently far from the proposed areas to be irrelevant to this phase of study. However, one Verreaux's Eagle nest was previously considered close enough to be relevant. An alternate nest for this pair of eagles also exists to the east. Wildskies have assigned a No-Go buffer for new infrastructure of 2km to these two nests (**Table 7-4**). This buffer size is determined by Wildskies own judgement and is intended to provide protection against disturbance of the birds' breeding during construction and operations; and destruction of foraging habitat for the birds. This buffer size is less than half that required for wind farms, because direct mortality of eagles (through collision) is not likely on the PV facilities. This buffer area is considered a No-Go area for new PV infrastructure and new roads. Use may be made of existing roads (which may be widened) within this area.

**Table 7-4 – Avifaunal sensitivity features for solar areas**

Category	Feature
No Go	<ul style="list-style-type: none"> <li>■ Dams plus 250m buffer</li> <li>■ Verreaux's Eagle nest x 2 (1 alternate) plus 2 000m buffer</li> </ul>

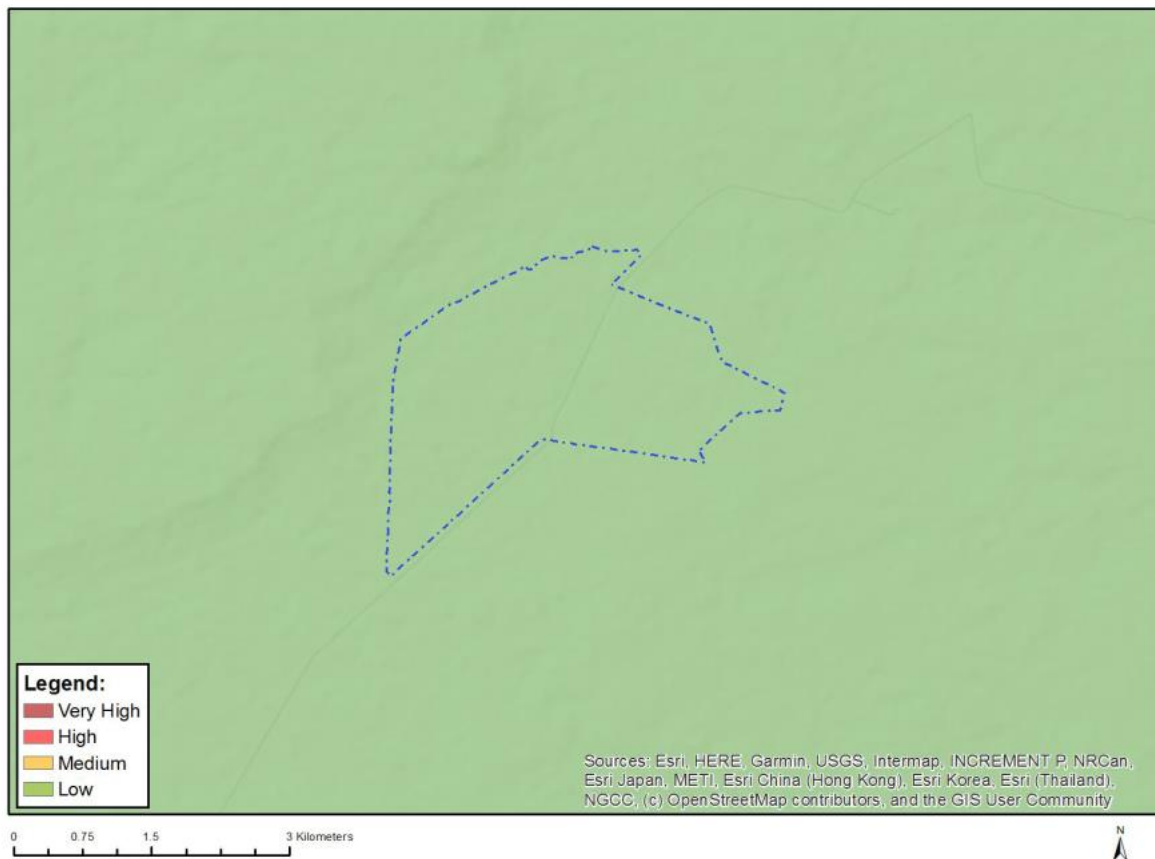
Avifaunal constraints are presented in **Figure 7-9** for the full site. There are no conflicts between the planned infrastructure and the No-Go areas.



**Figure 7-9 - Avifaunal sensitivity of the overall PV site**

### 7.1.7 ARCHAEOLOGICAL AND CULTURAL HERITAGE

The output of the DFFE Screening Tool for the Archaeological and Heritage Theme is illustrated in **Figure 7-10** and indicates that Mura 2 site is classified as low. The heritage specialist disputes the uniform low sensitivity of the broader study area noting that several areas of medium to high sensitivity are present. Also, the wider landscape can be considered as at least medium sensitivity. In sum, the overall sensitivity is best considered to be medium.



**Figure 7-10 - Map of Archaeological and Heritage Sensitivity**

Source: DFFE Screening Report

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), “cultural significance” means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. The reasons that a place may have cultural significance are outlined in Section 3(3) of the NHRA.

Although archaeological resources of up to grade IIIA occur close to the access road corridors, none are close enough to be of further concern. Within the PV footprint there are sites of up to grade IIIC, but sites graded up to IIIB occur nearby in areas excluded from development. These resources have variable cultural significance at the local level for their historical, social and scientific values.

Graves are deemed to have high cultural significance at the local level for their social value but are unlikely to occur. If found, they would be allocated a grade of IIIA.

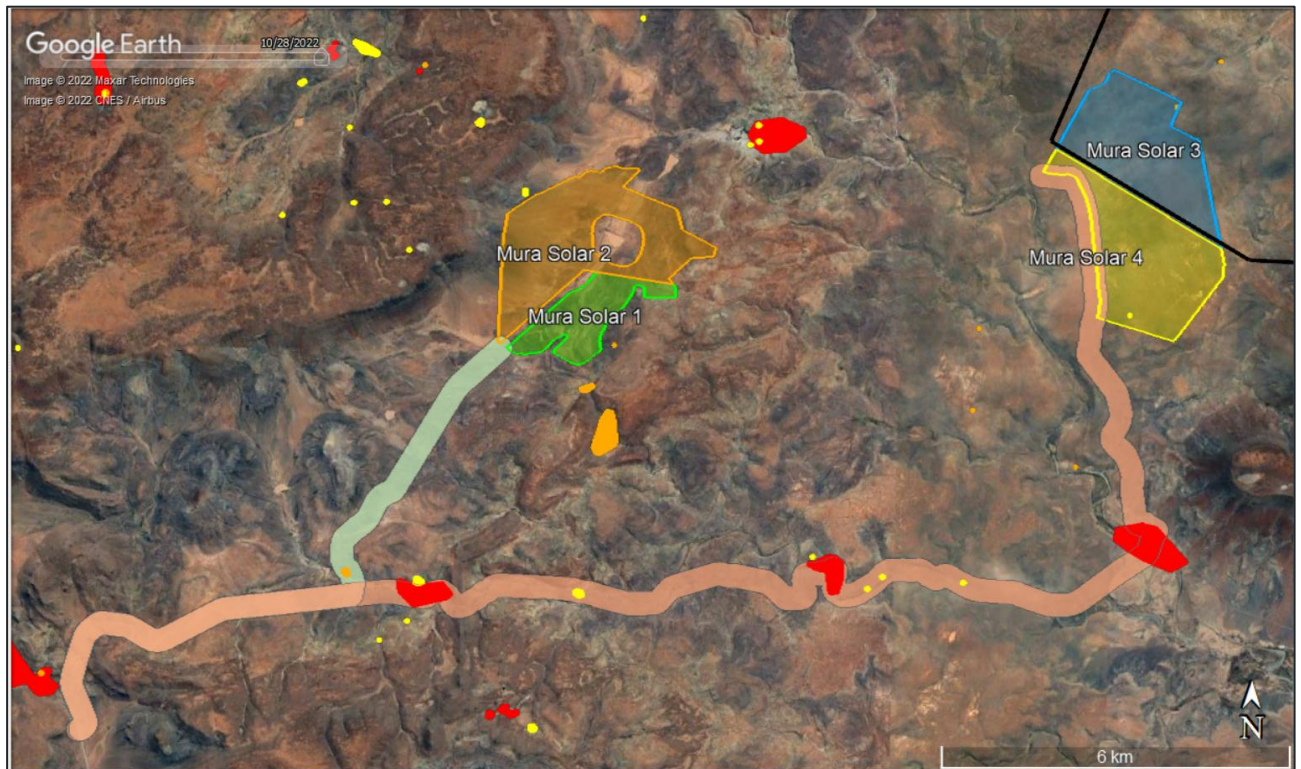
The cultural landscape is largely a natural landscape with aesthetic value and is rated as having medium cultural significance at the local level. It can be graded IIIB.

Known heritage resources are mapped with 50 m buffers in **Figure 7-11** and **Figure 7-12**.

The maps show the following heritage grading requirements:

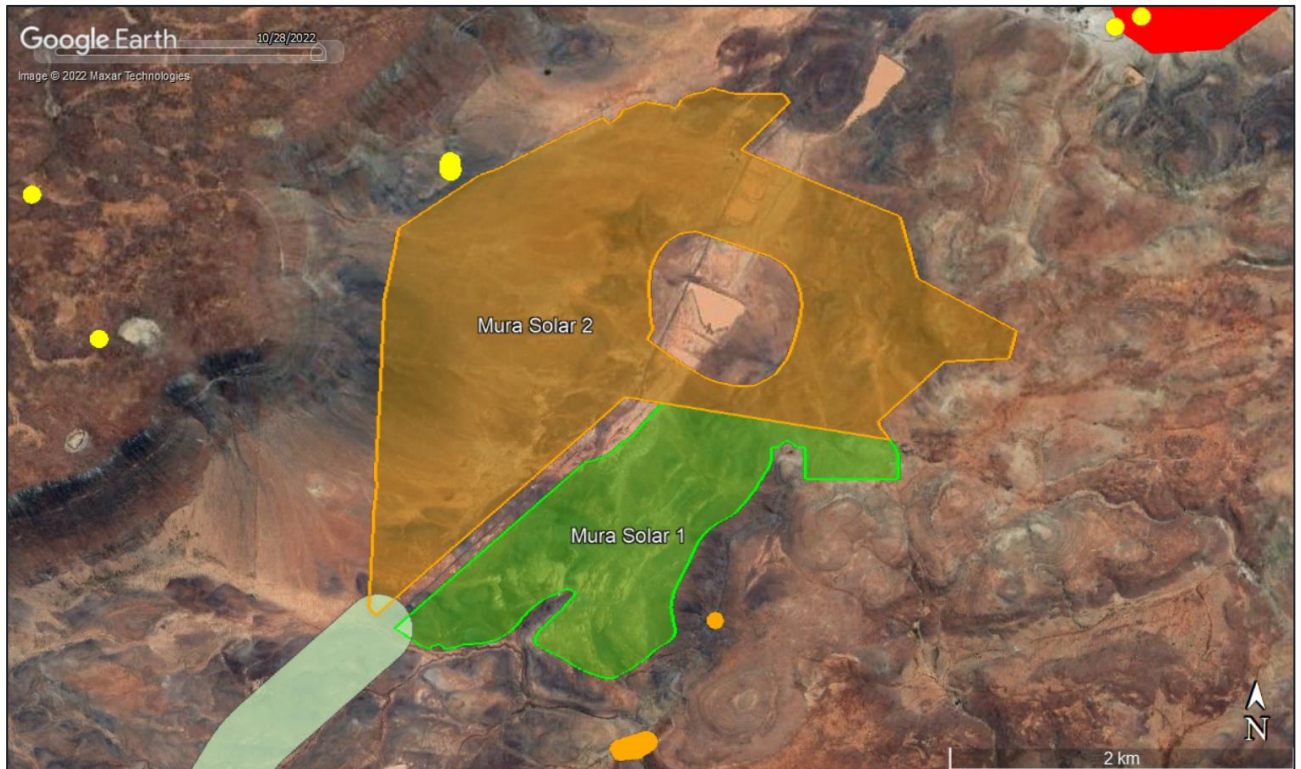
- Grade IIIA (red) is regarded as No-Go;
- Grade IIIB (orange) is high sensitivity; and

Grade IIIC/GPA/GPB (yellow) are medium.



**Figure 7-11 - Grade map of the study area. Note that it is constructed using data from several projects but that only those sites directly relevant to this project appear in the report**





**Figure 7-12 - Smaller scale map showing heritage resource grading in the vicinity of the Mura 1 and Mura 2 footprints**

The landscape on site is very flat and guidelines for the placement of infrastructure within the footprint areas are not deemed necessary.

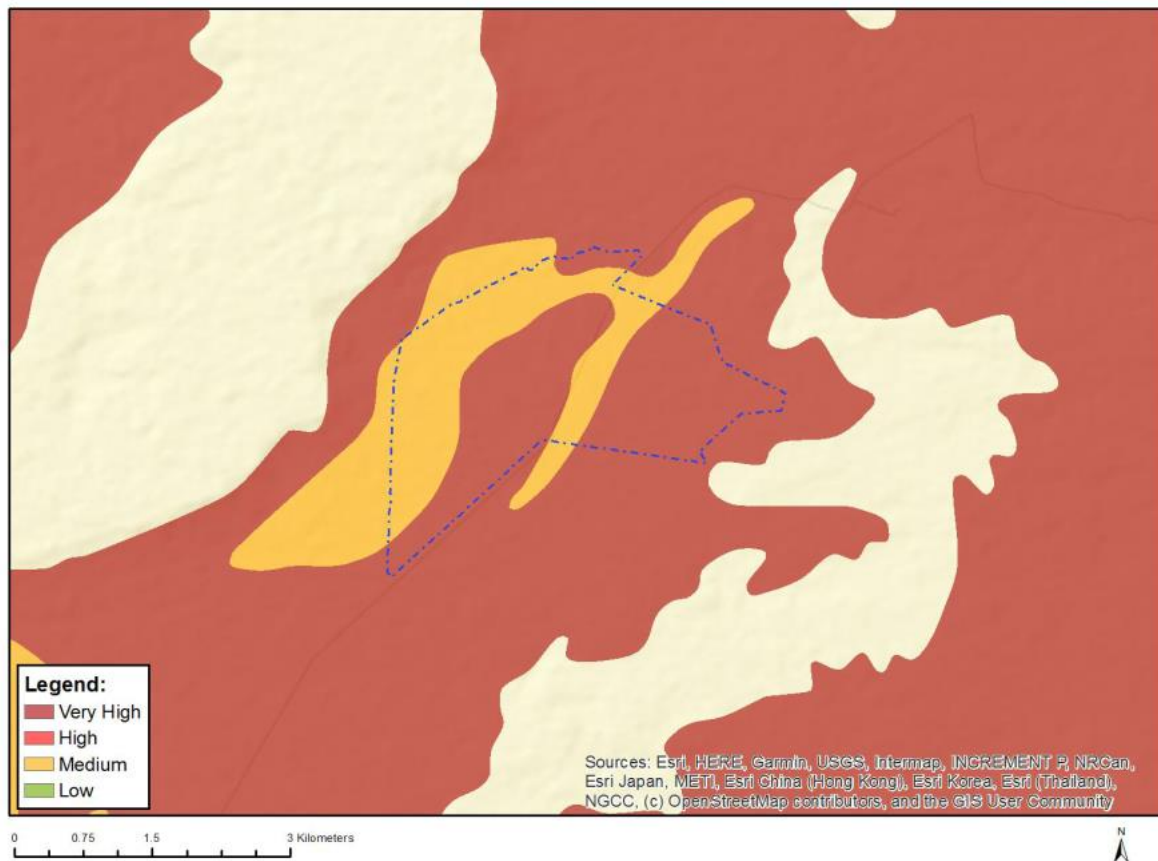
### 7.1.8 PALAEOLOGY

Provisional site sensitivity mapping for palaeontology using the DFFE National Web-Based Environmental Screening Tool (as well as the SAHRIS Palaeosensitivity Map) suggests that Mura 2 falls within a Very High Sensitivity (**Figure 7-13**). Small sectors of the project areas that are underlain by substantial alluvial deposits along major drainage lines are assigned a Medium Palaeosensitivity while areas underlain by dolerite intrusions are palaeontologically Insensitive.

A Low Palaeosensitivity for Mura Solar 2 is inferred in this report on the basis of:

- Desktop analysis of relevant geological maps and palaeontological databases, including previous PIA studies in the region by the author (e.g. Nuweveld WEF cluster and Grid Connection);
- A six-day palaeontological heritage site visit to the combined Mura project area which yielded only a very sparse scatter of fossil sites (mostly of low scientific / conservation value) within the Lower Beaufort Group bedrocks and no Late Caenozoic sites;
- Generally low to very low levels of bedrock exposure, especially within the low-relief Mura Solar 1-4 project areas. Most fossil sites occur in gullied hillslopes and along major drainage lines which form only a very minor part of the combined project area;
- Dolerite intrusions which have compromised fossil preservation in some sectors of the combined project area.



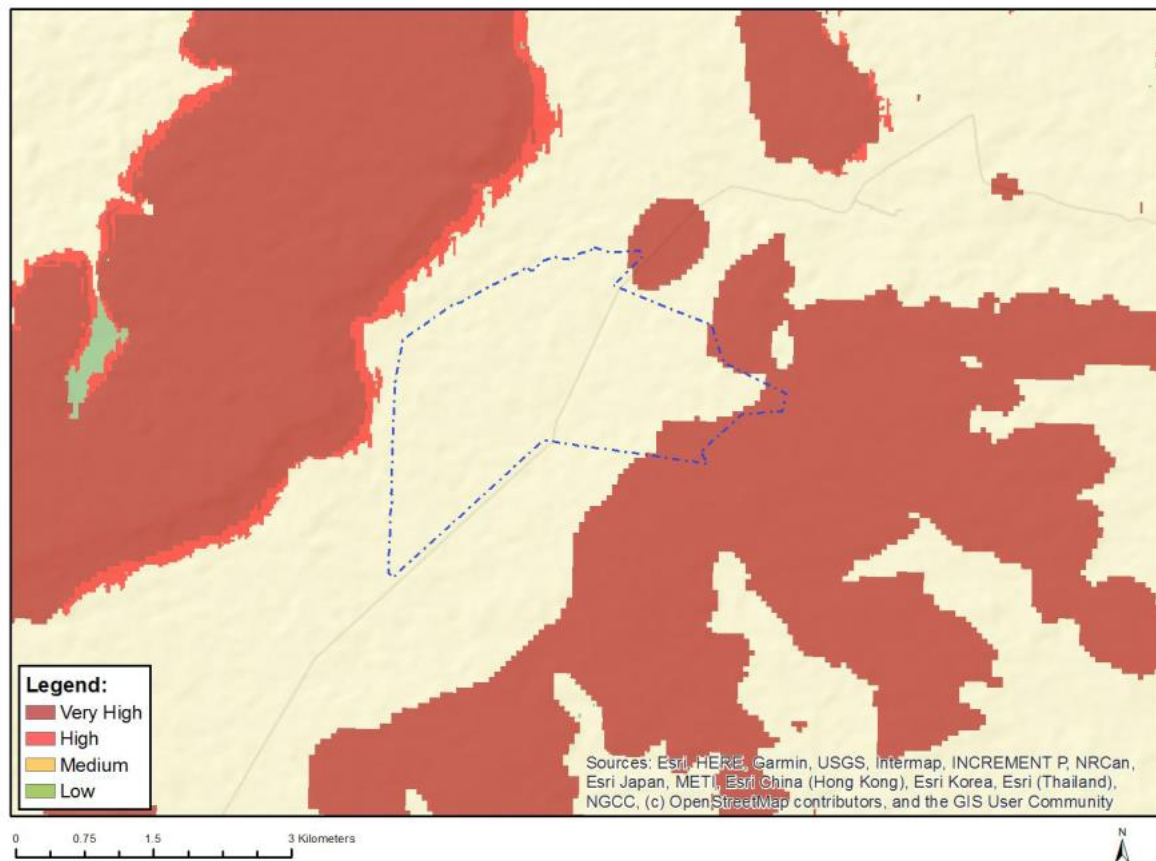


**Figure 7-13 - Map of Palaeontology Sensitivity**

Source: DFFE Screening Report

### 7.1.9 VISUAL

A map of the proposed Mura 2 development area overlaid on the screening tool sensitivity is given in **Figure 7-14**. The classification of the site as high sensitivity is because of the mountain tops and high ridges identified by the screening tool.



**Figure 7-14 - Map of Landscape Sensitivity**

Source: DFFE Screening Report

### Visibility

Estimated degrees of visibility based on the scale of the facilities and related infrastructure, and on distance from various receptors are indicated in **Table 7-5** and **Table 7-6**.

**Table 7-5 – Degrees of Visibility of Proposed Solar Project Facilities**

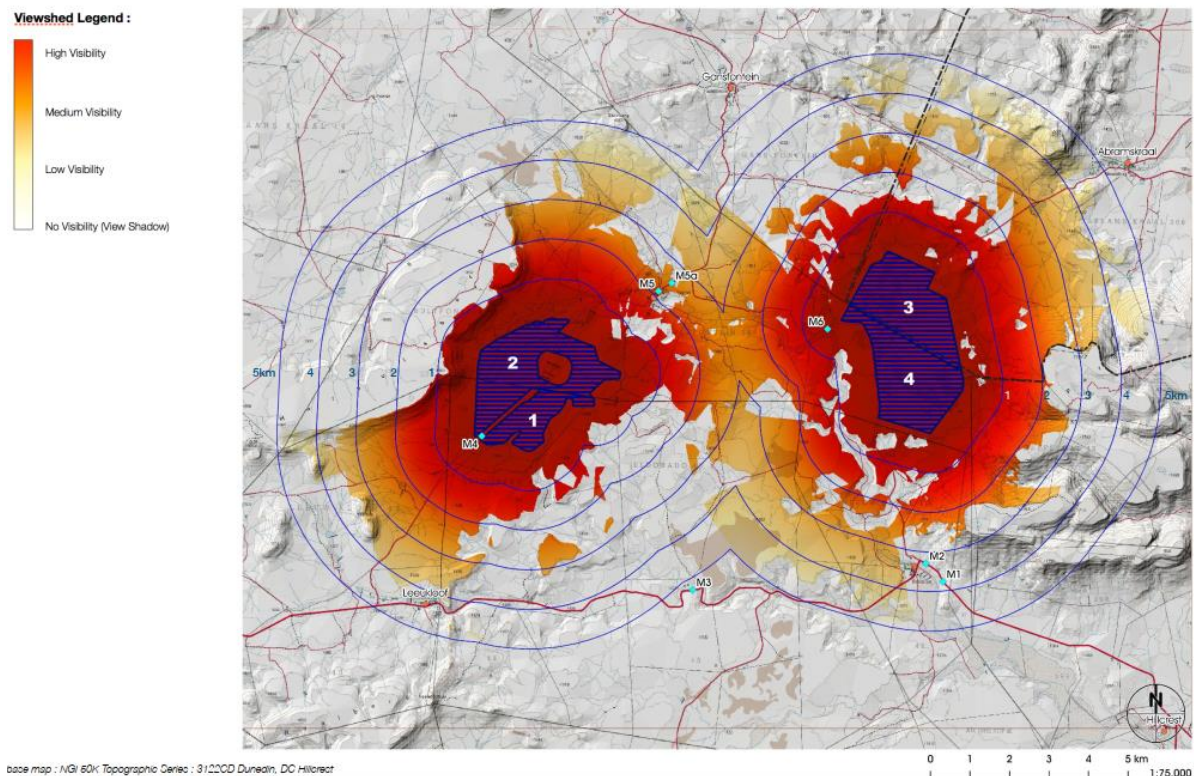
Very high visibility	0-500m	Prominent feature within the observer's view frame
High visibility	500m-1km	Relatively prominent within observer's view frame
Moderate visibility	1-2km	Only prominent as part of the wider landscape
Low visibility	2-4km	Visible as a minor element in the landscape
Very low visibility	>4km	Hardly visible with the naked eye in the distance

**Table 7-6 - Viewing Distances and Potential Visibility from Receptors**

Farmsteads in the Study Area	Distance to PV1	Distance to PV2	Distance to PV3	Distance to PV4	Potential Visibility
Leeukloof	4.36km	4.42km	13.14km	12.4km	Low visibility. View shadow.
Gansfontein	8.54km	7.15km	5.7km	6.25km	Low visibility. Beyond 5km
Abramskraal	14.76km	13.87km	5.61km	6.74km	Low visibility. Beyond 5km
Bultfontein	2.97km	1.96km	4.96km	4.79km	Moderate visibility (see pano)
Booiskraal	9.05km	8.83km	5.07km	3.38km	Low visibility. View shadow.

## Visual Exposure

The viewshed, or zone of visual influence, potentially extends for some 5km, but is partly restricted by topography in some directions, where parts of the surrounding area would be in a view shadow (Figure 7-15). The viewsheds of the proposed solar PV facilities tend to be fairly localised.



**Figure 7-15 – Nominal Viewshed**



## Visual Absorption Capacity (VAC)

This relates to the potential of the landscape to screen the proposed solar projects from view. The largely treeless landscape provides little screening effect. In most cases, clumps of trees around farmsteads tend to reduce visibility by receptors.

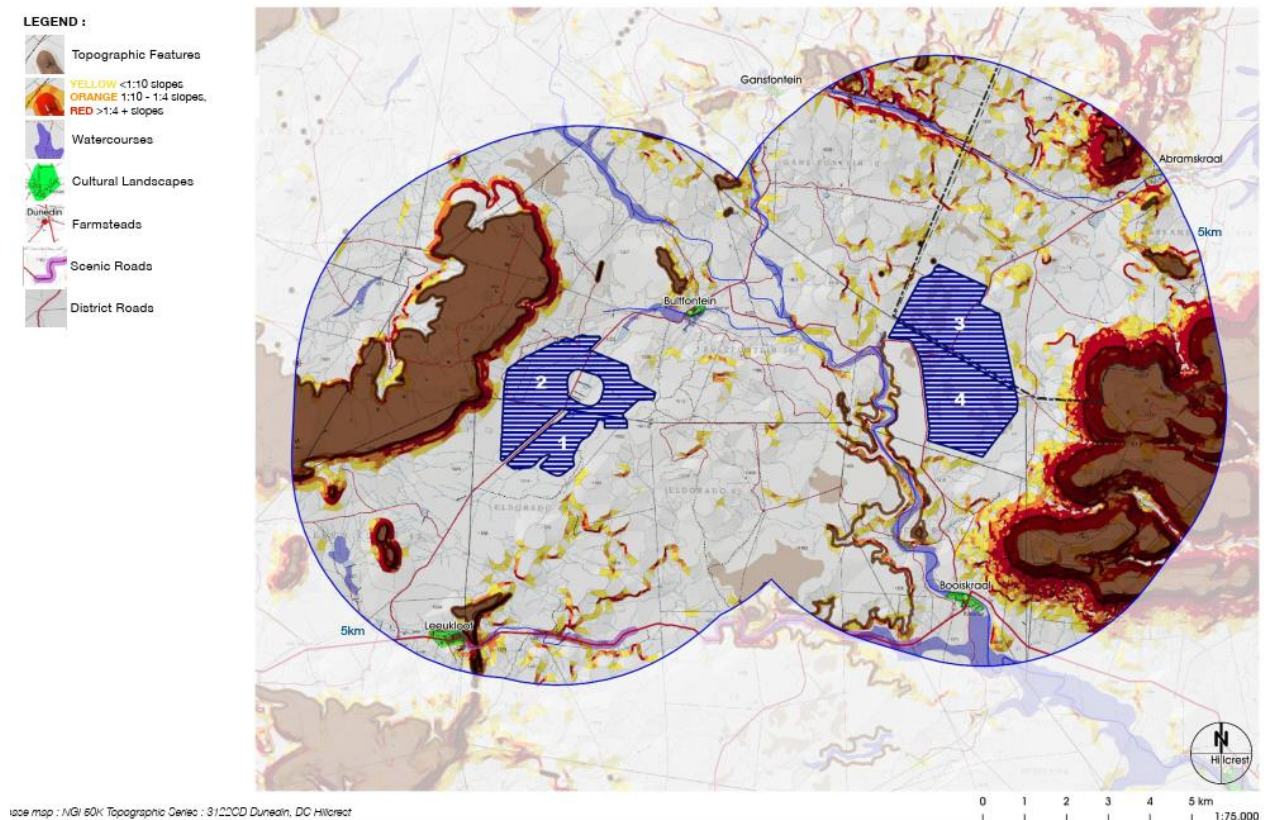
## Landscape Integrity

Landscape integrity tends to be enhanced by scenic or rural quality and intactness of the landscape, as well as absence of other visual intrusions. Cultural landscapes, such as rural or farming scenes also have visual or scenic value. On the other hand, industrial activity and visual 'clutter', including substations and powerlines, detract from these scenes. The sites for the solar projects generally have uncluttered, expansive landscapes with pastoral scenes.

## Visually Sensitive Resources

Natural and cultural landscapes, or scenic resources, form part of the 'National Estate' and may have local, regional or even national significance, usually, but not only, of tourism importance.

**Figure 7-16** indicates landscape features of interest Visual Impact Intensity.



**Figure 7-16 – Visual features**

The overall potential visual impact intensity (or magnitude) is determined in **Table 7-7** below by combining all the factors above, namely visual exposure, visibility, visual absorption capacity, landscape integrity and visually sensitive resources.

**Table 7-7 – Visual Impact Intensity**

Visual Criteria	Comments	Solar facilities	Internal Access roads (incl. construction camps)
Visual exposure	Limited viewshed of solar facilities	Medium-low	Low
Visibility	Visible from a number of farmsteads.	Medium	Low
Visual absorption capacity (VAC)	Visually exposed plains, and therefore low VAC.	Medium	Low
Landscape integrity / intactness	Effect on rural / pastoral farming character.	Medium-high	Low-medium
Landscape / scenic sensitivity	Effect on scenic resources.	Low	Low
Impact intensity	Summary	Medium	Low

### Visual Sensitivity Mapping

Landscape features of visual or scenic value, along with potential sensitive receptors in the surroundings, are described in **Table 7-8** below. Visual features are indicated on **Figure 7-16**.

**Table 7-8 - Typical Scenic Features and Sensitive Receptors**

Landscape features within study area	
Topographic features	Characteristic landforms include the mesas and koppies formed from horizontal dolerite sills and vertical dolerite dykes. These features contribute to the scenic value, providing visual interest or contrast in the open Karoo landscape.
Water Features	In the dry landscape, drainage features and the larger dams provide scenic and amenity value.
Cultural landscapes	Green patches of cultivated land and tree copses in alluvial valleys form part of the cultural landscape. Archaeological sites also form part of the cultural landscape, covered elsewhere in the Heritage Assessment.
Receptors within study area	
Protected Areas	Visual significance is increased by the protection status of reserves. There are no known proclaimed nature reserves, private reserves or game farms in the vicinity of the proposed solar projects.
Guest farms	Private guest farms and guest accommodation in the area are important for the local tourism economy and tend to be sensitive to loss or degradation of scenic quality. There are no guest farms within 3km of the solar projects.
Human settlements, farmsteads	Except for the nearby farmsteads, there are no other settlements within the study area.



Scenic and arterial routes	Much of the route between Leeukloof and Booiskraal has scenic features.
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Scenic resources and sensitive receptors within the study area have been categorised into no-go, high sensitivity, medium and low visual sensitivity zones, for the proposed solar PV facilities, as indicated in **Table 7-9** below.

**Table 7-9 – Sensitivity Categories**

Category	Feature
No Go	Areas or features considered of such sensitivity or importance that any adverse effects upon them may be regarded as a fatal flaw.
High	Development to be limited and remain within acceptable limits of change determined by the specialist, and comply with restrictions or mitigation measures identified by the specialist.
Medium	Areas considered to be developable, but to remain within acceptable limits of change as determined by the specialist, and comply with restrictions or mitigation measures identified by the specialist.
Low	Low sensitivity areas that are considered to be developable. However specialists may still wish to define acceptable limits of change where necessary.

The visual sensitivity categories in relation to the mapping are outlined in **Table 7-10**, and indicated on **Figure 7-17**.

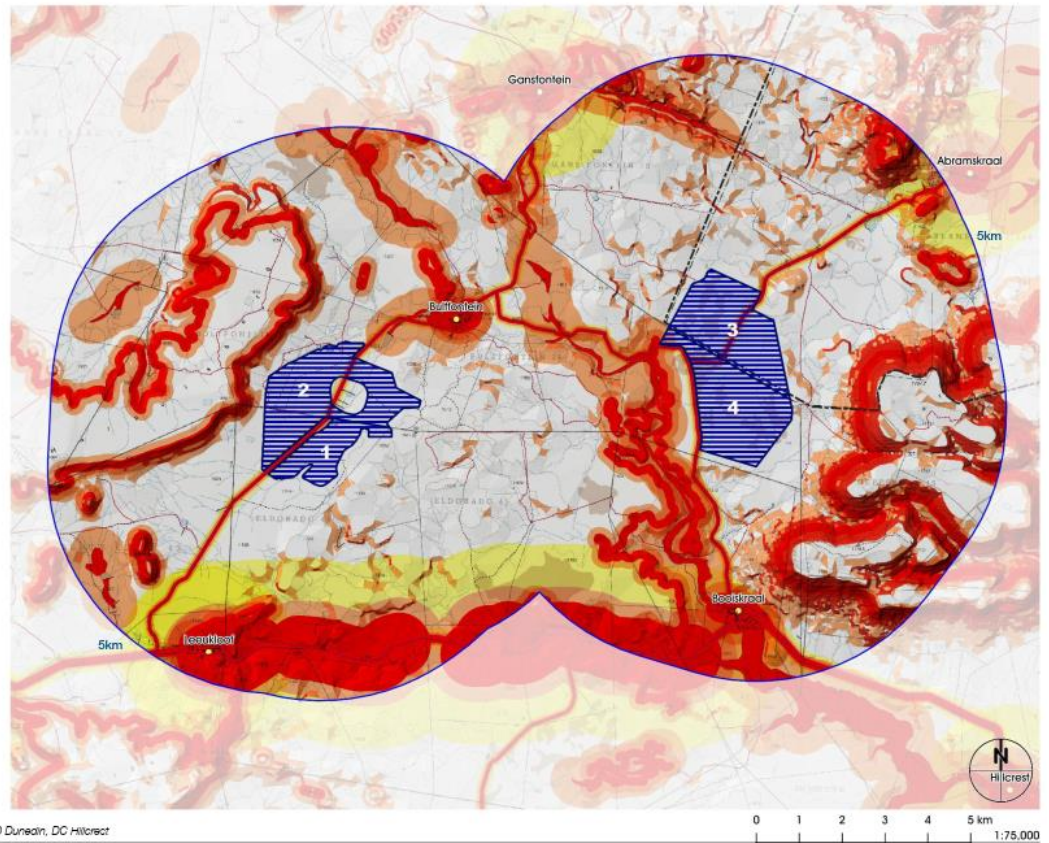
**Table 7-10 – Visual Sensitivity Buffers for the Proposed Solar Project Areas**

Scenic Resources	Very high sensitivity (No-go)	High visual sensitivity	Medium visual sensitivity	Low visual sensitivity
Topographic features	within 100m	within 250m	-	-
Steep slopes	Slopes > 1:4	Slopes > 1:10	-	-
River features	Feature	Within 500m	-	-
Cultural landscapes/ cropland	within 250m	within 500m	-	-
<b>Protected Landscapes / Sensitive Receptors</b>				
Private reserves /guest farms	within 500m	within 1 km	within 2 km	-
Farmsteads outside site	within 500m	within 1 km	within 2 km	-
Farmsteads inside site	within 250m	within 500m	-	-
Scenic routes, poorts, passes	within 750m	within 1 km	within 2 km	-
District roads	within 100m	within 150m	within 250m	-

Scenic Resources	Very high sensitivity (No-go)	High visual sensitivity	Medium visual sensitivity	Low visual sensitivity
Minor roads	within 50m	within 100m	within 150m	-

**Visual Sensitivity : SPV Arrays**

- Very High - NoGo
- High Visual Sensitivity
- Medium Visual Sensitivity
- Low Visual Sensitivity



**Figure 7-17 – Visual Sensitivity**

## 7.1.10 SOCIAL

No preliminary socio-economic sensitivities or sensitivity rating was identified or provided based on the DFFE Screening Tool (i.e. a preliminary sensitivity rating was not provided that could then be confirmed or altered based on further assessment).

It was determined by the specialist that the site would have a low to medium sensitivity rating based on the following:

- The planning documents relevant to the site do not identify significant or inherent constraints to appropriate development. Considered as a whole, the planning documents reviewed recognise the importance of integrated and diversified economic development that makes optimal use of the area's comparative advantages and creates economic opportunities. The concept of a renewable energy project is therefore broadly supported provided environmental impacts and impacts on other land uses and potentials are acceptable.
- Tourism facilities and attractions in the areas are very limited and sparsely distributed reducing tourism sensitivities. However, it should be recognised that the area is relatively isolated with

wilderness quality and limited signs of civilisation which contributes to its tourism potential. It has a remote sense of place which makes it more sensitive to potential impacts on tourism and also on surrounding landowners and communities.

- Given its remote and relatively isolated location, the site would be relatively sensitive to the influx of people, including job seekers, that may be associated with the project. The influx of large numbers of people are not thought likely and these risks should be manageable and are common to most larger projects.
- The area is sensitive, in a positive sense, to increased economic opportunities as they are much needed as reflected in low employment and income levels. Projects that can provide such opportunities are therefore to be encouraged where possible.

## 7.2 SENSITIVITY MAPPING

A preliminary consolidated environmental sensitivity map showing the “No-Go” areas (**Figure 7-18**) has been compiled based on the sensitivities and buffers outlined in the specialist studies.

The environmental sensitivities identified on site are included in **Table 7-11**. The development envelope avoids the very high (no-go) areas.

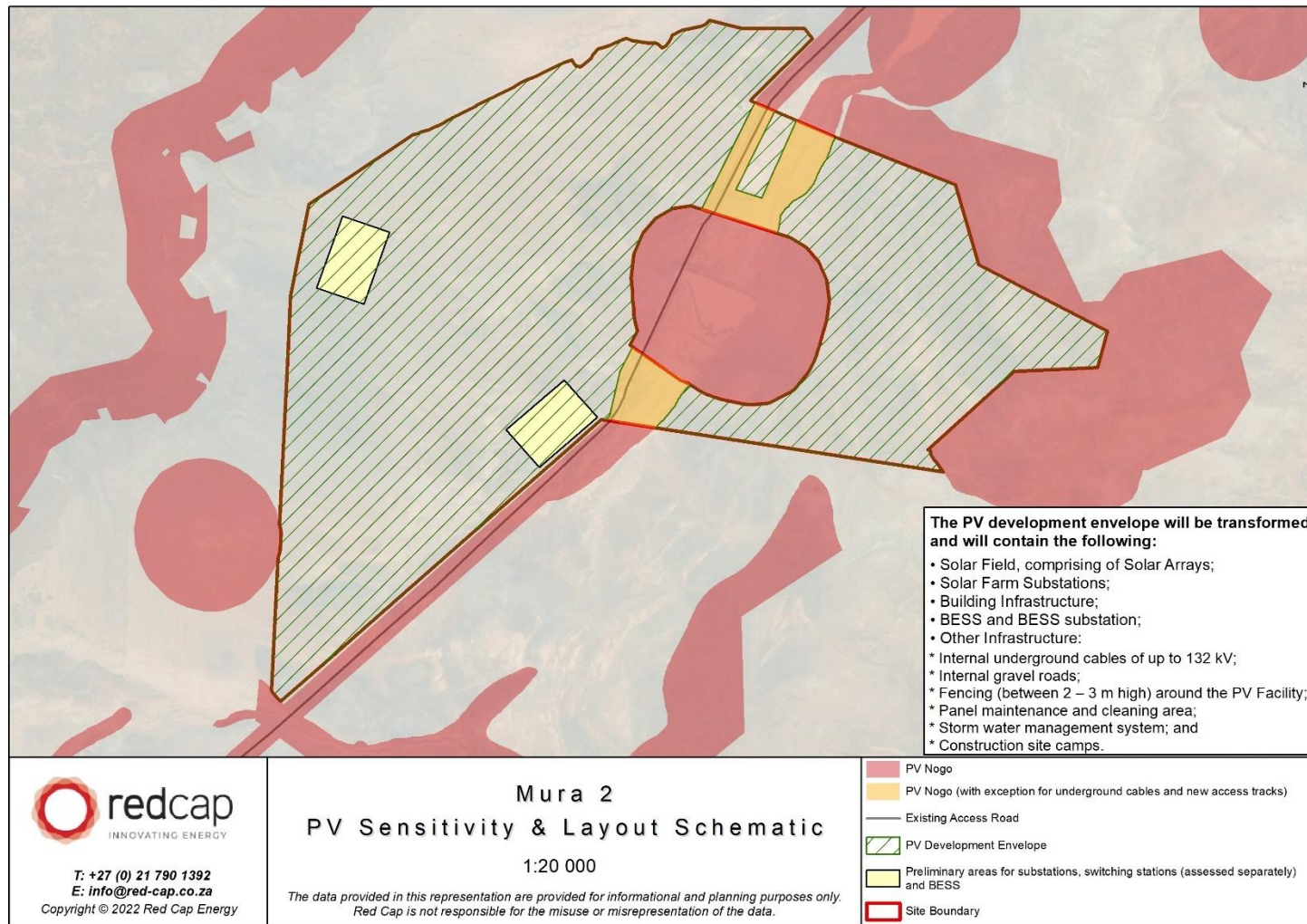
**Table 7-11 - Environmental Sensitivities identified by specialists**

Discipline	Infrastructure Type and Sensitivity Criteria		Exceptions
	Solar and associated infrastructure	New roads outside of the solar area	
Agriculture	<b>MEDIUM:</b> <ul style="list-style-type: none"> <li>■ Land capability Value of 6 - 8</li> </ul>	<b>MEDIUM:</b> <ul style="list-style-type: none"> <li>■ Land capability Value of 6 - 8</li> </ul>	
	<b>LOW:</b> <ul style="list-style-type: none"> <li>■ Land capability Value of 1 - 5</li> </ul>	<b>LOW:</b> <ul style="list-style-type: none"> <li>■ Land capability Value of 1 - 5</li> </ul>	
Aquatic Ecology	<b>NO-GO:</b> <ul style="list-style-type: none"> <li>■ 35m buffer of the Krom Rivier and surrounding valley bottom and floodplains wetlands</li> <li>■ 35m buffer of small tributaries</li> <li>■ 35m buffer of valley bottom wetlands</li> </ul>	<b>NO-GO:</b> <ul style="list-style-type: none"> <li>■ 35m buffer of the Krom Rivier and surrounding valley bottom and floodplains wetlands</li> <li>■ 35m buffer of small tributaries</li> <li>■ 35m buffer of valley bottom wetlands</li> </ul>	<p>Underground cables and limited-service tracks may be constructed through these features.</p> <p>The proposed widening of the access roads are along existing roads and the watercourse crossings can be adequately mitigated so that these aquatic ecosystems would not be a constraint to the required upgrade to the existing roads.</p>
Heritage	<b>NO-GO:</b>	<b>NO-GO:</b>	

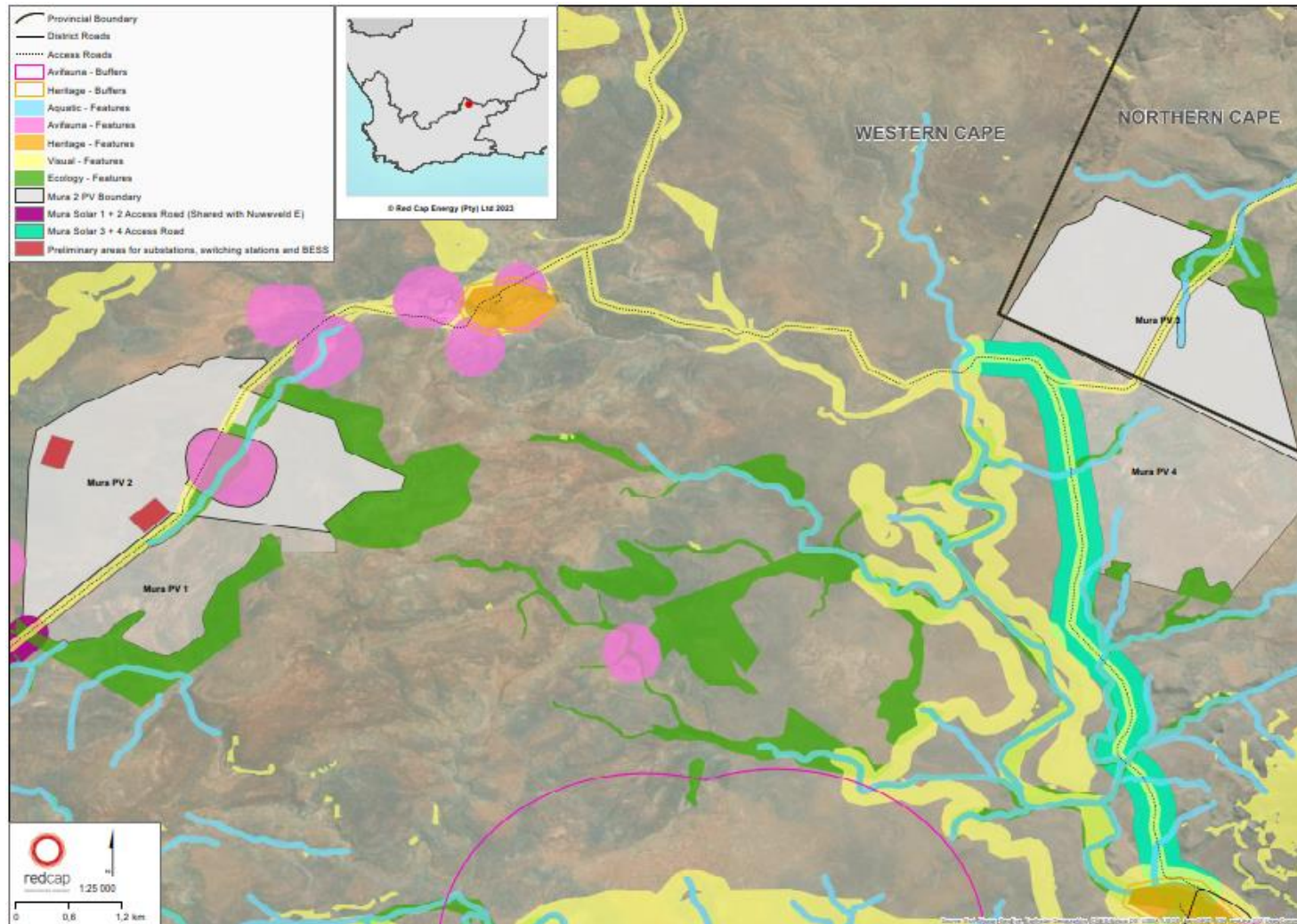
Discipline	Infrastructure Type and Sensitivity Criteria		Exceptions
	Solar and associated infrastructure	New roads outside of the solar area	
	<ul style="list-style-type: none"> <li>Grade IIIA features</li> </ul>	<ul style="list-style-type: none"> <li>Grade IIIA features with 50 m buffer</li> </ul>	
	HIGH: <ul style="list-style-type: none"> <li>Grade IIIB features</li> </ul>	HIGH: <ul style="list-style-type: none"> <li>Grade IIIB features with 50 m buffer</li> </ul>	
	MEDIUM: <ul style="list-style-type: none"> <li>Grade IIIC/GPA/GPB features</li> </ul>	MEDIUM: <ul style="list-style-type: none"> <li>Grade IIIC/GPA/GPB features with 50 m buffer</li> </ul>	
Avifauna	NO-GO: <ul style="list-style-type: none"> <li>2km buffer around a Verreaux Eagle nest</li> <li>250m buffer around dams</li> </ul>	NO-GO: <ul style="list-style-type: none"> <li>2km buffer around a Verreaux Eagle nest</li> <li>250m buffer around dams</li> </ul>	Use may be made of existing roads (which may be widened) within the no-go areas.
Terrestrial Ecology	NO-GO: <ul style="list-style-type: none"> <li>Optimal Riverine Rabbit Habitat</li> <li>Drainage lines</li> <li>Valleys</li> <li>Hills</li> </ul>	NO-GO: <ul style="list-style-type: none"> <li>Optimal Riverine Rabbit Habitat</li> <li>Drainage lines</li> <li>Valleys</li> <li>Hills</li> </ul>	The buffers do not apply to the widening of existing roads
Visual	NO-GO: <ul style="list-style-type: none"> <li>Topographic features within 100m</li> <li>Steep slopes &gt; 1:4</li> <li>River features</li> <li>Cultural landscapes and croplands within 250m</li> <li>Private reserves or guest farms and farmsteads outside the sites within 500m</li> <li>Farmsteads inside the site within 250m</li> <li>Scenic routes, ports, and passes within 750m</li> <li>District roads within 100m</li> <li>Minor roads within 50m</li> </ul>	NO-GO: <ul style="list-style-type: none"> <li>Topographic features within 100m</li> <li>Steep slopes &gt; 1:4</li> <li>Private reserves/guest farms</li> </ul>	The sensitivity buffers do not apply to the widening of existing roads

Discipline	Infrastructure Type and Sensitivity Criteria		Exceptions
	Solar and associated infrastructure	New roads outside of the solar area	
	<p>HIGH:</p> <ul style="list-style-type: none"> <li>Topographic features within 250m</li> <li>Steep slopes &gt; 1:10</li> <li>River features within 500m</li> <li>Private reserves or guest farms and farmsteads outside the sites within 1km</li> <li>Cultural landscapes and croplands within 500m</li> <li>Farmsteads inside the sites within 500m</li> <li>Scenic routes, ports, and passes within 1km</li> <li>District roads within 150m</li> <li>Minor roads within 100m</li> </ul>	<p>HIGH:</p> <ul style="list-style-type: none"> <li>Topographic features within 50m</li> <li>Steep slopes &gt; 1:10</li> <li>River features within 50m</li> <li>Private reserves or guest farms within 250m</li> </ul>	
	<p>MEDIUM:</p> <ul style="list-style-type: none"> <li>Limited viewshed of solar</li> <li>Private reserves or guest farms and farmsteads outside the sites within 2km</li> <li>Scenic routes, ports, and passes within 2km</li> <li>District roads within 250m</li> <li>Minor roads within 250m</li> </ul>	<p>MEDIUM:</p> <ul style="list-style-type: none"> <li>River features within 100m</li> <li>Cultural landscapes and cropland within 150m</li> <li>Private reserves and guest farms within 350m</li> </ul>	





**Figure 7-18 - Combined No-Go Sensitivity Map and Proposed Development Envelope for Mura 2 PV Facility**



**Figure 7-19 –Sensitivity Map for Mura 2 PV Facility**

## 8 POTENTIAL IMPACTS

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### 8.1 IDENTIFICATION OF POTENTIAL IMPACTS

The scoping phase of a S&EIR process is aimed to identify potential impacts that are most likely to be significant and which need to be assessed as part of the S&EIR process. The determination of anticipated impacts associated with the proposed development is a key component to the S&EIR process. This Chapter identifies the anticipated environmental and social impacts associated with the proposed project.

The issues identified stem from those aspects presented in **Section 6** and the description of project components and phases as outlined in **Section 3**. Each significant issue identified is to be investigated further during the S&EIR process. Non-significant issues will be scoped out of the study with reasonable consideration given within the Scoping Report.

The potential environmental and social impacts of the Mura 2 Solar PV Development have been identified at a high level and are discussed in **Table 8-1**. These impacts and mitigation measures will be further assessed during the EIA Process. The Impact Assessment Rating for these impacts are included in **Section 8.2**.

**Table 8-1 – Potential impacts**

Aspect	Impact	C	O	D	Mitigation Measures
Climate Change	Water stress in the context of climate change poses a risk to water availability. This is likely to be exacerbated by growing demand for water resources outside of the operations, particularly the agricultural sector in the region.	✓	✓	✓	<ul style="list-style-type: none"> <li>Implement water saving and conservation measures, including capturing and reusing as much of the water onsite to reduce dependence on external water sources.</li> </ul>
Climate Change	There is a high chance of an increase in the number of very hot, uncomfortable days over the next century. These are likely to have the greatest impact on i) water resources and ii) labour productivity. In terms of water resources, the very hot days will increase evapotranspiration and exacerbate water stress.	✓	✓	✓	<ul style="list-style-type: none"> <li>Implement water saving and conservation measures, including capturing and reusing as much of the water onsite to reduce dependence on external water sources.</li> <li>The operations will need to ensure that the relevant health and safety protocols are observed and potentially updated to reduce the impacts of heat-related health impacts that could occur.</li> <li>Health and safety personnel will need to pay attention to short-term weather forecasts to anticipate hot days and ensure there are either sufficient staff available for higher rotation of shifts during hot times of the day or to ensure there is machinery that can be used as an alternative (and itself be able to operate under more regular high temperatures).</li> <li>Safety training and screening of employees will also be important measures to set up. One or several on-site weather stations, which can alert operations personnel to heat thresholds being reached, would be useful installations.</li> </ul>
Climate Change	Although heavy rainfall days are not projected to increase significantly, they should nevertheless be considered. Heavy rainfall events can lead to flash flooding in arid environments, which could have an impact on site access both within and outside of the site.	✓	✓	✓	<ul style="list-style-type: none"> <li>Early warning systems including doppler radar storm warning systems (which are often used at facilities with open space such as schools, sports clubs and golf courses) can assist in alerting operations personnel to</li> </ul>



Aspect	Impact	C	O	D	Mitigation Measures
					impending storms in order to evacuate staff from at-risk areas.
Agriculture Potential	Occupation of land: Agricultural land directly occupied by the development infrastructure will become restricted for agricultural use, with consequent potential loss of agricultural productivity for the duration of the project lifetime.	✓	✓		-
Agriculture Potential	Soil erosion and degradation:  Erosion can occur as a result of the alteration of the land surface run-off characteristics, predominantly through the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related excavations.	✓	✓	✓	<ul style="list-style-type: none"> <li>Soil erosion is completely preventable. The stormwater management that will be an inherent part of the engineering on site and standard, best-practice erosion control measures recommended and included in the EMP, are likely to be effective in preventing soil erosion.</li> <li>Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there.</li> <li>Any excavations done during the construction phase, in areas that will be re-vegetated at the end of the construction phase, must separate the upper 30 cm of topsoil from the rest of the excavation spoils and store it in a separate stockpile.</li> <li>When the excavation is back-filled, the topsoil must be back-filled last, so that it is at the surface. Topsoil should only be stripped in areas that are excavated. Across the majority of the site, including construction laydown areas, it will be much more effective for rehabilitation, to retain the topsoil in place. If levelling requires significant cutting, topsoil should be temporarily stockpiled and then re-spread after cutting, so that there is a covering of topsoil over the entire cut surface.</li> </ul>



Aspect	Impact	C	O	D	Mitigation Measures
					<ul style="list-style-type: none"> <li>It will be advantageous to have topsoil and vegetation cover below the panels during the operational phase to control dust and erosion.</li> </ul>
Agriculture Potential	<p>Increased financial security for farming operations:</p> <p>Reliable and predictable income will be generated by the farming enterprises through the lease of the land to the energy facilities. This is likely to increase their cash flow and financial security and could improve farming operations and productivity through increased investment into farming.</p>	✓	✓		
Avifauna	<p>Habitat destruction:</p> <p>During the construction phase of this project, a certain amount of habitat destruction and alteration will take place. The nature of the proposed projects means that the majority of the development footprint (PV module) will be transformed from the current state to an industrial site. Most of this vegetation is currently in a fairly natural state. The amount of habitat that will be including the existing access roads that will be upgraded is 450 ha for Mura 2.</p>	✓			<ul style="list-style-type: none"> <li>There is no specific mitigation required. Impact avoidance has already been implemented in the project design phase through the adherence to no-go buffers around sensitive receptors on site.</li> </ul>
Avifauna	<p>Disturbance of birds &amp; displacement effects</p> <p>Disturbance of avifauna during the construction of the projects is likely to occur. Disturbance of breeding birds is typically of greatest concern. In this regard any breeding sites of sensitive bird species would be the most important. Wildskies have not identified any such breeding sites at this stage, other than those identified during screening and where impacts have been avoided in the location of the proposed four solar projects.</p>	✓			<ul style="list-style-type: none"> <li>There is no specific mitigation required.</li> </ul>

Aspect	Impact	C	O	D	Mitigation Measures
Avifauna	<p>Bird fatality at PV facility:</p> <p>Bird fatalities could occur at the site through a number of mechanisms, including collision with PV panels, entanglement in perimeter fence, electrocution in substations/electrical compounds, road kill and others.</p>		✓		<ul style="list-style-type: none"> <li>Implement mitigation measures included in the EMPr.</li> </ul>
Avifauna	<p>Disturbance of birds &amp; displacement effects:</p> <p>Disturbance of avifauna during the decommissioning of the projects is likely to occur. Disturbance of breeding birds is typically of greatest concern. In this regard any breeding sites of sensitive bird species would be the most important. Wildskies have not identified any such breeding sites at this stage, other than those identified during screening and where impacts have been avoided in the project design.</p>			✓	<ul style="list-style-type: none"> <li>There is no specific mitigation required. Impact avoidance has already been implemented in the project design phase through the adherence to no-go buffers around sensitive receptors on site.</li> </ul>
Palaeontology	<p>Loss of fossils:</p> <p>The construction phase will entail surface clearance as well as excavations into the superficial sediment cover and underlying bedrock. The development may adversely affect potential fossil heritage within the study area by destroying, damaging, disturbing or permanently sealing-in fossils preserved at or beneath the surface of the ground that are then no longer available for scientific research or other public good.</p>	✓			<ul style="list-style-type: none"> <li>If any substantial new fossil sites are revealed during the Construction Phase of the developments they should be handled using the Chance Fossil Finds Protocol.</li> <li>If no new fossils are found then no mitigation is required.</li> </ul>
Traffic	<p>Increased Road Incidents:</p> <p>The increased traffic volumes on the public roads will increase the potential of incidents on the road network within the study area.</p>	✓			<ul style="list-style-type: none"> <li>Post relevant road signage along affected routes;</li> <li>Create local WhatsApp Group, notifying other road users of expected deliveries and associated routes;</li> <li>Traffic Management Plan (TMP) is to be compiled once the contractor has been appointed and all the relevant</li> </ul>

Aspect	Impact	C	O	D	Mitigation Measures
					<p>details of the construction process are known. The TMP needs to address, inter alia:</p> <ul style="list-style-type: none"> <li>• clearly defined route/s to the site for specific vehicles needed to transport equipment and materials</li> <li>• scheduled deliveries to avoid local congestion;</li> </ul> <ul style="list-style-type: none"> <li>■ Ensure all vehicles are roadworthy, visible, adequately marked, and operated by an appropriately licenced operator.</li> <li>■ The developer shall ensure that the contractor provides the necessary driver training to key personnel to minimise the potential of incidents on the public road network.</li> <li>■ The developer shall ensure that the contractor erects temporary signs warning motorists of construction vehicles on the approaches to the access road.</li> </ul>
Traffic	<p>Road Degradation:</p> <p>The increased traffic volumes on public roads will increase the potential for localised road network degradation within the study area.</p>	✓			<ul style="list-style-type: none"> <li>■ Create a local WhatsApp Group for the local community and post notices of road conditions and proposed alternatives. Developer to contribute to the maintenance of the public roads in the area during the construction phase of the development/s.</li> <li>■ A photographic record of the road condition should be maintained throughout the various phases of the development/s. This provides an objective assessment and mitigates any subjective views from road users.</li> <li>■ Upgrade unpaved roads to a suitable condition for proposed construction vehicles;</li> <li>■ Ensure that the roads are left in the same or better condition, post-construction.</li> <li>■ All remedial work or modifications to any of the public roads shall be done in consultation with and have the approval of the local road's authority (as is standard</li> </ul>

Aspect	Impact	C	O	D	Mitigation Measures
					<p>practice, this will be finalised during and be a requirement of the municipal planning approval process</p> <ul style="list-style-type: none"> <li>■ The treacherous section of the gravel road, through the De Jager's Pass and Molteno Pass, is safety concern that need to be addressed by the developer in consultation with the local roads authority</li> <li>■ The route for construction vehicles from the TR 01606/7 to the TR05801 should not unduly impact the local community of Loxton and should avoid the commercial centre of Loxton</li> <li>■ The developer shall ensure that the condition of the roads impacted by construction of the development is left in a similar or better state once the construction phase is complete.</li> <li>■ All vehicles delivering equipment and material to the proposed development using the Molteno Pass and De Jager's Pass, shall be limited to a gross vehicle mass not exceeding ten tonnes</li> </ul>
Traffic	<p>Dust:</p> <p>The increased traffic volumes on unpaved public roads will generate more dust. The higher the speed and the larger the vehicle, the more dust is likely to be generated. This dust hinders the drivers wishing to over-take without a clear view of over-taking, resulting in drivers taking unnecessary chances, which could result in unfavourable consequences</p>	✓			<ul style="list-style-type: none"> <li>■ Reduce travel speed for construction vehicles on the gravel road to reduce dust</li> <li>■ Dust suppression of the roads in the immediate vicinity of the site where feasible</li> <li>■ Regular preventative maintenance of roads within the immediate vicinity of the site should be conducted over weekends to minimise the impact on the average construction period.</li> </ul>
Traffic	<p>Intersection Safety:</p> <p>The increased traffic volumes at intersections will increase the potential risk of accidents at the intersections, resulting in serious injuries or even</p>	✓	✓		<ul style="list-style-type: none"> <li>■ Compile TMP</li> <li>■ Reduce speed at intersections and use appropriate traffic warning signs</li> <li>■ Identify alternative routes where possible</li> <li>■ Request the assistance of local law enforcement</li> </ul>

Aspect	Impact	C	O	D	Mitigation Measures
	fatalities, especially at the intersection on the main roads, when slow moving vehicles from the site need to cross over fast travelling oncoming traffic.				<ul style="list-style-type: none"> <li>Ensure that all construction vehicles are roadworthy, visible, adequately marked, and operated by an appropriately licenced operator.</li> <li>Provide drivers with advanced driver training.</li> </ul>
Visual	<p>Visual effect of construction activities on scenic resources and sensitive receptors:</p> <p>Visual intrusion of heavy vehicles and construction activities required for the erection of solar arrays and related infrastructure, temporary construction areas e.g. camps and batching plants. Litter generated from construction site. Noise and dust from construction activity.</p>	✓			<ul style="list-style-type: none"> <li>Disturbed areas to be rehabilitated / revegetated as soon as possible during the construction phase.</li> <li>The layout of the solar project (including all associated infrastructure) must avoid the very high (No-go) areas identified.</li> <li>Stockpiles to be located within approved construction footprints.</li> <li>Recycling and refuse bins to be provided to eliminate litter from the site.</li> </ul>
Visual	<p>Visual intrusion on scenic resources and sensitive receptors:</p> <p>Potential visual effect of solar facilities on the rural landscape, scenic resources, and sensitive receptors. Change in the pastoral character and sense of place of the local area.</p>		✓		<ul style="list-style-type: none"> <li>Mitigation only achievable by means of avoidance of very high visual sensitivity areas and receptors or reduction in the extent of facilities.</li> </ul>
Visual	<p>Visual intrusion of activities to remove infrastructure:</p> <p>Visual effect of construction activities to remove infrastructure at the end of the life of the project, including substations, buildings and internal overhead powerlines.</p>			✓	<ul style="list-style-type: none"> <li>Disturbed areas to be rehabilitated / revegetated as soon as possible after the decommissioning phase.</li> <li>Structures to be removed at the end of the life of the project.</li> </ul>
Aquatic Biodiversity	<p>Decrease in habitat integrity:</p> <p>Disturbance of aquatic habitats within the watercourses with the associated impacts on sensitive aquatic biota.</p>	✓			<ul style="list-style-type: none"> <li>Minimise any works within aquatic ecosystems and buffers. Locate all infrastructure outside of high-sensitivity areas (except for underground cables and where existing</li> </ul>



Aspect	Impact	C	O	D	Mitigation Measures
	During construction, activities within watercourses could result in the disturbance or destruction of sensitive habitats and any listed and or protected plant or animal species. It is recommended that there is limited disturbance of the aquatic constraints areas indicated and that any disturbed areas be rehabilitated after construction activities are complete. No obligate aquatic species were observed on site. The terrestrial impact assessment considers the potential impact on terrestrial vegetation and associated biota, such as the Critically Endangered Riverine rabbit, <i>Bunolagus monticulari</i> . However, it is unlikely that construction activities would modify the aquatic habitat and biota to such an extent that the present or future desired state of the watercourses would be compromised. No Resource Quality Objectives exist for the watercourses concerned, however, the proposed activities are unlikely to prevent these objectives from being met.				<p>roads will be upgraded) and limit the placement of infrastructure in areas of medium aquatic sensitivity as far as possible. Make sure that any construction materials brought onto the site are certified to be free of alien plant seed.</p> <ul style="list-style-type: none"> <li>Rehabilitate disturbed aquatic habitats by revegetating them with suitable local indigenous vegetation.</li> <li>Use existing disturbed areas (e.g., roads and access tracks), where possible. In terms of new service tracks, these must be kept to a minimum and should ideally not result in any new / permanent water course crossings, but if these are required, then a specific walk down should be conducted with the specialist to identify the most suited crossing position. Where these crossings do occur, it needs to be monitored for erosion</li> <li>Construction site camps should be placed at least 35m away from the delineated aquatic features</li> <li>Ensure road crossings structures are properly designed to not result in blockage in the watercourses or erosion. For this area, a low water crossing, concrete slab through the watercourses is preferred.</li> <li>The water should be obtained for construction purposes from an existing water allocation to the property or should be provided from a viable water source, including new yield-tested boreholes.</li> <li>Construction near sensitive aquatic features should preferably be undertaken in the dry season; if necessary, sediment traps should be placed downstream of works to capture sediment; Construction sites and laydown areas should be placed at least 35m away from the delineated aquatic features; Good housekeeping measures should be implemented at the construction sites that are set out</li> </ul>
Aquatic Biodiversity	<p>Decrease in aquatic ecosystem integrity (removal of aquatic vegetation):</p> <p>The removal of indigenous riparian and instream vegetation will reduce the ecological integrity and functionality of the watercourses. Construction works, in particular, could result in the loss of riparian vegetation that provides ecosystem services within the site. This would occur especially where new access roads are required or road upgrades will widen any current road crossings. The impact would only be very localised at the proposed road crossings and would not impact the wider river reaches of the watercourses. With rehabilitation, this impact could be reduced to a negligible level.</p>	✓			

Aspect	Impact	C	O	D	Mitigation Measures
Aquatic Biodiversity	<p>Stress on water resource:</p> <p>Demand for water for construction could place stress on the existing available water resources. During construction, more water is required than during the operational phase to suppress dust and used in concrete batching. This water would be required for a 2-year period while construction works are ongoing. The water required for the construction phase is between 30 000m<sup>3</sup> - 48000 m<sup>3</sup> per annum. A geohydrological assessment has been undertaken for the proposed development and if this assessment finds that there is suitable groundwater available, then sourcing water from boreholes can be considered. The use of boreholes should be aligned with the sustainable water yield from these boreholes and the mitigation measures proposed within the geohydrological assessment must be adhered to.</p>	✓			in the EMP <sub>r</sub> and monitored by an appointed ECO for the project.
Aquatic Biodiversity	<p>Decrease in aquatic ecosystem integrity (alien vegetation infestation):</p> <p>Alien vegetation infestation within the aquatic features due to disturbance. The current presence of alien vegetation on the site is limited. Sources of alien seeds should be prevented from being brought onto the site with imported materials. Monitoring post-construction for the growth of alien vegetation can mitigate this potential impact.</p>	✓			
Aquatic Biodiversity	<p>Decrease in water quality:</p> <p>Increased sedimentation and risks of contamination of surface water runoff during construction. During construction, the earthworks near watercourses will</p>	✓			

Aspect	Impact	C	O	D	Mitigation Measures
	expose and mobilise soil as well as construction materials and chemicals that may end up in the water resources. Any spills during transport or while works are conducted in proximity to a watercourse also have the potential to affect the surrounding biota. Given the low rainfall in the area, if work are undertaken during the drier periods of the year, this impact would be unlikely.				
Aquatic Biodiversity	Decrease in aquatic ecosystem integrity (on-going disturbance):  Ongoing disturbance of aquatic features and associated vegetation along access roads or adjacent to infrastructure that needs to be maintained. As for the disturbance of aquatic features described under construction impacts, the disturbance of aquatic habitat is likely to be very localised to the road crossings and would not impact the larger aquatic ecosystem.		✓		<ul style="list-style-type: none"> <li>Access project infrastructure using existing roads and access tracks established during the construction phase.</li> <li>Ensure road crossings structures are not resulting in blockage in the watercourses or erosion.</li> <li>Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.</li> <li>Stormwater management systems must be in place at the access tracks and built areas to dissipate stormwater over a broad area by covering cleared areas with suitable local indigenous vegetation or by directing and spreading stormwater with berms or channels and swales adjacent to hardened surfaces.</li> </ul>
Aquatic Biodiversity	Decrease in aquatic ecosystem integrity (disturbance of cover vegetation and soil):  Modified runoff characteristics from hardened surfaces have the potential to result in erosion of hillslopes and watercourses. Limited hardening of surfaces will take place as a result of the proposed projects. Much of this is related to the increased road network and also serves to concentrate and convey runoff with its associated erosion.		✓		
Aquatic Biodiversity	Modified hydraulics in the watercourses as a result of any structures associated with the proposed road crossings through the watercourses. Any new structures within the watercourses associated with the proposed projects mustn't impede flow, or fragment the aquatic		✓		

Aspect	Impact	C	O	D	Mitigation Measures
	habitats, in the watercourses. Given the episodic flow in the watercourses, the structures at the road crossings should consist of nothing more than low water crossings that will not impede water or sediment movement. Areas identified as being of high sensitivity should be avoided by the projects with the exception being that existing roads may be widened at and underground cables may be constructed below these features.				
Aquatic Biodiversity	Water supply (and possibly sanitation services) is required for the operation of the facility. The water requirements during operation are much lower and could potentially be provided from groundwater without any aquatic ecosystem impacts (the water requirements for the operational phase is between 18 000m <sup>3</sup> – 28 000 m <sup>3</sup> per annum). The availability of groundwater for these projects are considered in a separate geohydrological assessment. Boreholes should not be sited within or immediately adjacent to watercourses where they would potentially be impacting the subsurface flow in the watercourses. The baseflow in the watercourse is important in maintaining aquatic vegetation and some aquatic biota. The larger flows in the watercourses are unlikely to be impacted by the proposed projects.		✓		
Aquatic Biodiversity	Loss of aquatic habitat and biota Increased disturbance of aquatic habitat due to the increased activity on the site			✓	
Aquatic Biodiversity	Aquatic ecosystem integrity Increased sedimentation and risks of contamination of surface water runoff			✓	<ul style="list-style-type: none"> <li>Minimise works within aquatic ecosystems as far as possible. If the layout of the PV has avoided these areas, the decommissioning of the PV would also be able to avoid aquatic habitats on the property.</li> <li>Rehabilitate disturbed areas.</li> <li>Decommission works near aquatic features should preferably be undertaken in the dry season; if necessary, sediment traps should be placed downstream of works to capture sediment; Laydown areas should be placed at</li> </ul>

Aspect	Impact	C	O	D	Mitigation Measures
					least 35m away from the delineated aquatic features; Good housekeeping measures should be implemented for the decommissioning activities that are set out in the EMPr and monitored by an appointed ECO for the project.
Heritage	Impacts to archaeological resources  Direct impacts to archaeological resources would occur during the construction phase when equipment is brought onto site and excavations for foundations, services and roadworks commence.	✓			<ul style="list-style-type: none"> <li>■ Avoid the sensitive area (strongly recommended).</li> <li>■ Create a detailed record of the site including any archaeological sampling that may be required.</li> <li>■ Ensure that any chance finds are reported.</li> </ul>
Heritage	Impacts to graves  Direct impacts to graves resources would occur during the construction phase when equipment is brought onto site and excavations for foundations, services and roadworks commence. Graves are not known from the PV areas and margins of the access road and the chances of graves being present and impacted are very low.	✓			<ul style="list-style-type: none"> <li>■ Ensure that any chance finds are reported.</li> </ul>
Heritage	Impacts to the cultural landscape  Direct impacts to the cultural landscape would occur during the construction/decommissioning phase when construction equipment is brought onto the site and construction/decommissioning activity commences.	✓		✓	<ul style="list-style-type: none"> <li>■ Keep the construction/decommissioning duration as short as possible.</li> <li>■ Ensure that the smallest area possible is cleared for construction/decommissioning.</li> <li>■ Ensure that any areas not required during operation are rehabilitated.</li> <li>■ Ensuring that the site is fully rehabilitated after the facility has been removed.</li> </ul>



Aspect	Impact	C	O	D	Mitigation Measures
Heritage	Impacts to the cultural landscape Direct impacts to the cultural landscape would occur during the operation phase due to the presence of the facility in the landscape.		✓		<ul style="list-style-type: none"> <li>Ensure that all maintenance activities remain within the approved footprint.</li> <li>Ensure that night time light pollution is minimised.</li> </ul>
Social	Impacts on regional employment and incomes associated with project activities and expenditure	✓	✓	✓	<ul style="list-style-type: none"> <li>Setting targets for how much local labour should be used based on the needs of the applicant and the availability of existing skills and people that are willing to undergo training. Opportunities for the training of unskilled and skilled workers from local communities should be maximized, including those from adjacent farms who have indicated that they would like to benefit from the proposed project and its related opportunities.</li> <li>Using local sub-contractors where possible and requiring that contractors from outside the local area that tender also meet targets for how many locals are given employment.</li> <li>Exploring ways to enhance local community benefits with a focus on broad-based BEE and preferential procurement.</li> </ul>
Social	Impacts associated with the funding of local socio-economic development, enterprise development and shareholding		✓		<ul style="list-style-type: none"> <li>The project must comply with the requirements of the REIPPPP bidding process which will have stringent requirements with regard to socio-economic development, enterprise development, BBEEE shareholding etc.</li> <li>The applicant must establish a communications committee early on in the project to ensure inclusive planning and regular feedback from stakeholders.</li> <li>Community development should be guided by a community needs analysis, drawn up by a third party and based on local socio-economic conditions, a review</li> </ul>

Aspect	Impact	C	O	D	Mitigation Measures
					<p>of planning documents such as the IDP, and discussions with local government and community representatives. Interventions should be planned in collaboration with other energy developers in the area where relevant.</p> <ul style="list-style-type: none"> <li>Close liaison with local municipal managers, local councillors and other stakeholders involved in socio-economic development is required to ensure that any projects are integrated into wider socio-economic development strategies and plans.</li> </ul>
Social	Impacts associated primarily with the influx of people	✓	✓	✓	<ul style="list-style-type: none"> <li>A 'locals first' policy with regard to construction and operational labour needs.</li> <li>The community should be able to contact the site manager or his/her representative to report any issues which they may have. The site manager and his/her representative should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised.</li> <li>A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction or operations processes.</li> <li>The applicant and the contractors should develop a Code of Conduct for the project. The code should identify what types of behaviour and activities by workers are not permitted in agreement with surrounding landowners and land managers. For example, access to land that is not part of the development will not be allowed.</li> <li>The applicant and the contractor should implement a Tuberculosis and HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.</li> </ul>

Aspect	Impact	C	O	D	Mitigation Measures
					<ul style="list-style-type: none"> <li>Arrangements must be made to enable workers from outside the area to return home over the weekends or at regular intervals. This would reduce the risk posed by non-local construction workers to local family structures and social networks.</li> <li>Condoms should be freely available to employees and all contractor workers.</li> <li>Introduce alcohol testing on a weekly basis for construction workers.</li> <li>The contractor should make the necessary arrangements for ensuring that all non-local construction workers are transported back to their place of residence once the construction phase is completed.</li> <li>Close coordination with the municipality is required, including regular meetings.</li> </ul>
Social	Impacts on tourism	✓	✓	✓	<ul style="list-style-type: none"> <li>Impacts on tourism are dependent on how the site is developed and managed to minimise negative biophysical impacts. The measures recommended in other specialist reports to these impacts (primarily the minimisation of visual, heritage, traffic and ecological impacts) would thus also minimise tourism impacts.</li> </ul>
Social	Impacts on surrounding landowners and communities	✓	✓	✓	<ul style="list-style-type: none"> <li>No construction workers, with the exception of security personnel, should be allowed to stay on the site overnight.</li> <li>The community should be able to contact the site manager to report any issues which they may have. The site manager should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised.</li> </ul>

Aspect	Impact	C	O	D	Mitigation Measures
					<ul style="list-style-type: none"> <li>▪ A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction or operations processes.</li> <li>▪ The applicant should develop a Code of Conduct for the project. The Code should identify what types of behaviour and activities by workers are not permitted in agreement with surrounding landowners and land managers.</li> <li>▪ The movement of workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis.</li> <li>▪ The applicant should implement measures to assist and, if needed, fairly compensate potentially affected surrounding landowners whereby damages to farm property, stock theft or significant disruptions to farming activities can be minimized or reduced. Measures should be agreed on before construction commences.</li> <li>▪ The EMPr must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.</li> </ul>

## 8.2 SUMMARY OF IMPACT SIGNIFICANCE SCREENING

This section provides an overview of the likely significance of construction phase (**Table 8-2**), operational phase (**Table 8-3**) and decommissioning phase (**Table 8-4**) presenting the results of the impact screening tool based on two criteria, namely probability and consequence (outlined in Section 2.5). This is used as a guide to determine whether additional assessment may be required in the EIA phase. Impacts will be refined and assessed during the EIA phase.

**Table 8-2 – Significance of potential construction phase impacts**

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Agricultural Potential	Occupation of land	Negative	2	4	Medium
	Soil erosion and degradation	Negative	3	1	Low
Avifauna	Habitat destruction	Negative	4	1	Medium
	Disturbance of birds & displacement effects	Negative	3	1	Low
Palaeontology	Loss of fossils	Negative	1	4	Medium
Traffic	Increased Road Incidents	Negative	3	2	Medium
	Road Degradation	Negative	3	2	Medium
	Dust	Negative	3	2	Medium
	Intersection Safety	Negative	3	3	Medium
Visual	Visual effect of construction activities on scenic resources and sensitive receptors	Negative	3	2	Medium
Aquatic Biodiversity	Decrease in habitat integrity	Negative	2	2	Low
	Decrease in aquatic ecosystem integrity	Negative	2	2	Low
	Stress on water resources	Negative	2	2	Low
	Flow Modification	Negative	2	1	Very Low
	Decrease in aquatic ecosystem integrity	Negative	2	1	Very Low
	Water quality impacts	Negative	1	2	Very Low



Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Heritage	Impacts to archaeological resources	Negative	4	3	High
	Impacts to graves	Negative	1	1	Very Low
	Impacts to the cultural landscape	Negative	4	1	Medium
Social	Impacts on regional employment and incomes associated with project activities and expenditure	Positive	4	1	Medium
	Impacts associated primarily with the influx of people	Negative	3	2	Medium
	Impacts on tourism	Negative	3	1	Medium
	Impacts on surrounding landowners and communities	Negative	4	3	Medium

**Table 8-3 – Significance of potential operational phase impacts**

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Agricultural Potential	Soil erosion and degradation	Negative	3	1	Low
	Increased financial security for farming operations	Positive	2	2	Low
Avifauna	Bird fatality at PV facility	Negative	2	3	Medium
Traffic	Increased Road Incidents	Negative	2	3	Medium
Visual	Visual intrusion on scenic resources and sensitive receptors	Negative	3	3	Medium
Aquatic Biodiversity	Aquatic ecosystem integrity	Negative	3	1	Low
	Aquatic ecosystem integrity	Negative	3	1	Low

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
	Stress on water resource	Negative	2	1	Very Low
	Flow/hydraulic modification	Negative	2	2	Low
Heritage	Impacts to the cultural landscape	Negative	4	1	Medium
Social	Impacts on regional employment and incomes associated with project activities and expenditure	Positive	4	1	Medium
	Impacts associated with the funding of local socio-economic development, enterprise development and shareholding	Positive	4	1	Medium
	Impacts associated primarily with the influx of people	Negative	3	2	Medium
	Impacts on tourism	Negative	3	1	Medium
	Impacts on surrounding landowners and communities	Negative	4	3	Medium

**Table 8-4 – Significance of potential decommissioning phase impacts**

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Agricultural Potential	Occupation of land	Negative	2	4	Medium
	Soil erosion and degradation	Negative	3	1	Low
Avifauna	Disturbance of birds & displacement effects	Negative	3	1	Low
Aquatic Biodiversity	Loss of aquatic habitat and biota	Negative	2	1	Very Low
	Aquatic ecosystem integrity	Negative	2	1	Very Low
Heritage	Impacts to the cultural landscape	Negative	4	1	Medium

Aspect	Impact	Nature	Probability	Consequence	Significance (Before Mitigation)
Social	Impacts on regional employment and incomes associated with project activities and expenditure	Positive	4	1	Medium
	Impacts associated primarily with the influx of people	Negative	3	2	Medium
	Impacts on tourism	Negative	3	1	Low
	Impacts on surrounding landowners and communities	Negative	4	3	Medium

## 9 CUMULATIVE IMPACT ASSESSMENT

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Although the objective of the NEMA S&EIA process is to undertake an impact and risk assessment process, inclusive of cumulative impacts, which is essential to assessing and managing the environmental and social impacts of projects, it may be insufficient for identifying and managing the incremental impacts on areas or resources used or directly affected by a given development from other existing, planned, or reasonably defined developments at the time the risks and impacts are identified.

IFC PS 1 recognizes that, in some instances, cumulative effects need to be considered in the identification and management of environmental and social impacts and risks. For private sector management of cumulative impacts, IFC considers good practice to be two pronged:

- Effective application of and adherence to the mitigation hierarchy in environmental and social management of the specific contributions by the project to the expected cumulative impacts; and
- Best efforts to engage in, enhance, and/or contribute to a multi-stakeholder, collaborative approach to implementing management actions that are beyond the capacity of an individual project proponent.

Even though Performance Standard 1 does not expressly require, or put the sole onus on, private sector clients to undertake a cumulative impact assessment (CIA), in paragraph 11 it states that the impact and risk identification process *“will take into account the findings and conclusions of related and applicable plans, studies, or assessments prepared by relevant government authorities or other parties that are directly related to the project and its area of influence” including “master economic development plans, country or regional plans, feasibility studies, alternatives analyses, and cumulative, regional, sectoral, or strategic environmental assessments where relevant.”*

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities (IFC GPH).

Evaluation of potential cumulative impacts is an integral element of an impact assessment. In reference to the scope for an impact assessment, IFC’s Performance Standards specify that *“Risks and impacts will be analysed in the context of the project’s area of influence. This area of influence encompasses...areas potentially impacted by cumulative impacts from further planned development of the project, any existing project or condition, and other project-related developments that are realistically defined at the time the Social and Environmental Assessment is undertaken; and (iv) areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.”* (IFC 2006).

A cumulative impact assessment is the process of (a) analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen Valued Environmental and Social Components (VECs) over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible (IFC GPH).

Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed Mura 2 Solar PV Facility. While one project may not have a significant negative

impact on sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts.

Therefore, a number of renewable energy developments within the surrounding area which have submitted applications for environmental authorisation (some of which have been approved and others now operational). It is important to note that the existence of an approved EA does not directly equate to actual development of the project.

The surrounding projects that have not already been awarded Preferred Bidder (PB) status under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) Bid window 5 or the Risk Mitigation IPP procurement programme (RMIPPPP), are still subject to the REIPPPP bidding process or subject to securing an off taker of electricity through an alternative process. Some of the surrounding proposed WEFs secured EAs several years ago but have not obtained PB status (or a private off taker agreement) and as such have not been developed.

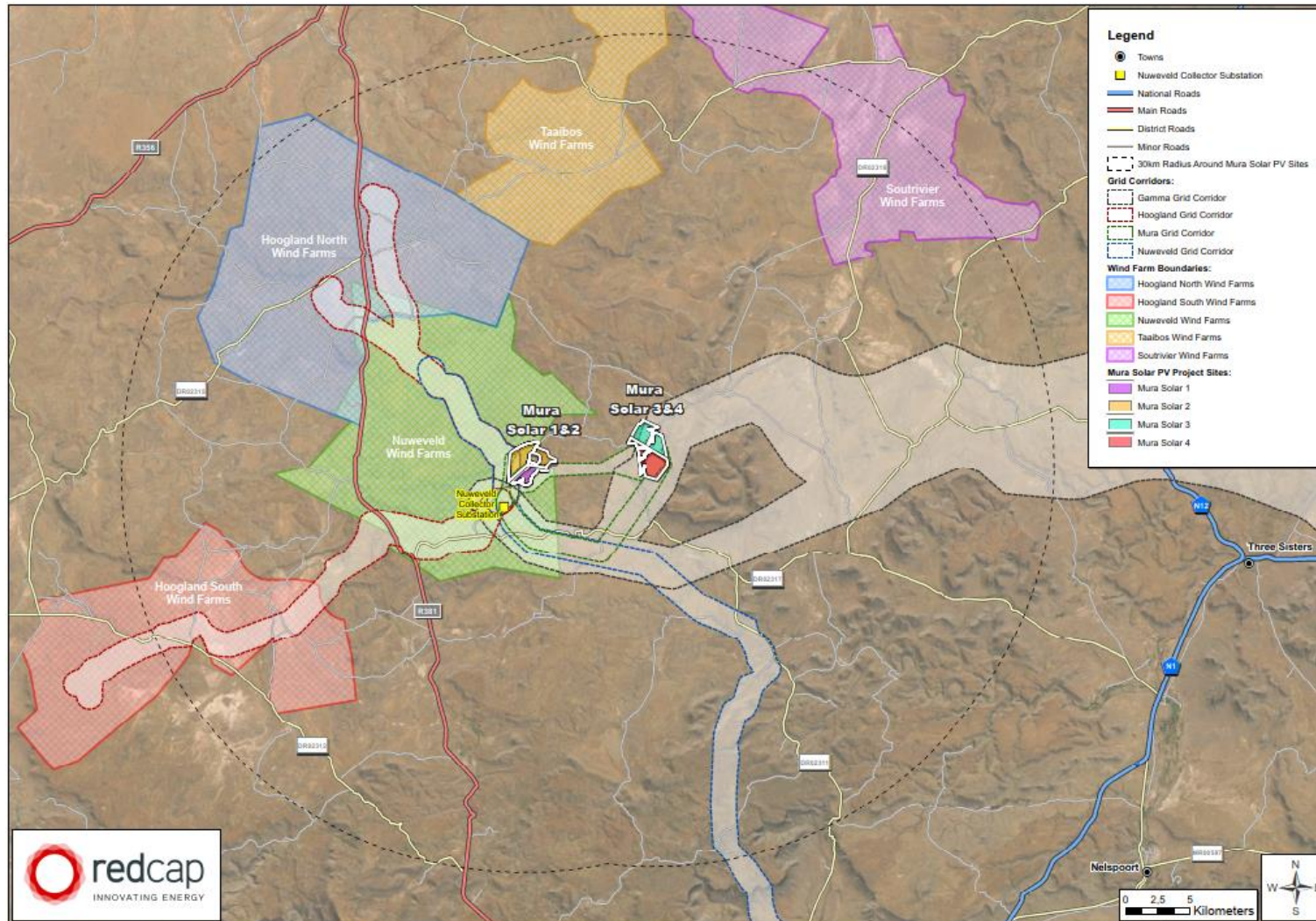
These existing surrounding projects of varying approval status have been detailed in **Figure 9-1**. Given the site's location within the Komsberg REDZ, it is considered to be located within the renewable energy hub that is developing in this focus area.

Projects within 30 km of the Mura sites includes:

- The three approved Nuweveld Wind Farm Projects
- The four proposed Hoogland Wind Farm Projects
- The approved Nuweveld gridline
- The two proposed gridline connections proposed as part of the Hoogland Wind Farm Projects
- The proposed Gamma gridline project
- The proposed WKN Wind Farm Projects (Soutrivier and Taaibos)

Potential cumulative impacts identified are summarised below. Other planned or existing projects that can interact with the Project will be identified during stakeholder engagement and finalisation of the S&EIA process.





**Figure 9-1 - Renewable Energy Projects with 30km of the Mura Solar Development**

## 9.1 CLIMATE CHANGE

Cumulative impacts can be defined as “the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may be significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities” (NEMA EIA Reg GN R982 of 2014).

In relation to the Hoogland Wind Farm Project, based on the assumption that 60 turbines would be constructed on each wind farm, over the lifetime of the project, the avoided emissions are approximately 11.6 million tonnes CO<sub>2</sub>e of emissions per wind farm. This equates to 46.3 million tons CO<sub>2</sub>e of emissions for the four wind farms (or 41 000 tonnes CO<sub>2</sub>e per MW installed). This could be considered as a very high positive impact as the avoided emissions for all four wind farms equate to 1.21% of the carbon budget. Therefore, the cumulative impact of this project on climate change is considered to be very high positive as a result of the avoided emissions opportunity. Furthermore, as although not quantified, the Nuweveld Projects cumulative emissions is also considered very high as a result of the avoided emissions that will accumulate.

As for the indirect emissions in relations to the Mura Solar PV Projects, the indirect emissions reported below considers only the construction phase of the four Mura Solar PV projects. The operation emissions have been excluded due to being immaterial. It is assumed that each solar facility will have a capacity of 150 MW with approximately 250 000 PV panels.

Four 150MW solar farms will only contribute 73.7 kt of indirect emissions from the construction phase (equivalent to 0.013 tCO<sub>2</sub>e per MWh or 0.49ktCO<sub>2</sub>e per MW installed). Most emissions during the construction phase are associated with the upstream production of construction materials and the purchasing of the PV panels. The emissions that would occur from operating and maintenance activities are negligible.

These emissions would equate to about 0.00195% of South Africa’s carbon budget. Relative to South Africa’s updated NDC, this is 0.0016% of the high emission scenario and 0.0020% of the low emission scenario. Based on this assessment, the impact of the four 150MW farms in relation to South Africa’s carbon budget is medium, as the solar Project emissions amount to approximately 0.0019% of the carbon budget. However, the cumulative impact of these projects on climate change is considered to be high positive as the Mura Solar PV Projects also further increase the opportunity for avoided emissions.

Whilst the Project’s indirect emissions for four 150MW solar farms in relation to South Africa’s carbon budget is medium, the cumulative impact of the Development, with Nuweveld and Hoogland, on climate change is considered to be very high positive. This is as a result of the avoided emissions that the Development creates over the lifetime of the project, with the Mura Solar PV Development of all four wind farms resulting in avoided emissions of around 16.39 million tons CO<sub>2</sub>e of emissions over the life of the project and the Hoogland Wind Farms resulting in avoided emissions of 46.3 million tons CO<sub>2</sub>e.

## 9.2 AGRICULTURAL POTENTIAL

The cumulative impact of a development is the impact that development will have when its impact is added to the incremental impacts of other past, present, or reasonably foreseeable future activities that will affect the same environment.

The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the impact of the proposed development will lead directly to the sum of impacts of all developments causing an acceptable level of change to be exceeded in the surrounding area. If the impact of the development being assessed does not cause that level to be exceeded, then the cumulative impact associated with that development is not significant.

The potential cumulative agricultural impact of importance is a regional loss (including by degradation) of future agricultural production potential. The defining question for assessing the cumulative agricultural impact is this:

*What loss of future agricultural production potential is acceptable in the area, and will the loss associated with the proposed development, when considered in the context of all past, present or reasonably foreseeable future impacts, cause that level in the area to be exceeded?*

The DFFE requires compliance with a specified methodology for the assessment of cumulative impacts. This is positive in that it ensures engagement with the important issue of cumulative impacts. However, the required compliance has some limitations and can, in the opinion of the author, result in an over-focus on methodological compliance, while missing the more important task of effectively answering the above defining question.

DFFE compliance for this project requires considering all renewable energy applications within a 30 km radius. There are a total of 5 other renewable energy project applications plus the 4 Mura applications within 30km of the proposed site. These are shown in **Figure 9-1**.

All of these projects have the same agricultural impacts in an almost identical agricultural environment, and therefore the same mitigation measures apply to all.

In quantifying the cumulative impact, the area of land taken out of grazing as a result of all 9 of the renewable energy developments within 30 km (total generation capacity of 4,920 MW) will amount to a total of approximately 4,292 hectares. This is calculated using the industry standards of 2.5 and 0.3 hectares per megawatt for solar and wind energy generation respectively, as per the Department of Environmental Affairs (DEA) Phase 1 Wind and Solar Strategic Environmental Assessment (SEA) (2015). As a proportion of the total area within a 30km radius (approximately 282,700 ha), this amounts to 1.52% of the surface area. That is within an acceptable limit in terms of loss of low potential agricultural land which is only suitable for grazing and of which there is no scarcity in the country. This is particularly so when considered within the context of the following point.

In order for South Africa to develop the renewable energy generation that it urgently needs, agriculturally zoned land will need to be used for renewable energy generation. It is far more preferable to incur a cumulative loss of agricultural land in a region such as the one being assessed, which has no crop production potential, and low grazing capacity, than to lose agricultural land that has a higher potential, and that is much scarcer, to renewable energy development elsewhere in the country. The limits of acceptable agricultural land loss are far higher in this region than in regions with higher agricultural potential.



It should also be noted that there are few land uses, other than renewable energy, that are competing for agricultural land use in this area. The cumulative impact from developments, other than renewable energy, is therefore likely to be very low.

As discussed above, the risk of a loss of agricultural potential by soil degradation can effectively be mitigated for renewable energy developments and the cumulative risk is therefore low.

Due to all of the considerations discussed above, the cumulative impact of loss of future agricultural production potential will be of low significance and will not have an unacceptable negative impact on the agricultural production capability of the area. The proposed development is therefore acceptable in terms of cumulative impact, and it is therefore recommended that it be approved.

### **9.3 TERRESTRIAL BIODIVERSITY**

In terms of cumulative impacts in and around the site, there are no built PV or wind energy facilities within 30km of the site to date. The three Nuweveld WEFs adjacent to the site have been authorised and there is also the Hoogland 1 and Hoogland 2 WEFs which have not yet been authorised and lie adjacent and to the north and west of the Nuweveld WEF site. The total footprint from these projects is estimated at 600ha. The adjacent Mura 1 project would add an additional 160 ha to this total. While it is clear that there is node of renewable energy development starting to develop south of Loxton, there are no facilities built to date and the current level of transformation in the area remains low. The contribution of the Mura 2 project at 430 ha is therefore considered low and acceptable, especially given the low sensitivity of the affected habitats.

In terms of specific cumulative impacts, the major fauna species of potential concern in the area would be the Riverine Rabbit and Karoo Dwarf Tortoise. However, as the current development lies outside of the habitat of either species, the contribution of the current project to cumulative impact on these two species is considered very low. In addition, there are no specific plant communities or habitats present within the footprint that are considered to be rare, localised or of high ecological significance, the development would not contribute to an impact on these features. As such, the contribution of the Mura 2 PV Facility to habitat loss would not change the overall threat status of any vegetation types or special habitats and the overall level of cumulative impact in the area is considered acceptable.

### **9.4 AQUATIC BIODIVERSITY**

Land use in the area currently consists mostly of low-density livestock farming due to the limited water supply and poor carrying capacity of the cover vegetation. Current land and water use impacts on the watercourses and surrounding area are therefore low to very low. The cumulative impact of the project activities, together with the existing activities in the area, could have the potential to 1) reduce the integrity of the watercourses and 2) overuse available groundwater, if not properly mitigated and managed. The largest potential impact to watercourses is a result of the associated new tracks and infrastructure, which can be mitigated such that its impact on the aquatic ecosystems will be of low significance.

Availability of water is a limiting factor in the further development of this area; however, the water requirements of these projects are the highest during the construction phase, and are the lowest during operation. It is assumed that not all these projects will not have overlapping construction phases and will adhere to the abstraction thresholds applicable to groundwater abstraction. Given this, the impact is expected to be of very low significance.

## 9.5 PLANT SPECIES

From a plant species and vegetation perspective, the Mura 2 Solar Facility would have very low impact on plant SCC and the Eastern Upper Karoo vegetation type is little impacted by renewable energy development to date. As a result, the contribution of the Mura 2 Solar Facility towards cumulative impact on plant SCC and vegetation is considered acceptable.

## 9.6 ANIMAL SPECIES

From a faunal species and associated habitat perspective, the Mura 2 Solar PV Facility would have very low impact on fauna SCC and the broader area has been little impacted by renewable energy development to date. As a result, the contribution of the Mura 2 Solar PV Facility to cumulative impact on fauna is considered acceptable.

## 9.7 AVIFAUNA

The two cumulative impacts that are of most concern are: habitat destruction; and collision of birds with overhead lines. The significance of these impacts is Moderate Negative pre mitigation.

## 9.8 HERITAGE

Cumulative impacts would occur through the construction, operation and decommissioning of many projects in the same area. **Figure 9-1** shows the projects considered in the assessment of cumulative impacts. Terms of archaeology, the magnitude and probability would increase but mitigation would still bring the significance down from moderate negative to very low negative. Graves are unlikely to be impacted and mitigation would reduce the impact significance from low negative to very low negative. Cumulative impacts to the landscape are likely to be moderate negative both before and after mitigation for both the construction and decommissioning phases. The operation phase impact significance could potentially be high negative before mitigation but with a slight reduction in intensity after mitigation this drops to moderate negative.

## 9.9 TRAFFIC

Cumulative impacts would occur through the construction, operation and decommissioning of many projects in the same area.

During the peak construction phase, the following safety and road network integrity impacts have been assessed:

- Increased Road Incidents:
  - The impact of increased traffic volumes on public roads will cause congestion and increase the potential of incidents on the road network within the study area. The significance of this impact is rated as Medium Negative, before mitigation.
- Road Degradation:
  - The impact of increased traffic volumes on the public roads will increase the potential for localised road network degradation within the study area. The significance of this impact is rated as Medium Negative, before mitigation.
- Dust:



- The larger the vehicle, the more dust is likely to be generated. This dust hinders the drivers wishing to over-take without a clear view for over-taking, resulting in drivers taking unnecessary chances, which could result in unfavourable consequences. The impact of increased traffic volumes on the unpaved public roads will generate dust. The significance of this impact is rated as Medium Negative, before mitigation.

■ Intersection Safety:

- The impact due to the increased traffic volumes at intersections will increase the potential risk of accidents at the intersections, resulting in serious injuries or even fatalities, especially at the intersection on the main roads, when vehicles from the site needing to cross over oncoming traffic. The significance of this impact is rated as Medium Negative, before mitigation.

During the operational phase of the development, the traffic volumes are considerably less than during the construction phase of the proposed development. Therefore, the only impact deemed essential during the operational phase is intersection safety. The cumulative impact due to the increased traffic volumes at intersections will increase the potential risk of accidents at the intersections, resulting in serious injuries or even fatalities, the intersection on the main roads, when vehicles from the site need to cross over oncoming traffic. The significance of this impact is rated as Medium Negative, before mitigation.

A separate traffic impact assessment will be undertaken during the decommissioning phase which will assess the cumulative impact during the decommissioning phase.

## 9.10 VISUAL

The combined visual effect of existing and proposed renewable energy projects on scenic resources and sensitive receptors will result in a moderate negative impact.

## 9.11 SOCIAL

Assessment of cumulative impacts considered Mura 1, 2, 3 and 4 SEFs; Hoogland 1, 2, 3 and 4 WEFs; Nuweveld North, East and West WEFs, Taaibos WEFs, Soutrivier WEFs, as well as the Mura, Hoogland, Nuweveld and Gamma Grid Corridors. The following cumulative impacts have been identified in terms of socio-economic:

- Impacts on regional employment and household income associated with project activities and expenditure:
  - The projects would generate construction expenditure which would accrue to construction workers. The cumulative annual operational spend would be equivalent to 53% of BWLM's Regional Gross Domestic Product (RGDP) and 37% of CKDM's RGDP. Note however that only a portion of operational expenditure would occur within the local and regional areas in accordance with REIPPPP requirements, with most of the impact likely to be experienced at the provincial level in the case of the Mura Development.
  - The projects would generate temporary jobs during construction and the operational phase. For reference, the number of jobs which would accrue to locals represents about 2–3% of the total jobs in BWLM as of 2019.
  - The significance of this impact is rated as High Positive.

- Impacts associated with the funding of local socio-economic development, enterprise development and shareholding:
  - The total cumulative funding of local socio-economic and enterprise development associated with the projects in the area would generate a substantial amount of economic activity.
  - The significance of this impact is rated as High Positive.
- Impacts associated primarily with the influx of people:
  - The projects in the area would increase in the likelihood of a larger influx of people to the area whether they have jobs secured or are job seekers. This would result in a higher risk of social problems associated with influx particularly during construction.
  - It is expected that adequate accommodation will be available. With adequate forewarning, it is also likely that businesses will respond to the opportunity and add accommodation stock if needed.
  - The significance of this impact is rated as Moderate Negative.
- Impacts on tourism:
  - The projects in the area would result in an increase in tourism risk but also tourism opportunities from business tourism, particularly during construction.
  - The significance of this impact is rated as Moderate Negative.
- Impacts on surrounding landowners and communities:

The assessment partially draws on the findings of other specialist studies including the TIA and VIA. The significance of this impact from is rated as Moderate Negative.

## 10 PLAN OF STUDY FOR EIA

### 10.1 PLAN OF STUDY FOR EIA TERMS OF REFERENCE

**Table 10-1** outlines the structure of the plan of study as required in terms of Appendix 2 of GNR 982.

**Table 10-1 – Plan of Study Requirements**

Plan of Study Chapter	Information Requirements as per GNR 982
<b>Description of EIA Tasks</b>	<ul style="list-style-type: none"> <li>A description of the tasks that will be undertaken as part of the environmental impact assessment process.</li> </ul>
<b>Description of Alternatives</b>	<ul style="list-style-type: none"> <li>A description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity.</li> </ul>
<b>Aspects to be Assessed in the EIA Process</b>	<ul style="list-style-type: none"> <li>A description of the aspects to be assessed as part of the environmental impact assessment report process.</li> </ul>
<b>Specialist Studies</b>	<ul style="list-style-type: none"> <li>Aspects to be assessed by specialists.</li> </ul>
<b>Impact Assessment Methodology</b>	<ul style="list-style-type: none"> <li>A description of the proposed method of assessing the environmental aspects, including a description of the proposed method of assessing the environmental aspects including aspects to be assessed by specialists.</li> <li>A description of the proposed method of assessing duration and significance.</li> </ul>
<b>Environmental Impact Report</b>	<ul style="list-style-type: none"> <li>Contents of EIAR as specified in GNR 982 (as amended) Annexure 2</li> </ul>
<b>Stakeholder and Authority Engagement</b>	<ul style="list-style-type: none"> <li>An indication of the stages at which the competent authority will be consulted.</li> <li>Particulars of the public participation process that will be conducted during the environmental impact assessment process.</li> </ul>

### 10.2 OVERVIEW OF THE EIA PHASE TASKS

The EIA phase will consist of the following tasks; each of these tasks is detailed separately in the following sub-sections:

- Specialist studies;
- Continuation of authority and stakeholder engagement;
- Assessment of the significance of potential impacts; and
- Preparation of the EIA Report.

## 10.3 DESCRIPTION OF ALTERNATIVES

The EIA process identifies two types of project alternatives:

- Concept Level Alternatives, which relate to the site, technology and process alternatives
- Detailed Level Alternatives which relate to mitigation measures

The feasibility of the higher-level Concept Alternatives have been considered and assessed within **Section 4** of this report. The Detailed Level Alternatives which relate to mitigation measures, will be addressed within the EIA Report.

## 10.4 ASPECTS TO BE ASSESSED IN THE EIA PROCESS

**Table 10-2** outlines the key aspects that were identified in the scoping phase; these aspects will be subject to further assessment in the EIA Phase.

**Table 10-2 – Summary of aspects to be addressed in the EIA Phase**

Environmental Aspect	Impact
Aquatic Biodiversity	<ul style="list-style-type: none"> <li>■ Decrease in habitat integrity</li> <li>■ Decrease in aquatic ecosystem integrity</li> <li>■ Stress on water resources</li> <li>■ Flow Modification</li> <li>■ Water quality impacts</li> <li>■ Aquatic ecosystem integrity</li> <li>■ Loss of aquatic habitat and biota</li> <li>■ Aquatic ecosystem integrity</li> </ul>
Avifauna	<ul style="list-style-type: none"> <li>■ Habitat destruction</li> <li>■ Disturbance of birds &amp; displacement effects</li> <li>■ Bird fatality at PV facility</li> </ul>
Heritage	<ul style="list-style-type: none"> <li>■ Impacts to archaeological resources (<u>Archaeological Impact Assessment</u>)</li> <li>■ Impacts to graves</li> <li>■ Impacts to the cultural landscape</li> </ul>
Traffic	<ul style="list-style-type: none"> <li>■ Increased Road Incidents</li> <li>■ Road Degradation</li> <li>■ Dust</li> <li>■ Intersection Safety</li> <li>■ Increased Road Incidents</li> </ul>
Visual	<ul style="list-style-type: none"> <li>■ Visual effect of construction activities on scenic resources and sensitive receptors</li> </ul>
Social	<ul style="list-style-type: none"> <li>■ Impacts on regional employment and incomes associated with project activities and expenditure</li> <li>■ Impacts associated with the funding of local socio-economic development, enterprise development and shareholding</li> <li>■ Impacts associated primarily with the influx of people</li> <li>■ Impacts on tourism</li> <li>■ Impacts on surrounding landowners and communities</li> </ul>

## 10.5 SPECIALIST STUDIES TO BE UNDERTAKEN

The following specialist assessments have been commissioned for the EIA Phase:

- Agricultural Compliance Statement;
- Terrestrial Biodiversity Compliance Statement;
- Aquatic Biodiversity Impact Assessment;
- Plant Species Compliance Statement;
- Animal Species Compliance Statement;
- Avifauna Impact Assessment;
- Heritage Impact Assessment;
- Palaeontological Impact Assessment;
- Traffic Impact Assessment;
- Climate Change Impact Assessment;
- Geohydrological Assessment (technical study);
- Visual Impact Assessment;
- Socio-Economic Impact Assessment; and
- RFI Compliance Statement.

It should be noted that the specialist studies will be undertaken according to the procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and Section 44 of the NEMA (GNR 320, dated 20 March 2020), where applicable.

## 10.6 IMPACT ASSESSMENT METHODOLOGY

### 10.6.1 ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct<sup>4</sup>, indirect<sup>5</sup>, secondary<sup>6</sup> as well as cumulative<sup>7</sup> impacts.

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<sup>4</sup> Impacts that arise directly from activities that form an integral part of the Project.

<sup>5</sup> Impacts that arise indirectly from activities not explicitly forming part of the Project.

<sup>6</sup> Secondary or induced impacts caused by a change in the Project environment.

<sup>7</sup> Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.



A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria<sup>8</sup> presented in **Table 10-3**.

**Table 10-3 – Impact Assessment Criterion and Scoring System**

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
<b>Impact Magnitude (M)</b> The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
<b>Impact Extent (E)</b> The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
<b>Impact Reversibility (R)</b> The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
<b>Impact Duration (D)</b> The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
<b>Probability of Occurrence (P)</b> The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
<b>Significance (S)</b> is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
Impact Significance Rating					
Total Score	4 to 15	16 to 30	31 to 60	61 to 80	81 to 100

<sup>8</sup> The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

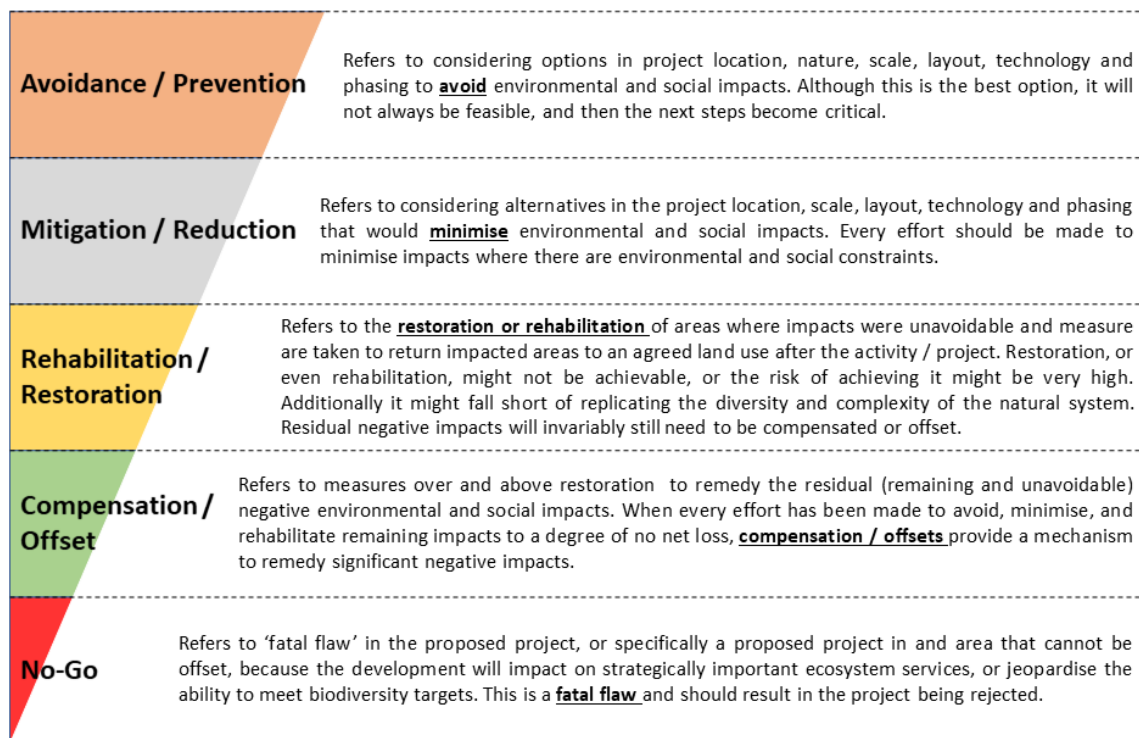
Environmental Significance Rating (Negative (-))	Very low	Low	Moderate	High	Very High
Environmental Significance Rating (Positive (+))	Very low	Low	Moderate	High	Very High

## 10.6.2 IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in **Table 10-3** below.



**Figure 10-1 - Mitigation Sequence/Hierarchy**

The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

## 10.7 ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Once the FSR has been approved the proposed project will proceed into detailed EIA phase, which involves the detailed specialist investigations.

WSP will produce a Draft EIA Report after the completion of the required specialist studies. The Draft EIAR will provide an assessment of all the identified key issues and associated impacts from the Scoping phase. All requirements as contemplated in the EIA Regulations, 2014 (GNR 982, as amended) will be included in the Draft EIAR.

The Draft EIAR will contain, inter alia, the following:

- Details of the EAP who prepared the report and the expertise of the EAP to carry out the S&EIR process, including a curriculum vitae;

- The location of the activity, including the 21 digit Surveyor General code of each cadastral land parcel, where available, the physical address and farm name; and the coordinates of the boundary of the property or properties;
- A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale;
- A description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for; and a description of the associated structures and infrastructure related to the proposed project;
- A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;
- A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location;
- A motivation for the preferred development footprint within the approved site;
- A full description of the process followed to reach the proposed development footprint within the approved site;
- Details of the public participation process undertaken;
- A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;
- The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;
- The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts;
- The methodology used in determining and ranking of potential environmental impacts and risks;
- Positive and negative impacts;
- An assessment of each identified potentially significant impact and risk;
- The possible mitigation measures that could be applied;
- An environmental impact statement;
- A description of any assumptions, uncertainties and gaps in knowledge;
- A reasoned opinion as to whether the proposed activity should or should not be authorised;
- An undertaking under oath or affirmation by the EAP; and
- An EMP.

## 10.8 STAKEHOLDER AND AUTHORITY ENGAGEMENT

Public participation during the EIA phase revolves around the review of the environmental impact assessment findings, which will be presented in the Draft EIA Report. All stakeholders will be notified of the progress to date and availability of the Draft EIA Report, via mail, email and/or SMS. A legislated period of 30 consecutive days will be allowed for public comment. Reports will be made available in the following way:

- Distribution for comment at central public places, which were used during the Scoping phase;
- The document will be made available to download from the WSP and Datafree websites; and
- Copies of CDs will be made available on request.

The EIA phase will provide the following information to I&APs:

- Initial Site Plan;

- Alternatives;
- A description of activities and operations to be undertaken;
- Baseline information;
- Specialist studies;
- Impact assessment; and
- Management measures.

The information outlined above will be presented in one or more of the following:

- Notifications;
- Scoping Report;
- EIA Report; and
- EMPr.

All comments received during the EIA phase will be recorded in the Comments and Responses table within the SER, which will be included in the draft and final EIA Reports. The final EIA Report will incorporate public comment received on the Draft EIA Report and will be made available for public review with hard copies distributed mainly to the authorities and key stakeholders.

All stakeholders will receive a letter notifying them of the authority's decision.



## 11 CONCLUSION AND WAY FORWARD

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This FSR contains:

- A description of the existing and proposed activities;
- A description of the alternatives considered to date;
- An outline of the proposed process to be followed;
- Information on the EAP and stakeholders who have chosen to participate in the project;
- An outline of the environment in which the project falls;
- Information on the potential environmental impacts to be studied in more detail during the EIAR phase of the project; and
- Information on the proposed specialist studies to be undertaken.

A number of environmental impacts have been identified as requiring some more in-depth investigation and the identification of detailed mitigation measures. Therefore, a detailed EIA is required to be undertaken in order to provide an assessment of these potential impacts and recommend appropriate mitigation measures.

The recommendation of this report is that detailed specialist studies as outlined in **Section 10.5** are undertaken.

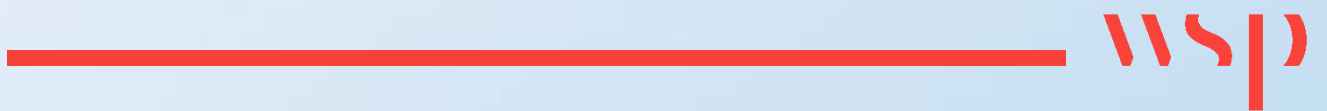
All issues and comments submitted to WSP during the scoping phase have been incorporated in Section 3 of the SER (Appendix D of the FSR). The FSR will be submitted to the DFFE, as the competent authority.

If you have any further enquiries, please feel free to contact:

WSP Group Africa (Pty) Ltd  
Attention: Megan Govender  
(T) 011 361 1410  
(F) 011 361 1301  
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# Appendix A

**EAP CV**



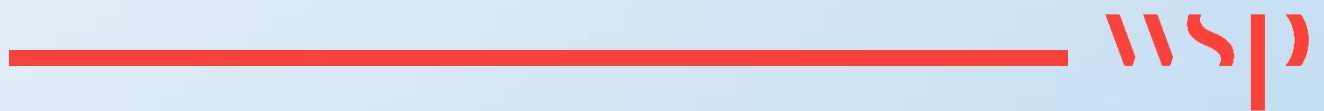
# Appendix B

## EAP DECLARATION



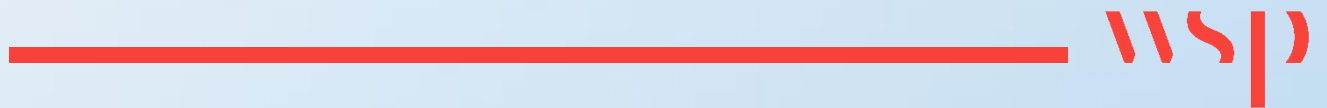
# Appendix C

## **SPECIALIST DECLARATIONS**



# Appendix D

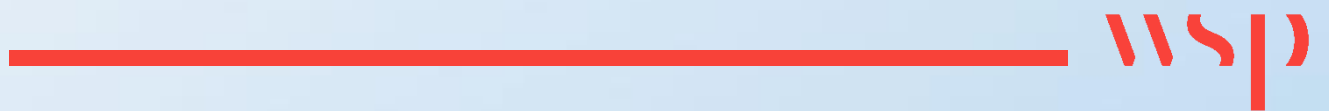
## **STAKEHOLDER ENGAGEMENT REPORT**





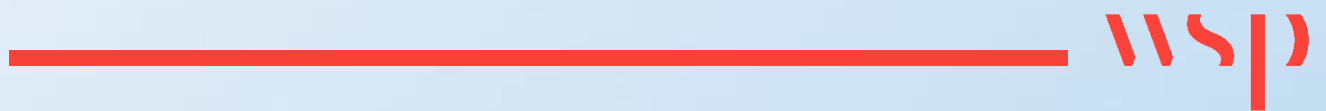
# Appendix E

**MAPS**



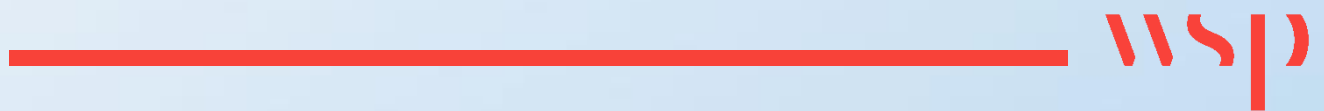
# Appendix F

## **DFFE SCREENING TOOL REPORTS**



# Appendix G

## **SPECIALIST STUDIES**



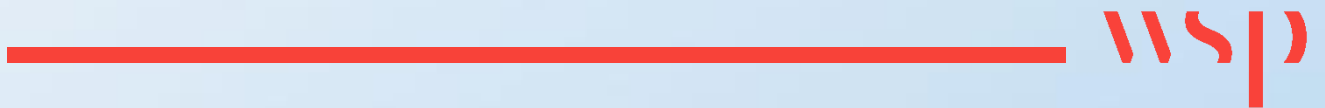
# Appendix G.1

## **CLIMATE CHANGE ASSESSMENT**



# Appendix G.2

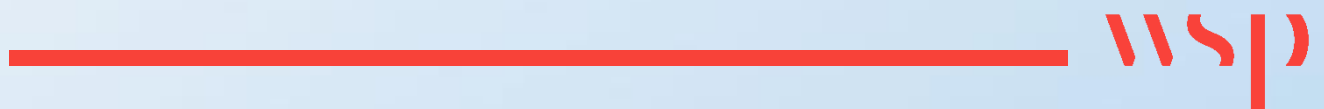
## **AGRICULTURAL COMPLIANCE STATEMENT**





# Appendix G.3

## **TERRESTRIAL BIODIVERSITY COMPLIANCE STATEMENT**



# Appendix G.4

## **AQUATIC BIODIVERSITY ASSESSMENT**



# Appendix G.5

## **PLANT SPECIES COMPLIANCE STATEMENT**



# Appendix G.6

## **ANIMAL SPECIES COMPLIANCE STATEMENT**



# Appendix G.7

## **AVIFAUNAL IMPACT ASSESSMENT**





# Appendix G.8

## HERITAGE ASSESSMENT



# Appendix G.9

## **PALAEONTOLOGICAL ASSESSMENT**



# Appendix G.10

## **TRAFFIC IMPACT ASSESSMENT**



# Appendix G.11

## **VISUAL IMPACT ASSESSMENT**



# Appendix G.12

## **SOCIAL ASSESSMENT**





# Appendix G.13

## **GEOHYDROLOGICAL ASSESSMENT**





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