CAMDEN I WIND (RF) (PTY) LTD

CAMDEN I WIND ENERGY FACILITY

FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DFFE Reference Number: 14/12/16/3/3/2/2137

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31 OCTOBER 2022

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CAMDEN I WIND (RF) (PTY) LTD

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DOCUMENT DESCRIPTION

APPLICANT

Camden I Wind (RF) (Pty) Ltd

PROJECT NAME

Proposed Camden I Wind Energy Facility, Mpumalanga, South Africa

PRE-APPLICATION REFERENCE NUMBER

2021-10-0008

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14/12/16/3/3/2/2137

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Final Environmental Impact Assessment Report

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41103247

PRODUCTION TEAM

APPLICANT

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WSP

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Principal Environmental Consultant	Babalwa Mqokeli
Noise Specialist	Kirsten Collett
Traffic Specialist	Christo Bredenhann
Groundwater Specialist	Adam Sanderson

SPECIALISTS

Heritage Specialist	Jaco van der Walt (Beyond Heritage)
Agriculture Specialist	Johan Lanz
Ecology Specialist	David Hoare (David Hoare Consulting (Pty) Ltd
Aquatic Specialist	Brian Colloty (EnviroSci Pty Ltd)
Avifauna Specialist	Chris van Rooyen (Chris van Rooyen Consulting)
Bat Specialist	Werner Marais (Animalia Consultant (Pty) Ltd
Social Specialist	Tony Barbour (Tony Barbour Environmental Consulting)
Visual Specialist	Kerry Schwartz (SLR Consulting)
Risk Specialist	Debra Mitchell (Ishecon cc)
Geotechnical Desk Study	Muhammad Osman (SLR Consulting)

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

Changes made from the Draft Environmental Impact Report have been underlined in this Final Environmental Impact Report for ease of reference to the updates made in the reporting.

1.1 PURPOSE OF THIS REPORT

This final Environmental Impact Report (EIR) documents the process and findings of the impact assessment phase of the Scoping and Environmental Impact Reporting (S&EIR) process for the proposed Camden I Wind Energy Facility (WEF). The proposed project is located approximately 10km south of Ermelo (near Camden) in the Mpumalanga Province of South Africa.

The environmental impact assessment (EIA) process is an interdisciplinary procedure to ensure that environmental considerations are included in decisions regarding projects that may impact the environment. The process identifies potential environmental impacts associated with a proposed project and management actions required to either mitigate or avoid the negative impacts or to enhance the positive impacts associated with a proposed project. In the context of this report, the purpose of the S&EIR process is to inform decision-makers and the public of the environmental consequences of the proposed project. This final EIR (this document) is a technical tool that identifies, predicts, and analyses impacts on the physical environment, as well as social, cultural, and health impacts. The report identifies alternatives and mitigation measures to reduce the environmental impact of the proposed project; and it also serves an important procedural role in the overall decision-making process by promoting transparency and public involvement.

1.2 BACKGROUND INFORMATION

The proponent is proposing the development of a Camden Renewable Energy Complex within the vicinity of the Camden Power Station in Mpumalanga. The Complex consists of eight distinct projects referred to as:

— Camden I Wind Energy Facility (up to 200MW) (subject to a S&EIR process);
— Camden I Wind Grid Connection (up to 132kV) (subject to a Basic Assessment (BA) Process);
— Camden Grid Connection and Collector substation (up to 400kV) (subject to a S&EIR process);
— Camden I Solar (up to 100MW) (subject to a S&EIR process);
— Camden I Solar Grid Connection (up to 132kV) (subject to a BA Process);
— Camden II Wind Energy Facility (up to 200MW) (subject to a S&EIR process);
— Camden II Wind Energy Facility up to 132kV Grid Connection (subject to a BA Process); and
— Camden Green Hydrogen and Ammonia Facility, including grid connection infrastructure (subject to a S&EIR process).

The Complex (except for the Green Hydrogen and Ammonia project) is being developed in the context of the Department of Mineral Resources and Energy's (DMRE Integrated Resource Plan, and the Renewable Energy Independent Power Producer Procurement Programme (REIPPP).

The focus of this Environmental Impact Assessment Report is the proposed Camden I WEF project.

The proposed project will be applied for under a Special Purpose Vehicle (SPV), and the Project Applicant is therefore Camden I Wind (RF) (Pty) Ltd. The proposed WEF will connect to the nearby Camden Collector substation through an up to 132kV single or double circuit powerline (subject to a separate BA process towards environmental authorisation, as mentioned above) between the grid connection substation portion (immediately adjacent the Camden I WEF on-site Independent Power Producer (IPP) substation portion) and that of the Camden Collector substation. The broader Camden developments (i.e. seven of the abovementioned projects) will connect to the Camden Power Station substation through an up to 400kV powerline (either single or double circuit) (subject to a separate Scoping and EIA process).

In order for the proposed project to proceed, it will require an Environmental Authorisation (EA) from the Competent Authority (CA) (i.e. the National Department of Forestry, Fisheries and Environment, (DFFE)).

1.3 KEY ROLE PLAYERS

1.3.1 PROJECT PROPONENT

Camden I Wind (RF) (Pty) Ltd is the project proponent (Applicant) with regards to this application for the construction and operation of the WEF and associated infrastructure. **Table 1-1** provides the relevant details of the project proponent.

Table 1-1: Details of Project Proponent

PROPONENT:	CAMDEN I WIND (RF) (PTY) LTD
Contact Person:	Mercia Grimbeek
Postal Address	Suite 104, Albion Springs, 183 Main Road, Rondebosch, Cape Town, South Africa 7700
Telephone:	071 752 8033
Email:	Gideon.raath@enertrag.com

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 CA 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.

The CA (i.e. DFFE) was confirmed during the Pre-Application Meeting held on **19 October 2021**.

Table 1-2 provides the relevant details of the competent authority on the Project.

Table 1-2: Competent Authority

ASPECT	COMPETENT / COMMENTING AUTHORITY	CONTACT DETAILS
Competent Authority: Environmental Authorisation	Department of Forestry, Fisheries, and the Environment (DFFE)	Case Officer: Makhosi Yeni Integrated Environmental Authorisations MYeni@dffe.gov.za DFFE Reference: 14/12/16/3/3/2/2137

1.3.3 COMMENTING AUTHORITIES

The following commenting authorities have been identified for this application:

- Department of mineral resources and Energy (DMRE);
- DFFE: Biodiversity and Conservation;
- DFFE: Protected Areas;
- DFFE: Air Quality;
- Mpumalanga Department Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA);

— Department of Water and Sanitation (DWS);
— Vaal Water Management Area (WMA) Authority;
— South African Heritage Resource Agency (SAHRA);
— Mpumalanga Heritage Resources Authority (MHRA);
— Mpumalanga Tourism and Parks Agency (MTPA);
— Civil Aviation Authority (CAA);
— Air Traffic and Navigation Services (ATNS);
— Department of Defence (SA Army) (DD);
— Astronomy Management Authority (AMA);
— South African Weather Services (SAWS);
— South African National Roads Agency Limited (SANRAL);
— Gert Sibande District Municipality;
— Msukaligwa Local Municipality; and
— Dr Pixley Ka Seme Local Municipality.

1.3.4 ENVIRONMENTAL ASSESSMENT PRACTITIONER

WSP Group Africa (Pty) Ltd (WSP) has been appointed in the role of Independent Environmental Assessment Practitioner (EAP) to undertake the S&EIR processes for the development of the 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. In order to adequately identify and assess potential environmental impacts, a number of specialists will support the EAP.

Table 1-3: Details of the Environmental Assessment Practitioner

ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)	WSP GROUP AFRICA (PTY) LTD
Contact Person:	Ashlea Strong
Postal Address:	Building C, Knightsbridge, 33 Sloane Street, Bryanston, 2191, South Africa
Telephone:	011 361 1392
Fax:	011 361 1381
E-mail:	Ashlea.Strong@wsp.com
EAP Qualifications:	— Masters in Environmental Management, University of the Free State — B Tech, Nature Conservation, Technikon SA — National Diploma in Nature Conservation, Technikon SA
EAPASA Registration Number:	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 declarations are included in **Appendix C**.

Table 1-4: Details of Specialists

ASSESSMENT	NAME OF SPECIALIST	COMPANY	SECTIONS IN REPORT
Agriculture	Johann Lanz	Independent consultant	Section 7.1.5 Section 8.4 **Appendix H-1**
Avifauna	Chris van Rooyen	Chris van Rooyen Consulting	Section 7.2.6 Section 8.10 **Appendix H-2**
Bats	Werner Marais	Animalia Consultants	Section 7.2.7 Section 8.11 **Appendix H-3**
Terrestrial Biodiversity	David Hoare	David Hoare Consulting (Pty) Ltd	Section 7.2.1 Section 7.2.2 Section 7.2.3 Section 7.2.4 Section 7.2.5 Section 8.9 **Appendix H-4**
Aquatic	Brian Colloty	EnviroSci Pty Ltd	Section 7.1.6 Section 8.5 **Appendix H-5**
Groundwater	Adam Sanderson	WSP Group Africa (Pty) Ltd	Section 7.1.7 Section 8.6
Heritage	Jaco van der Walt	Beyond Heritage	Section 7.3.4 Section 8.13 **Appendix H-6**
Palaeontology	Prof Marion Bamford	Beyond Heritage	Section 7.3.4 Section 8.14 **Appendix H-7**
Socio-economic	Tony Barbour	Tony Barbour Environmental Consulting	Section 7.3.6 Section 8.16 **Appendix H-8**
Traffic	Christo Bredenhann	WSP Group Africa (Pty) Ltd	Section 7.3.3 Section 8.15 **Appendix H-9**
Visual	Kerry Schwartz	SLR Consulting (Pty) Ltd	Section 7.3.5 Section 8.12 **Appendix H-10**
Noise	Kirsten Collett	WSP Group Africa (Pty) Ltd	Section 7.3.2 Section 8.2 **Appendix H-11**

ASSESSMENT	NAME OF SPECIALIST	COMPANY	SECTIONS IN REPORT
Safety Health and Environmental (SHE) Risk Assessment	Debra Mitchell	ISHECON	**Appendix H-12**
Geotechnical Desk Study	Muhammad Osman	SLR Consulting (Pty) Ltd	**Appendix H-13**

1.4 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The 2014 Environmental Impact Assessment (EIA) Regulations (GNR 982), as amended, identifies the proposed Camden I WEF development as an activity being subject to a S&EIR process due to the applicability of the EIA Listing Notices 1 and 2 (GNR 983 and 984, as amended).

This EIR follows the Scoping Phase of the S&EIR process. The Scoping Process carried out involved consultation with interested and affected parties and the drafting of the Plan of Study for EIA (POS for EIA), and culminated in the submission of a Final Scoping Report to the DFFE on 08 April 2022. The DFFE acceptance of the Final Scoping Report and authorisation to proceed with EIA was received on 24 May 2022 (letter dated, 23 May 2022) (**Appendix G**). A request for extension to the submission deadline of the FEIR was submitted to the DFFE in terms of EIA Regulation 3(7). A 60-day extension was approved by the DFFE on 24 June 2022. According to the extension approval letter, the new deadline for submission of the FEIR is 02 November 2022.

<u>This final EIR will be submitted to the DFFE on or before 02 November 2022 as required.</u>

As defined in Appendix 3 of GNR 982, as amended, the objective of the environmental impact assessment process is to, through a consultative process:

- Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted scoping report;
- Identify the location of the development footprint within the approved site as contemplated in the accepted scoping report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- Determine the—
  - nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and;
  - degree to which these impacts—
    - can be reversed;
    - may cause irreplaceable loss of resources, and
    - can be avoided, managed or mitigated;
- Identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted scoping report based on the lowest level of environmental sensitivity identified during the assessment;
- Identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity;
- Identify suitable measures to avoid, manage or mitigate identified impacts; and
- Identify residual risks that need to be managed and monitored.

Public participation is a requirement of the S&EIR process; 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&EIR 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 ENVIRONEMNTAL IMPACT ASSESSMENT REPORT STRUCTURE

Table 1-5 cross-references the sections within the EIR with the legislated requirements as per Appendix 3 of GNR 982.

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

APPENDIX 2	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 982	RELEVANT REPORT SECTION
(a)	Details of	
	the EAP who compiled the report; and	Section 1.3.4 **Appendix A**
	the expertise of the EAP, including a Curriculum Vitae	**Appendix A**
(b)	The location of the activity, including-	
	The 21 digit Surveyor code for each cadastral land parcel;	Section 6.1
	Where available, the physical address and farm name	Section 6.1
	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 2.1
	A description of the activities to be undertaken, including associated structures and infrastructure;	Section 6

APPENDIX 2	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 982	RELEVANT REPORT SECTION
(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 2
(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 5
(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 6.5
	Details of the public participation undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 4.3
	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;	**Appendix D**
	the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 7
	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 4.2
	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 6.5
	if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and	Section 6.5
	a concluding statement indicating the preferred alternatives, including preferred location of the activity;	Section 6.5 Section 10.5
(i)	a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including— -	
	a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	Section 8

APPENDIX 2	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 982	RELEVANT REPORT SECTION
	an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	Section 8
(j)	an assessment of each identified potentially significant impact and risk, including—	
	cumulative impacts;	Section 9
	the nature, significance and consequences of the impact and risk;	Section 8
	the extent and duration of the impact and risk;	Section 8
	the probability of the impact and risk occurring;	Section 8
	the degree to which the impact and risk can be reversed;	Section 8
	the degree to which the impact and risk may cause irreplaceable loss of resources; and	Section 8
	the degree to which the impact and risk can be mitigated.	Section 8
(k)	where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.	Section 10.3
(l)	an environmental impact statement which contains —	
	a summary of the key findings of the environmental impact assessment:	Section 10
	a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and	Section 10
	a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	Section 6.5 Section 10.4
(m)	based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for inclusion in the EMPr as well as for inclusion as conditions of authorisation.	Appendix I
(n)	the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.	Section 6.5
(o)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 8
(p)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.	Section 1.7

APPENDIX 2	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 982	RELEVANT REPORT SECTION
(q)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	Section 10.6
(r)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised.	N/A
(s)	an undertaking under oath or affirmation by the EAP in relation to—	
	the inclusion of comments and inputs from stakeholders and I&APs;	Appendix B
	the inclusion of inputs and recommendations from the specialist reports where relevant; and	Appendix B
	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.	Appendix B
(t)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	N/A
(u)	an indication of any deviation from the approved scoping report, including the plan of study, including—	N/A
	any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	N/A
	a motivation for the deviation	N/A
(v)	any specific information required by the competent authority; and	N/A
(w)	any other matter required in terms of section 24(4)(a) and (b) of the Act	N/A
(2)	Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report the requirements as indicated in such notice will apply.	Appendix H

1.6 ADDITIONAL PERMITS AND AUTHORISATION

outlines permits and authorisations required for the proposed development as well as the relevant Competent Authorities responsible.

Table 1-6: Additional Permits and Authorisations required for the proposed development

PERMITS/AUTHORISATION	LEGISLATION	RELEVANT AUTHORITY	STATUS
Water Use Licence / General Authorisation	National Water Act (Act No. 36 of 1998)	Department of Water and Sanitation	An application for water use authorisation is currently underway for this project.

PERMITS/AUTHORISATION	LEGISLATION	RELEVANT AUTHORITY	STATUS
Section 50 Approval	National Environmental Management: Protected Areas Act (Act No. 57 of 2003)	DFFE: Protected Areas Directorate	Section 50 Approvals have been received from the Management Authority (Landowner/s) for those farm portions that are directly affected by the proposed project, and have been submitted to the Competent Authority as part of this application. The Project Developer is currently engaging with the Landowner in obtaining Section 50 Approval for the remaining three land portions located outside of the project footprint but which also constitute the Langcarel Nature Reserve. It is important to note that further investigation and engagement with the MTPA has been conducted. The MTPA have furthermore confirmed their intent to de-proclaim the nature reserve and the process is currently in the early stages.
Section 38 Notification	National Heritage Resource Act (Act No. 25 of 1999)	Mpumalanga Heritage Resources Authority	In Process
Obstacle Permit	Civil Aviation Act (Act 13 of 2009)	Air Traffic and Navigation Services / Civil Aviation Authority	An Application for the Approval of Obstacles was submitted on 14 July 2021 to ATNS and the required permits will be obtained prior to the development of the project.
Section 53 Approval	Minerals and Petroleum Resources Development Act (MPRDA) (No. 28 of 2002)	Department of Mineral Resources and Energy (DMRE)	An application in terms of Section 53 of the MPRDA was submitted on 13 May 2022. An acknowledgment letter was issued by the DMRE on 20 September 2022 and the reference number allocated to this application is 11092SU – awaiting a decision from the DMRE.

PERMITS/AUTHORISATION	LEGISLATION	RELEVANT AUTHORITY	STATUS
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)	Department of Agriculture, Land Reform and Rural Development (DALRRD) / Msukaligwa Municipality	Given that the project is proposed on land zoned for Agriculture, SALA requires that any long-term lease associated with the renewable energy facility be approved by the DALRRD. Subdivision and consolidation of land are also regulated as part of municipal planning, and will therefore be subject to municipal by-laws and provincial legislation. The SALA consent and Land use zoning are separate processes from the Application for EA, and needs to be applied for and obtained separately from the EA and S&EIR process. It is however noted that a rezoning application is already underway for the proposed project, however, can only be complete once the EA is issued. The proponent will ensure all municipal approvals and zoning requirements are met prior to commencement of construction.

1.7 ASSUMPTION 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 the CA would not require additional specialist input, in order to make a decision regarding the application.

Aquatic Ecology:

- To obtain a comprehensive understanding of the dynamics of both the flora and fauna of communities within a study site, as well as the status of endemic, rare or threatened species in any area, assessments should always consider investigations at different time scales (across seasons/years) and through replication. However, due to time constraints these long-term studies are not feasible and are thus mostly based on instantaneous sampling.

- Therefore, due to the scope of the work presented in this report, a long-term investigation of the proposed site was not possible and as such not perceived as part of the Terms of Reference – EIA Phase. However, a concerted effort was made to sample and assess as much of the potential site, as well as make use of any supporting literature, species distribution data and aerial photography. This limitation is common to many impact assessment type studies, but the findings are deemed adequate for the purposes of decision-making support regarding project acceptability in this Phase, unless otherwise stated.
- It should be emphasised that information, as presented in this document, only has reference to the study area as indicated on the accompanying maps inclusive of any of the associated accesses, pipelines and grid corridors. Therefore, this information cannot be applied to any other area without detailed investigation.

Avifauna:

This study made the basic assumption that the sources of information used are reliable and accurate. The following must be noted:

- The SABAP2 dataset is a comprehensive dataset which provides a reasonably accurate snapshot of the avifauna which could occur at the proposed site. For purposes of completeness, the list of species that could be encountered was supplemented with personal observations, general knowledge of the area, and the results of the pre-construction monitoring which was conducted over 12 months.
- Conclusions in this report are based on experience of these and similar species at wind farm developments in different parts of South Africa. However, bird behaviour can never be predicted with absolute certainty.
- To date, only one peer-reviewed scientific paper has been published on the impacts wind farms have on birds in South Africa (Perold et al. 2020). The precautionary principle was therefore applied throughout. The World Charter for Nature, which was adopted by the UN General Assembly in 1982, was the first international endorsement of the precautionary principle. The principle was implemented in an international treaty as early as the 1987 Montreal Protocol and, among other international treaties and declarations, is reflected in the 1992 Rio Declaration on Environment and Development. Principle 15 of the 1992 Rio Declaration states that: "in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall be not used as a reason for postponing cost-effective measures to prevent environmental degradation."
- According to the specifications received from the proponent, the 33kV medium-voltage lines will be buried where practically feasible. It was therefore assumed that there could be 33kV overhead lines which could pose an electrocution risk to priority species.

Bats:

As with any environmental study, there are certain assumptions and limitations that exist around the current knowledge we possess regarding bats and their behaviour, movements and distribution. Some important points are discussed briefly below:

- Distribution maps of South African bat species still require further refinement, thus the bat species proposed to occur on the site (and not detected in the area yet) should be considered precautionary. If a species has a distribution marginal to the site, it was assumed to occur in the area.
- The migratory paths of bats are largely unknown, thus some uncertainty in this regard will remain until the end of operational monitoring of at least 2 years. Based on the currently available data from the pre-construction monitoring, there is nothing to date that indicates that the site is located in a migratory path.
- The sensitivity map is based partially on satellite imagery and from detailed site visits, although given the large extent of the site, there is always the possibility that what has been mapped may differ slightly to what is on the ground.

Terrestrial Biodiversity:

The following assumptions, limitations, uncertainties are listed regarding the ecological assessment of the Camden site:

- The assessment is based on a field survey conducted 3-7 February 2020. The current study is based on an extensive site visit as well as a desktop study of the available information. The time spent on site was adequate for understanding general patterns across affected areas. The seasons in which the fieldwork (peak summer flowering period) was conducted was ideal for assessing the composition and condition of the vegetation.

- The vegetation was in good condition for sampling at the time of the field assessment, and the species lists obtained are considered reliable and relatively comprehensive.
- Compiling the list of species that could potentially occur on site is limited by the paucity of collection records for the area. The list of plant species that could potentially occur on site was therefore taken from a wider area and from literature sources that may include species that do not occur on site and may miss species that do occur on site. In order to compile a comprehensive site-specific list of the biota on site, studies would be required that would include different seasons, be undertaken over a number of years and include extensive sampling. Due to time constraints inherent in the EIA process, this was not possible for this study. However, the comprehensive field survey is sufficient for the purposes of this report and towards sufficiently informing the decision making process by the Competent Authority.

Social:

- Technical suitability: It is assumed that the development site represents a technically suitable site for the establishment of the proposed development.
- Strategic importance of the project: The strategic importance of promoting renewable and other forms of energy is supported by the national and provincial energy policies.
- Fit with planning and policy requirements: Legislation and policies reflect societal norms and values. The legislative and policy context therefore plays an important role in identifying and assessing the potential social impacts associated with a proposed development. In this regard, a key component of the SIA process is to assess the proposed development in terms of its fit with key planning and policy documents. As such, if the findings of the study indicate that the proposed development in its current format does not conform to the spatial principles and guidelines contained in the relevant legislation and planning documents, and there are no significant or unique opportunities created by the development, the development cannot be supported.
- Assessment of components: The potential social impacts associated with the battery energy storage systems (BESS) and internal substations are negligible and do not have a bearing on the findings of the SIA. The focus of the SIA is therefore on the WEF and associated wind turbines.
- Demographic data: Some of the provincial documents do not contain data from the 2011 Census and or 2016 Household Community Survey. However, where required the relevant 2011 and 2016 data has been provided.

Visual

This VIA is based on a combination of desktop-level assessment supported by field-based observation. The following assumptions and limitations are applicable:

- Wind turbines are very large structures and could impact on visual receptors that are located relatively far away, particularly in areas where the terrain is very flat. Given the nature of the receiving environment and the height of the proposed wind turbines, the study area or visual assessment zone is assumed to encompass an area of 10km from the proposed WEF – i.e. an area of 10km from the boundary of the WEF application site. The application of the 10km limit on the visual assessment zone relates to the fact that visual impacts decrease exponentially over distance. Thus although the WEF may still be visible beyond 10km, the degree of visual impact would diminish considerably. As such, the need to assess the impact on potential receptors beyond this distance would not be warranted.
- In assessing the potential visual impacts of the proposed 132kV power line, the visual assessment zone is assumed to encompass a zone of 5km from the outer boundary of the power line assessment corridors.
- The identification of visual receptors involved a combination of desktop assessment as well as field-based observation. Initially Google Earth imagery was used to identify potential receptors within the study area. Where possible, these receptor locations were verified and assessed during a site visit which was undertaken in mid-September 2019. Due to the extent of the study area however and the number of receptors that could potentially be sensitive to the proposed development, it was not possible to visit or verify every potentially sensitive visual receptor location. As such, a number of assumptions have been made in terms of the likely sensitivity of the receptors to the proposed development.
- It should be noted that not all receptor locations would necessarily perceive the proposed development in a negative way. This is usually dependent on the use of the facility, the economic dependency of the occupants on the scenic quality of views from the facility and on people's perceptions of the value of "Green Energy". Sensitive receptor locations typically include sites such as tourism facilities and scenic locations within natural settings which are likely to be adversely affected by the visual intrusion of the

proposed development. Thus, the presence of a receptor in an area potentially affected by the proposed development does not necessarily mean that any visual impact will be experienced.

- The potential visual impact at each sensitive visual receptor location was assessed using a matrix developed for this purpose. The matrix is based on three main parameters relating to visual impact and, although relatively simplistic, it provides an indicative assessment of the degree of visual impact likely to be experienced at each receptor location as a result of the proposed development. It is however important to note the limitations of quantitatively assessing a largely subjective or qualitative type of impact and as such the matrix should be seen merely as a representation of the likely visual impact at a receptor location.
- As stated, the exact status of all the receptors could not be verified during the field investigation and as such the receptor impact rating was largely undertaken via desktop means. Where details of the levels of leisure / tourism activities on different sectors of the relevant farms are not known, the impact rating matrix for these receptors is based on the assumed location of the main accommodation complex on each property.
- Where receptors have been identified within the WEF project area, it has been assumed that the land owners or residents at these locations support the proposed WEF development and would not view the project in a negative light.
- Based on the project description provided by the Proponent, all analysis for this VIA is based on a worst-case scenario where turbine heights are assumed to be 300 m at the blade tip. On-site substations, Battery Energy Storage (BESS) facilities and office building heights are assumed to be less than 25m in height.
- Visual analysis in respect of the power lines is based on a worst-case scenario where power line tower heights are assumed to be 35 m.
- Due to the varying scales and sources of information; maps may have minor inaccuracies. Terrain data for this area, derived from the National Geo-Spatial Information (NGI)'s 25m Digital Elevation Model (DEM), is fairly coarse and somewhat inconsistent and as such, localised topographic variations in the landscape may not be reflected on the DEM used to generate the viewshed(s) and visibility analysis conducted in respect of the proposed development.
- In addition, the viewshed / visibility analysis does not take into account any existing vegetation cover or built infrastructure which may screen views of the proposed development. This analysis should therefore be seen as a conceptual representation or a worst-case scenario.
- No feedback regarding the visual environment has been received from the public participation process to date. Any feedback from the public during the review period of the Draft EIA Report (DEIR) or Draft Basic Assessment Report (DBAR) will however be incorporated into further drafts of this report, if relevant.
- At the time of undertaking the visual study no information was available regarding the type and intensity of lighting that will be required for the proposed WEF and therefore the potential impact of lighting at night has not been assessed at a detailed level. However, lighting requirements are relatively similar for all WEFs and as such, general measures to mitigate the impact of additional light sources on the ambiance of the nightscape have been provided.
- At the time of undertaking the visual study no *detailed* information was available regarding the design and layout of services and infrastructure associated with the proposed development. The potential visual impact of the *typical* infrastructure associated with a wind farm has therefore been assessed.
- In the light of the fact that the renewable energy industry is still relatively new in South Africa, this report draws on international literature and web material to describe the generic impacts associated with WEFs.
- Photomontages *<u>have not</u>* been compiled for all sensitive and potentially sensitive receptor locations. Instead, a range of locations was selected for modelling purposes to provide an indication of the possible impacts from different locations within the study area. It should be noted that these photomontages are specific to the location, and that even sites in close proximity to one another may be affected in different ways by the proposed WEF development. The visual models represent a visual environment that assumes that all vegetation cleared during construction will be restored to its current state after the construction phase. This is however an improbable scenario as some vegetation cover may be permanently removed which may reduce the accuracy of the models generated.
- At the request of the Proponent, photomontages were compiled for this WEF in October 2019 at which time, the proposed project was still in the planning phase. As such, the photomontages are based on a turbine layout which has since changed. Accordingly, the photomontages presented in this report should be seen merely as indicative illustrations and not as an accurate representation of the proposed Camden 1 WEF turbine layouts.

- Although the grid connection and on-site infrastructure associated with the WEF has not been included in the models, this is not considered to be a major limitation as the visual impact of associated infrastructure would be minor when considering the scale of these infrastructural elements in relation to wind turbines.
- This study includes an assessment of the potential cumulative impacts of other renewable energy and infrastructural / mining developments on the existing landscape character and on the identified sensitive receptors. This assessment is based on the information available at the time of writing the report and where information has not been available, broad assumptions have been made as to the likely impacts of these developments.
- It should be noted that the fieldwork for this study was undertaken in mid-September 2019, during late winter which is characterised by low levels of rainfall and reduced vegetation cover. In these conditions, increased levels of visual impact will be experienced from receptor locations in the surrounding area.
- The overall weather conditions in the study area have certain visual implications and are expected to affect the visual impact of the proposed development to some degree. In clear weather conditions, the wind turbines and power lines would present a greater contrast with the surrounding environment than they would on an overcast day. Although the field investigation was conducted during clear weather conditions however, localised pollution in the study area results in relatively hazy skies which would reduce the visibility of the turbines.

Heritage

- The authors acknowledge that the brief literature review is not exhaustive on the literature of the area. Due to the nature of heritage resources and pedestrian surveys, the possibility exists that some features or artefacts may not have been discovered/recorded and the possible occurrence of graves and other cultural material cannot be excluded. This limitation is successfully mitigated with the implementation of a Chance Find Procedure and monitoring of the study area by the Environmental Control Officer (ECO). This report only deals with the footprint area of the proposed development and consisted of non-intrusive surface surveys, however assessed the broader cadastral portions for the Project and therefore is representative of the entire study area. This study did not assess the impact on medicinal plants and intangible heritage as it is assumed that these components will be highlighted through the public consultation process if relevant. It is possible that new information could come to light in future, which might change the results of this Impact Assessment.

Palaeontology:

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and do contain fossil plant, insect, invertebrate and vertebrate material. The site visit and walk through confirmed that there are no fossils present on the land surface. It is not known if there are any fossils below the land surface. The sands of the Quaternary period and the Jurassic dolerite would not preserve fossils.

Agriculture:

There are no specific assumptions, uncertainties or gaps in knowledge or data that affect the findings of this study.

Noise/Acoustic:

In this Environmental Acoustic Impact Assessment, various assumptions were made and limitations experienced that may impact on the results obtained. These include:

- The turbine specifications provided are assumed to be representative of what will be installed in reality.
- The turbine locations provided are assumed to be an accurate representation of where these will be located in reality.
- Identification of sensitive receptors is based on a desktop assessment and it is assumed that all key receptors have been included.

Geotechnical (Desktop study):

The interpretation of the overall geotechnical conditions across the site is based on a review of available information on the project area. Subsurface and geotechnical conditions have been inferred at a desktop level from the available information, past experience in the project area and professional judgement. The information and interpretations are given as a guideline only and there is no guarantee that the information given is totally representative of the entire area in every respect. No responsibility will be accepted for consequences arising out of the fact that actual conditions vary from those inferred. The information must be verified by the undertaking of a detailed geotechnical site investigation.

Risk:

This study proceeded based on the assumption that vanadium redox flow batteries would most likely be installed within a building and lithium solid state batteries would be installed in containers.

Traffic:

The traffic impact assessment assumptions associated with the construction phase with the are as follows:

- An estimated construction period of 24 months, with a variable number of staff required depending on the construction phase.
- An estimated maximum of 250 workers will be on-site every day during the peak construction period.
- Workers will not be accommodated on-site.
- 90% of the work force (unskilled and semi-skilled workers) is expected to utilise public transport to site from neighbouring towns, most notably Ermelo which is located approximately 30km away.
- It is unlikely that bus transport will be available, therefore all public transport trips will be via minibus taxi, with an average 16 person per vehicle occupancy.
- Staff will not utilise non-motorised transport (NMT), such as cycling or walking to site due to the excessive distances to the closest towns.
- 10% of the work force is expected to travel to site by private car, with an average occupancy of 1.5 persons.
- It is assumed that the public transport vehicles will not remain on-site during the workday, therefore all these vehicles will arrive and again depart during the AM and PM peaks.

Notwithstanding these assumptions and limitations, it is the view of WSP that this EIR provides a good description of the issues associated with the project, and the resultant impacts.

2 GOVERNANCE FRAMEWORK

2.1 NATIONAL ENVIRONMENTAL LEGAL 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 2-1**.

Table 2-1: Applicable National Legislation[1]

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 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)	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. 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&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. 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&EIR process must be followed. An EA is required and will be applied for with the DFFE.
Listing Notice 1: GNR 983	***Activity 11(i):*** *The development of facilities or infrastructure for the transmission and distribution of electricity—* *(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or* **Description:** The Facility is located outside urban areas. Furthermore, internal distribution electrical infrastructure required to connect the respective electrical components related to the Facility, and the onsite substation, including cabling (buried or overhead) will be between 33kV and 132kV. The onsite substation will be rated 33/132kV whereas internal cabling will be up to 33kV.

[1] 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
Listing Notice 1: GNR 983	***Activity 12(ii)(a)(c)*** *The development of—* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;* **Description:** The Facility will require the development of internal roads and/or access roads around the site (total physical footprint of approximately 720 000 m^2). The physical footprint of internal access roads and electrical cabling required to connect the various components of the Facility will either traverse the delineated watercourses on site, or be located within 32m of the outer extent of the delineated watercourses on site and is estimated at ~ 1 300m^2, subject to detail design, thereby exceeding the threshold value and triggering this activity.
Listing Notice 1: GNR 983	***Activity 14*** *The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.* **Description:** The Facility will require storage and handling of dangerous goods, including fuel, cement and chemical storage onsite, that will be greater than 80m^3 but not exceeding 500m^3. The following estimated maximum capacities of dangerous good will be stored on site: — Concrete Batching: ~145 m^3 — Fuel stores (Petrol and/or Diesel): ~250m^3 — Paint, grease, transformer oils, construction chemicals, lubricants: ~100m^3
Listing Notice 1: GNR 983	***Activity 19*** *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;* **Description:** Internal access roads and stormwater control infrastructure, as well as electrical cabling required to connect the various components of the Facility will collectively require the excavation, infilling or removal of soil exceeding 10m^3 from delineated watercourses on site. The exact values will be confirmed once final designs have been provided however, these will be within the thresholds relevant to this Listed Activity and therefore within the threshold values and triggering this activity.
Listing Notice 1: GNR 983	***Activity 24(ii)*** *The development of a road—* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres*

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	Description: Internal access roads required by the Facility will be between 5m and 6m wide, and exceed 1km in length. Where required for turning circle/bypass areas, however, access or internal roads may be up to 20m to allow for larger component transport. The exact values will be confirmed once final designs have been provided however, these will be within the thresholds relevant to this Listed Activity and therefore within the threshold values and triggering this activity.
Listing Notice 1: GNR 983	***Activity 28(ii)*** *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:* *(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;* **Description:** The Facility is considered a commercial and/or industrial development, and is located on several farm portions outside an urban area, used for agricultural purposes. The total area to be developed for the Facility (buildable area) is approximately 200ha (i.e. greater than 1 hectare within agricultural use land).
Listing Notice 1: GNR 983	***Activity 30*** *Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).* **Description:** The Facility infrastructure is located within, and will require vegetation clearance or disturbance of, Eastern Highveld Grassland, Eastern Temperate Freshwater Wetlands and Chrissiesmeer Panveld. All three ecosystems are confirmed to be listed in the National List of Ecosystems that are Threated and in Need of Protection (as indicated in GNR 1002 of 9 December 2011). Due to the fact that these ecosystems are listed as threatened it is assumed that various threatened or protected species may be found within the development area. The restricted activity of "cutting, chopping off, uprooting, damaging or destroying, any specimen" has been identified in terms of NEM:BA and is therefore applicable to the vegetation clearance that will be required to construct the development. In light of this, Activity 30 is considered applicable.
Listing Notice 1: GNR 983	***Activity 48(i)(a)(c)*** *The expansion of—* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or* *where such expansion occurs—* *(a) within a watercourse;* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;* **Description:** Transport of large infrastructure components related to the facility will require the expansion of existing access and/or internal roads, culverts or similar drainage crossing infrastructure collectively exceeding 100m^2 or more beyond existing road or road reserves located within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	on site. Expansion of ~ 2 000m^2 is anticipated, subject to detail design, thereby exceeding the threshold value and triggering this activity.
Listing Notice 1: GNR 983	***Activity 56(ii)*** *The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre—* *(ii) where no reserve exists, where the existing road is wider than 8 metres;* **Description:** Transport of large infrastructure components related to the facility will require the widening of existing access and/or internal roads where no reserve exists and where such road is wider than 8 metres. The Facility is located within a rural area. Subject to detail design widening up to 14m, collectively exceeding 1km in length is anticipated, thereby exceeding the threshold value and triggering this activity.
Listing Notice 2: GNR 984	***Activity 1*** *The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more,* **Description:** The project comprises a Wind Energy Facility of up to 200MW, allowing for up to 200MW export from the Facility.
Listing Notice 2: GNR 984	***Activity 15*** *The clearance of an area of 20 hectares or more of indigenous vegetation,* **Description:** The clearance required for the Facility will be approximately 200ha (subject to finalisation based on technical, final design and environmental requirements) of indigenous vegetation. Although the approximate footprint will be confirmed at final design, more than 20ha of indigenous vegetation would be removed for the construction of the individual project infrastructure.
Listing Notice 3: GNR 985	***Activity 4(f)(i)(aa)(bb)(cc)(ee)(gg)*** *The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *f. Mpumalanga* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding disturbed areas;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas, where such areas comprise indigenous vegetation; or*

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	Description: Internal access roads required by the Facility will be between 5m and 6m wide, and approximately 60km in length. Where required for turning circle/bypass areas, however, access or internal roads may be up to 20m to allow for larger component transport. The exact values will be confirmed following detailed design. Development activities planned thereby exceeding the activity threshold within the following areas: In addition, the Facility is located in the Mpumalanga Province outside urban areas, and partly on Portion 1 & 2 of Farm No. 322 (Welgelegen), which are a declared Private Nature Reserve (Langcarel Private Nature Reserve) under the Game Ordinance, 1949 (No. 23 of 1949) and the Native Flora Protection Ordinance, 1940 (No. 9 of 1940). It should be noted that abovementioned Private Nature Reserve is not being managed as a nature reserve and a separate process is underway to have it withdrawn or deproclaimed (partially or wholly) as part of ongoing province-wide reserve verification efforts by the provincial authorities. The facility is therefore currently both located within the extent (aa), and within 5km of the abovementioned private nature reserve (gg). In addition, and on the basis of the DFFE Screening Tool output identifying the study area within the "Protected Areas Expansion Strategy" (Low Priority - Mpumalanga Protected Area Expansion Strategy), the development activity occurs within NPAES focus area thereby triggering this activity (bb). Furthermore, roads required for the Facility will be located within, and will require vegetation clearance or disturbance of, Eastern Highveld Grassland, Eastern Temperate Freshwater Wetlands and Chrissiesmeer Panveld, all three ecosystems of which are listed in the National List of Ecosystems That Are Threated And In Need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)(cc). Similarly, roads required for the Facility will be located within, and will require vegetation clearance or disturbance within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA)(ee).
Listing Notice 3: GNR 985	***Activity 12(f)(i)(ii)(iii)*** *The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *f. Mpumalanga* *i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;* *ii. Within critical biodiversity areas identified in bioregional plans; or* *iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning or proclamation in terms of NEMPAA.* **Description:** The clearance required for the Facility will be approximately 200ha of indigenous vegetation. Such clearance will be in excess of 300m^2 and be partly located within Eastern Highveld Grassland, Eastern Temperate Freshwater Wetlands and Chrissiesmeer Panveld, all three ecosystems of which are listed in the National List of Ecosystems That Are Threated And In Need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)(i). Similarly, vegetation clearance required for the Facility will be located within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA), in excess of 300m2(ii).

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	Lastly, such clearance will exceed the threshold value and occur partly on Portion 1 & 2 of Farm No. 322 (Welgelegen), which are a declared Private Nature Reserve (Langcarel Private Nature Reserve) under the Game Ordinance, 1949 (No. 23 of 1949) and the Native Flora Protection Ordinance, 1940 (No. 9 of 1940) (iii). It should be noted that abovementioned Private Nature Reserve is not being managed as a nature reserve and a separate process is underway to have it withdrawn or deproclaimed (partially or wholly) as part of ongoing province-wide reserve verification efforts by the provincial authorities.
Listing Notice 3: GNR 985	***Activity 14(ii)(a)(c)(f)(i)(aa)(bb)(dd)(ff)(hh)*** *The development of—* *(ii) infrastructure or structures with a Physical footprint of 10 Square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(c) if no development setback has been adopted,* *within 32 metres of a watercourse, measured from the edge of a watercourse;* *f. Mpumalanga* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation;* **Description:** The Facility will require the development of internal roads and/or access roads around the site (total physical footprint of approximately 72 hectares). The physical footprint of internal access roads, stormwater control infrastructure and electrical cabling required to connect the various components of the Facility will either traverse the delineated watercourses on site, or be located within 32m of the outer extent of the delineated watercourses on site, and is estimated at ~ 1 300m^2, subject to detail design, thereby exceeding the threshold value and triggering this activity. In addition, the Facility is located in the Mpumalanga Province outside urban areas, and partly on Portion 1 & 2 of Farm No. 322 (Welgelegen), which are a declared Private Nature Reserve (Langcarel Private Nature Reserve) under the Game Ordinance, 1949 (No. 23 of 1949) and the Native Flora Protection Ordinance, 1940 (No. 9 of 1940). It should be noted that abovementioned Private Nature Reserve is not being managed as a nature reserve and a separate process is underway to have it withdrawn or deproclaimed (partially or wholly) as part of ongoing province-wide reserve verification efforts by the provincial authorities. The facility is therefore currently both located within the extent (aa), and within 5km of the above mentioned private nature reserve (hh). In addition, and on the basis of the DFFE Screening Tool output identifying the study area within the "Protected Areas Expansion Strategy" (Low Priority - Mpumalanga Protected Area Expansion Strategy), the development activity occurs within NPAES focus area thereby triggering this activity (bb). Furthermore the development activity contemplated will be located within Eastern Highveld Grassland, Eastern Temperate Freshwater Wetlands and Chrissiesmeer Panveld, all three ecosystems of which are listed in the National List of Ecosystems that are Threatened and in need of

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)(dd). Finally, the development activity contemplated will be will either traverse the delineated watercourses on site, or be located within 32m of the outer extent of the delineated watercourses on site, located within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA)(ff).
Listing Notice 3: GNR 985	***Activity 15 (d)(ii)*** *The transformation of land bigger than 1000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, such land was zoned open space, conservation or had an equivalent zoning, on or after 02 August 2010.* *d. Mpumalanga* *ii. A protected area identified in terms of NEMPAA, excluding conservancies.* **Description:** The Facility is considered a commercial and/or industrial development, and will require the transformation of a footprint of approximately 200ha (within several farm portions outside an urban area zoned for agriculture, while being partly located on Portion 1 & 2 of Farm No. 322 (Welgelegen), which is a declared Private Nature Reserve (Langcarel Private Nature Reserve) under the Game Ordinance, 1949 (No. 23 of 1949) and the Native Flora Protection Ordinance, 1940 (No. 9 of 1940)(ii). It should be noted that abovementioned Private Nature Reserve is not being managed as a nature reserve and a separate process is underway to have it withdrawn or deproclaimed (partially or wholly) as part of ongoing province-wide reserve verification efforts by the provincial authorities.
Listing Notice 3: GNR 985	***Activity 18(f)(i)(aa)(bb)(cc)(ee)(gg)*** *The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *f. Mpumalanga* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation;* **Description:** Transport of large infrastructure components related to the facility will require the widening of existing access and/or internal roads where by more than 4 metres or in excess of 1km within the Mpumalanga Province and outside urban areas. Subject to detail design widening up to 14m, collectively exceeding 1km in length is anticipated, thereby exceeding the threshold value and triggering this activity. Such widening will be occur partly on Portion 1 & 2 of Farm No. 322 (Welgelegen), which are a declared Private Nature Reserve (Langcarel Private Nature Reserve) under the Game Ordinance, 1949 (No. 23 of 1949) and the Native Flora Protection Ordinance, 1940 (No. 9 of 1940). It should be noted that abovementioned Private Nature Reserve is not being managed as a nature reserve

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	and a separate process is underway to have it withdrawn or deproclaimed (partially or wholly) as part of ongoing province-wide reserve verification efforts by the provincial authorities. The facility is currently therefore both located within the extent (aa), and within 5km of the above mentioned private nature reserve (gg). In addition, and on the basis of the DFFE Screening Tool output identifying the study area within the "Protected Areas Expansion Strategy" (Low Priority - Mpumalanga Protected Area Expansion Strategy), the development activity occurs within NPAES focus area thereby triggering this activity (bb). Furthermore, such widening will occur within Eastern Highveld Grassland, Eastern Temperate Freshwater Wetlands and Chrissiesmeer Panveld, all three ecosystems of which are listed in the National List of Ecosystems that are Threated and in need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)(cc). Finally, such widening will be located within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA)(ee).
Listing Notice 3: GNR 985	***Activity 23(ii)(a)(c)(f)(i)(aa)(bb)(cc)(ee)(gg)*** *The expansion of—* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;* *where such expansion occurs —* *(a) within a watercourse;* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *f. Mpumalanga* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation;* **Description:** Transport of large infrastructure components related to the facility will require the expansion of existing access and/or internal roads, culverts or similar drainage crossing infrastructure collectively exceeding $10m^2$ or more within delineated watercourses on site, or within 32m of the outer extent of the delineated watercourses on site. Expansion of ~ 2 $000m^2$ is anticipated, subject to detail design, thereby exceeding the threshold value and triggering this activity. In addition, the development activity contemplated is located in the Mpumalanga Province outside urban areas, and partly on Portion 1 & 2 of Farm No. 322 (Welgelegen), which are a declared Private Nature Reserve (Langcarel Private Nature Reserve) under the Game Ordinance, 1949 (No. 23 of 1949) and the Native Flora Protection Ordinance, 1940 (No. 9 of 1940). It should be noted that abovementioned Private Nature Reserve is not being managed as a nature reserve and a separate process is underway to have it withdrawn or deproclaimed (partially or wholly) as part of ongoing province-wide reserve verification efforts by the provincial authorities.

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	The facility is therefore currently both located within the extent (aa), and within 5km of the abovementioned private nature reserve (gg). In addition, and on the basis of the DFFE Screening Tool output identifying the study area within the "Protected Areas Expansion Strategy" (Low Priority - Mpumalanga Protected Area Expansion Strategy), the development activity occurs within NPAES focus area thereby triggering this activity (bb). Furthermore the development activity contemplated will be located within Eastern Highveld Grassland, Eastern Temperate Freshwater Wetlands and Chrissiesmeer Panveld, all three ecosystems of which are listed in the National List of Ecosystems that are Threated and in need of Protection (GNR 1002 of 9 December 2011), and subsequently listed in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)(cc). Finally, the development activity contemplated will either traverse the delineated watercourses on site, or be located within 32m of the outer extent of the delineated watercourses on site, located within Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA)(ee).
National Environmental Management: Waste Act (59 of 2008) (NEM:WA)	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. The proposed project does not constitute a Listed Activity requiring a Waste Management Licence (WML) as defined in GNR 921. However, the contents of this Report include reasonable measures for the prevention of pollution and good international industry practice (GIIP).
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	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 addition, the NEMBA provides for the establishment and functions of a South African National Biodiversity Institute (SANBI). 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. The biodiversity assessment identifies CBAs which represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives. Based on the preliminary desktop assessment and the terrestrial biodiversity report, a sizeable area in the south-eastern part of the site is mapped as a "CBA: Irreplaceable" area, and a sizeable area in the northern part of the site is mapped as a "CBA: Optimal" area. There is also a large wetland area adjacent and to the north of the Vaal River (near the southern part of the site) that is mapped as an Ecological Support Area (ESA). According to the description for the MBSP Terrestrial Assessment categories, CBAs are areas that are required to meet biodiversity targets (for biodiversity pattern and ecological process features). The management approach is that they should remain in a natural state. CBAs are areas of high biodiversity value which are usually at risk of being lost and usually identified as important in meeting biodiversity targets, except for Critically Endangered Ecosystems or Critical Linkages. CBAs in the Province can be divided into two sub-categories: — <u>Irreplaceable</u> (parts of the site are within this sub-category), and — <u>Optimal</u> (northern parts of the site are within this sub-category). Supplementary baseline terrestrial ecology studies were undertaken during this EIA phase to inform the assessment of impacts and include flora surveys of the project footprint to determine

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	the presence of flora species of concern (SoC), and bird surveys of the area to define the potential risks to bird SoC. 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 have been included in the Environmental Management Programme (EMPr) (**Appendix I**). It is a legal requirement to obtain permits for specimens or protected species that will be lost due to construction of the project. A detailed pre-construction walk-through survey will be required prior to the commencement of construction, to locate any individuals of protected plants, as well as for any populations of threatened plant species.
National Environmental Management Protected Areas Act (No. 57 of 2003)	The purpose of the National Environmental Management Protected Areas Act (No. 57 of 2003) (NEMPAA) is to, inter alia, 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. 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*." The Facility is located in the Mpumalanga Province outside urban areas, partly within a National Protected Area Expansion Strategy Focus area and within 5km of Portion 1 & 2 of Farm No. 322 (Welgelegen), which are declared as Private Nature Reserve (Langcarel Private Nature Reserve) under the Game Ordinance, 1949 (No. 23 of 1949) and the Native Flora Protection Ordinance, 1940 (No. 9 of 1940). This reserve is noted as having farming activity present, and is currently managed and actively utilised for agriculture. The land owner further was not aware of any protected area on these properties and intends to utilise any suitable legal avenues available to continue operation of the properties for the current land use of agriculture, in conjunction with the planned Renewable Energy land use subject to this application. The protected area and has undergone similar levels of degradation as surrounding areas due primarily to overgrazing, but also partially due to alien invasive plants. In addition, no conservation management activities were evident on site during the ecological field assessment. This pattern of over-utilization affects all grasslands on site, resulting in them being in moderate to poor condition. The habitat has been used for livestock production and is impacted by this land-use. The biodiversity specialist concluded that, on the basis of the current land use and levels of modification, the private nature reserve does not align with the objective and purpose of the protected area status. <u>It is important to note that the de-proclamation/withdrawal of the Protected Area is being addressed by the MTPA as part of ongoing province-wide reserve verification efforts by the provincial authorities</u>. The MTPA has submitted a letter to the Department (letter dated, 20 June 2022) of the intent to issue a notice to withdraw the declaration of the Langcarel Private Nature Reserve in terms of the Mpumalanga Nature Conservation Act (Act No. 10 of 1998). <u>Furthermore, the MTPA have included the following towards confirmation of ongoing deproclamation/withdrawal in their comments on the draft EIA and associated report (*"The MTPA is satisfied with the discussion that took place on site and planning of the development of the wind energy facility. The potential de-proclamation of part of the Protected Area will be addressed."*)</u>. <u>Consent letters to the withdrawal/de-proclamation have been received from the Landowner/s for those farm portions that that are directly affected by the proposed project, and have been submitted to the Competent Authority as part of this application. These letters give consent of the respective Langcarel Private Nature Reserve properties to be withdrawn and/or de-proclaimed as a nature reserve by the relevant Mpumalanga MEC. These letters have also been provided to the MTPA towards the de-proclamation/withdrawal process</u>.

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
The National Water Act (No. 36 Of 1998)	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. 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. 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: *a) Taking water from a water resource;* *c) Impeding or diverting the flow of water in a watercourse;* *i) Altering the bed, banks, course or characteristics of a watercourse;* 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.
The National Heritage Resources Act (No. 25 Of 1999)	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. 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: — Section 35 (4) - No person may, without a permit issued by the responsible heritage resources authority- — destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite; — destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite. — Section 38 (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as- — any development or other activity which will change the character of a site— (i) exceeding 5 000 m^2 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. 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 Camden I WEF, 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). A Heritage Impact Assessment Report (**Appendix H-6**) has been carried out by a suitably qualified specialist, revealing:

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	— No archaeological sites of significance were noted, and finds were limited to ruins, ephemeral stone packed features of farm labourer dwellings and kraals, as well as a cemetery in the Project area. Based on the current layout, the following could be impacted on by the proposed Camden 1 WEF: — degraded farmhouse with multiple related structures scattered around the area. (located ~ 18 meters west of a proposed road); and — small degraded square packed stone feature (located ~ 7 meters west of a proposed road). — No direct impact is expected on the recorded burial sites in the Project area. According to the SAHRA Paleontological sensitivity map the study area is of zero to very high paleontological significance and an independent study was conducted for this aspect. The Palaeontological Impact Assessment (**Appendix H-7**) concluded that the impact on palaeontological resources is low and the project should be authorised from a paleontological point of view. A Fossil Chance Find Protocol has been added to the EMPr. The proposed project was loaded onto the SAHRIS portal (CaseID: 18077) for comment by SAHRA and/or Mpumalanga Heritage Resources Authority. Comments received from SAHRA are included in the Stakeholder Engagement (SER) (**Appendix D**)
Mineral and Petroleum Resources Development Act (No. 28 of 2002)	The aim of the Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA) is to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources. Section 53(1) of the MPRDA provides that any person who intends to use the surface of any land in any way that may be contrary to any object of the MPRDA, or which is likely to impede any such object, must apply to the Minister of Mineral Resources (the Minister) for approval. Section 53 of the MPRDA provides a mechanism for ensuring that, inter alia, the mining of mineral resources is not detrimentally affected through the use of the surface of land and which may, for example, result in the sterilisation of a mineral resource. A Section 53 approval will be required due to the fact that the project is located on various mining right areas. The Amendment Regulations (GNR 420 of 27 March 2020) introduced a template for section 53 applications (Form Z) and the specific information that applicants will need to provide as part of a section 53 application. An application <u>in terms of Section 53 of the MPRDA </u>was submitted on 13 May 2022<u>. An acknowledgement letter was issued by the DMRE on 20 September 2022 and the reference number allocated to this application is </u>11092SU – awaiting a decision from the DMRE.
Noise Control Regulations in terms of the Environmental Conservation, 1989 (Act 73 of 1989)	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: *(1) The minister may prescribe essential national standards –* *(a) for the control of noise, either in general or by specific machinery or activities or in specified places or areas; or* *(b) for determining –* *(i) a definition of noise; and* *(ii) the maximum levels of noise.* *(2) When controlling noise, the provincial and local spheres of government are bound by any prescribed national standards.*

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	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. 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.
Conservation of Agricultural Resources Act (No. 43 of 1983)	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. 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. 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. According to the Agriculture Specialist rehabilitation after disturbance to agricultural land is managed by the CARA. A consent in terms of CARA is required for the cultivation of virgin land. Cultivation is defined in CARA as "any act by means of which the topsoil is disturbed mechanically". The purpose of this consent for the cultivation of virgin land is to ensure that only land that is suitable as arable land is cultivated. Therefore, despite the above definition of cultivation, disturbance to the topsoil that results from the construction of a renewable energy facility and its associated infrastructure does not constitute cultivation as it is understood in CARA. This has been corroborated by Anneliza Collett (Acting Scientific Manager: Natural Resources Inventories and Assessments in the Directorate: Land and Soil Management of the Department of Agriculture, Land Reform and Rural Development (DALRRD)). As confirmed by the Agriculture Specialist, the construction and operation of the facility will therefore not require consent from the Department of Agriculture, Land Reform and Rural.
Civil Aviation Act (No. 13 of 2009)	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). 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. The DEA Screening Tool Report identified Civil Aviation as having low sensitivity for the proposed Camden I WEF, and as being located between 8 and 15km of other civil aviation arerodrome. An Application for the Approval of Obstacles has been submitted to ATNS and the required permits will be obtained prior to the development of the project. The South African Civil Aviation Authority (SACAA) was included on the project stakeholder database. Comments received from this stakeholder to date have been captured and responded to within the Comments and Responses Report (CRR) included in the SER (**Appendix D**) of this EIR.

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
Occupational Health and Safety Act (No. 85 of 1993)	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.
National Energy Act (No. 34 of 2008)	The National Energy Act aims to ensure that diverse energy resources are available, in sustainable quantitates, 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. The main objectives of the Act are to: — Ensure uninterrupted supply of energy to the Republic; — Promote diversity of supply of energy and its sources; — Facilitate effective management of energy demand and its conservation; — Promote energy research; — Promote appropriate standards and specifications for the equipment, systems and processes used for producing, supplying and consuming energy; — Ensure collection of data and information relating to energy supply, transportation and demand; — 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; — Provide for certain safety, health and environment matters that pertain to energy; — Facilitate energy access for improvement of the quality of life of the people of Republic; — Commercialise energy-related technologies; — Ensure effective planning for energy supply, transportation, and consumption; and — Contribute to sustainable development of South Africa's economy. 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.
Electricity Regulation Act (No. 4 of 2006)	The Electricity Regulation Act (No. 4 of 2006) (ERA) aims to: — Achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa; — 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: — Facilitate investment in the electricity supply industry; — Facilitate universal access to electricity; — Promote the use of diverse energy sources and energy efficiency; — Promote competitiveness and customer and end user choice; and — Facilitate a fair balance between the interests of customers and end users, licensees, investors in the electricity supply industry and the public. 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

LEGISLATION	DESCRIPTION OF LEGISLATION AND APPLICABILITY
	manner in which generation, transmission, distribution, trading and the import and export of electricity are regulated.

2.2 POLICIES AND PLANS

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

Table 2-2: Applicable Regional Policies and Plans

APPLICABLE POLICY	DESCRIPTION OF POLICY
National Development Plan	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. 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. 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. 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: — 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. — 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. 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.
Integrated Resource Plan 2010 – 2030	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)

APPLICABLE POLICY	DESCRIPTION OF POLICY
	emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development. The IRP recognises that Solar photovoltaic (PV), wind and concentrated solar power (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.
New Growth Path	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.
National Infrastructure Plan	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. 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.
Integrated Energy Plan	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 roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. 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: — Objective 1: Ensure security of supply. — Objective 2: Minimise the cost of energy. — Objective 3: Promote the creation of jobs and localisation. — Objective 4: Minimise negative environmental impacts from the energy sector. — Objective 5: Promote the conservation of water. — Objective 6: Diversify supply sources and primary sources of energy. — Objective 7: Promote energy efficiency in the economy. — Objective 8: Increase access to modern energy. 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

APPLICABLE POLICY	DESCRIPTION OF POLICY
	environmental policies, energy efficiency policies, transport policies and industrial policies, amongst others. 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. As part of the analysis four key scenarios were developed, namely the Base Case, Environmental Awareness, Resource Constrained and Green Shoots scenarios: — 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. — 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. — The Resource Constrained Scenario in which global energy commodity prices (i.e. coal, crude oil and natural gas) are high due to limited supply. — 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. 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 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. 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. 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.
National Protected Area Expansion Strategy, 2010	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

APPLICABLE POLICY	DESCRIPTION OF POLICY
	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. On the basis of the Screening Tool output, which identifies "Protected Areas Expansion Strategy" as a factor within the study area, the terrestrial Biodiversity Specialist has assumed that natural areas within the study area fall within this category (Low Priority - Mpumalanga Protected Area Expansion Strategy).

2.3 PROVINCIAL AND MUNICIPAL LEGAL AND REGULATORY FRAMEWORK

Table 2-3: Provincial Plans

APPLICABLE PLAN	DESCRIPTION OF PLAN
Mpumalanga Growth and Development Path	The primary objective of the Mpumalanga Economic Growth and Development Path (MEGDP) (2011) is to foster economic growth that creates jobs, reduce poverty and inequality in the Province. The MEGDP identifies supporting the development of clean forms of energy such as wind and hydro power generation opportunities, as well as opportunities including gas production from landfill and organic waste, as one of the key interventions to facilitate growth and job creation in the manufacturing sector. A focal point of the MEGDP is massive investments in infrastructure as a key driver of job creation across the economy, with alternative energy production identified as one of the key opportunities in the Mpumalanga Economic sectors.
Mpumalanga Spatial Development Framework (MSDF), 2019	The Mpumalanga Spatial Development Framework (SDF) (2019) identifies that tourism is an important economic sector and has emerged as a robust driver of growth for emerging economies. The SDF also notes that a significant portion of Mpumalanga's land area is classified as Moderate to High-Very High agricultural potential which can be utilised for agricultural production. However, there are other factors affecting the agricultural sector including loss of agricultural land to other activities, availability of water, contamination of the water used for irrigation by other economic activities, and access to the market. The SDF further notes that mining is the largest economic sector in the province and has assisted other sectors such as manufacturing and power generation, to grow in the province. However, the mining sector has posed some key challenges, including soil and water contamination and environmental pollution, development of mines on good agricultural soil thus threatening food security, restriction of animal movement due to open cast mining thus affecting the ecosystem etc. It also notes that Mpumalanga's manufacturing plants and coal fired power plants are the key polluters of air, with climate change also identified as a key challenge in the province. Therefore, the province must carefully design interventions that provide a gradual shift from mining oriented sectors to the sustainable economic sectors to maintain sustained growth of the provincial economy. The SDF notes that a significant amount of the country's electricity comes from coal-fired stations in Mpumalanga. It also observes that there is a steady increase in the demand for electricity in the province, mostly attributed to residential, commercial and industrial development, including mining and heavy industry. The Provincial SDF also notes that the abundance of coal has led to the development of many coal-fired power stations in the province, however these coalfields are depleting, therefore making it necessary to consider renewable power sources in Mpumalanga. The SDF also recognises that Mpumalanga's Coal Mining and Coal Fired Power Plant region (mainly the Highveld area) will be under immense pressure for environmental considerations and as a result, the region will witness a possible decline in demand of coal and large-scale employment. The SDF proposes to

APPLICABLE PLAN	DESCRIPTION OF PLAN
	diversify the regional economy and facilitate the gradual transition of economic activities in the region.
Mpumalanga Industrial Development Plan	In terms of industry, the purpose of the Mpumalanga Industrial Development Plan (MIDP) (2015) is to promote the establishment of new industries and promote growth of existing industries in the province. It is however noted that the Msukaligwa Municipality (within which the project falls under) is not directly impacted by the 2025 MIDP and its proposed priority hubs
Mpumalanga Conservation Act (No. 10 of 1998)	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: — Various species are protected; — The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. The Act provides lists of protected species for the Province. According to the Mpumalanga Nature Conservation Act, a permit is required for the removal of any species on this list.

Table 2-4: District and Local Municipality Plans

APPLICABLE PLAN	DESCRIPTION OF PLAN
Gert Sibande Municipality Integrated Development Plan	According to the Municipal Systems Act (Act 32 of 2000) (MSA), all municipalities have to undertake an Integrated Development Plan (IDP) process. The IDP is a legislative requirement thus it has legal status and supersedes all other plans that guide development at local government level. The Gert Sibande Municipality (GSM) IDP Review(2019/ 2020) and Final IDP (2020/2021) has identified the following development priorities: — Municipal Transformation and Organisational Development — Basic Service Delivery and Infrastructure Development — Local Economic Development — Municipal Financial Viability and Management — Good Governance and Public Participation — Spatial Development Analysis and Rationale The main goal and strategic objective of the Basic Service Delivery and Infrastructure Development priority is a reliable and sustainable service. One of the main strategic objectives for reaching the goal is the provision of basic services such as water and electricity to an approved minimum level of standards in a sustainable manner; as per the national guidelines.
Msukaligwa Local Municipality IDP	The Msukaligwa Local Municipality Revised IDP (2020/2021) has identified the following key Municipal priorities: — Revenue collection. — Access to basic services by communities. — Job creation and economic development. — Infrastructure maintenance and upgrading. — Community participation in the affairs of the municipality.

APPLICABLE PLAN	DESCRIPTION OF PLAN
	— Fight against fraud and corruption. — Capable and responsive organizational structure. — Capabilities of the municipal ICT. — Integrated human settlements One of the main strategic objectives for the access to basic services priority is to provide sustainable and reliable services to communities. Most of the basic services are rendered within the municipality, however some rural areas are still faced with some challenges in the provision water, sanitation and electricity. The Municipality, through the IDP, aims to facilitate the provision of electricity, with a number of key projects planned to be implemented over the period of five years linked to the Municipal IDP.
Msukaligwa Spatial Development Framework	The Msukaligwa SDF is informed by a number of spatial objectives, including: — Providing a spatial structure that facilitates access to services for all communities. — Protecting strategic water sources and sensitive eco-systems. — Providing space for the diversification of the local economy. — Eliminating past spatial settlement patterns. The provision of space of the diversification of the local economy is of specific relevance to the proposed development. The SDF highlights the key role and spatial extent of mining in the Msukaligwa Municipality, including reference to the Camden coal-fired power station located in proximity to the proposed development. Over the longer term the rehabilitation of mining areas and a range of alternative peri-urban uses should be considered for the impacted areas in view of the decrease reliance on coal. Commercial Agriculture also represents a key economic activity in the Municipality.

2.4 INTERNATIONAL ENVIRONMENTAL AND SOCIAL STANDARDS

2.4.1 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 2-5.**

Table 2-5: IFC Performance Standards Applicability to the Project

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts			
Overview	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.		
Objectives	— To identify and evaluate environmental and social risks and impacts of the project. — 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. — To promote improved environmental and social performance of clients through the effective use of management systems. — To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately. — 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.		
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 final EIR deliverable from the Scoping and 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 has been compiled during this EIA phase of the project. A formal project specific ESMS will be compiled in the event that the project is developed in the future. Management and monitoring
	1.2	Identification of Risks and Impacts	
	1.3	Management Programmes	
	1.4	Organisational Capacity and Competency	
	1.5	Emergency Preparedness and Response	

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
	1.6	Monitoring and Review	plans outlines in the EMPr will serve as the basis for an ESMS for the proposed Project.
	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	— To promote the fair treatment, non-discrimination, and equal opportunity of workers. — To establish, maintain, and improve the worker-management relationship. — To promote compliance with national employment and labour laws. — 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. — To promote safe and healthy working conditions, and the health of workers. — To avoid the use of forced labour.		
Aspects	2.1	— Working Conditions and Management of Worker Relationship — Human Resources Policy and Management — Working Conditions and terms of Engagement — Workers organisation — Non- Discrimination and Equal Opportunity — Retrenchment — Grievance Mechanism	The construction activities will require contractors for completion. A safe working environment and fair contractual agreements must be in place. The operational phase will have permanent employees for day-to-day activities as well as contractors who will all need a safe working environment and fair contractual agreements. Whilst PS2 will be applicable to the Project, it is not intended to be addressed in detail at the ESIA 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 addition, measures to address the Interim Advice for IFC Clients on Supporting Workers in the Context of COVID-19 are referenced. The EMPr incorporates the requirements for compliance with local and international Labour and Working legislation and good practice on the part of the contractors.
	2.2	— Protecting the Workforce — Child Labour — Forced Labour	
	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.		

REFERENCE	REQUIREMENTS			PROJECT SPECIFIC APPLICABILITY
Objectives	— To avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities. — To promote more sustainable use of resources, including energy and water. — To reduce project related GHG emissions.			
Aspects	3.1	— Policy Resource Efficiency — Greenhouse Gases — Water Consumption		PS3-related impacts, such as the management of construction waste, hazardous substances, and stormwater are assessed in **Section 8** of this report. There are no material resource efficiency issues associated with the Project. The EMPr includes general resource efficiency measures (**Section 6 of Appendix I**). The project is not GHG emissions intensive and a climate resilience study or a GHG emissions-related assessment is not deemed necessary for a project of this nature. However, the Camden I WEF seeks to facilitate resource efficiency and pollution prevention by contributing to the South African green economy. Dust air pollution in the construction phase has been adequately addressed in the EMPr (**Section 6** (**Air Quality Management**) **of Appendix I**). The Project will not result in the release of industrial effluents. Potential pollution associated with sanitary wastewater is low and mitigation measures have been included in the EMPr. Land contamination of the site from historical land use (i.e. low intensity agricultural / grazing) is not considered to be a cause for concern. The waste generation profile of the project is not complex. Waste mitigation and management measures have been included in EMPr. 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 identifies these anticipated hazardous materials and recommends relevant mitigation and management measures. 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 identifies these anticipated hazardous materials and recommends relevant mitigation and management measures (**Section 6 of Appendix I**).
	3.2	— Pollution Prevention — Air Emissions — Stormwater — Waste Management — Hazardous Materials Management — Pesticide use and Management		
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	— 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. — 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.			
Aspects	4.1	— Community Health and Safety — Infrastructure and Equipment Design and Safety — Hazardous Materials Management and Safety — Ecosystem Services		The requirements included in PS 4 have been addressed in this S&EIA process and the development of the EMPr. 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 have been qualitatively evaluated in the S&EIA process and the clients' standard safety and security measures, as well as potential

REFERENCE		**REQUIREMENTS**	**PROJECT SPECIFIC APPLICABILITY**
		— Community Exposure to Disease — Emergency Preparedness and Response	additional measures recommended by WSP, is detailed in the EMPr (**Section 6** and **Section 7.9 of Appendix I**).
	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.		
Objectives	— To avoid, and when avoidance is not possible, minimise displacement by exploring alternative project designs. — To avoid forced eviction. — 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. — To improve, or restore, the livelihoods and standards of living of displaced persons. — To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.		
Aspects	5.1	— Displacement — Physical Displacement — Economic Displacement — Private Sector Responsibilities under Government Managed Resettlement	PS5 is not applicable to the proposed Camden I WEF as no physical or economic displacement or livelihood restoration will be required. The proposed Camden I WEF 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. The Camden I WEF, including all its associated infrastructure and roads, will only excludes 0.8% of the total farmland from potential agricultural production. All agricultural activities are able to continue unaffectedly on all parts of the farmland other than this small agricultural footprint and the actual loss of production potential is therefore insignificant.
Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources			
Overview	Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.		
Objectives	— To protect and conserve biodiversity. — To maintain the benefits from ecosystem services. — To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.		
Aspects	6.1	Protection and Conservation of Biodiversity	A part of the Project Area falls within CBAs (Irreplaceable and Optimal) and a large wetland area adjacent and to the north of the Vaal River (near the southern part of the site) is mapped as an ESA. A Biodiversity Impact Assessment as well as an Avifaunal Impact Assessment and Freshwater Ecology Impact Assessment have been included in the EIA scope, **Appendix H-4** and **H-2** of this EIR respectively.

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
			These specialist assessments comprise of a combination of literature review, in-field surveys and sensitivity mapping, as well as the assessment of impacts on biodiversity associated with the proposed project. This substantively complies with the PS 6 general requirements for scoping and baseline assessment for determination of biodiversity and ecosystem services issues, as well as the risks and impacts identification process requirements. The determination of habitat sensitivity was undertaken within the legal and best practice reference framework for South Africa. Specific mitigation and management measures for alien invasive species control are included in the EMPr (**Section 6** (**Biodiversity Management**) and **Section 7.2 of Appendix I)**.
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	— To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples. — 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. — To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner. — 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. — 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. — To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.		
Aspects	7.1	General — Avoidance of Adverse Impacts — Participation and Consent	As per the international instruments under the United Nations (UN) Human Rights Conventions, no indigenous peoples are present within the study area. The Project does not involve displacement. PS7 will not be triggered.
	7.2	Circumstances Requiring Free, Prior, and Informed Consent — Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use — Critical Cultural Heritage — Relocation of Indigenous Peoples from Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use	
	7.3	Mitigation and Development Benefits	
	7.4	Private Sector Responsibilities Where Government is	

REFERENCE	REQUIREMENTS		PROJECT SPECIFIC APPLICABILITY
		Responsible for Managing Indigenous Peoples Issues	
Performance Standard 8: Cultural Heritage			
Overview	Performance Standard 8 recognizes the importance of cultural heritage for current and future generations.		
Objectives	— To protect cultural heritage from the adverse impacts of project activities and support its preservation. — To promote the equitable sharing of benefits from the use of cultural heritage.		
Aspects	8.1	Protection of Cultural Heritage in Project Design and Execution	A Heritage Impact Assessment Report (**Appendix** Error! Reference source not found.) has been carried out by a suitably qualified specialist, revealing that no archaeological sites of significance were noted, and finds were limited to several ruins and graves recorded in the Project area. Based on the current layout, none of the recorded sites will be directly impacted on. A Chance Find Procedure has been included in the EMPr (**Section 7.13.1 of Appendix I)**.

2.4.2 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:

- *Wind Energy (August 2015)* **-** The EHS Guidelines for wind energy include information relevant to environmental, health, and safety aspects of onshore and offshore wind energy facilities. It should be applied to wind energy facilities from the earliest feasibility assessments, as well as the environmental impact assessment, and continue to be applied throughout the construction and operation phases

  The guidelines list issues associated with wind energy facilities which need to be considered. These include:

  - Environmental impacts associated with the construction, operation, and decommissioning of wind energy facilities activities may include, among others, impacts on the physical environment (such as noise or visual impact) and biodiversity (affecting birds and bats, for instance).
  - Due to the typically remote location of wind energy facilities, the transport of equipment and materials during construction and decommissioning may present logistical challenges (e.g., transportation of long, rigid structures such as blades, and heavy tower sections).
  - Environmental issues specific to the construction, operation, and decommissioning of wind energy projects and facilities include the following:

  - Landscape, Seascape, and Visual impacts;
  - Noise;
  - Shadow Flicker; and
  - Water Quality.
- *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 form 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.

2.4.3 EQUATOR PRINCIPLES

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 2-6**.

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 2-6: Requirements and Applicability of the Equator Principles

REQUIREMENT		PROJECT SPECIFIC APPLICABILITY
Principle 1: Review and Categorisation		
Overview	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. Using categorisation, the EPFI's environmental and social due diligence is commensurate with the nature,	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 addressed through mitigation measures.

REQUIREMENT		PROJECT SPECIFIC APPLICABILITY
	scale, and stage of the Project, and with the level of environmental and social risks and impacts. The categories are: — Category A: Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented; — 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 — Category C: Projects with minimal or no adverse environmental and social risks and/or impacts.	
Principle 2: Environmental and Social Assessment		
Overview	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. 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 risks or impacts identified during the categorisation process. The client is expected to include assessments of potential adverse Human Rights impacts and climate change risks as part of the ESIA or other Assessment, with these included in the Assessment Documentation.	This document is the final deliverable (i.e. final EIR) from the S&EIA process undertaken for the proposed Project. The assessment appropriately and comprehensively assessed the key environmental and social impacts and complies with the requirements of the South African EIA Regulations and this Principle. In addition, an EMPr has been compiled and is included in **Appendix I**. A formal project specific ESMS will be compiled in the event that the project is developed in the future. Management and monitoring plans outlined in the EMPr will serve as the basis for an ESMS for the proposed Project.
Principle 3: Applicable Environmental and Social Standards		
Overview	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. 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.	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&EIA process has been undertaken in accordance with NEMA (the host country's relevant legislation).

REQUIREMENT		PROJECT SPECIFIC APPLICABILITY
	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.	
Principle 4: Environmental and Social Management System and Equator Principles Action Plan		
Overview	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). 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.	A formal project specific ESMS will be compiled in the event that the project is developed in the future. Management and monitoring plans outlined in the EMPr will serve as the basis for an ESMS for the proposed Project.
Principle 5: Stakeholder Engagement		
Overview	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 Affected Communities, the client will conduct an Informed Consultation and Participation process. 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. 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. All Projects affecting Indigenous Peoples will be subject to a process of Informed Consultation and Participation, and will need to comply with the rights and protections for Indigenous Peoples contained in relevant national law, including those laws implementing host country obligations under international law.	The S&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, and a range of government sector stakeholders (state owned enterprises, national, provincial and local departments). 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. The stakeholder engagement process is detailed in **Section 4.3.**
Principle 6: Grievance Mechanism		
Overview	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	The EMPr includes a *Grievance Mechanism Process for Public Complaints and Issues* (**Section 7.15.1 of Appendix I**). This procedure effectively allows for

REQUIREMENT		PROJECT SPECIFIC APPLICABILITY
	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. 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.	external communications with members of the public to be undertaken in a transparent and structured manner.
Principle 7: Independent Review		
Overview	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.	This principle will only become applicable in the event that that the project is developed in the future.
Principle 9: Independent Monitoring and Reporting		
Overview	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.	This principle will only become applicable in the event that the project is developed in the future.

3 SCOPING PHASE SUMMARY

3.1 PROCEDURAL PROCESS

The application form was compiled and submitted to the DFFE on **22 February 2022**. An updated application form was submitted to the DFFE on **08 April 2022**. Furthermore, an amended application form was submitted with the draft EIR on 06 September 2022, as the listed activity applicability descriptions were updated as requested by DFFE. It must be noted that the technical details have been updated in the project description of the Final EIR. As such, an amended/updated application form is being included in the submission of this Final EIR. This is however only an update to the technical details and not a change/update to the listed activities.

The DFFE reference number allocated to this application is **14/12/16/3/3/2/2137**. This reference number will appear on all official correspondence with the authorities and the public regarding the Proposed Project. A copy of the acknowledgement of receipt of the application is included in **Appendix F**.

The Draft Scoping Report (DSR) was released for public review between 25 February and 28 March 2022. Subsequently the scoping report was finalised and submitted to the DFFE on 08 April 2022 for their review and approval. The submission of the final scoping report was within 44 days of receipt of the application by the DEA as required by GNR 982.

The approval of the Final Scoping Report (FSR) and the plan of study for the environmental impact assessment was received on 24 May 2022 (letter dated, 23 May 2022) and is included in **Appendix G**.

The draft EIR was released for public review between 07 September 2022 to 10 October 2022.

3.2 AUTHORITY CONSULTATION

A pre-application meeting was held on 19 October 2021 with the DFFE in order to discuss the proposed project. The minutes of this meeting are included in **Appendix K**. In addition, WSP notified a number of commenting authorities of the Proposed Project via a notification letter, these included:

- DMRE;
- DFFE: Biodiversity and Conservation;
- MDARDLEA;
- DWS;
- Vaal WMA Authority;
- SAHRA;
- MHRA;
- MTPA;
- CAA;
- ATNS;
- DD (SA Army);
- AMA;
- SAWS;
- SANRAL;
- Gert Sibande District Municipality;
- Msukaligwa Local Municipality; and
- Dr Pixley Ka Seme Local Municipality.

WSP received comments on the DSR from the DFFE on 29 March 2022. The comments and responses have been outlined in **Table 3-1** and included in the SER (**Appendix D**). In addition to the above, WSP received comments on the FSR from the DFFE on **20 May 2022** (letter dated, 19 May 2022), and on the Draft EIR on 06 October 2022. The comments and responses have been outlined in **Table 3-2** and **Table 3-3**, respectively, and included in the SER (**Appendix D**). A request for extension to the submission deadline of the FEIR was submitted to the DFFE in terms of EIA Regulation 3(7). A 60-day extension was approved on 24 June 2022. According to the extension approval letter, the new deadline for submission of the FEIR is 02 November 2022.

Table 3-1: Comments received from the DFFE regarding the DSR

COMMENT	RESPONSE
Listed Activities The Department has noted that activity 14 of Listing Notice 1 and activity 10 of Listing Notice 3 are applied for as it relates to the installation of Battery Energy Storage System (BESS). Therefore, you are required to indicate whether the BESS will be assembled on site or pre-assembled. Additionally provide reasons for applying for the above mentioned activity even though the BESS is not regarded as a facility or infrastructure for the storage or storage and handling of a dangerous goods. In addition, it is noted that fuel, cement and chemical storage onsite will be greater than $80m^3$ but not exceeding 500m3. As such, please ensure that the environmental impacts of fuel, cement and chemical storage are fully assessed and mitigation measures are provided.	WSP can now confirm that the BESS components will be pre-assembled and not assembled on site. Therefore, reference to the BESS in Activity 14 of Listing Notice 1 and Activity 10 of Listing Notice 3 has been removed from the amended application to be submitted with the FSR. Furthermore, WSP confirm that the environmental impacts of fuel, cement and chemical storage will be fully assessed during the EIA phase (see Section 6.7 of the FSR) and mitigation measures will be provided in the EMPr.
It has been noted that words such as should have been used in the description of the portion of the proposed project to which the applicable listed activity relates. Please refrain from using these words.	WSP can confirm that the use of the word “Should” has been removed from the application form and the description of the portion of the proposed project to which the applicable listed activity relates.
The Department has noted that activities 12, 27 and 28 of Listing Notice 1 and activities 12, 14, 18 and 23 of Listing Notice 3 are applied for as it relates to the footprint of the access road and non-linear activities and the application form on page 12 of 37 indicated that the total footprint will be confirmed once final design have been provided/subject to finalisation based on technical, final design and environmental requirements. Please ensure that clarity regarding the total footprint of the access road and non-linear activities are included in the final SR and as well as the amended application form as confirmation of the activities triggered by the proposed development.	WSP can confirm that clarity regarding the total footprint of the access roads and non-linear activities have been included in the FSR and the amended application form as confirmation of the activities triggered by the proposed development.
It is noted that activity 30 of Listing Notice 1 has been applied for and the motivation is that the ‘facility infrastructure is located within, and will require vegetation clearance or disturbance of, Eastern Highveld Grassland”, etc. It is unclear as to which process or activity identified in terms of Section 53(1) of NEM:BA is required. As such, you are requested to clarify or provide information regarding the process or activity identified in terms of NEM:BA.	WSP confirm that the development will be located within the Eastern Highveld Grassland, Eastern Temperate Freshwater Wetlands and Chrissiesmeer Panveld. All three ecosystems are confirmed to be listed in the National List of Ecosystems that are Threatened and in Need of Protection (as indicated in GNR 1002 of 9 December 2011). Due to the fact that these ecosystems are listed as threatened it is assumed that various threatened or protected species may be found within the development area. The restricted activity of “cutting, chopping off, uprooting, damaging or destroying, any specimen” has been identified in terms of NEM:BA and is therefore applicable to the vegetation clearance that will be required to construct the development. In light of this, Activity 30 is considered applicable. WSP can confirm that protected species have been identified on site and are listed in the Terrestrial Ecology Scoping Study included in Appendix I of the FSR. Furthermore, the associated impacts on threatened and protected species will be assessed during the EIA Phase,

COMMENT	RESPONSE
	and relevant mitigation and management measures provided in the EMPr.
Please ensure that all relevant listed activities are applied for, are specific and can be linked to the development activity or infrastructure as described in the project description. In addition, the onus is thus on the applicant and the Environmental Assessment Practitioner (EAP) to ensure that all the applicable listed activities are included in the application. Failure to do so may result in unnecessary delays in the processing of the application.	WSP can confirm that all relevant listed activities have been applied for. Furthermore, the descriptions of applicability in the amended application form and Table 3-1 of the FSR are specific and have been linked to the development activity or infrastructure as described in the project description.
If the activities applied for in the application form differ from those mentioned in the final SR, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following link https://www.environment.gov.za/documents/forms	Although the activities do not differ, WSP can confirm that an amended application form has been submitted as the activity applicability descriptions have been updated as requested. WSP can confirm that the most recent application form template has been utilised.
BESS Alternative Page 6 of 37 of the application form included BESS as part of the component for the proposed development and trigger listed activity 14 of LN 1 and activity 10 of LN 3 is included on page 12 and 15 of 37. However, it has been noted on page 31 of the DSR that BESS technologies such as Lithium Battery Technologies, such as Lithium Iron Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology, however the specific technology will only be determined following Engineering, Procurement, and Construction (EPC). Therefore, you are advised to assess the risk associated with the technologies and indicate how impacts will be minimised.	WSP can confirm that the risks associated with the BESS technologies will be assessed through a Qualitative Risk Assessment to be undertaken in the EIA phase. This study will also indicate how impacts will be minimised.
Further note that the preferred alternative for the BESS must be clearly determined and give clear information on whether the BESS will be assembled on site or pre-assembled for this project.	WSP can confirm that the risks associated with the BESS technologies will be assessed through a Qualitative Risk Assessment to be undertaken in the EIA phase. This study will also indicate how impacts will be minimised. The preferred alternative for the BESS will be identified during the EIA phase.
Alternatives Appendix 7: Locality Map highlights 2 location alternatives for the substation and BESS, however they are not discussed in report. Please provide a description of any identified alternatives for the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives will have on the environment and on the community that may be affected by the activity as per Appendix 2 of GN R.982 of 2014 (as amended).	WSP can confirm that two location alternatives for the substation and BESS have been identified. Both alternatives are considered feasible and reasonable with no apparent advantages and disadvantages. Additional text to this effect has been included in Section 2.5 of the FSR as required. Both alternatives will be assessed during the EIA Phase where the preferred alternative will be confirm.
Alternatively, you should submit written proof of an investigation and motivation if no reasonable or feasible alternatives exist in terms of Appendix 2.	WSP can confirm that two location alternatives for the substation and BESS have been identified. Both alternatives are considered feasible and reasonable with no apparent advantages and disadvantages. Additional text to

COMMENT	RESPONSE
	this effect has been included in Section 2.5 of the FSR as required. Both alternatives will be assessed during the EIA Phase where the preferred alternative will be confirm.
Public Participation Process Please ensure that all issues raised and comments received during the circulation of the draft SR from registered I&APs and organs of state (including this Department's Biodiversity and Protected Areas Section), which have jurisdiction in respect of the proposed activity are adequately addressed in the final SR.	WSP can confirm that all issues raised and comments received during the circulation of the draft SR from registered I&APs and organs of state have been included in the SER and adequately addressed and responded to. WSP can confirm that comments from the Biodiversity Directorate of the DFFE were received and are included in the SER. Furthermore, consultation with the Protect Areas Directorate has been undertaken and they will be provided with a copy of the FSR. Any further comments from these two DFFE Directorates received post submission of the FSR will be considered and adequately addressed during the EIA Phase.
Proof of correspondence with the various stakeholders must be included in the final SR. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	Proof of correspondence with the various stakeholders is included in Appendix B and Appendix D of the SER.
The Public Participation Process must be conducted in terms of Regulations 39, 40 41, 42, 43 & 44 of the EIA Regulations 2014, as amended.	WSP confirm that the Public Participation Process is being conducted in terms of Regulations 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014, as amended.
A comments and response trail report (C&R) must be submitted with the final SR. The C&R report must incorporate all historical comments for this development. The C&R report must be a separate document from the main report.	WSP can confirm that all issues raised and comments received during the circulation of the draft SR from registered I&APs and organs of state have been included in a comment and response report included in Section 2.3 of the SER. WSP can confirm that the SER will also be submitted as a separate report.
Please refrain from summarising comments made by I&APs. All comments from I&APs must be copied verbatim and responded to clearly. Please note that a response such as "Noted" is not regarded as an adequate response to I&AP's comments.	WSP confirm that all comments from I&APs have been copied verbatim and responded to clearly. Furthermore the response "Noted" has not been utilised.
The final SR must provide evidence that all identified and relevant competent authorities have been given an opportunity to comment on the proposed development particularly the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA), South African Heritage Resources Agency (SAHRA), the District and Local Municipalities.	WSP confirms that the FSR provides evidence that all identified and relevant competent authorities have been given an opportunity to comment on the proposed development including Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA), South African Heritage Resources Agency (SAHRA), the District and Local Municipalities.
Layout & Sensitivity Maps A copy of the layout and environmental sensitivity map must be submitted with the final SR and all available biodiversity information must be used in the finalisation of these maps.	A layout (Figure 2.2) and environmental sensitivity map (Figure 5-30) have been included in the FSR
The layout map must indicate the following: — Positions of the solar facility and all associated infrastructure (includes the coordinates of each infrastructure);	A layout map of the development is included in Figure 2-2 of the FSR. This layout map will be updated as require in the EIA phase. Please note that corridors have been included for

COMMENT	RESPONSE
— All supporting onsite infrastructure e.g. roads (existing and proposed); — Permanent laydown area footprint; — Substation(s) and/or transformer(s) sites including their entire footprint; — Proposed infrastructure related to the proposed development; — Connection routes (including pylon positions) to the distribution/transmission network; and — All existing infrastructure on the site.	the connection routes as pylon positions will only be confirmed subject to micro-siting and final design.
The environmental sensitivity map must indicate the following: — The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected; — Buffer areas; and — All "no-go" areas.	An environmental sensitivity map (Figure 5-30) has been included in the FSR
The above layout maps must have a clear legend with information communicating with that on the map, be overlain with the sensitivity map which shows neighbouring energy developments and existing grid infrastructure.	WSP can confirm that both the layout and sensitivity map have clear legends. Furthermore, both maps include the relevant requested information.
According to the Biodiversity map on page 102 of the DSR, he proposed development is located within the Protected Area National Park, Nature Reserve, CBA irreplaceable and other natural areas. You are required to provide details of the National Park or Nature Reserve and other natural areas. Furthermore, proof of approval in terms of Section 50 of NEM:PA obtained before submission of the application of the proposed development must be submitted with the final SR.	The Protected Area reference on page 102 of the DSR refers to the Langcarel Private Nature Reserve. It has been confirmed that this Nature Reserve was gazetted with no 3256 of 1967 and notice 61. This reserve is however noted as having farming activity present, and is currently managed actively and entirely for livestock and crop agriculture. The management and land use thereof is therefore inconsistent with the Private Nature Reserve status and has not, and continues to not be, managed and utilised as a private nature reserve. The landowner further disputes the nature reserve status of the properties and intends to utilise any suitable legal avenues available to continue operation of the properties for the current land use of agriculture, in conjunction with the planned Renewable Energy land use subject to this application. WSP can confirm that the relevant approval is being obtained in terms of Section 50 of NEM:PAA. As agreed during the consultation meeting dated 31 March 2022 with the Competent Authority, this approval will be available during the course of the EIA phase. The minutes of the meeting have been included in Appendix C-2 of this SER.
It has been noted that the location of the proposed development is situated in an area with CBA, natural areas, Eastern Highveld Grassland, which is endangered and or vulnerable. Therefore, you are required to explain why the site is considered suitable for the proposed development.	It should be noted that even though the development is located within the vulnerable Eastern Highveld Grassland, the conditions on site are not considered pristine. The proposed development area is largely utilised for agricultural activities with large portions being cultivated, and others subject to cattle grazing. Section 2.6 of the FSR outlines the need and desirability of the project which includes the benefits of the location close to the Camden Power Station and ash dump including other collieries in the area, which has been listed for decommissioning in the coming years. The location of the development will also allow for the use of the existing power transmission infrastructure that would otherwise become defunct post decommissioning.

COMMENT	RESPONSE
	The terrestrial ecologist notes that the project study area consists largely of natural habitat within a rural area. Currently, the rates of transformation within the vegetation in this general region is moderately high, although on-site habitats have not been transformed to as high degree as surrounding areas. The ecologist further noted that it is possible that sensitive habitats on site can be minimised or avoided with the application of appropriate mitigation or management measures, and therefore that the development is not considered fatally flawed and should be subjected to further study in accordance with the specialist Plan of Study. Subsequently, the layout of the development will be updated such that high sensitivity areas and buffers are avoided as far as possible in consideration of the specialist sensitivity findings. Considering all of the above and in conjunction with layout consideration of the highly sensitive areas determined by the ecological specialist, suitable area within the Eastern Highveld Grassland habitats may be utilised towards development.
The delineated water-bodies (Figure 5-15) on page 92 of the DSR indicate the sensitive areas with buffer according to the legend, however, the buffers of those areas are not indicated on the map. Please ensure that the legend of the maps are clear and communicate with the details of the maps	It must be noted that the sensitive areas reflected on Figure 5-16 outline the relevant delineated surface water structure inclusive of the buffer, thereby indicating that the surface water body together with the buffer is considered the sensitive area. The legend therefore correctly communicates the detail of the map and is inclusive of the buffer.
According to figure 5-13, the site is located within the Freshwater Ecosystem Priority Areas (FEPA), therefore, you are required to indicate the impacts of the area by the proposed development.	Potential impacts on the Aquatic Environment are indicated in Section 6.5 of the FSR. These impacts will be assessed during the EIA Phase.
Specialist Assessments The EAP must ensure that the terms of reference for all the identified specialist studies must include the following: — A wake loss effect (study) must be undertaken for the proposed development, taking into consideration other similar development in the area that will be affected by the proposed development	WSP can confirm that only the proposed Camden II Wind Energy Facility is considered potentially affected by the proposed development. However, the proposed Camden II Wind Energy Facility is: — Submitted by the same proponent (via respective SPVs) and therefore will not be impacting on a second or third party, as none are currently known to have EIA applications underway. — Located ~ 5.2kms towards the south-east of the proposed Camden I Wind Energy Facility (this application). Through the use of the DFFE web-based environmental screening tool as well as the Environmental Geographical Information System (E-GIS), WSP have confirmed that there are no similar projects within 30km radius of the development to date.
— A detailed description of the study's methodology; indication of the locations and descriptions of the development footprint, and all other associated infrastructures that they have assessed and are recommending for authorisation.	WSP can confirm that the specialist studies to be undertaken in the EIA phase will be undertaken in line with Appendix 6 of the EIA Regulations, 2014, as amended, or as required under the gazetted specialist protocols (GNR 320 of 20 March 2020 and GNR 1150 of

COMMENT	RESPONSE
	30 October 2020). Therefore, the requested information will be included.
— Provide a detailed description of all limitations to the studies. All specialist studies must be conducted in the right season and providing that as a limitation will not be allowed.	All relevant specialist assumptions and limitations have been included Section 1.6. These will be updated as required during the EIA Phase.
— Please note that the Department considers a 'no-go' area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads is allowed in the 'no-go' areas.	WSP acknowledge the DFFE's definition of 'No-go' areas. No-go areas will be re-evaluated and assessed during the EIA phase, based on further specialist field assessments. Where specialist definitions of 'no-go' areas differ from the Department's definition; these will be clearly indicated.
— Should the specialist definition of 'no-go' area differ from the Department's definition; this must be clearly indicated. The specialist must also indicate the 'no-go' area's buffer if applicable.	To date, specialists have clearly indicated where it is suitable for linear infrastructure (water pipelines, roads, powerline infrastructure etc.) to traverse a no-go area where required.
— All specialist studies must be final, and provide detailed/practical mitigation measures for the preferred alternative and recommendations, and must not recommend further studies to be completed post EA.	All specialist studies to be appended to the Final EIA Report will be final. Specialist reports will provide detailed/practical mitigation measures for the preferred alternative and recommendations and will not recommend further studies to be completed post EA with the exception of pre-construction walkthroughs, search and rescue and micro-siting. The Specialist Studies will sufficiently inform the EA decision phase.
— Should a specialist recommend specific mitigation measures, these must be clearly indicated.	All specific mitigation measures, will be clearly indicated and included in the EMPr during the EIA Phase.
— Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and were necessary, include further expertise advice.	In the EMPr, WSP will clearly indicate the most reasonable recommendation and substantiate this with defendable reasons should any specialist recommendations be contradictory. To date no contradictory recommendations have been received.
— It is further brought to your attention that Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes (as per the Screening Report), 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"), have come into effect. Please note that specialist assessments must be conducted in accordance with the requirements of these protocols.	WSP can confirm that the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes (as per the Screening Report), 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") are being considered as applicable.
— In addition, the Specialist Declaration must also indicate the name of scientific organisation/council and member number and the status of the registration/membership of each specialist.	Specialist Declarations included in the FSR do indicate the name of scientific organisation/council and member number and the status of the registration/membership of each specialist.
Cumulative Impact Assessment Should there be any other similar projects within a 30km radius of the proposed development site and or in this case all the proposed Camden Energy Facilities, the cumulative impact assessment for all identified and assessed impacts must be refined to indicate the following:	Through the use of the DFFE web-based environmental screening tool as well as the Environmental Geographical Information System (E-GIS), WSP have confirmed that there are no similar projects within 30km radius of the development to date. WSP confirm that cumulative impacts will be considered in the EIA phase.

COMMENT	RESPONSE
— Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.	This will be re-affirmed during the EIA Phase.
— Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project.	This information will be included in the EIA Report to be compiled in the EIA Phase, along with the related impact and cumulative assessments, and concluding remarks.
— The cumulative impacts significance rating must also inform the need and desirability of the proposed development.	This information will be included in the EIA Report to be compiled in the EIA Phase, along with the related impact and cumulative assessments, and concluding remarks.
— A cumulative impact environmental statement on whether the proposed development must proceed.	This information will be included in the EIA Report to be compiled in the EIA Phase, along with the related impact and cumulative assessments, and concluding remarks.
Environmental Management Programme (EMPr) Ensure that the generic EMPr is submitted for the management of impacts of the substation that will be constructed as part of this development.	This information will be included in the EMPr to be compiled in the EIA Phase.
The EMPr for the facility must comply with the requirements of Appendix 4 in the EIA Regulation, as amended.	WSP confirm that the EMPrs to be submitted in the EIA phase, will comply with the requirements of Appendix 4 in the EIA Regulation, as amended
Specific comments You are requested to submit the application form signed by both the Environmental Assessment Practitioner (EAP) and the Applicant. The application form must be submitted with the final SR.	WSP confirm that a signed amended application form will be submitted with the FSR
General You are further reminded to comply with Regulation 21(1) of the NEMA EIA Regulations 2014, as amended, which states that: *"If S&EIR must be applied to an application, the applicant must, within 44 days of receipt of the application by the competent authority, submit to the competent authority a scoping report which has been subjected to a public participation process of at least 30 days and which reflects the incorporation of comments received, including any comments of the competent authority"*	WSP confirms that the FSR will be submitted to the DFFE within 44 days of the receipt of the application, in line with the regulated timeframes.
You are further reminded that the final SR to be submitted to this Department must comply with all the requirements in terms of the scope of assessment and content of Scoping report in accordance with Appendix 2 and Regulation 21(1) of the EIA Regulations 2014, as amended.	WSP confirm that the FSR complies with all the requirements in terms of the scope of assessment and content of Scoping report in accordance with Appendix 2 and Regulation 21(1) of the EIA Regulations 2014, as amended. Please refer to Table 1-5 of the final Scoping Report for the checklist against the regulatory requirements.
Further note that in terms of Regulation 45 of the EIA Regulations 2014, as amended, this application will lapse if the applicant fails to meet any of the timeframes prescribed in	WSP notes that the application will lapse if the applicant fails to meet any of the timeframes prescribed in terms of these Regulations.

COMMENT	RESPONSE
terms of these Regulations, unless an extension has been granted in terms of Regulation 3(7).	
You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an Environmental Authorisation being granted by the Department.	WSP and the Applicant take note of this reminder.

Table 3-2: Comments received from the DFFE regarding the Final Scoping Report

COMMENT	RESPONSE
Listed Activities There are discrepancies identified regarding to the listed activities and sub-activities as well as the description of the activities in the application form and FSR that really need to be addressed. In the comments dated 25 March 2022, you were advised to ensure that only relevant listed activities are applied for, are specific and can be linked to the development activity or infrastructures as described in the project description. For instance, activity 24 of Listing Notice 1 description of the portion of the proposed project to which the applicable listed activity relates is not clear whether this activity is applicable to the proposed development. This is the responsibility of the EAP to ensure only relevant information is included in the report. Please ensure the EIAr address all the listed activities applied for.	The Listed Activities captured in the Final Scoping Report and amended Application Form were as set out in the relevant Listing Notices. However, based on this comment, these have been further evaluated and updated accordingly. It can be confirmed that only the applicable activities and sub-activities have been included in the draft EIR and amended Application Form, to ensure that the relevant sub-activities triggered by the project are applied for. Please refer to Section 2.1 of the draft EIR for the updated description of the activities and sub-activities applicable to the proposed development.
For activity 12 of Listing Notice 1, you are required to provide the total footprint of the proposed infrastructure in square meters.	WSP can confirm that the total physical footprint has been provided in square metres as required, and has been updated accordingly in the relevant Listed Activity contained in Section 2.1 as well as the amended Application Form.
The CA has noted that activity 14 of Listing Notice 1 and 10 of Listing Notice 3 are applied for as it relates to the infrastructure for the storage or storage and handling of a dangerous goods, in which fuel, transformer oil, cement and chemical storage onsite will be greater than $80m^3$ but not exceeding $500m^3$. As such, please ensure that the environmental impacts of fuel, cement and chemical storage are fully assessed, and mitigation measures are provided.	Please note that based on the comments on the FSR, the following Listed Activity has been removed in the EA Application and draft EIR: — GNR 985: *Activity 10 - 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 30 but not exceeding 80 cubic metres.* The Listed Activity is considered not applicable as the capacities for the dangerous goods will exceed the threshold listed in Activity 10, and the capacities fall within the ambit of a similar Listed Activity of higher threshold (i.e., Activity 14 of GNR 983). WSP can confirm that the risks associated with the storage and handling of hazardous materials/dangerous goods have been assessed through a Qualitative Risk Assessment undertaken as part of the EIA phase for this project. The Risk Assessment provides detailed preventative and mitigation measures for potential impacts associated with dangerous goods. Furthermore, the EMPr (included in Appendix I of this draft EIR) identifies anticipated impacts associated with

COMMENT	RESPONSE
	hazardous materials and recommends relevant mitigation and management measures.
The above-mentioned activities have been applied for as it relates to BESS as will require the storage and handling of dangerous goods should it be assembled on site. Please ensure relevant activities related to BESS are applied for only if this activity is triggered.	WSP can confirm that the BESS components will be pre-assembled and not assembled on site. Therefore Activity 14 of Listing Notice 1 and Activity 10 of Listing Notice 3 included in the amended application form submitted with the FSR referred to the storage and handling of dangerous goods, including fuel, cement and chemical storage onsite. These Listed Activities will not be triggered by the proposed BESS, as the function of the battery is not for storage or storage and handling of a dangerous good, but rather a storage facility for the electricity generated by the renewable energy facility (Camden I WEF). Activity14 of Listing Notice 1, applied for and included in the draft EIR does **not** relate to the BESS. As stated above, please note that based on the comments on the FSR, the listed activities initially applied for have been reviewed. The following Listed Activity, applicable to the storage and handling of dangerous goods, has been removed in the EA Application and draft EIR: — GNR 985: *Activity 10 - 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 30 but not exceeding 80 cubic metres.* The Listed Activity is considered not applicable as the capacities for the dangerous goods (including fuel, cement and chemical storage) will exceed the threshold listed in Activity 10, and the capacities fall within the ambit of a similar Listed Activity of higher threshold (i.e., Activity 14 of GNR 983). Therefore, only Activity 14 of GNR 983 is considered applicable, as it applies to this activity, and the Application Form and draft EIR Section has been updated accordingly
For activity 19 of Listing Notice 1, it has been indicated on page 12 of 35 of the application form in describing the activity that the exact value will be confirmed once the final design is provided. Please ensure that this activity is applied for, only if it is triggered by the proposed development.	The proposed project will likely require the excavation, removal or moving of more than $10m^3$ of soil from aquatic features (with buffers included) for the required access roads or underground cables. It is however important to note that the overall Camden I WEF layout has avoided the delineated systems inclusive of the calculated buffers recommended by the Aquatic Specialist. The only exception is the required road crossings that have been specifically designed to use existing track and/or roads (i.e., areas that are already impacted), however these may require installation of larger culvert structures to allow for large crane access. As a result, this Activity is applied for.
It has been mentioned in Activities14, 24 and 48 of LN 1 as well as Activity 10 of LN 3 to mention the few, that details will be confirmed once the final design, BESS will require storage and handling of dangerous goods should it be assembled on site. Therefore, please ensure the details are provided in the final report and relevant activities triggered are applied for.	WSP can confirm that the BESS components will be pre-assembled and not assembled on site. Therefore Activity 14 of Listing Notice 1 and Activity 10 of Listing Notice 3 included in the amended application form submitted with the FSR referred to the storage and handling of dangerous goods, including fuel, cement and chemical storage onsite. These Listed Activities will not be triggered by the

COMMENT	RESPONSE
	proposed BESS, as the function of the battery is not for storage or storage and handling of a dangerous good, but rather a storage facility for the electricity generated by the renewable energy facility (Camden I WEF). It is important to note that a detailed project description, particularly exact specifications of the project components will be based on the approved scope of EPC Contractor and cannot be confirmed at this stage. It has been confirmed by the Proponent that the total combined storage capacity on site will not exceed 500 cubic metres. The following approximate, estimated maximum capacities of dangerous good will be stored on site: — Concrete Batching: ~145 m^3 — Fuel stores (Petrol and/or Diesel): ~250 m^3 — Paint, grease, transformer oils, construction chemicals, lubricants: ~100m^3 A condition to this effect has been incorporated into the EMPr for consideration during final design phase and site establishment. Please note that based on the comments on the FSR, the listed activities initially applied for have been reviewed. The following Listed Activity, applicable to the dangerous goods activities referred to in this comment, has been removed in the EA Application and draft EIR: — GNR 985: *Activity 10 - 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 30 but not exceeding 80 cubic metres.* The Listed Activity is considered not applicable as the capacities for the dangerous goods will exceed the threshold listed in Activity 10, and the capacities fall within the ambit of a similar Listed Activity of higher threshold (i.e., Activity 14 of GNR 983). Therefore, only Activity 14 of GNR 983 is considered applicable, as it applies to this activity, and the Application Form and draft EIR Section has been updated accordingly.
Please ensure that all relevant listed activities are applied for, are specific and can be linked to the development activity or infrastructure as described in the project description. In addition, the onus is thus on the applicant and the environmental assessment practitioner (EAP) to ensure that all the applicable listed activities are included in the application. Failure to do so may result in unnecessary delays in the processing of the application.	The listed activities applied for have been further revised in the draft EIR to ensure that only applicable activities and sub-activities have been applied for. The following listed activities are considered no longer applicable and are thus no longer included in the Application and draft EIR: — GNR 983: *Activity 27 - The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation* — GNR 985: *Activity 10 - 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 30 but not exceeding 80 cubic metres.* These have been removed either because the capacities fall within the ambit of a similar Listed Activity of higher threshold, and/or the thresholds noted in the Listed

COMMENT	RESPONSE
	Activities will be exceeded and the activity is applied for in a similar Listed Activity. Furthermore, the descriptions of applicability have been updated and are specific (where possible) and have been linked to the development activity or infrastructure as described in the project description. Please refer to Section 2.1 of the draft EIR for the updated description of the proposed project to which the applicable listed activity relates.
If the activities applied for in the application form differ from those mentioned in the final EIAr, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following link https://www.environment.gov.za/documents/forms.	The listed activities initially applied for have been further revised in the draft EIR to ensure that only applicable activities and sub-activities have been applied for. WSP can confirm that an amended Application Form has been submitted as the activity applicability descriptions have been updated as requested in these comments. WSP can confirm that the most recent application form template has been utilised.
Project Description It is noted that the project description in the application form and FSR are not the same. For instance, page 7 of the application form included the following components "**fencing and lighting, lightning protection, telecommunication infrastructure, storm water channels, water pipelines, offices, operational control centre, Operation and Maintenance Area / Warehouse / workshop, Ablution facilities, a gate house, control centre, offices, warehouses, security building, a visitor's centre; and substation building**", whereas the FSR does not includes the aforementioned components. Please ensure that the project description in the application and draft EIAr (including the final EIAr) are the same prior submitting to the CA for consideration.	Please note that based on the comments on the FSR, the description of infrastructure has been updated accordingly on the draft EIR to reflect the description in the Application Form. Please refer to Section 5 of the Application Form, as well as Section 6.3 of the draft EIR.
The project description given on page 14 of 37 (application form) for listed activity 1 of Listing Notice 2, is that "*wind energy facility that will generate up to 210MW of electricity*", however on page 6 of 37, it is mentioned that "*the proposed Camden I WEF will be developed with a capacity of up to 200MW*". You are requested to submit the correct information in the draft EIA report. In addition, page 14 of the application form refers to 200MW and page 30 of the FSR refers to 210MW. Please clarify these discrepancies before submitting the draft EIAr to the CA.	The proposed Camden I WEF will be developed with a capacity of up to 200 MW. WSP can confirm that this has been updated accordingly in the amended Application Form and draft EIR.
It is noted that listed activity 14 of Listing Notice 1 and activity 10 of Listing Notice 3 are applied for as it relates to the infrastructure for the storage and handling of dangerous goods, in which fuel, transformer oil, cement and chemical storage onsite will be greater than 80m³ but not exceeding 500m³. However, section 5 of the application form on page 6 to 7 of 37 and FSR does not provide any description of the infrastructure for the storage and handling of dangerous goods. As such. You	Please note that based on the comments on the FSR, the listed activities initially applied for have been reviewed. Consequently, Listed Activity 10, referred to in this comment, has been removed in the EA Application and draft EIR. Therefore, only Activity 14 of GNR 983 is considered applicable, as it applies to this activity, and the Application Form and draft EIR Section has been updated accordingly.

COMMENT	RESPONSE
are requested to provide the exact type and capacity of the dangerous goods applicable to the proposed development.	With regards to the description of infrastructure on the Application Form, additional text to this effect has been included in Section 5 of the Application Form, as well as in section 6.3 of the draft EIR. It has been confirmed by the Proponent that the total combined storage capacity on site will not exceed 500 cubic metres. The following approximate, estimated maximum capacities of dangerous good will be stored on site: — Concrete Batching: ~145 m^3 — Fuel stores (Petrol and/or Diesel): ~250 m^3 — Paint, grease, transformer oils, construction chemicals, lubricants: ~100m^3 A condition to this effect has been incorporated into the EMPr for consideration during final design phase and site establishment.
BESS Alternative Page 6, 7, 12 and 15 of 37 of the application form, BESS has been mentioned as part of the component for the proposed development. Page 30 of the FSR indicated the technology related to BESS and further highlighted that specific technology will only be determined following Engineering, Procurement, and Construction (EPC) procurement. Therefore, you are advised to be clear of the technology preferred in the final report and ensure assessment of the risk associated with the technology and indicate how impacts will be minimised.	The Proponent is considering two types of preferred battery technologies for the BESS. These are Vanadium Redox flow technologies and Lithium battery technologies. WSP can confirm that the risks and/or impacts associated with the two preferred technologies being considered have been assessed through a Qualitative Risk Assessment undertaken as part of the EIA phase for this project. The Risk Assessment provides detailed preventative and mitigation measures for potential impacts associated with each preferred technology. The preferred technology, from a technical and financial perspective, is Lithium battery technologies (Solid State Lithium (SSL)), however both SSL and the redox flow batteries are considered reasonable and feasible. Alternatives have been reviewed and the preferred alternatives are provided in the Alternatives Section of the draft EIR (Section 6.5). The Qualitative Risk Assessment is included in Appendix H-12 of the draft EIR. All mitigation measures recommended in the various Specialist studies for this project, including those applicable to the BESS, have been incorporated into the EMPr. Both BESS technologies were assessed, and no fatal flaws were identified. However, the SSL technology is preferred.
Alternatives Appendix 7: Locality Map highlights 2 location alternatives for the substation and BESS, however they are not discussed in report. Please provide a description of any identified alternatives for the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives will have on the environment and on the community that may be affected by the activity as per Appendix 2 of GN R.982 of 2014 (as amended). Alternatively, you should submit written proof of an investigation and motivation if no reasonable or feasible alternatives exist in terms of Appendix 2.	It must be noted that Section 2.5.3 of the Final Scoping Report outlined a conceptual layout of the turbine positions and associated WEF components. Two alternative locations (Alternative 1 and Alternative 2) were identified for the on-site substation, which include the BESS. These were considered based on environmental screening, site accessibility, distance to existing grid connection and technical connection requirements, topography etc and were both considered feasible and reasonable. Alternative 2 was considered the preferred alternative during the Scoping phase as it provides the shorter connection to the preferred collector substation.

COMMENT	RESPONSE
	The conceptual layout, including the two locations for the BESS and on-site substation, was assessed by the relevant Specialists during the Scoping Phase. The relevant Specialist studies mapped out sensitive areas to be avoided or mitigated through the planning process. Based on the Specialist findings, a revised layout was developed to avoid sensitive features and buffer areas where possible and mitigate against overall impact. The amended layout reflected a reduced number of turbine positions and amended placement, and changes to the location of some of the associated infrastructure (including the BESS and on-site substation). The optimised/revised layout was taken forward for further Specialist assessments during the EIA Phase. A description of the location alternatives associated with the project, as well as the advantages and disadvantages associated with the layout/location alternatives have now been included in Section 6.5 of the EIR. Site alternatives have also been assessed and the preferred alternatives outlined (that is as per Specialist input) in the Alternatives Assessment section of the draft EIR (Section 10.5).
Public Participation Please ensure that all issues raised, and comments received during the circulation of the draft report from registered I&APs and organs of state (**including this Department's Biodiversity and Protected Areas Section**), which have jurisdiction in respect of the proposed activity are adequately addressed in the final EIAr.	WSP can confirm that all issues raised and comments received during the circulation of the DSR and draft EIR, as well as those received on the FSR, from registered I&APs and organs of state (including those mentioned in this comment) have been and will be included in the final EIR and adequately addressed and responded to.
Proof of correspondence with the various stakeholders must be included in the final EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	Proof of correspondence with the various stakeholders is included in Appendix B and Appendix D of the SER (Appendix D), and will be included in the final EIR.
The Public Participation Process must be conducted in terms of Regulations 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014, as amended.	WSP confirm that the Public Participation Process is being conducted in terms of Regulations 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014, as amended.
A comments and response trail report (C&R) must be submitted with the final EIAr. The C&R report must incorporate all historical comments for this development. The C&R report must be a separate document from the main report.	WSP can confirm that all issues raised and comments received thus far from registered I&APs and organs of state have been included in a comment of response report included in Section 2.3 of the SER. WSP can confirm that the SER will be submitted as a separate report.
Please refrain from summarising comments made by I&APs. All comments from I&APs must be copied verbatim and responded to clearly. Please note that a response such as "Noted" is not regarded as an adequate response to I&AP's comments.	WSP can confirm that all comments from I&APs have been and will continue being copied verbatim and responded to clearly. Furthermore, the response "Noted" has not been utilised.
The final EIAr must provide evidence that all identified and relevant competent authorities have been given an opportunity to comment on the proposed development particularly the **Mpumalanga Department of Agriculture, Rural**	WSP can confirm that the draft and final EIR will provide evidence that all identified and relevant authorities have been given an opportunity to comment on the proposed development including Mpumalanga Department of

COMMENT	RESPONSE
Development, Land and Environmental Affairs (MDARDLEA, Mpumalanga Tourism and Parks Agency (MTPA), Langcarel Private Nature Reserve, South African Heritage Resources Agency (SAHRA) and the District and Local Municipalities.	Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA), Mpumalanga Tourism and Parks Agency (MTPA), Langcarel Private Nature Reserve (Management Authority i.e., Landowner), South African Heritage Resources Agency (SAHRA), the District and Local Municipalities.
Layout & Sensitivity Maps A copy of the layout and environmental sensitivity map must be submitted with the final EIAr and all available biodiversity information must be used in the finalisation of these maps.	A conceptual layout map (Scoping Phase), as well as the optimised/revised layout map (EIA Phase) have been included in the draft EIR. This layout map will be updated as required in the final EIR phase. A revised layout and environmental sensitivity map is included in Figure 6-2 and Figure 10-11 , respectively, of the draft EIR.
The layout map must indicate the following: — Positions of the wind turbines and all associated infrastructure; — All supporting onsite infrastructure e.g. roads (existing and proposed); — Permanent laydown area footprint; — Substation(s) and/or transformer(s) sites including their entire footprint; — Proposed infrastructure related to the proposed development; — Connection routes (including pylon positions) to the distribution/transmission network; and — All existing infrastructure on the site.	The revised layout and environmental sensitivity map included in **Figure 10-11** of the draft EIR includes all the relevant detail as required in this comment. Please note that corridors have been included for the connection routes as pylon positions will only be confirmed subject to micro-siting and final design.
The environmental sensitivity map must indicate the following: — The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected; — Buffer areas; i.e., 1km of the Protected Area, etc, and — All "no-go" areas.	A consolidated environmental sensitivity map has been compiled based on the sensitivities and buffers outlined in the relevant specialist studies. Please refer to **Figure 10-11** of the draft EIR for the relevant sensitivity map. It is however important to note that the part of the shown as a Protected Area is not being managed as a nature reserve and a separate process is underway to have it (or part thereof) de-proclaimed as part of ongoing province-wide reserve verification efforts by the provincial authorities. According to the Terrestrial Biodiversity Report, assuming that this area would no longer be treated as a conservation area, the landscapes inside this boundary have been allocated to conservation plan categories that most closely match the surrounding areas and the buffer area would not be applicable. It is therefore assumed that any areas of natural habitat within the "Protected Area" (i.e. excluding any modified areas) would have been designated as CBA1, the next-highest category. This is on the basis that these areas are within two different listed ecosystems (Chrissiesmeer Panveld, listed as Endangered, and Eastern Highveld Grassland, listed as Vulnerable) and it is likely that the conservation planning process would have counted these areas as secured before searching for additional "Irreplaceable" sites. This categorization was used to define sensitivities on site (described in the Terrestrial Biodiversity Report (Appendix H-4)).
The above layout map must have a **clear legend with information communicating with that on the map**, be	WSP can confirm that both the layout (Figure 6-2) and sensitivity map (Figure 10-11)have clear legends.

COMMENT	RESPONSE
overlain with the sensitivity map which shows neighboring energy developments.	Furthermore, both maps include the relevant requested information.
According to information contained on page 89 of the FSR, the aquatic environment for the study area has a very high sensitivity due to presence of Wetlands, Critical Biodiversity Areas (CBA), Freshwater Ecosystem Priority Areas (FEPA) (as depicted on figure 5-14), therefore, you are required to indicate impacts of the area by the proposed development.	During the EIA phase of the assessment, the Aquatic Specialist, has assessed potential impacts associated with the proposed project and layout with the Aquatic Biodiversity Protocol in mind. Identified impacts include loss of very high sensitivity systems, namely the wetlands through physical disturbance. Detailed mitigation measures to avoid these sensitive features and/or reduce the potential overall impact and risk to Aquatic resources have been recommended. Please refer to Appendix H-5 of this EIR for the Aquatic Impact Assessment, as well as the EMPr (Appendix I) and Section 8.6 of this EIR.
It has been mentioned that development layout map will be confirmed in the EIA phase. Please ensure it considers the buffers of the sensitive areas.	The Proponent has revised the project layout based on findings and input in terms of sensitivity and associated buffer recommendations from the relevant Specialists during Scoping phase. Detailed maps indicating the revised layout and sensitivity are included in Figure 6-2 and Figure 10-11, respectively, of this draft EIR.
Figure 8 in the Terrestrial assessment report shows the boundary of the site on the northern side adjacent to the Protected Area National Park and Nature Reserve. However, the legend provided does not show the buffer of the Protected Area National Park and Nature Reserve. Please ensure the final layout shows the buffer of the aforesaid Protected Area National Park and Nature Reserve in relation to the area earmarked for the development.	It should be noted that the area shown as a Protected Area (Langcarel Nature Reserve) (proclaimed in 1967) is not being managed as a nature reserve and a separate process is underway to have it deproclaimed as part of ongoing province-wide reserve verification efforts by the provincial authorities. No evidence was observed on site of any conservation activities during the Terrestrial Ecology field assessment. Furthermore, The MTPA has submitted a letter to the Department (letter dated, 20 June 2022) of the intent to issue a notice to withdraw the declaration of the Langcarel Private Nature Reserve in terms of the Mpumalanga Nature Conservation Act (Act No. 10 of 1998). Subject to successful completion of the withdrawal of the declaration of the Private Nature Reserve status, the concept of a buffer zone around this area will not be applicable. The Terrestrial biodiversity Specialist has stated that; assuming that this area would no longer be treated as a conservation area, the landscapes inside this boundary have been allocated to conservation plan categories that most closely match the surrounding areas and the buffer area would not be applicable. It is therefore assumed that any areas of natural habitat within the "Protected Area" (i.e. excluding any modified areas) would have been designated as CBA1, the next-highest category. This is on the basis that these areas are within two different listed ecosystems (Chrissiesmeer Panveld, listed as Endangered, and Eastern Highveld Grassland, listed as Vulnerable) and it is likely that the conservation planning process would have counted these areas as secured before searching for additional "Irreplaceable" sites. This categorization was used to

COMMENT	RESPONSE
	define sensitivities on site (described in the Terrestrial Biodiversity Report (Appendix H-4)).
Specialist Assessments The following Specialist Assessments will form part of the EIAr: — Soils and Agricultural Potential Assessment; — Archaeological and Cultural Heritage Assessment; — Palaeontology Impact Assessment; — Visual Impact Assessment; — Biodiversity Impact Assessment (inclusive of terrestrial biodiversity, plant species and animal species); — Freshwater Assessment; — Avifauna Impact Assessment; — Bat Impact Assessment; — Environmental Acoustic (Noise) Impact Assessment; — Social Impact Assessment; — Qualitative Risk Assessment (specific to the BESS); — Desktop Geotechnical Assessment; and — Desktop Traffic Assessment.	WSP can confirm that the Specialist Assessments, as outlined in this comment, have been included as part of the EIR. Please refer to Appendix H of the EIR for the relevant Specialist Reports.
It is further brought to your attention that Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes (as per the Screening Report), 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"), have come into effect. Please note that specialist assessments must be conducted in accordance with the requirements of these protocols. For instance, **RFI, Landscape (wind) and Flicker Themes** were rated as very high sensitive by the screening report dated 14 September 2021. These studies are not included in the studies to be undertaken in the EIA phase.	WSP can confirm that all applicable Specialist Assessments were conducted in line with the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes (as per the Screening Report), 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"). A Visual Impact Assessment (VIA) (Appendix H-10)was undertaken as part of the S&EIA process relating to the Camden I WEF. In assessing visual sensitivity, consideration was given to the Landscape and Flicker Themes of the National Environmental Screening Tool. It must be noted that the Sensitivity Analysis undertaken by the Visual Specialist states that although the Screening Tool identifies significant areas of very high landscape and flicker sensitivity, the site sensitivity verification exercise conducted in respect of the Assessment found little evidence to support this sensitivity rating. The sensitivity rating for this site is heavily influenced by the Langcarel Private Nature Reserve which is identified in the South African Protected Areas Database. As stated however, the area is entirely managed for commercial agriculture with no conservation activities present and no evidence of public access to the site. Any landscape value or visual appeal has therefore been reduced. Accordingly, the site is not subject to the usual visual / landscape sensitivity associated with nature reserves. In addition, the desktop topographic assessment of the area did not indicate the presence of mountaintops, *high* ridges or any significantly steep slopes. This assessment, confirmed by the Specialist field investigation, showed the presence of a few ridges in

COMMENT	RESPONSE
	a largely undulating landscape. The sensitivity analysis has recognised these ridges and identified the higher ridges as zones where development would be least preferred (Figure 27 of VIA report). A Radio Frequency Interference (RFI) Study will not be undertaken as part of the S&EIA process. The proposed development area is not located within any Astronomy Advantage Area. The South African Weather Service (SAWS) and relevant telecommunications stakeholders have been included on the projects database (Appendix D of this SER) as a key stakeholder for the Public Participation Process. Furthermore, the Project Developer has engaged SAWS towards confirmation of any RFI impact of the proposed Camden developments. SAWS have issued a letter in this respect, (dated, 27/07/2022) as confirmation of engagements with the Applicant. The letter stipulates that further engagements between SAWS and the Developer are underway as a separate process to the EIA, in order to determine mutually acceptable solution/s.
The EAP must ensure that the terms of reference for all the identified specialist studies must include the following: — A detailed description of the study's methodology; indication of the locations and descriptions of the development footprint, and all other associated infrastructures that they have assessed and are recommending for authorisation.	WSP can confirm that the specialist studies have been undertaken in line with Appendix 6 of the 2014 EIA Regulations, as amended, or, where relevant, in line with the gazetted specialist protocols of GNR 320 and GNR 1150. All specialist studies include a detailed description of the methodologies, project infrastructure descriptions and locations and recommendations for authorisations.
— Provide a detailed description of all limitations to the studies. All specialist studies must be conducted in the right season and providing that as a limitation will not be allowed.	All specialist assessments include applicable limitations to the studies, as well as the timing/season of the field survey, where applicable, and relevance thereof to the studies/assessments.
— Please note that the Department considers a 'no-go' area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads is allowed in the 'no-go' areas.	WSP acknowledge the DFFE's definition of 'No-go' areas. The relevant specialist assessments have indicated 'No-go' areas, as well as areas where it is suitable for linear infrastructure (water pipelines, roads, powerline infrastructure etc.) to traverse a no-go area where required. Where specialist deviations or qualifications are applicable, these have been noted in the Specialist Conclusions (also captured in Section 10.3 of the EIR).
— All specialist studies must be final, and provide detailed/practical mitigation measures for the preferred alternative and recommendations, and must not recommend further studies to be completed post EA.	All specialist studies conducted have been included in Appendix H of the EIR. The Specialist studies include detailed mitigation measures to prevent or avoid adverse impacts on the receiving environment, which have been incorporated into the EIR and EMPr. The Specialist recommendations and conclusions are included in Section 10.3 of this EIR. There are no recommendations or requirements from the Specialists to conduct further studies post EA. The Terrestrial Biodiversity Specialist has recommended a walk-through survey of footprint areas prior to the commencement of construction. The Avifauna Specialist has also recommended a pre-construction

COMMENT	RESPONSE
	inspection (avifaunal walk-through) to identify SCC that may be breeding within the infrastructure footprints.
— Should a specialist recommend specific mitigation measures, these must be clearly indicated.	Recommendations and mitigation measures provided by the relevant specialists have been included in the Draft EIR (Section 8) and EMPr (Section 6 and 7 of Appendix I).
Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and were necessary, include further expertise advice.	The specialists have not specified contradicting recommendations. All recommendations are aligned and are considered practical and able to be implemented.
— It has been noted that the conclusions by the Terrestrial Ecological specialist on page 56 with the use of the word "**may**" and the Aquatic specialist on page 30 highlighting that "once the layout design has been finalised, the EIA phase of the assessment will continue" indicate that at this stage, adequate assessment has not been undertaken and the area is not determined if it is suitable for the proposed development. Therefore, ensure detailed assessment is undertaken and submitted in the final report.	This comment is noted and relates to the Specialist inputs (reports) for the Scoping Phase of the proposed WEF project. Once the FSR was approved the proposed WEF project proceeded into a detailed EIA phase which involved detailed specialist assessments. WSP can confirm that detailed assessments (including terrestrial biodiversity and aquatic assessments) have been undertaken during the EIA Phase of the proposed WEF and the specialist assessments area included the draft EIR (this report).
— It has also been noted that the location of the proposed development is situated in an area with Eastern Highveld Grassland, which is listed as Threatened Ecosystem under NEMA. Therefore, you are required to explain why the site is considered suitable for the proposed development and specialists' findings must be considered while addressing this issue.	According to the Terrestrial Biodiversity Assessment, the proposed turbine layout, consisting of 37 turbines, has a small footprint area, and those natural areas that are affected are generally in relatively poor condition due to overgrazing. The Specialist has calculated that the entire project, including a 3m buffer area around all proposed infrastructure for possible edge effects, only affects a total of 65 hectares of natural habitat of a total of 3222 hectares of natural habitat on site (approximately 2%). The entire project has a total footprint area (all sensitivity classes) of around 115 hectares within a site that is 6712 hectares in size. The project therefore has a very small footprint area which results in an insignificant impact. Furthermore, in terms of the assessed terrestrial impacts, the extent of the impact on the loss of indigenous natural vegetation is negligible. On this basis, the Biodiversity Specialist deems the project as acceptable from a terrestrial biodiversity perspective and recommends that Environmental Authorisation is granted.
According to the Biodiversity map on page 102 of the FSR, part of the proposed development site is located within the protected area identified in terms of NEM:PAA. Therefore, proof of approval in terms of Section 50 of NEM:PAA obtained and submitted with the draft EIAr.	It is noted that there is a proclaimed conservation area on site, the Langcarel Private Nature Reserve. This area has not been managed as a protected area and has undergone similar levels of degradation as surrounding areas due primarily to overgrazing, but also partially due to alien invasive plants. In addition, no conservation management activities were evident on site during the Terrestrial Biodiversity field assessment. This pattern of over-utilization affects all grasslands on site, resulting in them being in moderate to poor condition. The habitat has been used for livestock production and is impacted by this landuse. It is therefore the terrestrial Biodiversity Specialist's opinion on the basis of the current land use and levels of modification, that the private nature reserve does not align with the objective and purpose of the protected area status. It is important to note that the Project

COMMENT	RESPONSE
	Proponent is engaging with the MTPA and the Management Authority (Landowner/s) to investigate the best way forward regarding the Langcarel Nature Reserve. The MTPA has undertaken a site visit on 01 June 2022. The MTPA has furthermore submitted a letter to the Department (letter dated, 20 June 2022) of the intent to issue a notice to withdraw the declaration of the Langcarel Private Nature Reserve in terms of the Mpumalanga Nature Conservation Act (Act No. 10 of 1998). Available information on the Nature Reserve (i.e., de-proclamation or removal of Nature Reserve status) and/or relevant approval (i.e., Section 50 Approval where applicable) will be submitted to the Department once available, possibly together with the FEIR.
Cumulative Impact Assessment The cumulative impacts of the proposed development must be undertaken as per the requirements of the EIA Regulations. Should there be any other similar projects within a 30km radius of the proposed development site, the cumulative impact assessment for all identified and assessed impacts must be refined to indicate the following: — Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e., hectares of cumulatively transformed land. — Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. — The cumulative impacts significance rating must also inform the need and desirability of the proposed development. — A cumulative impact environmental statement on whether the proposed development must proceed.	In assessing the cumulative impacts of the proposed Camden I WEF, renewable energy projects within a 30km radius of the proposed project, that have received an EA or have a Basic Assessment (BA) or EIA process in progress have been considered. Through the use of the DFFE web-based environmental screening tool as well as the Environmental Geographical Information System (E-GIS), WSP have confirmed that there are no similar projects within 30km radius of the development to date. Therefore, with the exception of the other proposed Camden developments forming part of the Camden Renewable Energy Complex, no other renewable energy projects within a 30km radius have been considered in this S&EIA process. Please refer to Section 9 of this EIR for the assessment of the cumulative impacts associated with the proposed development. The specialists assessments also include a detailed assessment of the identified cumulative impacts associated with the proposed Camden I WEF, as detailed in the relevant specialist reports.
You are required to provide wake loss risks (wake effects) posed by this development and measures to mitigate those risks.	WSP can confirm that only the proposed Camden II Wind Energy Facility is considered potentially affected by the proposed development. However, the proposed Camden II Wind Energy Facility is: Submitted by the same proponent (via respective SPVs) and therefore will not be impacting on a second or third party, as none are currently known to have EIA applications underway. Located ~ 5.2kms towards the south-east of the proposed Camden I Wind Energy Facility (this application). Through the use of the DFFE web-based environmental screening tool as well as the Environmental Geographical Information System (E-GIS), WSP have confirmed that there are no similar projects within 30km radius of the development to date. Considering only the Camden II Wind Energy Facility is considered potentially affected by the proposed development, and both applications (Camden I and II

COMMENT	RESPONSE
	Wind Energy Facilities) are being submitted by the same applicant, as well as the large distance between the planned site, zero to negligible wake influence is anticipated between the two proposed WEFs. Furthermore, should any wake effects be realised between the two WEFs, the impact thereof will be considered acceptable given both are proposed by the same proponent (via respective SPVs) and therefore loss will only be applicable to one party. Given the above, and the negligible wake loss effects potentially applicable, no wake loss assessment is considered meaningful for this application.
Issues regarding S50 approval in terms of NEM: PAA In the comments dated 25 March 2022, you were advised to obtain approval in terms of S50 of NEM: PAA to be submitted with the FSR, considering that Section 50 (5) of NEM: PAA says that "no development, construction or farming may be permitted in a nature reserve without written approval of the management authority". It is the opinion of the Department that this refers to the buffer of the Protected Area. Therefore, you are advised to obtain approval to be submitted with the final report. In terms of the listed activities applied for, it has been confirmed that the site partly falls within the protected area identified in terms of NEMPAA. Hence, in the comments dated 25 March 2022, you were advised to obtain approval in terms of S50 of NEM: PAA to be submitted with the FSR, considering that Section 50 (5) of NEM: PAA says that "no development, construction or farming may not be permitted in a nature reserve without written approval of the management authority".	At the time of lodging the Application for EA together with the DSR submission, the Landowner of the project properties declared as Private Nature Reserve (Langcarel Nature Reserve) was not aware of the Protected Area status of the properties. In addition, the Terrestrial Biodiversity Report did not confirm the proclamation status of the Nature Reserve. However, comments received on the DSR from the Mpumalanga Tourism and Parks Agency (MTPA) confirmed the gazetting of the Langcarel Nature Reserve. Furthermore, discussions with the DFFE Protected Areas Directorate, the Management Authority (Landowner) of the area declared as a Private Nature Reserve, as well as the MTPA were undertaken in confirming the validity of the Protected Area, as well as the requirements of approval in terms of Section 50 of NEMP:AA. It is important to note that the Project Proponent is engaging with the MTPA and the Management Authority (Landowner/s) to investigate the best way forward regarding the Langcarel Nature Reserve. The MTPA has undertaken a site visit on 01 June 2022. The MTPA has furthermore submitted a letter to the Department (letter dated, 20 June 2022) of the intent to issue a notice to withdraw the declaration of the Langcarel Private Nature Reserve in terms of the Mpumalanga Nature Conservation Act (Act No. 10 of 1998). Subject to successful completion of the withdrawal of the declaration of the Private Nature Reserve status, a Section 50 approval is not applicable for this project. Available information on the Nature Reserve (i.e., de-proclamation or removal of Nature Reserve status) will be submitted to the Department once available, possibly together with the FEIR.
During the meeting held on 31 March 2022, you indicated that the landowner is not aware that the site is located within the Nature Reserves. However, in the description of how the activities applied for are listed or triggered, you indicated that Portion 1 and 2 of Welgelegen No 322 are partly located in a declared Langcarel Private Nature Reserve. Considering the above, the argument provided that the terrestrial ecologist considers the area as protected by error and that the landowner is not aware that the site is located within/partly within the Nature Reserve is not valid. In addition, MTPA mentioned in their comments dated 25 March 2022, that the site is located within the Nature Reserve. You were further advised (by DFFE: Protected Area officials) that comments from MTPA would not be disregarded, therefore, this matter must be addressed accordingly prior submission of the EIA report, to	At the time of lodging the Application for EA together with the DSR submission, the Landowner of the project properties declared as Private Nature Reserve (Langcarel Nature Reserve) was not aware of the Protected Area status of the properties. In addition, the Terrestrial Biodiversity Report did not confirm the proclamation status of the Nature Reserve. However, comments received on the DSR from the Mpumalanga Tourism and Parks Agency (MTPA) confirmed the gazetting of the Langcarel Nature Reserve. Furthermore, discussions with the DFFE Protected Areas Directorate, the Management Authority (Landowner) of the area declared as a Private Nature Reserve, as well as the MTPA were undertaken in confirming the validity of the Protected Area, as well as

COMMENT	RESPONSE
determine whether the site falls within the Nature Reserve or not in order to obtain S50 approval in terms of NEM: PAA for any development on site, to be submitted with the report.	the requirements of approval in terms of Section 50 of NEMP:AA. It is important to note that the Project Proponent is engaging with the MTPA and the Management Authority (Landowner/s) to investigate the best way forward regarding the Langcarel Nature Reserve. The MTPA has undertaken a site visit on 01 June 2022. The MTPA has furthermore submitted a letter to the Department (letter dated, 20 June 2022) of the intent to issue a notice to withdraw the declaration of the Langcarel Private Nature Reserve in terms of the Mpumalanga Nature Conservation Act (Act No. 10 of 1998). Subject to successful completion of the withdrawal of the declaration of the Private Nature Reserve status, a Section 50 approval is not applicable for this project. Available information on the Nature Reserve (i.e., de-proclamation or removal of Nature Reserve status) will be submitted to the Department once available, possibly together with the FEIR.
It has been noted that even in the FSR compiled by you as an EAP on page 42, when describing the activity, you indicated that the facility is partly located within a National Protected Area Expansion Strategy Focus area a and within 5km of Portion 1 & 2 of Farm No. 322 (Welgelegen), which are a declared Private Nature Reserve (Langcarel Private Nature Reserve) under the Game Ordinance, 1949 (No. 23 of 1949) and the Native Flora Protection Ordinance, 1940 (No. 9 of 1940). Therefore, you are required to provide proof that the site is not located within the Nature Reserve or affected by such.	
Considering that the gazette dated 15 February 1967 (Gazette No 3256) confirmed that the area falls within the Nature Reserve, this shows that detailed investigation was not undertaken by the EAP on behalf of the Applicant, confirming that the site falls within the Nature Reserve.	
Environmental Management Programme (EMPr Ensure that generic EMPr is submitted for the management of impacts of the infrastructure related to the transmission and distribution of energy.	The generic EMPr for the Development and Expansion of Substation Infrastructure for the Transmission and Distribution of Electricity has been included for the Camden I WEF onsite substation. Please refer to Appendix D of the EMPr (Appendix I).
A construction and operational phase EMPr that includes mitigation and monitoring measures must be submitted with the final EIAr.	This comment is noted and has been complied with. The EMPr (Appendix I) for the proposed project has been compiled in accordance with the requirements of Appendix 4 and will be submitted with this EIR The mitigation measures and monitoring measures recommended by the relevant specialists during the construction and operational phases of the Camden I WEF have been included in the EMPr.
Additional Information Should there be a similar project in a close proximity, in terms of Appendix 2 (1) (h) (k) of the NEMA EIA Regulations 2014, as amended, you are required to provide information on the potential wake effects of the proposed development.	WSP can confirm that only the proposed Camden II Wind Energy Facility is considered potentially affected by the proposed development. However, the proposed Camden II Wind Energy Facility is: — Submitted by the same proponent (via respective SPVs) and therefore will not be impacting on a second or third party, as none are currently known to have EIA applications underway. — Located ~ 5.2kms towards the south-east of the proposed Camden I Wind Energy Facility (this application). Through the use of the DFFE web-based environmental screening tool as well as the Environmental Geographical Information System (E-GIS), WSP have confirmed that there are no similar projects within 30km radius of the development to date. Considering only the Camden II Wind Energy Facility is considered potentially affected by the proposed development, and both applications (Camden I and II Wind Energy Facilities) are being submitted by the same applicant, as well as the large distance between the planned site, zero to negligible wake influence is anticipated between the two proposed WEFs.

COMMENT	RESPONSE
	Furthermore, should any wake effects be realised between the two WEFs, the impact thereof will be considered acceptable given both are proposed by the same proponent (via respective SPVs) and therefore loss will only be applicable to one party. Given the above, and the negligible wake loss effects potentially applicable, no wake loss assessment is considered meaningful for this application.
General The applicant is hereby reminded to comply with the requirements of Regulation 45 of GN R982 of 04 December 2014, as amended, regarding the time allowed for complying with the requirements of the Regulations.	The reminder to meet timeframes stipulated Regulation 45 of GN R982 of 04 December 2014, as amended, is noted. An extension request, in terms of the provision within EIA Regulation 3(7), has been submitted to the Department and subsequently approved for extension to the submission deadline of the FEIR by 60 days
You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an environmental authorisation being granted by the Department.	WSP and the Applicant take note of this reminder.

Table 3-3: Comments received following the release of the Draft EIA Report

COMMENT	RESPONSE
Project Description You are requested to provide in the table format all the technical details for the proposed development specifying the description and/or dimensions of each. Page 6 of 35 of the application form and page 125 of the draft EIAr refers to **up to 37 wind turbines**. Please ensure that the final EIAr **specify the exact number of wind turbines** to be developed.	The Final EIR has been updated to adhere to this comment. Please refer to Section 6 of the EIR for the summary of the technical details in a table format (Table 6-2).
Listed Activities Please ensure that all relevant listed activities are applied for, are specific and can be linked to the development activity or infrastructure as described in the project description. Only activities applicable to the development must be applied for and assessed.	WSP can confirm that following comments from the Department on the FSR, the listed activities for the proposed project were evaluated and updated accordingly. Only the applicable activities triggered by the proposed development have now been applied for (Section 2.1).
If the activities applied for in the application form differ from those mentioned in the final EIAr, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following link https://www.environment.gov.za/documents/forms.	WSP can confirm that the amended Application Form submitted with the Draft EIR contains the same activities as those included in the Final EIR.

Specialist Assessments It is acknowledged that specialists undertaken for the proposed development considered the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation, which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. "the Protocols"), and in Government Notice No. 1150 of 30 October 2020 (i.e. protocols for terrestrial plant and animal species. You are advised to ensure that specialist assessments to be included in the final EIAr are conducted in accordance with these protocols unless proof is provided to demonstrate that the specialist assessments were commissioned prior to 50 days after the promulgation of GN 320 and after promulgation of GN1150 (30 October 2020).	WSP can confirm that all applicable Specialist Assessments were conducted in line with the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes (as per the Screening Report), 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").
Cumulative Assessment Should there be any other similar projects within a 30km radius of the proposed development site, the cumulative impact assessment for all identified and assessed impacts must be refined to indicate the following: — Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e., hectares of cumulatively transformed land. — Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. — The cumulative impacts significance rating must also inform the need and desirability of the proposed development. — A cumulative impact environmental statement on whether the proposed development must proceed.	In assessing the cumulative impacts of the proposed Camden I WEF, renewable energy projects within a 30km radius of the proposed project, that have received an EA or have a Basic Assessment (BA) or EIA process in progress have been considered. It is noted that there is a proposed Wind Energy Facility (Ummbila Emoyeni), located within 28 – 32km from the Camden I WEF. Information on the proposed Ummbila Emoyeni WEF was obtained during the 30-day review period of the Draft EIR for this project. The Final EIR and Specialist studies for this project (Camden I WEF) has thus considered the proposed Ummbila Emoyeni WEF in the Cumulative Impact Assessment. The Department's guiding principle (this comment) on the cumulative impact assessment is duly noted and has been adhered to. Please refer to Section 9 of this EIR for the assessment of the cumulative impacts associated with the proposed development. The specialist assessments also include a detailed assessment of the identified cumulative impacts associated with the proposed Camden I WEF, as detailed in the relevant specialist reports. Where applicable, the specialist reports include an addendum as to whether the proposed Ummbila Emoyeni WEF will have a significant impact on the environmental aspects assessed for the Camden projects.
It has been noted in the draft EIAr that only Camden II will be near the proposed development and are initiated by the same proponent, therefore, you are advised to consider similar development that maybe proposed in the 30km radius excluding Camden II.	It is noted that there is a proposed Wind Energy Facility (Ummbila Emoyeni), located beyond a 30km radius of the Camden II WEF. Information on the proposed Ummbila Emoyeni WEF was obtained during the 30-day review period of the Draft EIR for this project. The Final EIR and Specialist studies for the Camden II WEF has thus considered the proposed Ummbila Emoyeni WEF in the Cumulative Impact Assessment.

Layout & Sensitivity Maps A copy of the layout and environmental sensitivity map must be submitted with the final EIAr, and all available biodiversity information must be used in the finalisation of these maps.	Based on the Department's comments on the Draft EIR, the layout and environmental sensitivity maps have been updated to reflect the relevant requirements of the comments contained in this section (Layout & Sensitivity Maps). The updated layout map and environmental sensitivity map is included in Figure 6-2 and Figure 10-11 of the Final EIR. Please note that following completion of the pre-construction bird monitoring programme (August 2020 – September 2021 for Camden I WEF and July 2020 – May 2021 for Camden II WEF), and after the closure and conclusion of the Draft EIR Public Participation period for the Camden Renewable Energy complex (07 September 2022 to 10 October 2022), The avifauna Specialist was informed of a potential Martial Eagle (*Polemaetus bellicosus*) nest located near the Camden II WEF. Detailed information on the Martial Eagle nest finding is included as **Annexure 1** of the Avifauna Impact Assessment (**Appendix H-2**). In accordance with best practice and in alignment with the buffer distance recommended by BirdLife South Africa, a 5km no-turbine exclusion zone around this nest must therefore be implemented. This has been consequently considered and included as an additional environmental sensitivity map (Figure 10-12) of the Final EIR.
The layout map must indicate the following: — Positions of the wind turbines, its numbers, and all associated infrastructure, — All supporting onsite infrastructure e.g., roads (existing and proposed), — Permanent laydown area footprint, — Substation(s) and/or transformer(s) sites including their entire footprint, — Connection routes (including pylon positions) to the distribution/transmission network; and	The updated layout map, included in Figure 6-2 of the Final EIR, includes all the relevant details as required in this comment. Please note that 500m corridors have been included for the connection routes as pylon positions will only be confirmed subject to micro-siting and final design. Please further note that the electrical grid connection infrastructure to connect to the distribution/transmission network is subject to a distinct and separate application for environmental authorisation.
The environmental sensitivity map must indicate the following: — The location of sensitive environmental features on site e.g., CBAs, heritage sites, wetlands, drainage lines etc. that will be affected, — Buffer areas, i.e., 1km of the Protected Area, etc, and — All "no-go" areas.	The updated environmental sensitivity map has been compiled based on the sensitivities and buffers outlined in the relevant specialist studies. Please refer to **Figure 10-11** and **Figure 10-12** of the Final EIR for the relevant sensitivity maps. WSP can confirm this map adheres to the content requirements requested in this comment.

According to the sensitivity map dated 18 August 2022, drawn by TS, attached as Appendix E, the following has been noted: — The boundary of the property where the proposed development will take place is not shown, — There are turbines located within the high sensitivity grassland avifauna, other natural areas, in close proximity to the burial sites and CBA irreplaceable as well as ESA. Please ensure that the sensitivity map legend avoids showing similar colours, since it is difficult to differentiate the environmental sensitivity features. — The map does not show the buffer zones of the environmental sensitivity features. — No numbering of turbines on the aforesaid map, — Therefore, you are advised to include on the map and the legend the sensitive feature and its buffer zone. — You are required to specify what are other natural areas and ensure no development of infrastructure within these areas should it be considered as sensitive.	WSP can confirm that the environmental sensitivity map has been updated to adhere to the requested information contained in this comment, including numbering of turbine positions. The updated sensitivity map is included in Figure 10-11 of the Final EIR. With regards to the areas shown as Other Natural Areas in terms of the Mpumalanga Biodiversity Sector Plan (MBSP), this has been defined in the Footnote of the associated Figure caption (Figure 10-11). According to the Technical Report for the MBSP (2015), ***Other Natural Areas:*** *These are natural areas that have not been selected to meet biodiversity pattern or ecosystem process targets, or to support the functioning of Critical Biodiversity Areas. Despite this, they are not without 'value'. ONAs often retain much of their natural character and may contribute significantly to maintenance of viable species populations and natural ecosystem functioning, and may provide important ecological infrastructure and ecosystem services. They are not, however, prioritized for immediate conservation action in the MBSP, unless CBAs or ESAs are lost, or impacting activities within the ONAs impact negatively on other areas.*
The above layout map must have a clear legend with information communicating with that on the map, be overlain with the sensitivity map which shows neighboring energy developments.	WSP can confirm that the layout (Figure 6-2) and sensitivity map (Figure 10-11) have clear legends. Furthermore, both maps include the relevant requested information.
Environmental Management Programme The EMPr must also include the following: — All recommendations and mitigation measures recorded in the final EIAr and the specialist studies conducted. — An environmental sensitivity map indicating environmental sensitive areas and features identified during the assessment process. — Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants. — In addition to the above, the EMPr must comply with Appendix 4 of the EIA Regulations, 2014, as amended for the facility. — Ensure that generic EMPr for the 33/132kV substation (and powerline if any) is compiled and submitted as the proposed development triggers activity 11 of Listing Notice 1 of NEMA EIA Regulations 2014 as amended.	This comment is noted and has been complied with. The EMPr (Appendix I) for the proposed project has been compiled in accordance with the requirements of Appendix 4 of the EIA Regulations. The mitigation measures and monitoring measures recommended by the relevant specialists during the construction and operational phases of the Camden I WEF have been included in the EMPr. A consolidated environmental sensitivity map has been compiled based on the sensitivities and buffers outlined by the relevant specialist studies during the assessment process. Please refer to **Figure 10-11** of the EIR for the relevant sensitivity map. Detailed mitigation measures to avoid and/or protect very high sensitive systems, i.e. hydrological features, and to reduce the potential overall impact and risk to aquatic resources have been recommended in the Aquatic Impact Assessment, as well as the EMPr (Appendix I) and Section 8.6 of the EIR. The generic EMPr for the Development and Expansion of Substation Infrastructure for the Transmission and Distribution of Electricity has been compiled for the Camden I WEF onsite substation. Please refer to Appendix D of the EMPr (Appendix I). The 132 kV powerline component is being assessed as part of a separate application and BA process. The associated generic EMPr will therefore be included in that separate BA submission.

Public Participation Process **The CA acknowledges that the proponent engaged with the Mpumalanga Tourism and Parks Agency (MTPA) and the letter dated 20 June 2022 indicating the intention to withdraw the Langcarel Private Nature Reserve has been included in the draft EIAr, however, you are advised that the letter indicating that the aforesaid Nature Reserve has been withdrawn must be submitted with the final EIAr as indicated in the comments and response report, page 93 of the draft EIAr.**	It is important to note that the de-proclamation/withdrawal of the Protected Area is being addressed by the MTPA as part of ongoing province-wide reserve verification efforts by the provincial authorities. The MTPA has submitted a letter to the Department (letter dated, 20 June 2022) of the intent to issue a notice to withdraw the declaration of the Langcarel Private Nature Reserve in terms of the Mpumalanga Nature Conservation Act (Act No. 10 of 1998). Furthermore, the MTPA have included the following towards confirmation of ongoing deproclamation/withdrawal in their comments on the draft EIA and associated report (*"The MTPA is satisfied with the discussion that took place on site and planning of the development of the wind energy facility. The potential de-proclamation of part of the Protected Area will be addressed."*). It is understood that this is a fairly long process, inclusive of a public participation and authorisation obtained from the Minister/Member of Executive Council (MEC) to have the Protected Area withdrawn or deproclaimed (wholly or partially) as may be the case. The timeframes for this process are anticipated to be longer than those within the remit of the EIA process and scope. The withdrawal letter is therefore not available at this stage for submission with the Final EIR, as the withdrawal process has not been concluded. Notwithstanding the above, WSP can confirm that Consent letters to the withdrawal/de-proclamation have been received from the Landowner/s for those farm portions that that are directly affected by the proposed project, and have been submitted to the Competent Authority as part of this application. These letters give consent of the respective Langcarel Private Nature Reserve properties to be withdrawn and/or de-proclaimed as a nature reserve by the relevant Mpumalanga MEC. These letters have also been provided to the MTPA towards the de-proclamation/withdrawal process.
Please ensure that comments from all relevant stakeholders are submitted to the CA with the final Environmental Impact Assessment Report. This includes but not limited to the **Department of Forestry, Fisheries and the Environment (DFFE): Biodiversity Planning and Conservation at BCAdmin@dffe.gov.za and Protected Area Section**; Department of Human Settlements, Water And Sanitation; Department of Mineral Resources and Energy; **Mpumalanga Department of Agriculture, Rural development, Land and Environmental Affairs (DARDLEA)**; Land Claims Commission; South African Heritage Resources Agency (SAHRA); Mpumalanga Public Works, Roads & Transport; **Mpumalanga Tourism and Parks Agency (MTPA)**; South African Civil Aviation Authority (SACAA; National Energy Regulator of South Africa (NERSA); Gert Sibande District Municipality, and Msukaligwa Local Municipality.	All comments received to date from relevant stakeholders are included in this SER. Please refer to the Comments and Responses tables (this Section), as well as Appendix B and Appendix D of this SER for all correspondence sent to stakeholders and government departments. Comments have been received from the following stakeholders and authorities, as captured in this Section: — Department of Water and Sanitation — DFFE Directorate: Biodiversity Planning and Conservation — DFFE Directorate: Air Quality — Mpumalanga Tourism and Parks Agency — Department of Agriculture, Land Reform and Rural Development — Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs — Civil Aviation Authority — South African Heritage Resources Agency — Department of Defence — Co-operative Governance & Traditional Affairs: Mpumalanga Province — DFFE: Protected Areas Planning and Management Effectiveness
Furthermore, ensure that all issues raised, and comments received during the circulation of the Draft Environmental Impact Assessment Report from registered I&APs and organs of state which have jurisdiction in respect of the proposed activity are adequately addressed in the final Environmental Impact Assessment Report.	WSP can confirm that all issues raised and comments received during the circulation of the Draft EIR from registered I&APs and organs of state have been included in the SER of the Final EIR and adequately addressed and responded to.

Proof of correspondence with the various stakeholders must be included in the Final Environmental Impact Assessment Report. This must indicate that this draft Environmental Impact Assessment Report has been subjected to 30 days public participation process, stating the start and end date of the PPP. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	Proof of correspondence with the various stakeholders is included in Appendix B and Appendix D of the SER.
The Public Participation Process must be conducted in terms of Regulations 39, 40 41, 42, 43 & 44 of the NEMA EIA Regulations 2014, as amended.	WSP confirm that the Public Participation Process was/is being conducted in terms of Regulations 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014, as amended.
Specific Comments It has been noted on page 347 of the draft EIAr, ***"Figure 10.11: Site Layout overlain onto Environmental Sensitivity Map",*** that both substation alternatives are within the high sensitivity areas. You are required to clarify why these sensitive areas are deemed best suitable for the proposed infrastructure.	The Avifauna Specialist assessed both substation alternatives as acceptable, due to the low impact of the small footprint (Appendix H-2). Furthermore, according to the Terrestrial Biodiversity Assessment (Appendix H-4), the amount of grassland (High sensitivity) affected by the substation and BESS Alternative 1 is 10.46 hectares of a total of 2390 hectares (approximately 0.4%). Alternative 2 affects 10.55 hectares of a total of 2390 hectares (approximately 0.4%). These alternatives do not constitute a significant footprint area. It is noted that according to the Biodiversity Specialist, natural grassland on site is in moderate to poor condition, primarily due to heavy overgrazing. There are significant areas of low grass cover and bare areas, and plant species composition has been degraded by grazing effects. Furthermore, the proposed layout avoids sensitivities to a large degree. The Biodiversity Specialist has calculated that the entire project, including a 3m buffer area around all proposed infrastructure for possible edge effects, only affects a total of 65 hectares of natural habitat of a total of 3222 hectares of natural habitat on site (approximately 2%). The entire project has a total footprint area (all sensitivity classes) of around 115 hectares within a site that is 6712 hectares in size. The project therefore has a very small footprint area which results in an insignificant impact. Furthermore, in terms of the assessed terrestrial impacts, the extent of the impact on the loss of indigenous natural vegetation is negligible. On this basis, the Biodiversity Specialist deems the project as acceptable from a terrestrial biodiversity perspective and recommends that Environmental Authorisation is granted.
The following has been noted on figure 10 in the Aquatic specialist report: — There is no numbering of the turbine on the aforesaid map, — The sensitive features and its buffer zone do not reflect on the map, however, indicated on the legend of the map, — It has been noted that a substation and BESS will be located either at the edge of the riverine floodplains. — Therefore, you are advised to include on the map and the legend of the sensitive feature and its buffer zone.	WSP can confirm that Figure 10 of the Aquatic Specialist report has been updated accordingly to adhere to the requirements of this comment.

You are advised to ensure that the findings of the 12 (twelve) months pre-construction bat monitoring plan complying with the South African Best Practice Guidelines for Pre-Construction Monitoring of Bats at Wind Energy Facilities (5th Edition, 8 June 2020) is submitted with the final EIAr.	The results of the 12-Month Pre-construction Bat monitoring are incorporated into the Bat Environmental Impact Assessment (Appendix H-3). Please refer to the Methodology section (Section 3.2) as well as the results contained in Section 4.7 of Appendix H-3. According to the Report, the pre-construction bat monitoring was completed in accordance with the latest monitoring protocols and guidelines, passive bat activity data was gathered and provides comparative bat activity and species assemblages across all seasons as well as various habitats, terrain and/or areas of the site.
General Please also ensure that the final EIAr includes the period for which the Environmental Authorisation is required and the date on which the activity will be concluded as per Appendix 3 of the NEMA EIA Regulations, 2014, as amended.	The Environmental Authorisation period is included in Section 10.6 of the Final EIR. The EA is required to be valid for a period of 10 years from the date of issuance of the EA. This is considered a reasonable period to allow the Applicant time to conduct relevant internal processes which can only begin after issuance of the EA. The date on which the activity will commence cannot be confirmed at this stage as it will be based on external factors such as obtaining finance and other timeframes dictated by off taker and/or tender processes. The project will therefore require, at minimum, a 20 year validity and the environmental authorisation (EA) should remain valid for at least ten (10) years prior to the activity commencing. In addition, the anticipated construction period will be an additional 2 years. It is requested that all of the above be taken into consideration within the EA.
You are further reminded to comply with Regulation 23(1)(a) of the NEMA EIA Regulations, 2014, as amended, which states that: *"The applicant must within 106 days of the acceptance of the scoping report submit to the competent authority -* *(a) an environmental impact assessment report inclusive of any specialist reports, an EMPr, a closure plan in the case of a closure activity and where the application is a mining application, the plans, report and calculations contemplated in the Financial Provisioning Regulations, which must have been subjected to a public participation process of at least 30 days and which reflects the incorporation of comments received, including any comments of the competent authority."*	The DFFE acceptance of the Final Scoping Report and authorisation to proceed with EIA was received on 24 May 2022 (letter dated, 23 May 2022) (**Appendix G of the EIR**). A request for extension to the submission deadline of the Final EIR was submitted to the DFFE in terms of EIA Regulation 3(7). A 60-day extension was approved by the DFFE on 24 June 2022. According to the extension approval letter, the new deadline for submission of the FEIR is 02 November 2022. WSP can confirm that the Final EIR inclusive of all applicable Specialist Reports and EMPr will be submitted to the DFFE on or before 02 November as required.

Should there be significant changes or new information that has been added to the EIAr or EMPr which changes or information was not contained in the reports or plans consulted on during the initial public participation process, you are required to comply with Regulation 23(1)(b) of the NEMA EIA Regulations, 2014, as amended, which states: *"The applicant must within 106 days of the acceptance of the scoping report submit to the competent authority – (b) a notification in writing that the documents contemplated in sub-regulation 1(a) will be submitted within 156 days of acceptance of the scoping report by the competent authority or where regulation 21(2) applies, within 156 days of receipt of the application by the competent authority, as significant changes have been made or significant new information has been added to the documents, which changes or information was not contained in the original documents consulted on during the initial public participation process contemplated in sub-regulation (1)(a), and that the revised documents contemplated in sub-regulation 1(a) will be subjected to another public participation process of at least 30 days".*	
Should you fail to meet any of the timeframes stipulated in Regulation 23 of the NEMA EIA Regulations, 2014, as amended, your application will lapse.	WSP notes that the application will lapse if the applicant fails to meet any of the timeframes prescribed in terms of these Regulations.
You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an Environmental Authorisation being granted by the Department.	WSP and the Applicant take note of this reminder.

3.3 STAKEHOLDER CONSULTATION

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

— Utilising existing databases from other projects in the area;
— Networking with local business owners, non-governmental agencies, community based organisations, and local council representatives;
— Field work in and around the project area;
— 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 Appendix A of the SER (**Appendix D**).

Table 3-4 provides a breakdown of stakeholders currently registered on the database while **Figure 3-1** illustrates the number of stakeholders per representative sector.

Table 3-4: Breakdown of Stakeholders currently registered on the database

REPRESENTATIVE SECTOR	FURTHER EXPLANATION	NO. STAKEHOLDERS
Government Departments	All tiers of government, namely, national, provincial, local government and parastatal organisations including: — Department of Mineral Resources and Energy (DMRE); — DFFE: Biodiversity and Conservation; — DFFE: Protected Areas; — Mpumalanga Department Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA); — Department of Water and Sanitation (DWS); — Vaal Water Management Area (WMA) Authority; — South African Heritage Resource Agency (SAHRA); — Mpumalanga Heritage Resources Authority (MHRA); — Mpumalanga Tourism and Parks Agency (MTPA); — Civil Aviation Authority (CAA); — Air Traffic and Navigation Services (ATNS); — Department of Defence (SA Army) (DD); — Astronomy Management Authority (AMA); — South African Weather Services (SAWS); — South African National Roads Agency Limited (SANRAL); — Gert Sibande District Municipality; — Msukaligwa Local Municipality; and — Dr Pixley Ka Seme Local Municipality	86

Business and consultants	— Local and neighbouring businesses in the area.
	— Representatives of consulting organisations that provide services in the area
	— Prospecting/Mineral rights holders within the broader project area which may have an interest in the development. These include:
	    — Langcarel (Pty) Ltd (Mooiplaats Colliery) MC Mining
	    — Anker Coal
	    — Exxaro Coal Mpumalanga
	    — South 32
	    — Kangra Coal
	    — Hoyohoyo Mining (Pty) Ltd
	    — Bulemin Resources
		13

Non-governmental organisations (NGOs) and community based organisations	Agricultural unions, churches, and environmental NGOs	23

REPRESENTATIVE SECTOR	FURTHER EXPLANATION	NO. STAKEHOLDERS
General public	Local communities, farmers, and other such individuals who may have an interest in the project	5
Land Owners		4
Adjacent Land Owners		16
Mining Right Holders		11

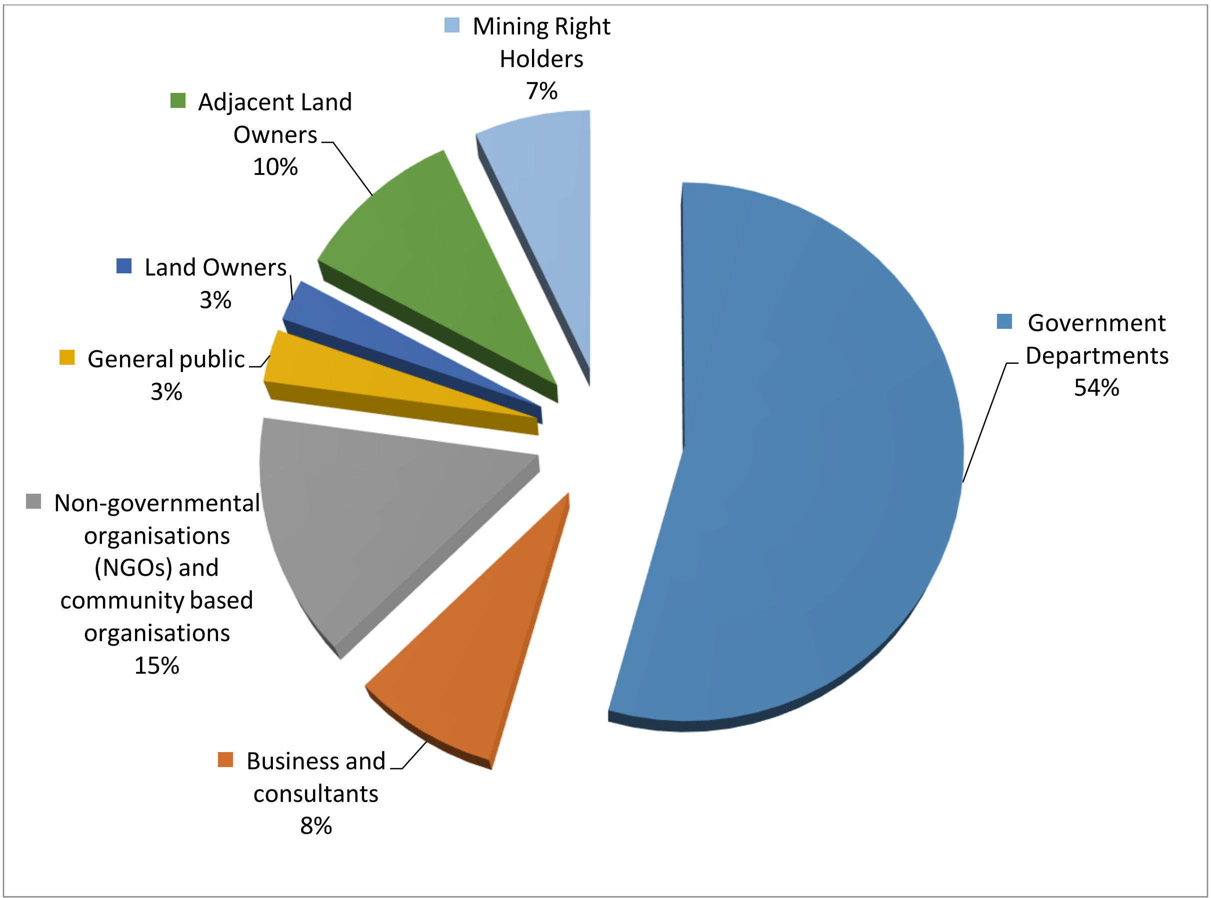

Figure 3-1: Pie chart showing the breakdown of the stakeholder currently registered on the database

All concerns, comments, viewpoints and questions (collectively referred to as 'issues') received to date have been documented and responded to in a Comment and Response Report included in **Appendix D**. The following key issues were highlighted during the scoping phase:

— Job creation for local residents; and

— Impacts on the biodiversity of the area with specific reference to Critical Biodiversity Areas, wetlands and the Langcarel Private Nature Reserve.

3.3.1 STAKEHOLDER NOTIFICATION

DIRECT NOTIFICATION

Notification of the proposed Project was_issued to potential Stakeholders, via direct correspondence (i.e. site notices and e-mail) on **25 February 2022**. The notification letter was circulated is included in Appendix B-3 of the SER **(Appendix D)**. Proof of notification is included in the SER (i.e. **Appendix D**).

NEWSPAPER ADVERTISEMENTS

In accordance with the requirements of GNR 982, as amended, the proposed project was advertised in two local newspapers. The purpose of the advertisement was to notify the public about the proposed project and to invite them to register as stakeholders. A copy of the advertisements are included in Appendix B-1 of the SER **(Appendix D)**. The relevant scoping phase advertisement dates are listed in **Table 3-5**.

Table 3-5: Dates on which the Adverts were published

NEWSPAPER	PUBLICATION DATE	LANGUAGE
Standerton Advertiser	25 February 2022	English and Zulu
Highvelder	25 February 2022	Afrikaans

SITE NOTICES

The official site notices were erected as per GNR 982, as amended, on the boundary fence of the proposed site. In addition, general project notices, announcing the Proposed Project and inviting stakeholders to register, were placed at various locations in and around the project area. A copy of the site notice is included in_Appendix B-2 of the SER (**Appendix D**).

3.4 SCOPING STUDY FINDINGS

The scoping phase identified a number of impacts associated with the proposed Camden I WEF. The findings of the preliminary significance ratings undertaken during the scoping phase for the construction phase, operational phase and initial cumulative impacts are included in **Table 3-6** and **Table 3-7**, respectively.

Table 3-6: Construction Phase Impacts

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
Air Quality	Dust Emissions	Negative	3	1	**Low**	**No**
Noise and Vibrations	Noise and Vibration Emissions	Negative	3	1	**Low**	**No**
Topography, & Geology	Constructability	Negative	3	1	**Low**	**No**
Soils, Land Capability and	Loss of agricultural potential by soil degradation	Negative	4	3	**High**	**Yes**

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
Agricultural Potential	Loss of agricultural potential by occupation of land	Negative	4	3	**High**	
Surface water	Loss of aquatic species of special concern	Negative	3	3	**Medium**	**Yes**
	Damage or loss of riparian and wetlands systems and disturbance of the waterbodies during construction	Negative	3	3	**Medium**	
	Potential impact on localised surface water quality	Negative	3	3	**Medium**	
	Impact on habitat change and fragmentation related to hydrological regime changes	Negative	3	3	**Medium**	
Groundwater	Ground Contamination	Negative	3	1	**Low**	**No**
Hazardous Substances and Pollutants	Soil, groundwater and surface water contamination	Negative	3	3	**Medium**	**No**
Waste Generation	Generation of General Waste	Negative	3	2	**Medium**	**No**
	Generation of Hazardous Waste	Negative	3	2	**Medium**	
	Sanitation Waste	Negative	3	2	**Medium**	
Biodiversity	Loss and Fragmentation of Vegetation and Habitat	Negative	4	3	**High**	**Yes**
	Impacts on CBAs and broad-scale ecological processes	Negative	4	3	**High**	
	Loss and Displacement of Fauna	Negative	4	3	**High**	
	Proliferation of alien invasive plant species	Negative	4	3	**High**	

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
Avifauna	Displacement due to disturbance during the Construction Phase	Negative	4	3	**High**	**Yes**
Bats	Loss of foraging habitat by clearing of vegetation	Negative	4	3	**High**	**Yes**
	Roost destruction during earthworks	Negative	4	3	**High**	
Visual and Landscape	Potential visual intrusion resulting from large construction vehicles and equipment	Negative	3	2	**Medium**	**Yes**
	Potential visual effect of construction laydown areas and material stockpiles.	Negative	3	2	**Medium**	
	Potential impacts of increased dust emissions from construction activities and related traffic	Negative	3	2	**Medium**	
	Potential visual scarring of the landscape as a result of site clearance and earthworks	Negative	3	2	**Medium**	
	Potential visual pollution resulting from littering on the construction site	Negative	3	1	**Low**	
Heritage and Cultural Resources	Disturbance to known Cultural Resources	Negative	3	2	**Medium**	**Yes**
	Chance Find of Cultural Resources	Negative	3	2	**Medium**	
Palaeontology	Chance Find of Palaeontological resources	Negative	3	2	**Medium**	**Yes**
Traffic	Increased traffic generation around the study area by construction vehicles	Negative	3	1	**Low**	**Yes**

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
	Deterioration of the surrounding road network due to an increase of traffic around the site	Negative	3	2	**Medium**	
	Transportation of abnormal loads during the construction phase	Negative	4	1	**Medium**	
Socio-Economic	Creation of local employment, training, and business opportunities	Positive	2	3	**Medium**	**Yes**
	Impact of construction workers on local communities	Negative	3	3	**Medium**	
	Influx of job seekers	Negative	3	3	**Medium**	
	Risk to safety, livestock, and farm infrastructure	Negative	3	3	**Medium**	
	Increased risk of grass fires	Negative	3	3	**Medium**	
	Nuisance impacts associated with construction related activities	Negative	3	3	**Medium**	
	Impacts associated with loss of farmland	Negative	3	3	**Medium**	
Climate Change	Greenhouse Gas Emissions	Negative	2	1	**Very Low**	**No**
	Climate Risks & Vulnerabilities	Negative	2	1	**Very Low**	

Table 3-7: Operational Phase Impacts

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
Noise and Vibrations	Noise Emissions	Negative	4	3	**High**	**Yes**

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
Soils, Land Capability and Agricultural Potential	Enhanced agricultural potential through increased financial security for farming operations	Positive	3	3	**Medium**	**Yes**
	Prevention of crop spraying by aircraft over land occupied by turbines.	Negative	4	3	**High**	
	Interference with farming operations	Negative	4	3	**High**	
Surface Water	Increased runoff, sedimentation and erosion	Negative	3	3	**Medium**	**Yes**
Waste Generation	Generation of General Waste	Negative	3	2	**Medium**	**Yes**
	Generation of Hazardous Waste	Negative	3	2	**Medium**	
	Sanitation Waste	Negative	3	2	**Medium**	
Biodiversity	Proliferation of alien invasive plant species	Negative	3	3	**Medium**	**Yes**
Avifauna	Displacement due to habitat loss	Negative	4	3	**High**	**Yes**
	Collisions Mortality on wind turbines	Negative	4	3	**High**	
	Electrocution on the medium voltage network	Negative	4	3	**High**	
	Collisions with the medium voltage network	Negative	4	3	**High**	
Bats	Bat mortalities during foraging	Negative	4	3	**High**	**Yes**
	Bat mortalities during migration	Negative	4	3	**High**	
	Increased bat mortalities due to light attraction and habitat creation	Negative	4	3	**High**	

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
Visual	Potential alteration of the visual character of the area;	Negative	4	3	**High**	**Yes**
	Potential visual intrusion resulting from wind turbines dominating the skyline in a largely natural / rural area	Negative	4	3	**High**	
	Potential visual clutter caused by substation and other associated infrastructure on-site	Negative	3	3	**Medium**	
	Potential visual effect on surrounding farmsteads	Negative	4	3	**High**	
	Visual impact of shadow flicker impact, and motion-based visual intrusion	Negative	4	3	**High**	
	Potential alteration of the night time visual environment as a result of operational and security lighting as well as navigational lighting on top of the wind turbines	Negative	3	3	**Medium**	
Social	Improve energy security and support the renewable energy sector	Positive	3	3	**Medium**	**Yes**
	Creation of employment and business opportunities	Positive	3	3	**Medium**	
	Generate income for affected landowners	Positive	3	3	**Medium**	
	Benefits associated with the socio-economic development contributions	Positive	3	3	**Medium**	
	Visual impact and impact on sense of place	Negative	4	3	**High**	
	Potential impact on property values	Negative	3	3	**Medium**	

ASPECT	IMPACT	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
	Potential impact on tourism	Negative	3	3	**Medium**	
Climate Change	Reduced GHG Emissions	Positive	4	3	**High**	**No**
	Contribution of cleaner energy to the National Grid	Positive	4	3	**High**	

Table 3-8: Initial Cumulative Impacts

RECEPTOR	DESCRIPTION	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
Noise and Vibrations	Cumulative Noise Emissions	Negative	4	3	**High**	**Yes**
Soils, Land Capability and Agricultural Potential	Cumulative Agricultural Impacts	Negative	4	3	**High**	**Yes**
Biodiversity	Cumulative impacts on biodiversity	Negative	4	3	**High**	**Yes**
Avifauna	Cumulative Collision impacts	Negative	4	3	**High**	**Yes**
	Cumulative Electrocution Impacts	Negative	4	3	**High**	
Bats	Cumulative Mortalities	Negative	4	3	**High**	**Yes**
Visual	Combined visual impacts from mining, industrial, infrastructural and renewable energy development in the broader area could potentially alter the sense of place and visual character of the area	Negative	4	3	**High**	**Yes**

RECEPTOR	DESCRIPTION	NATURE	PROBABILITY	CONSEQUENCE	SIGNIFICANCE (BEFORE MITIGATION)	FURTHER ASSESSMENT REQUIRED
	Combined visual impacts from mining, industrial, infrastructural and renewable energy development in the broader area could potentially exacerbate visual impacts on visual receptors	Negative	4	3	**High**	
Social	Cumulative impact on sense of place	Negative	4	3	**High**	**Yes**
	Cumulative impact on local service and accommodation	Positive	3	3	**Medium**	
	Cumulative impact on local economy	Positive	3	3	**Medium**	

3.5 SCOPING RECOMMENDATIONS

The scoping report identified and evaluated the feasibility of a range of site and technology options. **Table 3-9** provides a summary of the scoping phase alternatives assessment.

Table 3-9: Alternatives Summary

ALTERNATIVE CATEGORY	ALTERNATIVE IDENTIFIED IN SCOPING	ASSESSMENT IN EIA PHASE (YES / NO)
Infrastructure Location/Layout Alternatives	— Initial Turbine Layout (47)	No
	— **Revised Turbine Layout (37)**	**Yes**
	— Site Substation & BESS Alternatives: Alternative 1 and Alternative 2 (Preferred)	Yes
	— Three Construction Camp & Batching Plants Alternatives	Yes
	— Temporary Laydown Areas (2 locations)	Yes
Technology Alternatives	Wind Technology	Yes
	Two types of BESS Battery Technologies: Vanadium Redox flow technologies and Lithium battery technologies.	Yes

4 EIA METHODOLOGY

The EIA process was initiated in accordance with Appendix 3 of GNR 982 pertaining to applications subject to an S&EIR process.

4.1 DETAILED ENVIRONMENTAL ASSESSMENT

4.1.1 SPECIALIST STUDIES

Specialist studies were undertaken during the EIA phase to consider and assess environmental impacts associated with the proposed project. The outcomes of these studies are included in the relevant reports contained in **Appendix H**. **Table 4-1** provides a list of the Specialist Studies that have been undertaken.

Table 4-1: Details of Specialists

SPECIALIST FIELD	SPECIALIST NAME	COMPANY
Agriculture	Johann Lanz	Independent consultant
Avifauna	Chris van Rooyen	Chris van Rooyen Consulting
Bats	Werner Marais	Animalia Consultant (Pty) Ltd
Terrestrial Ecology	David Hoare	David Hoare Consulting (Pty) Ltd
Aquatic	Brian Colloty	EnviroSci Pty Ltd
Groundwater	Adam Sanderson	WSP Group Africa (Pty) Ltd
Heritage	Jaco van der Walt	Beyond Heritage
Palaeontology	Prof Marion Bamford	
Socio-economic	Tony Barbour	Tony Barbour Environmental Consulting
Traffic	Christo Bredenhann	WSP Group Africa (Pty) Ltd
Visual	Kerry Schwartz	SLR Consulting (Pty) Ltd
Noise	Kirsten Collett	WSP Group Africa (Pty) Ltd
SHE Risk	Debra Mitchell	Ishecon cc
Geotechnical	Muhammad Osman	SLR Consulting (Pty) Ltd

4.1.2 CUMULATIVE ASSESSMENT

Due to the number of renewable energy applications in the area, the specialist assessments include a detailed cumulative environmental impact assessment. The cumulative impact assessment is provided in **Section 9**. In assessing the cumulative impacts of the proposed Camden I WEF, renewable energy projects within a 30km radius of the proposed project, that have received an EA or have a BA or EIA process in progress have been considered. It is noted that there is a proposed Wind Energy Facility (Ummbila Emoyeni), located within 28 – 32km from the Camden I WEF. Information on the proposed Ummbila Emoyeni WEF was obtained during the 30-day review period of the Draft EIR for this project. The Final EIR and Specialist studies for this project (Camden I WEF) has thus considered the proposed Ummbila Emoyeni WEF in the Cumulative Impact Assessment.

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4.2 IMPACT ASSESSMENT METHODOLOGY

The EIR uses a methodological framework developed by WSP to meet the combined requirements of international best practice and NEMA 2014 EIA Regulations (GNR 982), as amended.

As required by the 2014 EIA Regulations as amended, the determination and assessment of impacts will be based on the following criteria:

- Nature of the Impact
- Significance of the Impact
- Consequence of the Impact
- Extent of the impact
- Duration of the Impact
- Probability if the impact
- Degree to which the impact:
  - can be reversed;
  - may cause irreplaceable loss of resources; and
  - can be avoided, managed or mitigated.

Following international best practice, additional criteria have been included to determine the significant effects. These include the consideration of the following:

- Magnitude: to what extent environmental resources are going to be affected;
- Sensitivity of the resource or receptor (rated as high, medium and low) by considering the importance of the receiving environment (international, national, regional, district and local), rarity of the receiving environment, benefits or services provided by the environmental resources and perception of the resource or receptor); and
- Severity of the impact, measured by the importance of the consequences of change (high, medium, low, negligible) by considering inter alia magnitude, duration, intensity, likelihood, frequency and reversibility of the change.

It should be noted that the definitions given are for guidance only, and not all the definitions will apply to all of the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

4.2.1 METHODOLOGY

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[2], indirect[3], secondary[4] as well as cumulative[5] impacts.

[2] Impacts that arise directly from activities that form an integral part of the Project.
[3] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[4] Secondary or induced impacts caused by a change in the Project environment.
[5] 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[6] presented in **Table 4-2**.

Table 4-2: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) 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
Impact Extent (E) 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
Impact Reversibility (R) 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
Impact Duration (D) 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
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) 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**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

4.2.2 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.

[6] 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.

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 Figure 4-1 below.

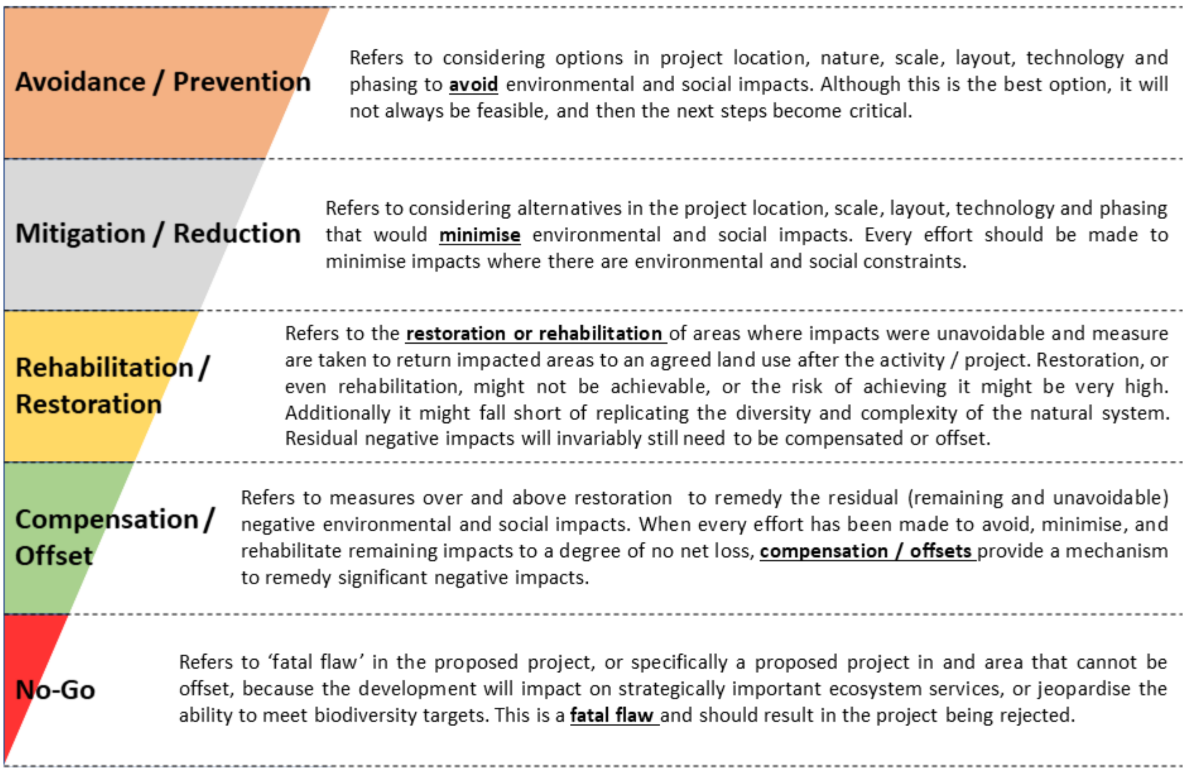


Figure 4-1: Mitigation Sequence/Hierarchy

4.3 STAKEHOLDER ENGAGEMENT

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.

It is important to note that since the proposed individual projects associated with the Camden Renewable Energy Complex, subject to a S&EIA Process, are located within the same geographical area, an integrated stakeholder engagement process (public participation) is being undertaken for these projects. A SER (**Appendix D**) has been compiled and included in the Draft EIR detailing the projects' compliance with Chapter 6 of the NEMA EIA Regulations 2014, as amended.

4.3.1 STAKEHOLDER AND AUTHORITY CONSULTATION

There will continue to be ongoing communication between WSP and stakeholders throughout the S&EIR process. These interactions include the following:

- Interactions with stakeholders will be recorded in the comment and response report;
- Feedback to stakeholders will take place both individually and collectively;
- Written responses (email, faxes or letters) will be provided to stakeholders acknowledging issues and providing information requested (dependent on availability) and
- A letter will sent out to all registered stakeholders notifying them of the outcome of the environmental authorisation process
- As per the GNR 982, particular attention will be paid to landowners, and neighbouring communities, specifically where literacy levels and language barriers may be an issue.

A site visit was undertaken on 11 October 2022 with the DFFE officials.

4.3.2 PUBLIC REVIEW

The Draft EIR was placed on public review for a period of 30 days from **07 September 2022** to **10 October 2022**, at the following public places:

- Gert Sibande District Municipality;
- Ermelo Public Library;
- Thusiville Public Library;
- Msukaligwa Local Municipality Ermelo Office;
- WSP website (https://www.wsp.com/en-ZA/services/public-documents); and
- Datafree Website (https://wsp-engage.com/).

All registered stakeholders and authorising/commenting state departments were notified of the public review period as well as the locations of the draft EIR via email and SMS.

4.3.3 STAKEHOLDER MEETINGS

A Public Open Day Meeting was held for the proposed Camden Renewable Energy Complex projects in Ermelo (NG Kerk) on 29 September 2022. This was to provide information on the proposed projects and present the findings of the impact assessments associated with the Complex projects (i.e., Camden I WEF, Camden Grid Connection and Collector substation, Camden I SEF, Camden II WEF and Camden Green Hydrogen and Ammonia Facility).

A copy the Open Day Public Meeting Attendance Register is included in Appendix C-3 of the SER (**Appendix D**).

4.3.4 COMMENT AND RESPONSE REPORT

All concerns, comments, viewpoints and questions (collectively referred to as 'issues') will continue to be documented and responded to adequately in the Comment and Response Report. The Comment and Response Report records the following:

- List of all issues raised;
- Record of who raised the issues;
- Record of where the issues were raised;
- Record of the date on which the issue was raised; and
- Response to the issues.

The updated Comment and Response Report has been included in the SER in **Appendix D**.

4.3.5 SUBMISSION AND DECISION MAKING

The EAP must submit the final EIR to the competent authority within 106 days of the acceptance of the scoping report. A request for extension to the submission deadline of the FEIR was submitted to the DFFE in terms of EIA Regulation 3(7). A 60-day extension was approved on 24 June 2022. The final EIR is due to the DFFE on 02 November 2022. Once submitted, the delegated competent authority (i.e. the DFFE) will be allocated 107 days to review the final EIR in order to either grant or refuse and environmental authorisation.

The final EIR will be placed on stakeholder review for a reasonable time period during the DFFE's final review and decision-making process. All comments on the Final EIR should be submitted directly to the DFFE. The delegated competent authority must issue their decision within this specified timeframe.

4.3.6 NOTIFICATION OF ENVIRONMENTAL AUTHORISATION

All stakeholders will receive a letter at the end of the process notifying them of the authority's decision, thanking them for their contributions, and explaining the appeals procedure as outlined in the national Appeal Regulations, 2014 (GNR 993 of 2014).

4.4 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 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 Camden I WEF was generated on 14 September 2021 and is attached as **Appendix J**. 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 4-3 below provides a summary of the sensitivities identified for the development footprint.

Table 4-3: Sensitivities identified in the screening report

THEME	VERY HIGH SENSITIVITY	HIGH SENSITIVITY	MEDIUM SENSITIVITY	LOW SENSITIVIY
Agricultural Theme	✓			
Animal Species Theme		✓		
Aquatic Biodiversity Theme	✓			
Archaeological and Cultural Heritage Theme	✓			
Avian Theme				✓
Bats Theme		✓		
Civil Aviation Theme			✓	
Defence Theme				✓
Flicker Theme	✓			
Landscape	✓			
Palaeontology Theme	✓			
Noise Theme	✓			
Plant Species Theme			✓	
RFI Theme	✓			
Terrestrial Biodiversity Theme	✓			

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 (please refer to Section 4.4.1 below for the EAP motivation applicable to this list):

— Agricultural Impact Assessment
— Archaeological and Cultural Heritage Impact Assessment
— Palaeontology Impact Assessment
— Landscape/Visual Impact Assessment
— Terrestrial Biodiversity Impact Assessment
— Freshwater Impact Assessment
— Avifauna Impact Assessment
— Bat Impact Assessment

- Social Impact Assessment
- Noise Impact Assessment
- A Geotechnical Assessment
- Civil Aviation Impact Assessment
- Radio Frequency Interference (RFI) Assessment
- Plant Species Assessment
- Animal Species Assessment

4.4.1 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."

As summarised in **Table 4-3** above, the following specialist assessments have been commissioned for the project based on the environmental sensitivities identified by the Screening Report:

- Soils and Agricultural Potential Assessment;
- Archaeological and Cultural Heritage Assessment;
- Palaeontology Impact Assessment;
- Visual Impact Assessment[7] ;
- Biodiversity Impact Assessment (inclusive of terrestrial biodiversity, plant species and animal species);
- Freshwater Assessment;
- Avifauna Impact Assessment;
- Bat Impact Assessment;
- Environmental Acoustic (Noise) Impact Assessment;
- Social Impact Assessment;
- Qualitative Risk Assessment (specific to the BESS);
- Desktop Geotechnical Assessment; and
- Desktop Traffic Assessment.

Four of the identified specialist studies will not be undertaken as part of the S&EIA process for the proposed Camden I WEF. Motivation for the exclusion of these specialist studies is provided below:

- **Detailed Geotechnical**

  A desktop Geotechnical Assessment has been commissioned and has been incorporated into the EIA. However, a detailed Geotechnical Assessment will not be undertaken as part of the S&EIA Process as this will be undertaken during the detailed design phase.
- **RFI Assessment**

  A Radio Frequency Interference (RFI) Study will not be undertaken. The proposed development area is not located within any Astronomy Advantage Area. The South African Weather Service (SAWS) and relevant telecommunications stakeholders have been included on the projects database as a key stakeholder for the Public Participation Process. Furthermore, the Project Developer has engaged SAWS towards confirmation of any RFI impact of the proposed Camden developments. SAWS have issued a letter in this respect, (dated, 27/07/2022) as confirmation of engagements with the Applicant. The letter stipulates that further engagements between SAWS and the Developer are underway as a separate process to the EIA, in order to determine mutually acceptable solution/s.
- **Civil Aviation**

[7] The Visual Impact Assessment will consider the impact of flicker associated with the Camden I WEF development.

According to the DFFE Screening Tool Report, civil aviation is regarded as having low sensitivity. The proposed development site is located between 8 and 15 km of civil aviation aerodromes. A formal Civil Aviation Assessment will not be undertaken as part of the S&EIA Process. Nevertheless, the relevant Authorities have been included on the project stakeholder database. 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. An Application for the Approval of Obstacles was submitted to ATNS (ATNS Ref: OP017) on 14 July 2021 and the required permits will be obtained prior to the development of the project. Revised format information was further resubmitted on 25 August 2021 and 24 February 2022. ATNS have indicated that "ATNS have completed and forward the assessments results to the South African Civil Aviation Authority (SACAA) for verification, validation and approval". SACAA was also included on the project stakeholder database. Comments received from this stakeholder to date have been captured and responded to within the Comments and Responses Report (CRR) included in the SER (**Appendix D**) of this EIR.

— **Defence**

According to the DFFE Screening Tool Report, the proposed Camden I WEF is located in a Low sensitivity area from a defence perspective. In terms of GN R320, this would mean that no further requirements are applicable should the proposed site be found of low sensitivity during the site sensitivity verification (as is the case).The Department of Defence was included on the project stakeholder database. Comments received from this stakeholder to date have been captured and responded to within the Comments and Responses Report (CRR) included in the SER (**Appendix D**) of this EIR.

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"), where applicable. The assessment protocols followed are indicated in **Table 4-4**.

Table 4-4: Assessment protocols followed

SPECIALIST ASSESSMENT	ASSESSMENT PROTOCOL
Agricultural Impact Assessment	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, gazetted on 20 March 2020 in GN 320 (in terms of Sections 24(5)(A) and (H) and 44 of NEMA, 1998).
Aquatic Impact Assessment	Protocol for specialist assessment and minimum report content requirements for the environmental impacts on aquatic biodiversity (Government Gazette 43110, 20 March 2020).
Terrestrial Biodiversity Assessment	Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species, terrestrial plant species and terrestrial biodiversity.
Terrestrial Plant Species Assessment	Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial plant species.
Terrestrial Animal Species Assessment	Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species.
Avifaunal Impact Assessment	Protocol for the specialist assessment and minimum report content requirements for environmental impacts om avifaunal species by onshore wind energy generation facilities where the electricity output is 20MW or more. The Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species.

SPECIALIST ASSESSMENT	ASSESSMENT PROTOCOL
Social Impact Assessment	As of September 2020, there are no sensitivity layers on the Screening Tool for Socio-economic- features. Part A has therefore not been compiled for this assessment. The assessment has been compiled in line with Appendix 6 of the EIA Regulations, as amended.

5 NEED AND DESIRABILITY

South Africa is faced with significant increases in electricity demand and a shortage in electricity supply. South Africa is the seventh 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 Camden I WEF has been considered from an international, national, and regional perspective.

5.1.1 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 WEF 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 WEF qualifies as a clean technology that will generate 200MW 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 12$^{th\ of}$ 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. This project will aid in the efforts towards a just energy transition in accordance to recently signed Political Declaration between SA, USA, UK, EU, Ireland etc.

The authorization of the Project 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.

5.1.2 NATIONAL PERSPECTIVE

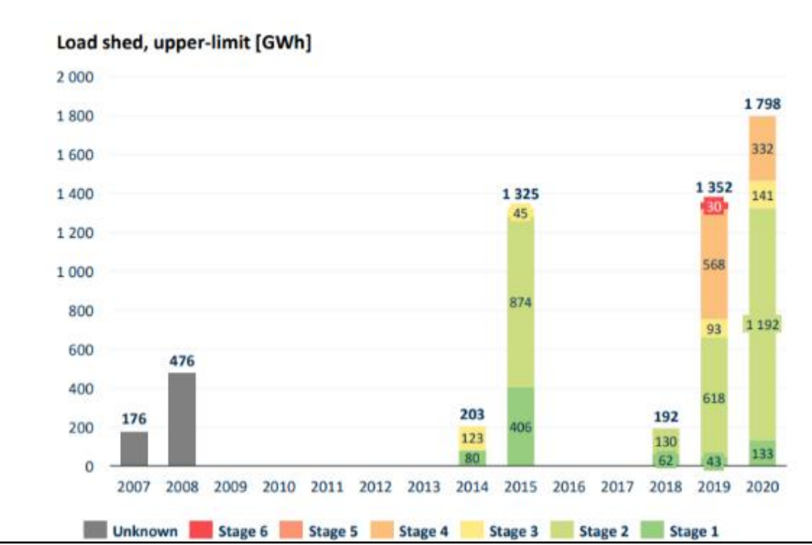
The South African Government, through the IRP, has set a target to secure 17 800 MW of renewable energy by 2030. This is an effort to diversify the country's energy mix in response to the growing electricity demand and promote access to clean sources of energy.

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 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 Camden I WEF 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 Camden Renewable Energy Complex, which includes the Camden I WEF, will pave the way for the Just Energy Transition (JET)[8] in South Africa and promote the transition from a fossil fuel-based economy to a low carbon economy. The proposed Camden I WEF aims towards the aforementioned national energy targets of diversification of energy supply and the promotion of clean energy. Wind and solar energy developments contribute to reduced emissions and subsequently climate change whilst promoting industrial development and job creation.

The proposed Camden I WEF will also aid in overcoming the power shortages that are currently faced in the country. In 2020, South Africa witnessed its longest recorded hours of load shedding, with the power being off for 859 hours of the year as shown in **Figure 5-1**. The South African Government has taken strides to try reducing these power cuts through the implementation of bid Windows in REIPPP and lifting the independent power generation threshold to 100MW, but it is still expected that the country will undergo more load shedding. Over the years the construction of 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.



Year	Duration of outages (hours)	Energy shed (GWh)
2007	-	176
2008	-	476
....	....	....
2014	121	203
2015	852	1325
2016	-	-
2017	-	-
2018	127	192
2019	530	1352
2020	859	1798

Figure 5-1: Load shedding hours over the years in South Africa

In addition, the Council for Scientific and Industrial Research (CSIR) reported that renewable energy assisted in relieving pressure on the constrained South African power system during load shedding in the first quarter of 2019. This indicates that renewable energy is a key factor in ensuring that the country does not face further load shedding in the future.

5.1.3 REGIONAL AND LOCAL PERSPECTIVE

JUST ENERGY TRANSITION

Coal power stations and the coal mining industry play a vital component in the economic and social components of the local Mpumalanga economy. Shifting to a low carbon economy will thus need to offset or exceed the benefits being realized by fossil fuels in the province. Thus, a key factor to ensuring the success of the Just Energy Transition is not only to focus on the transition from fossil fuels to renewable energy resources but to simultaneously ensure the Just Transition of jobs and skills.

The transition towards renewable energy will improve the socio-economic conditions of the Gert Sibande District Municipality. The Gert Sibande District Municipality recorded an unemployment rate of 26.7% in 2017, with the majority of its employed in the trade and community services sectors. The Project will aid in solving two of the leading challenges faced by the Gert Sibande District Municipality, namely the cost of electricity and

[8] The Just Transition is described as the transition towards a low-carbon and climate-resilient economy that maximizes the benefits of climate action while simultaneously improving the welfare of the workers and their communities.

lack of adequate employment opportunities. The Project will be the first large-scale wind energy facilities being developed in Mpumalanga. The proponent foresees this project as being the catalyst to realizing a true Just Energy Transition for Mpumalanga. As various career opportunities are presented by the wind industry, and these are divided into four pillars that are aligned with the value chain. These four pillars are project development, component manufacturing, construction, and operation & maintenance as shown in **Figure 5-2**.

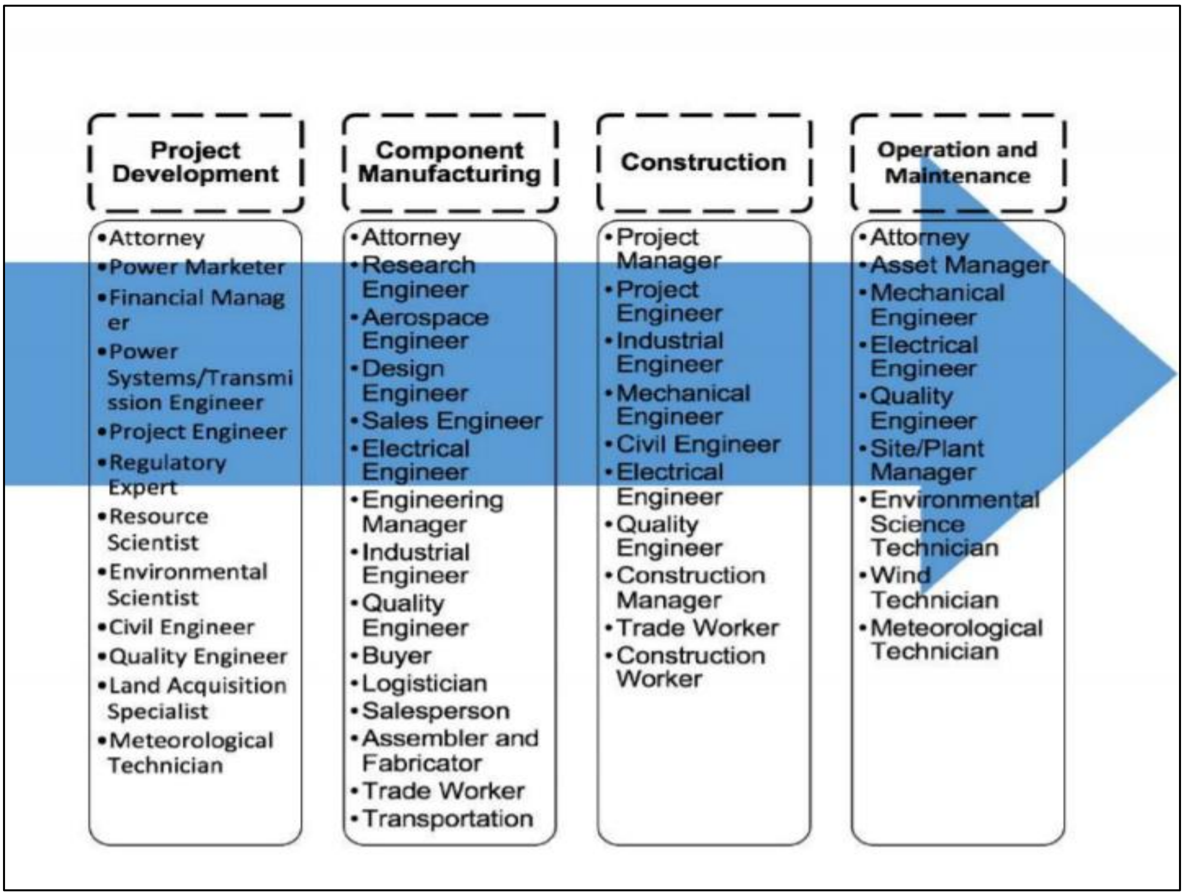


Figure 5-2: Career Opportunities presented by the Wind Industry (Source: https://www.res4africa.org/wp-content/uploads/2020/09/RES4Africa-Foundation-A-Just-Energy-Transition-in-South-Africa.pdf)

Figure 5-2 shows that the wind industry will create job opportunities throughout the supply chain. The wind industry will contribute to the Just transition in South Africa to ensure that there are no job losses but rather job transfers and skill exchange. For these opportunities to arise, renewable energy projects need to be approved in Mpumalanga to ensure that the transition from fossil fuels to renewable energy happens gradually and takes off effectively.

MULTIPLE LAND USE

Unlike opencast coal mining within the broader Camden study area, the Project facilitates multiple land use functions within the development area. As wind turbines are spread out across the development area this allows multiple land use functions such as operating the wind farm in tandem with agricultural activities or even underground coal mining. This will boost the economic activities in the area which will in turn increase job opportunities in that area and help improve the local community's welfare without jeopardizing the environment.

DESIRABILITY OF THE PROJECT SITE

As mentioned previously, four of Eskom's coal-fired power stations have been targeted for decommissioning in the short term: Komati, Camden, Grootvlei, and Hendrina. Eskom is looking to decommission 5 400MW of electricity from coal generation by the year 2022, increasing to 10 500MW by 2030 and 35 000MW by 2050. Simultaneously Eskom has been looking at options for repurposing these power stations with the core aims of reusing existing power transmission infrastructure, developing new generation capacity, providing ancillary services, and mitigating socio-economic impact. The proposed Camden Renewable Energy Complex, inclusive of the Camden I WEF, is ideally located to form part of this proposed repurposing of the Camden power station and will help Eskom achieve its diversification goal.

6 PROJECT DESCRIPTION

6.1 SITE LOCATION

The proposed Camden I WEF will have a project area of approximately 6 700 hectares (ha). Within this project area the extent of the buildable area will be approximately 200 ha subject to finalization based on technical and environmental requirements.

The proposed WEF is located south-west of Ermelo in Mpumalanga and falls within the jurisdiction of the Msukaligwa Local Municipality and Gert Sibande District Municipality. The eight projects of the Camden Renewable Energy Complex are located adjacent each other and as such, the overall locality of the Camden Renewable Energy Complex is included in **Figure 6-1**. The Camden I WEF (*project under consideration for this EIR*) project site, including associated alternatives, is indicated in **Figure 6-2**. The details of the properties associated with the proposed Camden I WEF, including the 21-digit Surveyor General (SG) codes for the cadastral land parcels are outlined in **Table 6-1.**

Table 6-1: Camden I WEF Affected Farm Portions

FARM NAME	21 DIGIT SURVEYOR GENERAL CODE OF EACH CADASTRAL LAND PARCEL
Portion 0 of Klipfontein Farm No. 442	T0IS00000000044200000
Portion 1 of Klipfontein Farm No. 442	T0IS00000000044200001
Portion 3 of Klipfontein Farm No. 442	T0IS00000000044200003
Portion 1 of Welgelegen Farm No. 322	T0IT00000000032200001
Portion 2 of Welgelegen Farm No. 322	T0IT00000000032200002
Portion 2 of Uitkomst Farm No. 292	T0IT00000000029200002
Portion 10 of Uitkomst Farm No. 292	T0IT00000000029200010
Portion 3 of Langverwacht Farm No. 293	T0IT00000000029300003
Portion 14 of Mooiplaats Farm No. 290	T0IT00000000029000014
Portion 3 of Klipbank Farm 295	T0IT00000000029500003

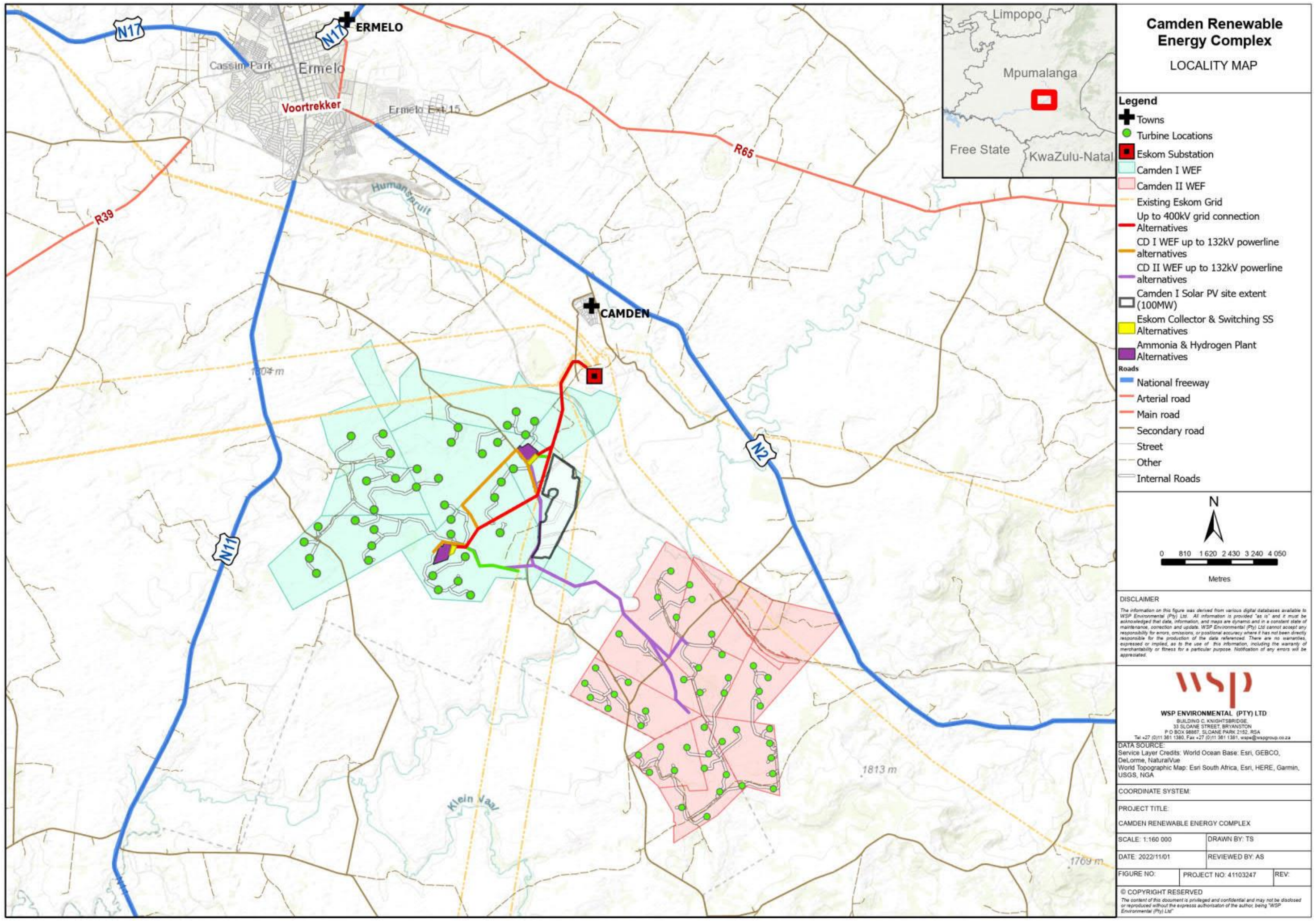


Figure 6-1: Locality map for the proposed Camden Renewable Energy Complex, near Camden in the Mpumalanga Province, showing the location and proximity of the respective projects to each other.

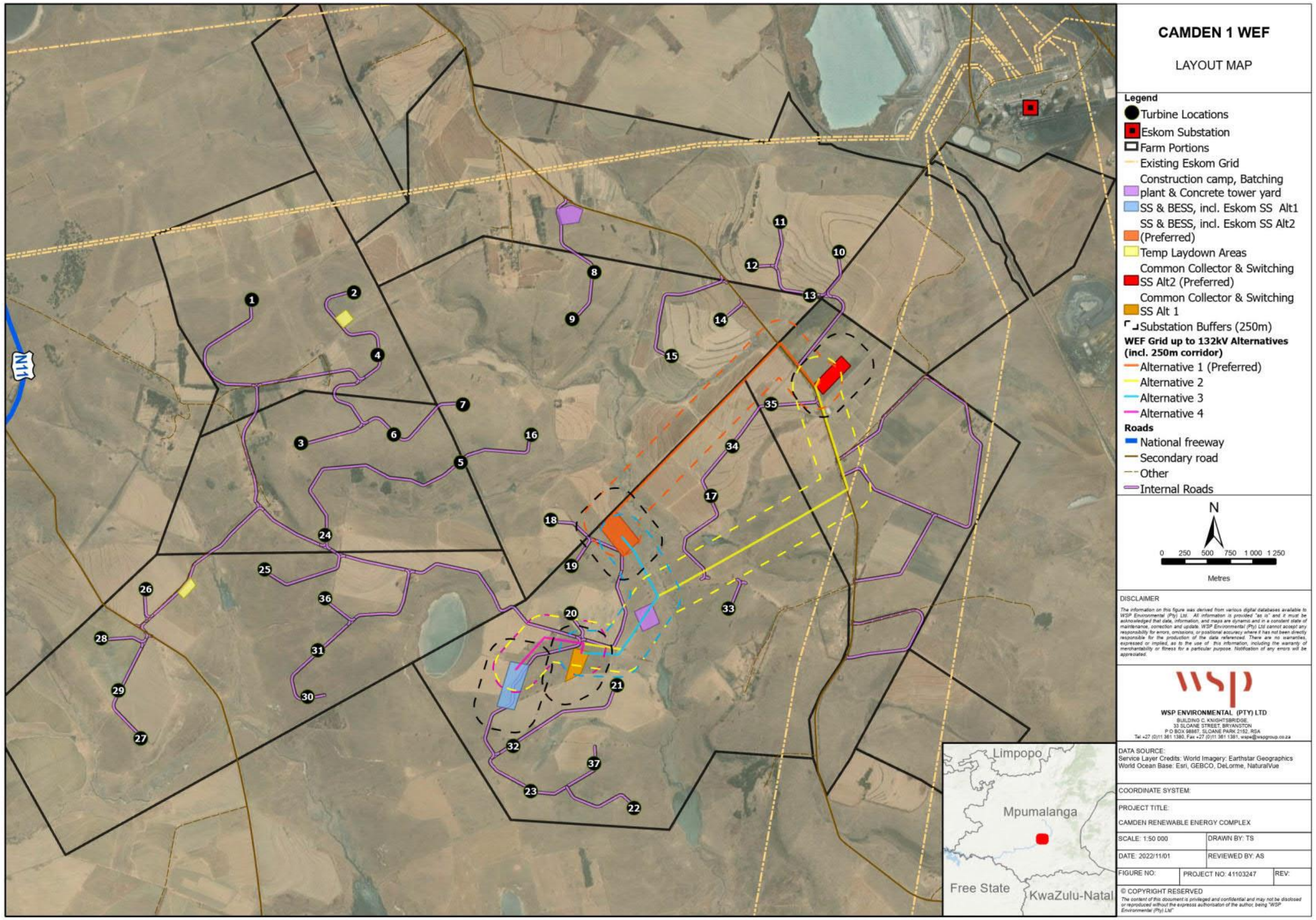


Figure 6-2: Proposed Camden I WEF and associated main components

6.2 WIND ENERGY POWER GENERATION PROCESS

Wind power is the conversion of wind energy into a useful form of energy, such as electricity, using modern and highly reliable wind turbines. Wind Power is non-dispatchable, meaning that for economic operation, all the available output must be taken when it is available.

Wind turbines, like windmills, are mounted on a tower to harness wind energy at an increased level above the ground where wind is faster and less turbulent. The kinetic energy of the wind is used to turn the blades of the turbine to generate electricity. Wind turbines can operate at varying wind speeds, with the amount of energy the wind transfers to the rotor depending on the density of the air, the rotor area and the wind speed.

The electricity generated by the wind turbines is passed through the step-up transformer and then transmitted via either underground or overhead cables to a central substation, which connects the wind energy facility to a high voltage network. Wind turbines are designed to operate automatically with minimal maintenance for approximately 20-25 years.

Figure 6-3 illustrates the following main components of a wind turbine:

— The **rotor** consists of three **blades** which are attached to a **hub**. The blades collect energy from the wind and converts the wind energy into rotational shaft motion/energy to turn the generator;

— The **nacelle** houses the equipment at the top of the tower as well as a gearbox, a generator that converts the turning motion/mechanical energy of the blades into electricity and coupling and brake;

— The **tower** supports the nacelle and rotor and allows the blades to be distanced safely off the ground so as to reach the stronger winds found at higher elevations;

— Turbine **step-up transformer** which can be indoor or outdoor, depending on the turbine model whose function is to increase the voltage capacity of the electricity generated by the turbine to a higher, grid-equivalent.

— The **foundation** unit ensures the stability of the turbine structure.

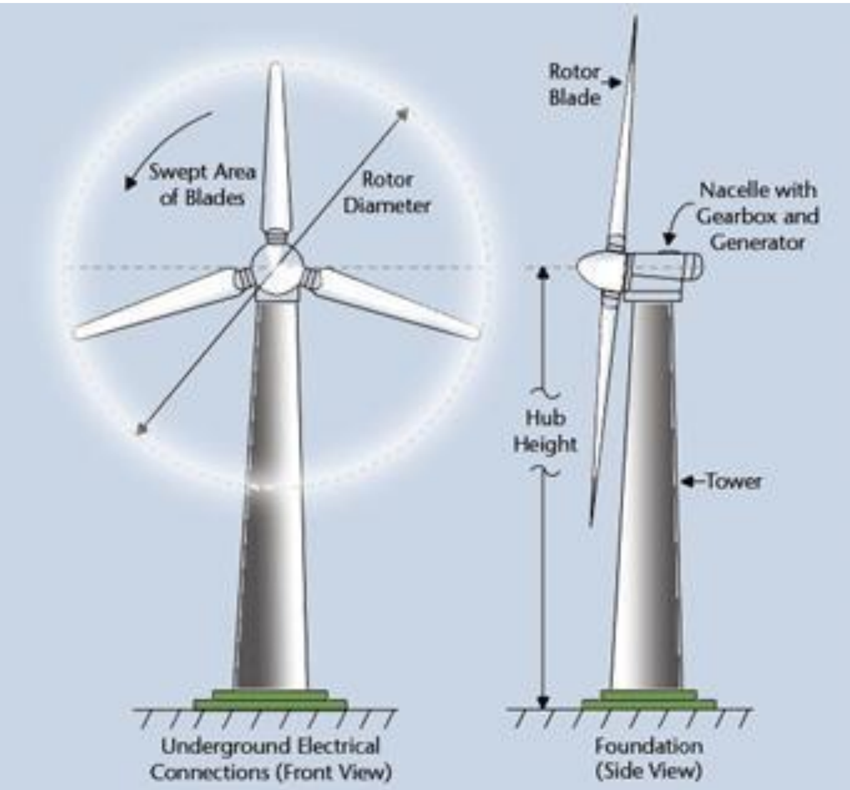


Figure 6-3: Illustration of the main components of a wind turbine

6.3 PROJECT INFRASTRUCTURE

The proposed Camden I WEF will be developed to allow for up to 200 MW for export from the facility. The proposed Camden I WEF will comprise the following key components, as outlined in **Table 6-2**.

Table 6-2: Technical summary of the proposed Camden I WEF and associated infrastructure

TECHNICAL DETAILS OF THE PROPOSED CAMDEN I WEF FACILITY

Capacity	200 MW
Number of Turbines	37
Development Footprint (Buildable Area)	Approximately 200 ha
Project Area (Assessed Area)	Approximately 6700 ha
Turbine hub height	Up to 200m
Rotor diameter	Up to 200m
Turbine foundation	25m diameter x 4.5m deep
Permanent hard standing area for each wind turbine	Approximately 4 ha. **Figure 6-4** illustrates the typical hardstanding requirements for the construction of each turbine (it should be noted that the figure below is for illustration purposes only – the exact layout and specification of the hardstanding will be determined once the design phase has been completed).
Onsite substation	— Footprint of approximately 1.5ha. — Up to 132kV capacity
Battery Energy Storage System (BESS)	— Footprint of up to 5 ha. — Storage capacity will be up to 200MW/800 megawatt-hour (MWh) with up to four hours of storage — Lithium Battery or Vanadium Redox Flow Technologies — Main components include the batteries, power conversion system and transformer which will all be stored in various rows of containers — BESS components will arrive on site pre-assembled.
Operations and Maintenance Building Infrastructure	Operations and maintenance (O&M) building infrastructure will be required to support the functioning of the WEF and for services required by operations and maintenance staff. The O&M building infrastructure will be in close proximity to the site substation and will include: — Operations building of approximately 200m^2; — Workshop and stores area of approximately 300m^2; and — Refuse area for temporary waste storage and conservancy tanks to service ablution facilities.

Construction Camp Laydown, batching plant, concrete wind tower factory, laydown areas	— Construction camp laydown and concrete batching plant footprint of up to 5ha; — Concrete wind tower plant of approximately 7ha (if necessary), comprising amongst others, a concrete storage area, batching plant, electrical infrastructure and substation, generators and fuel stores, gantries and loading facilities, offices, material stores (rebar, concrete, aggregate and associated materials), mess rooms, workshops, laydown and storage areas, sewage and toilet facilities, offices and boardrooms, labour mess and changerooms, mixers, moulds and casting areas, water and settling tanks, pumps, silos and hoppers, a laboratory, parking areas, internal and access roads; — Temporary laydown area of up to 3ha for the storage of equipment, materials, fuels, cement, chemicals etc; and — Sewage: conservancy tanks and portable toilets.
Access road	Via two existing farm gravel roads; the D260 or the D1107 roads
Length of internal roads	Gravel roads of approximately 60km
Width of roads	The roads will be between 5m and 6m wide. However, where required for turning circle/bypass areas, access or internal roads may be up to 20m to allow for larger component transport.
Height of fencing	Up to 4m high
Specifications of onsite switching stations, transformers, invertors, onsite cables etc	The medium voltage collector system will comprise of cables up to and including 33kV that run underground, except where a technical assessment suggest that overhead lines are required, within the facility connecting the turbines to the onsite substation
Other associated infrastructure	Lighting, lightning protection, telecommunication infrastructure, storm water channels, water pipelines, offices, operational control centre, Operation and Maintenance Area / Warehouse / workshop, Ablution facilities, a gate house, control centre, offices, warehouses, security building, a visitor's centre; and substation building

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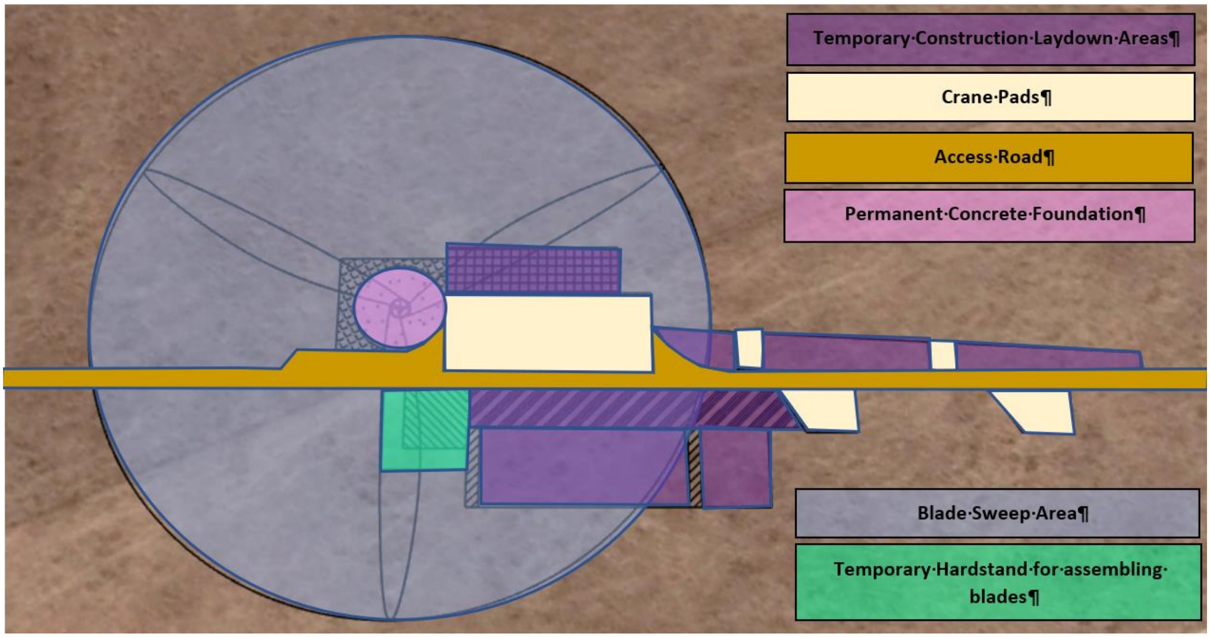

Figure 6-4: Typical Turbine Hard Standing Requirements (illustration purposes only)

The proposed development footprint (buildable area) is approximately 200ha (subject to finalisation based on technical and environmental requirements), and the extent of the project area is approximately 6700 ha. The development footprint includes the turbine positions and all associated infrastructures as outlined above.

6.4 GENERAL CONSTRUCTION ACTIVITIES

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

Table 6-3: Construction Activities

ACTIVITY	DESCRIPTION
Site preparation and establishment	Site establishment will include clearing of vegetation and topsoil at the footprint of each turbine, for laydown area and access routes. The temporary laydown area will be constructed, including establishment of the construction camp (temporary offices, storage containers, concrete batching plant, concrete wind tower factory, etc). Site establishment will also entail the installation and/or connection of services (sanitation, electricity etc).
Transport of components and equipment to site	Bulk materials (aggregate, steel etc.), infrastructure components (masts, blades, tower sections etc), lifting and construction equipment (excavators, trucks, compaction equipment etc.) will be sourced and transported to site via suitable National and provincial routes and designated access roads. The infrastructure components may be defined as abnormal loads in terms of the Road Traffic Act (Act 29 of 1989) due to their large size and abnormal lengths and loads for transportation. A permit may be required for the transportation of these loads on public roads.
Excavation and earthworks	Subject to the determination of founding specifications, earthworks will be required. This is likely to entail: — Excavation of foundation holes to a depth of approximately 4.5m, and pouring of concrete foundations of approximately 2500m^3 from the batching plant. Concrete foundations will be constructed at each turbine location — Levelling of the construction camp area, substation area, and O&M building area, and excavation of foundations prior to construction. — Excavation of trenches for the installation of underground cables.

ACTIVITY	DESCRIPTION
Construction of wind turbines, site substation and BESS	A large lifting crane(s) will be required to lift the turbine sections (nacelle, blades) into place. The lifting crane/s will be brought on site and will be required to move between the turbine site. Cranes of varying sizes may be required depending on the size of the components. An IPP substation will be constructed on the site. The wind turbines will be connected to the IPP substation via underground or overhead (if required) up to 33kV electrical cables. The BESS will typically require the placement of multiple containers to house the BESS components.
Establishment of ancillary infrastructure	Ancillary infrastructure will include construction site office, temporary laydown area and workshop 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.

6.5 ALTERNATIVES

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 alternatives; 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 in a comparative way, 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.

6.5.1 SITE ALTERNATIVES

The selection of the Camden site 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. The Camden site was selected because it is strategically located due to the following factors:

1) **Proximity to the Eskom grid** – The proposed wind energy facility requires connection to the Eskom grid to transmit the generated electricity. As such, the location of the facility would benefit from being close to an existing substation (Camden Power Station substation). The proposed project location is adjacent to the Camden Power Station substation, consequently reducing the length of the powerline that will be constructed for connection. In addition, further existing powerlines are located within proximity to the site, allowing for potential direct connection to these existing lines where insufficient allocation may be available at the Camden substation, or where Eskom planning indicates different future use. Furthermore, the location and proximity of the site to the Camden Power Station reduces environmental impacts associated with long connection lines and reduces energy loss across the lines, ensuring a better production and project competitiveness.
2) **Land Availability** – The availability of land is a key feasibility criterion in the site selection process. The project site is of a suitable land size for the proposed development. The land available for the development of the Camden I WEF extends approximately 6500ha, providing a substantial amount of land for a 200ha development. Furthermore, this region is home to some of the biggest coal power stations in the country (Komati and Camden among many others), and most land parcels have been given mining rights for coal beneficiation to provide fuel stock supply these power stations. Thus, there is very limited land available for the development of renewable energy facilities. The proponent has however secured sufficient land for the development of the proposed WEF with landowners within the respective cadastral portions comprising the

development footprint, indicating their support and willingness for the project to proceed to development via entering into agreement with the developer.

3) **Strategic Approach** – Five of Eskom's coal-fired power stations are targeted for decommissioning in the short term. These include the Komati, Camden, Grootvlei, Arnot, and Hendrina power stations. These power stations range between 50 - 60 years of age. According to the 2019 IRP, over a 11-year period Eskom are expected to decommission over 11GW of its coal fired capacity. The development site is therefore strategically located such that the power generated from the WEF can replace those generated by the Camden Power Station if Camden is decommissioned in the future.
4) **Road and labour pool accessibility** – The site is near the N11 and N2 highways and the town of Ermelo, which will benefit construction logistics and provide a labour resource respectively. There is also an existing road that goes through the land parcels to allow for direct access to the project development area.

The site is considered suitable for the reasons provided. This EIR only investigated the identified Camden I WEF site.

There is no Site alternative for the Camden I WEF.

6.5.2 TECHNOLOGY ALTERNATIVES

The Camden 1 WEF will utilize wind technology to generate power. Therefore, no technology alternatives are being considered for this project. The motivation for the use of wind technology for this project is provided below:

WIND RESOURCE

The Project site was also selected on the availability of wind resource in the Mpumalanga region. The availability of the wind resource is the main drivers of project viability. The Project site was identified by the proponent through a desktop pre-feasibility analysis based on the estimation of the wind energy resource. The average annual wind speed for the site was considered sufficient to ensure the economic viability of a wind energy facility. This viable wind resource ensures the best value for money is gained from the project, allowing for competitive pricing and maximum generation potential, with the resulting indirect benefits for the South African economy. Furthermore, near the proposed Project site the proponent have also identified a suitable area to develop a complementary wind facility that will assist to balance the supply of electricity.

TOPOGRAPHY

The surrounding landscape has a rolling hill topography which is suitable for the development of a wind project. The Project site itself is located on the highest lying ground near the Camden power station and thus has the greatest wind resource within the immediate area.

COMPETITION

With regards to renewable energy facilities, there is minimal competition in the area. Should the project proceed, it will be the first WEF in the province and will act as one of the pioneering developments and open opportunities for other renewable developments. It will also serve as a case study for wind resource in the province, showing that commercially viable wind energy facilities are suitable for certain parts of Mpumalanga Province.

6.5.3 LAYOUT/LOCATION ALTERNATIVES

A conceptual layout of the turbines on the landscape was developed during the Scoping Phase of the S&EIA process for the Camden I WEF and is included in **Figure 6-5.** The layout included 47 turbine positions and associated main WEF components. The project site consists of the following farm portions:

— Portion 0 of Klipfontein Farm No. 442
— Portion 1 of Klipfontein Farm No. 442
— Portion 3 of Klipfontein Farm No. 442

- Portion 1 of Welgelegen Farm No. 322
- Portion 2 of Welgelegen Farm No. 322
- Portion 2 of Uitkomst Farm No. 292
- Portion 10 of Uitkomst Farm No. 292
- Portion 3 of Langverwacht Farm No. 293
- Portion 14 of Mooiplaats Farm No. 290
- Portion 3 of Klipbank Farm 295

The location of the project infrastructure (i.e., layout) was determined based on initial environmental and technical screening which considered the infrastructure locations feasible from a constructability perspective. This included several key aspects including environmental constraints and opportunities, distance to grid connection, topography, site accessibility. The proposed development footprint will comprise of approximately 200 ha, with the main project components consisting of wind turbines and associated infrastructure including the substation and BESS, access and internal roads, construction camp laydown areas (including batching plants).

The initial layout alternative (**Figure 6-5**) for assessment during the Scoping phase included 47 turbines within the development footprint. The two on-site substation alternatives, which include the BESS, were identified during preliminary technical investigations. Both Substation and BESS Alternative 1 and Substation and BESS Alternative 2 were located within Portion 2 of Welgelegen Farm No. 322. Alternative 2 is preferred as it provides the shorter connection to the preferred collector substation. However, both Alternatives are considered feasible and reasonable.

The preliminary Camden I layout (Figure 6-5), inclusive of the various project infrastructure alternatives, has been updated and refined following input from the various Specialist studies during the Scoping Phase. The relevant Specialist studies mapped out sensitive areas (and no-go areas) to be avoided or mitigated through the planning process. Based on the Specialist findings, the refined/revised layout was developed (Figure 6-6) to avoid sensitive features and buffer areas and mitigate against overall impact. The revised layout includes a reduced number of turbines positions from 47 to 37 turbine positions, as well as a slight change in the location of Substation and BESS Alternative 1. The location of Alternative 1 moved slightly southwest of the preliminary identified location. It is however still located within Portion 2 of Welgelegen Farm No. 322.

Access to the proposed Camden I WEF site is via existing farm gravel roads, either the D260 and the D1107 off the N11 or the D1264 off the N2. The existing access roads, as well as the proposed internal roads and service access roads, have been included in the project layout and assessed by the various Specialists during the EIA Phase.

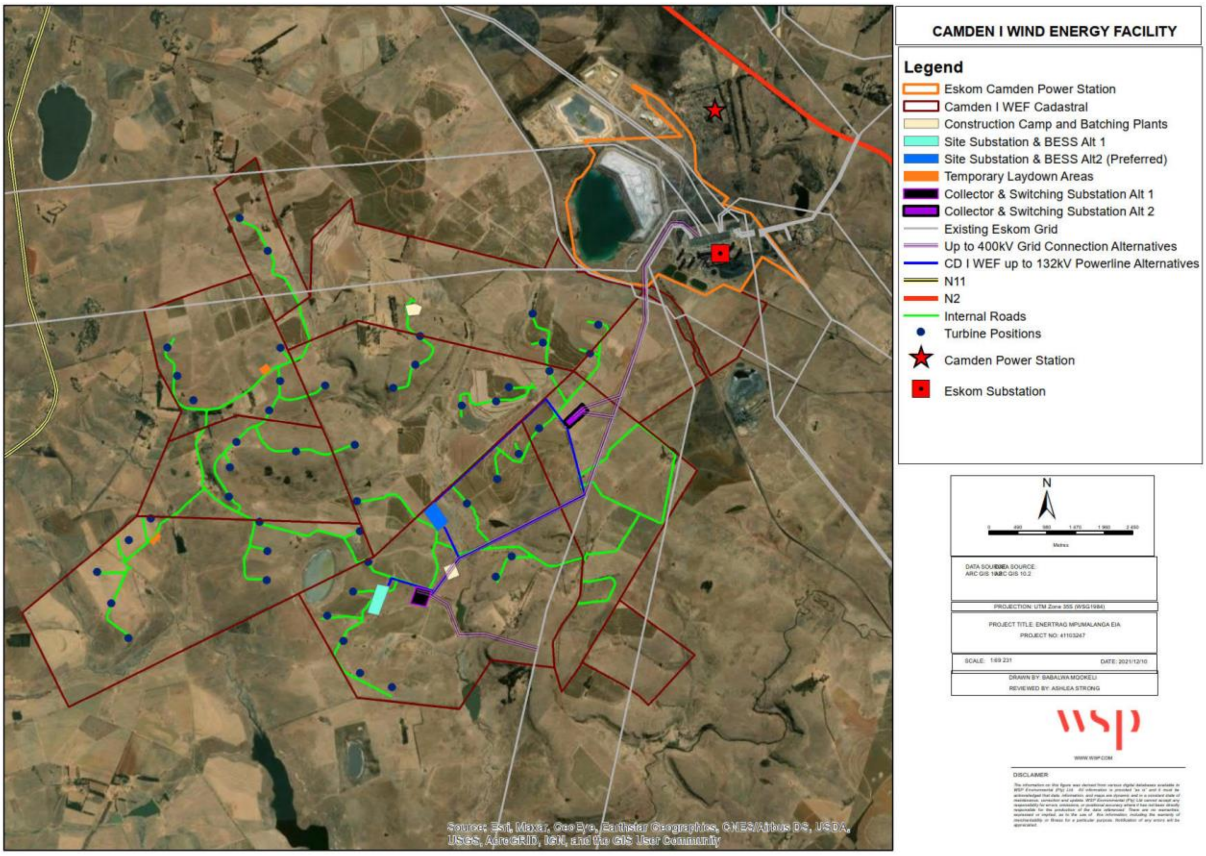

Figure 6-5: Initial Layout for the Camden I WEF (up to 47 Turbines)

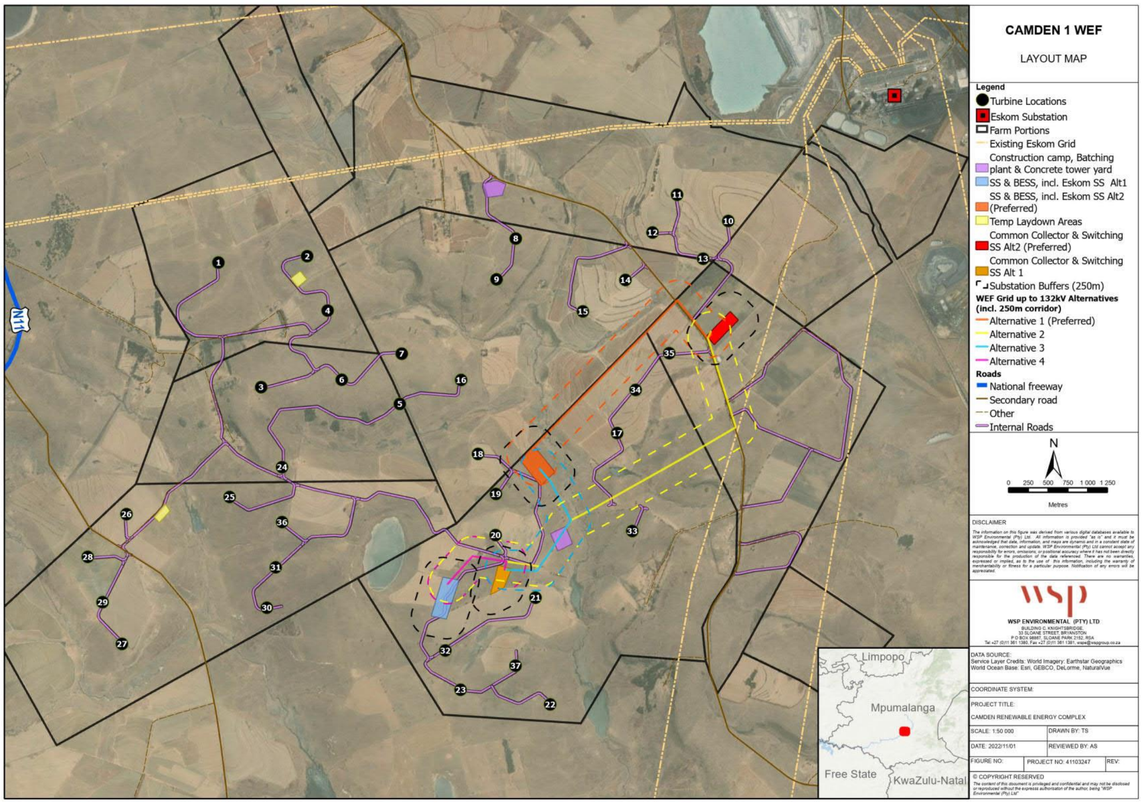

Figure 6-6: Revised layout for the Camden I WEF (up to 37 Turbines)

Table 6-4: Advantages and Disadvantages of Layout Alternatives on the Environment

ALTERNATIVE	ADVANTAGES	DISADVANTAGES
Site Substation & BESS Alternative 1	— Acceptable impact from an avifaunal perspective due to the low impact of the small footprint. — No direct impact to recorded heritage ruins and graves (closest grave located approximately 1800m away). — Not located in significant proximity to any social receptors (further than 1 km). — Site alternative found favourable from a visual perspective (i.e., the impact will be relatively insignificant).	— Impinges partially on cropland — Half located in high sensitivity grassland and half located in cultivated land (LOW sensitivity). — Located within declared Langcarel Nature Reserve. — Potential displacement impact on priority avifauna. — The Option 1 alternative location for the BESS is approximately 200m from a stream that tributes to the Vaal River system. This proximity to an important water course is a disadvantage of this location, but with suitable mitigation measures in place, the risks are acceptably low and this option remain a viable.
Site Substation & BESS Alternative 2 (Preferred)	— Preferred from an agricultural impact point of view because it is located entirely off cropland. — Acceptable impact from an avifaunal perspective due to the low impact of the small footprint. — No direct impact to recorded heritage ruins and graves (closest grave located approximately 590m away). — Not located in significant proximity to any social receptors (further than 1 km). — Site alternative found favourable from a visual perspective (i.e., the impact will be relatively insignificant).	— Located in high sensitivity grassland next to a wetland. — Potential displacement impact on priority avifauna. — Located in rangeland and marginal portion of a cropped field. — Located within declared Langcarel Nature Reserve. — Located approximately 200m from a stream that tributes to the Vaal River system. This proximity to an important water course is a disadvantage of this location, from a SHE risk assessment point of view, but with suitable mitigation measures in place, the risks are acceptably low and this option remain a viable option.
Revised Turbine Layout (37)	— 35 Turbine positions are located outside of avifaunal no-go zones. — From a terrestrial biodiversity perspective, the proposed turbine layout has a small footprint area, and those natural areas that are affected are generally in relatively poor condition due to overgrazing. — No direct impact to recorded heritage ruins and graves (closest grave located approximately 220m away). — None of the identified sensitive receptors would experience high levels of visual impact as a result of the proposed Camden I WEF development. — Despite the proximity of some turbines to farmsteads, none of the affected landowners interviewed raised concerns about potential visual impacts associated with the proposed project. Most of the	— Turbine position 22 and 33 are located within a 5km radius of Martial Eagle nest (i.e., 5 km no-turbine exclusion zone). These two turbine positions would require relocation outside the avifaunal no-turbine zone during the final layout approval process. — Located within grasslands and cultivated areas, therefore affecting areas either with LOW, MEDIUM-HIGH (Cultivated wetlands) or HIGH sensitivity (grassland). — Two of the fourteen potentially visual sensitive receptor locations are expected to experience moderate levels of visual impact as a result of the WEF development. — Turbines are proposed within a 500 m to 1 km range of residential receptors

ALTERNATIVE	ADVANTAGES	DISADVANTAGES
	local farmsteads are also screened by the rolling topography or trees.	

6.5.4 LAND-USE ALTERNATIVES

Current use of land is a key consideration in terms of finding a suitable site that does not significantly hinder existing land-use practices. The current land use of the site properties is agricultural land-use, mainly used for cultivation and livestock grazing. According to the Agricultural Impact Assessment (Appendix H-1 of this EIR), due to the favourable climate and suitable soils on the croplands, crop yields are fairly high with average maize yields of around 7 to 8 tons per hectare according to the farmers on site. The long-term grazing capacity of the area is fairly high at 4.5 hectares per large stock unit. However, as noted in Appendix H-1, the impact of the proposed development on the agricultural production capability of the site is assessed as being acceptable. The proposed development will only exclude an insignificantly small proportion of the land, approximately 0.8%, from agricultural production and consequently has an insignificantly small impact on the future production potential of the farmland on which it is located. Farming will be able to continue with the development and with no discernible change as a result of it. Construction (and decommissioning) activities are likely to have some nuisance impact for farming operations but are highly unlikely to have an impact on agricultural production.

Agricultural land is preferred as the majority of farming activities can share land use with the operation of the wind facility. As noted in Section 5.1.3 of this EIR, the preferred project (wind farm) facilitates multiple land use functions within the development area. Wind turbines are spread out across the development area allowing multiple land use functions such as operating the wind farm in tandem with agricultural activities or even underground coal mining. This will boost the economic activities in the area which will in turn increase job opportunities in that area and help improve the local community's welfare without jeopardizing the environment.

6.5.5 TECHNOLOGY ALTERNATIVES

The Proponent is considering two types of preferred battery technologies for the BESS, that is, either Solid State Lithium (SSL) or Vanadium Redox Flow (VRF) Battery Energy Storage Systems.

LITHIUM SOLID STATE BATTERIES

Solid-State Battery consists of multiple battery cells that are assembled together to form modules. Each cell contains a positive electrode, a negative electrode and an electrolyte. The BESS will comprise of multiple battery units or modules housed in shipping containers and/or an applicable housing structure which is delivered pre-assembled to the project site. Containers are usually raised slightly off the ground and layout out is rows. They can be stacked if required although this may increase the risk of events in one container spreading to another container. Supplementary infrastructure and equipment may include substations, power cables, transformers, power converters, substation buildings & offices, HV/MV switch gear, inverters and temperature control equipment that may be positioned between the battery containers. The solid-state batteries that are being considered are Lithium-ion systems.

In Lithium battery technologies, energy storage and release is provided by the movement of lithium ions from the negative electrode to the positive electrode during discharge and back when charging. Solid-State lithium (SSL) batteries have become increasing popular due to their high energy density, low self-discharge and long lifetime and cycling performances.

VANADIUM REDOX FLOW BATTERY

The project will employ utility scale batteries. These energy storage systems can be supplied either as containerized units or as a fixed installation within a building etc. Due to the proposed size of the facility (200MW) the Camden facility is currently envisioned as having units housed within a large battery building.

All electrochemical energy storage systems convert electrical energy into chemical energy when charging, and the process is reversed when discharging. With conventional batteries, the conversion and storage take place in closed cells. With redox flow batteries, however, the conversion and storage of energy are separated. Redox flow batteries differ from conventional batteries in that the energy storage material is conveyed by an energy converter. This requires the energy storage material to be in a flowable form. In redox flow batteries, charging and discharging processes can take place in the same cell. Redox flow batteries thus have the distinguishing feature that energy and power can be scaled separately. The power determines the cell size, or the number of cells and the energy is determined by the amount of the energy storage medium. In theory, there is no limit to the amount of energy that can be produced and/or stored thereby allowing for scalability of these systems. VRF battery is considered to have a large cycle life, independent power and energy ratings, relatively poor round trip, moderate cost and no self-discharge.

Figure 6-7 shows the general operating principle of redox flow batteries. The energy conversion takes place in an electrochemical cell which is divided into two half cells. The half cells are separated from each other by an ion-permeable membrane or separator, so that the liquids of the half cells mix as little as possible. The separator ensures a charge balance between positive and negative half cells, ideally without the negative and positive.

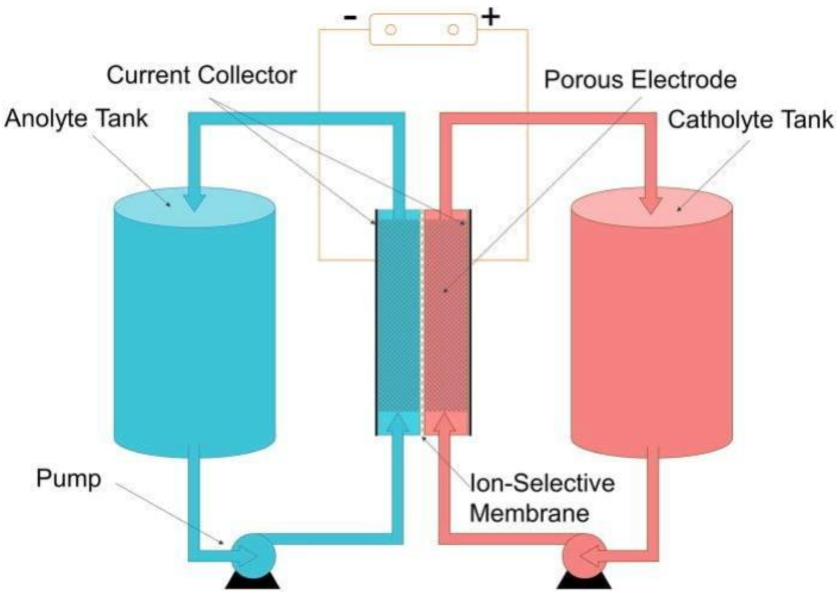

Figure 6-7: Schematic Diagrams of Redox Flow BESS Systems (Source: Wikipedia)

It is important to note that the selection of specific technology will only be determined following EPC, therefore both types of battery technologies have been considered in the EIA. The potential risks and impacts of the proposed BESS at the Camden I WEF have been assessed as part of this EIA and the Risk Assessment is included in **Appendix H-12**. Both options have been investigated in **Section 7.4** of this report, and assessed in **Section 8.18**.

From a safety and health point of view, the risk assessment shows that risks posed by VRFB systems may be slightly lower than those of SSL facilities, particularly with respect to fire and explosion risks. From an environmental spill and pollution point of view the VRFB systems present higher short-term risks than the SSL systems. However, the above conclusions may be due to the fact that the VRFB technology is not as mature as SSL technology and therefore there is not as much operating experience and accident information available for the VRFB.

From a SHE risks assessment point of view, where there is a choice of location that is further from public roads, water courses or isolated farmhouses, this would be preferred. VRFB hazards are mostly related to possible loss of containment of electrolyte and SSL batteries to fires producing toxic smoke and fire fighting which may result in contaminated of firewater runoff. One would not want these liquids to enter water courses nor the smoke to pass close to houses / public traffic.

From a SHE perspective no fatal flaws were found with the proposed VRFB or Lithium Solid-state BESS installations. The preferred technology, from a technical and financial perspective, is Lithium battery technologies (Solid State Lithium (SSL)), however both SSL and the redox flow batteries are considered reasonable and feasible. Both BESS technologies were assessed, and no fatal flaws were identified, therefore it is recommended that both alternatives be authorised. However, the SSL technology is preferred.

6.5.6 ‘NO PROJECT’ ALTERNATIVE

In the “no project” alternative, the Camden I WEF 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 Camden I WEF would be avoided.

The “no project” alternative has been considered in this EIA phase as a baseline against which the impacts of the Camden I WEF project have been assessed.

7 DESCRIPTION OF BASELINE ENVIRONMENT

7.1 PHYSICAL ENVIRONMENT

7.1.1 CLIMATE AND METEOROLOGY

LOCAL METEOROLOGY OVERVIEW

According to the Köppen-Geiger Classification, the Camden/Ermelo area is classified as having a temperate climate with summer rainfall and dry winters. Meteorological variables, including hourly temperature, rainfall, humidity, wind speed and wind direction, were sourced for the South African Weather Service (SAWS) Ermelo ambient air quality monitoring (AAQM) station as well as Eskom's ambient air quality monitoring station (AQMS)[9] located ~6 km to the northeast. The datasets were analysed for the period January 2018 – December 2020 (i.e. three calendar years as required by the Regulations Regarding Air Dispersion Modelling[10], hereafter referred to as 'the Modelling Regulations'). The Ermelo AAQM station is located approximately 20 km to the northwest of the project site. Station details and data recovery information for the assessed period is given in **Table 7-1**.

Table 7-1: Details of the Ermelo AAQMI station

STATION NAME	LATITUDE (ᴼS)	LONGITUDE (ᴼE)	ALTITUDE (M)	DATA RECOVERY		
				Temperature	Rainfall	Wind
Ermelo	-26.497000°	29.983000°	1752	97%	98%	98%
Camden	-26.622600°	30.106000°	1646	97%	97%	96%

TEMPERATURE AND RAINFALL

Figure 7-1 and **Figure 7-2** presents average monthly temperature, rainfall and humidity as recorded at the Ermelo and Camden stations respectively. Both stations exhibit seasonal trends typical for the eastern half of South Africa. Higher rainfall occurs during the warmer summer months (December, January and February), with drier conditions during cooler winter months (June, July and August). Summer temperatures for the region average at 17.8°C while winter temperatures average at 11.0°C. Ermelo received 1 806 mm of rainfall over the three-year period, with approximately 49% of that received during the summer months and 3% during the winter months.

[9] This station's main function is the measurement of ambient air pollution; however, the station also measures an array of meteorological parameters. The nearest standalone SAWS meteorological station is Witbank (over 50 km to the north-northwest of the development site) and thus not representative of site conditions.

[10] Department of Environmental Affairs (2014): Regulations Regarding Air Dispersion Modelling (No. R. 533), Government Gazette, 11 July 2014, (No. 37804).

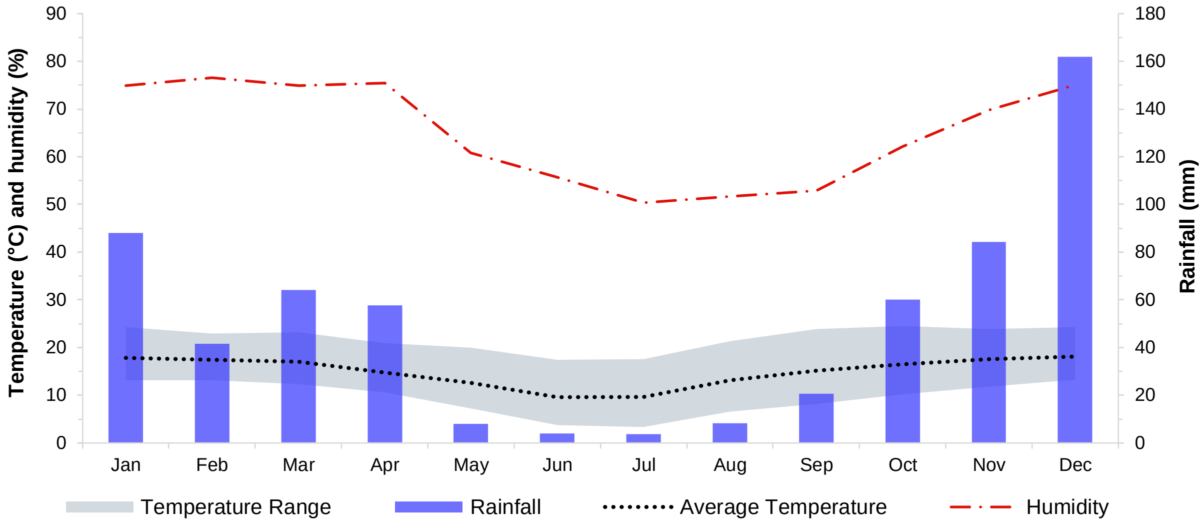

Figure 7-1 Meteorological summary for Ermelo (January 2018 - December 2020)

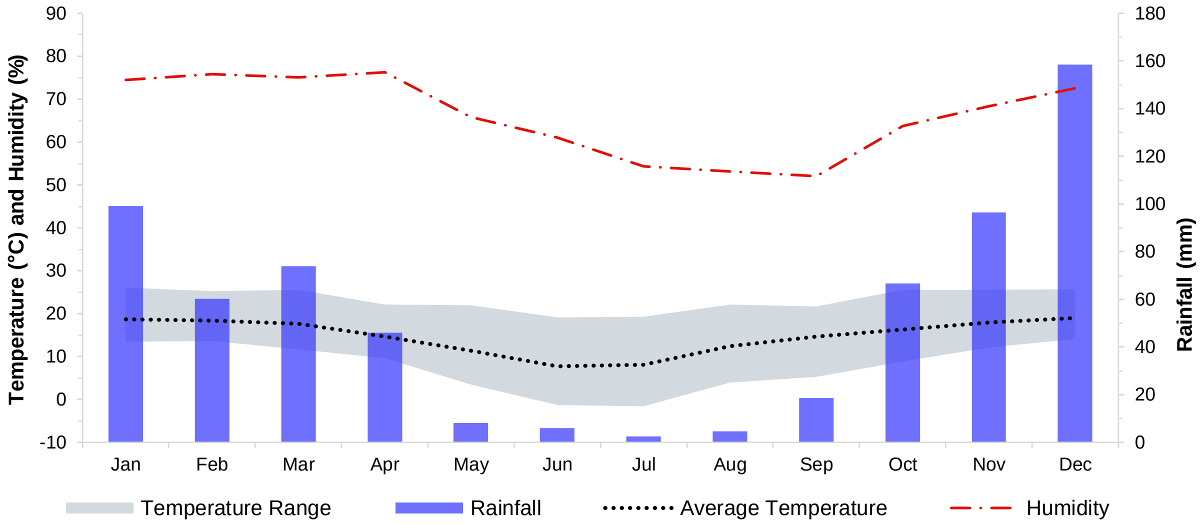

Figure 7-2: Meteorological summary for Camden (January 2018 - December 2020)

WIND

Wind roses summarize wind speed and directional frequency at a location. Calm conditions are defined as wind speeds less than 1.0 m/s (i.e. based on the typical sensitivity of the wind sensor installed at SAWS stations). Each directional branch on a wind rose represents wind originating from that direction. Each directional branch is divided into segments of colour, each representative of different wind speeds.

Typical wind fields are analysed for the full period (January 2018 – December 2020); diurnally for early morning (00h00–06h00), morning (06h00–12h00), afternoon (12h00–18h00) and evening (18h00–00h00); and seasonally for summer (December, January and February), autumn (March, April and May), winter (June, July and August) and Spring (September, October and November). Typical wind fields have been analysed using Lakes Environmental WRPlot Freeware (Version 7.0.0)

Wind roses for Ermelo are presented in **Figure 7-3**.

— Calm conditions (wind speeds <1.0 m/s) occurred 1.40% of the time;
— Moderate to strong easterlies and east-southeasterlies prevailed in the region;
— Peak (14 m/s) wind speeds occurred from the north-northwest;
— Winds from the east-northeast and north prevailed during the early morning (00h00 – 06h00);

- Easterly winds with components from the north-westerly quadrant prevailed during the morning (06h00 – 12h00);
- Winds from the west, west-northwest, northwest, east-southeast and east prevailed in the afternoon (12h00 – 18h00). Diurnal peak (12.9 m/s) wind speeds occurred during the afternoon;
- Easterlies prevail during the night (18h00 – 00h00);
- Winds from the east prevailed during the spring, summer and autumn months;
- Westerlies and north-north westerlies prevail during winter with higher directional variability noted for this period; and
- Highest average wind speeds of 4.9 m/s were observed during the spring months, with peak seasonal wind speeds of 12.9 m/s observed during winter.

Wind roses for Camden are presented in **Figure 7-4**.

- Calm conditions (wind speeds <1 m/s) occurred 14.13% of the time;
- Gentle to strong breezes from the east prevailed in the region;
- Peak (13.8 m/s) and highest average (5.5 m/s) wind speeds occurred from the west;
- Easterly winds prevail throughout the day and night with northwesterly components noted during the early morning (00h00-06h00), morning (06h00-12h00) and night-time (18h00-00h00) hours, as well as westerly components noted during the afternoon (12h00-18h00);
- Diurnal peak (13.3 m/s) and highest average (5.0 m/s) wind speeds occurred during the afternoon;
- Winds from the east prevailed during the spring and autumn months;
- Winds from the northwest, west-northwest, west and east prevailed during winter;
- Winds from the east and northwest prevailed during spring; and
- Seasonal peak (13.3 m/s) wind speeds occur during winter and highest average (4.0 m/s) wind speeds occur during spring

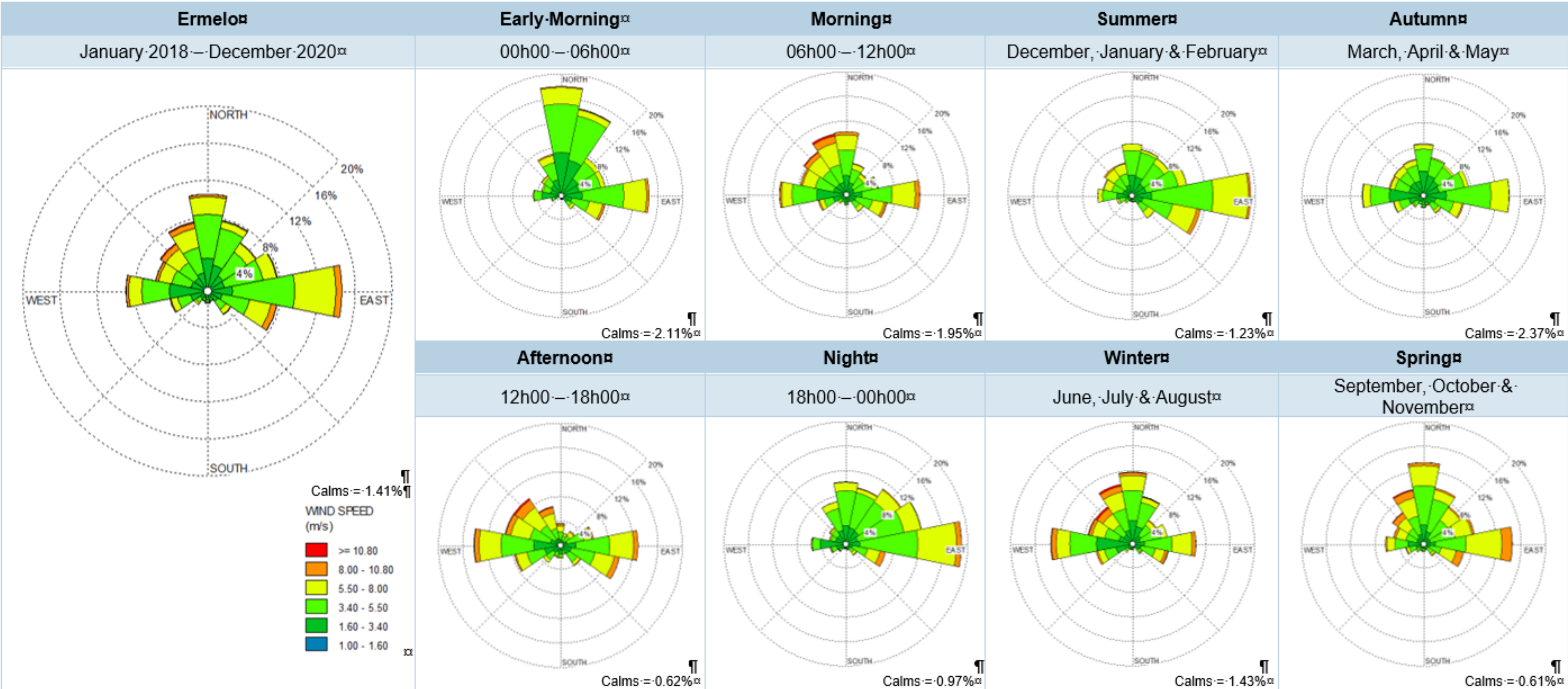

Figure 7-3: Local Wind Conditions at Ermelo

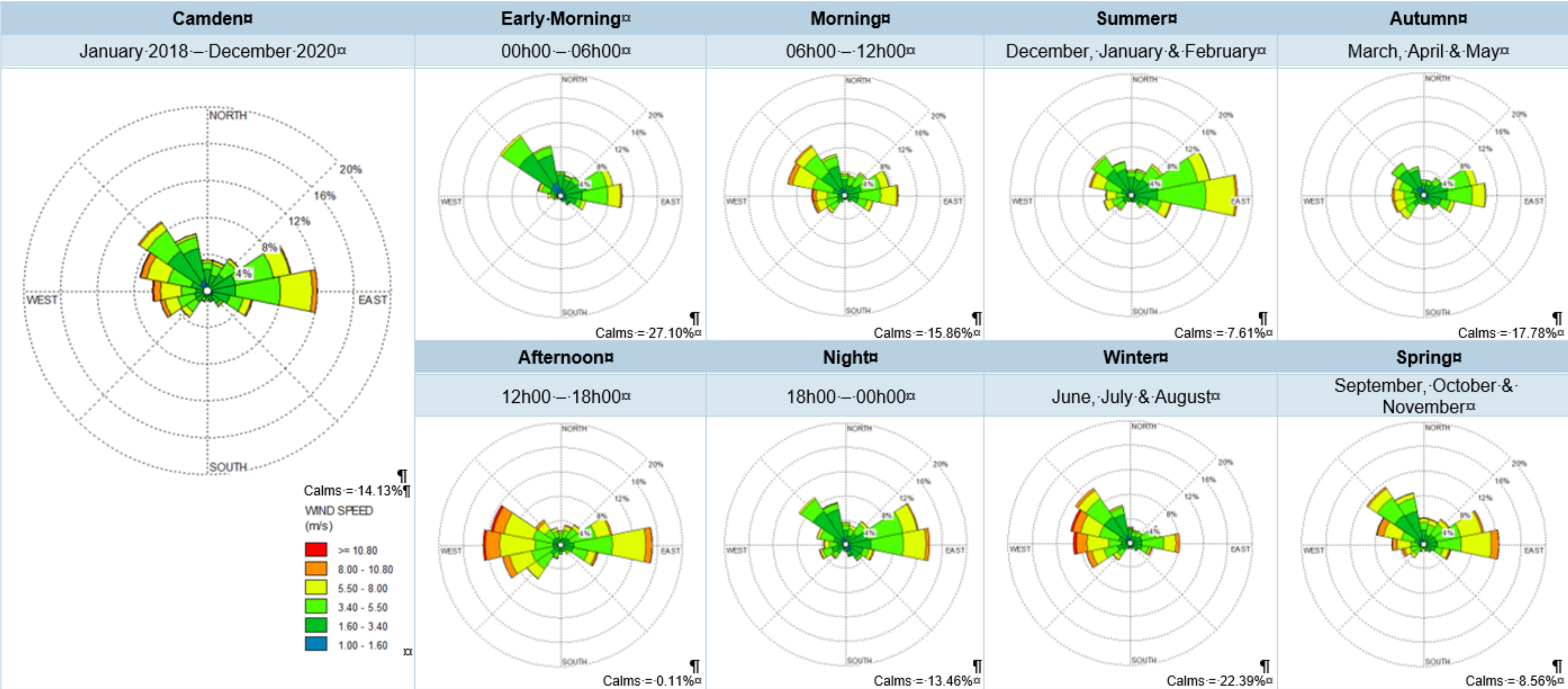

Figure 7-4: Local Wind Conditions at Camden

7.1.2 TOPOGRAPHY

The Project area is largely characterised by a mix of undulating plains and greater relief in the form of higher lying plateaus intersected by river valleys. Slopes across the study area are relatively gentle to moderate, with steeper slopes being largely associated with the more incised river valleys. The main water course in the study area is the Vaal River in the south-eastern portion of the study area. Gently undulating terrain prevails across much of the Camden I WEF development site.

The study area undulates over a wide elevation range from a minimum of around 1 620m above mean sea level (amsl) within the west to a maximum of approximately 1 735m amsl in the north, with an overall topographic fall from north to south. The eastern portion of the area lies on a ridge that largely topographically separates the site from Camden Power Station to the northeast.

The topography and slopes within and in the immediate vicinity of the Camden I WEF area are indicated in **Figure 7-5** and **Figure 7-6** respectively.

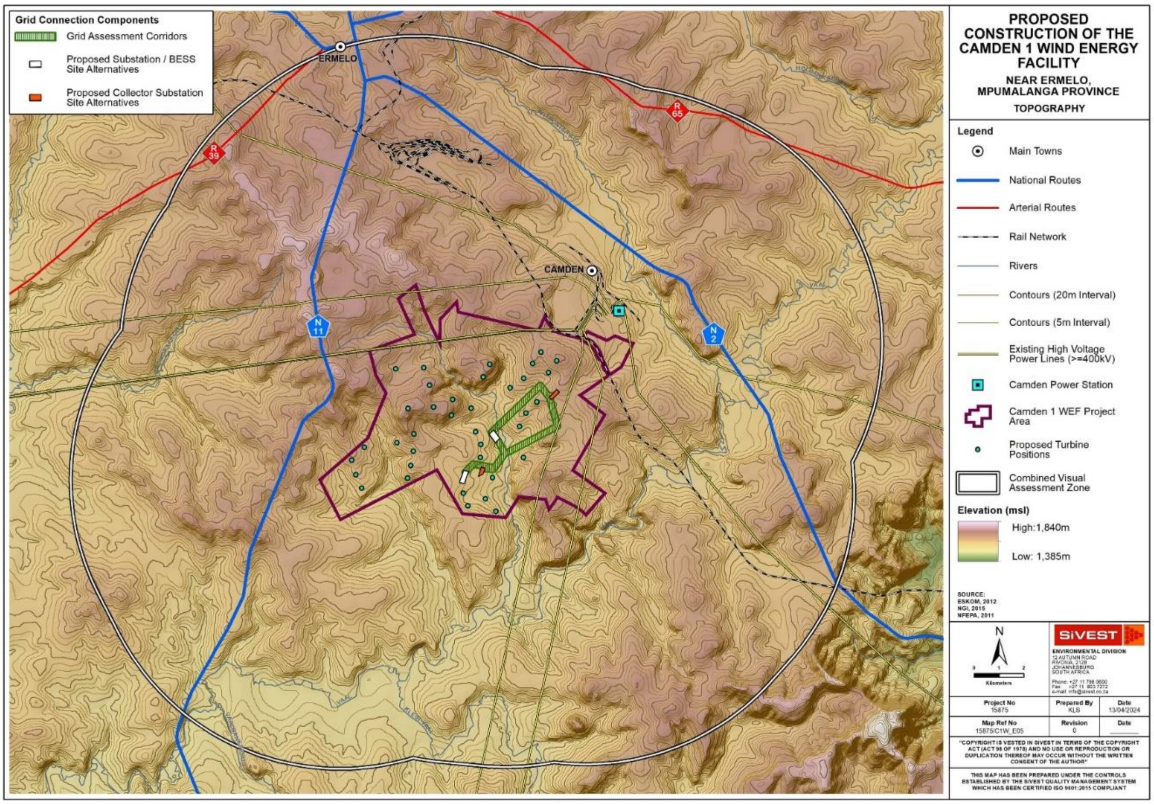

Figure 7-5: Topographical Map of Project Area (SiVest, 2022)

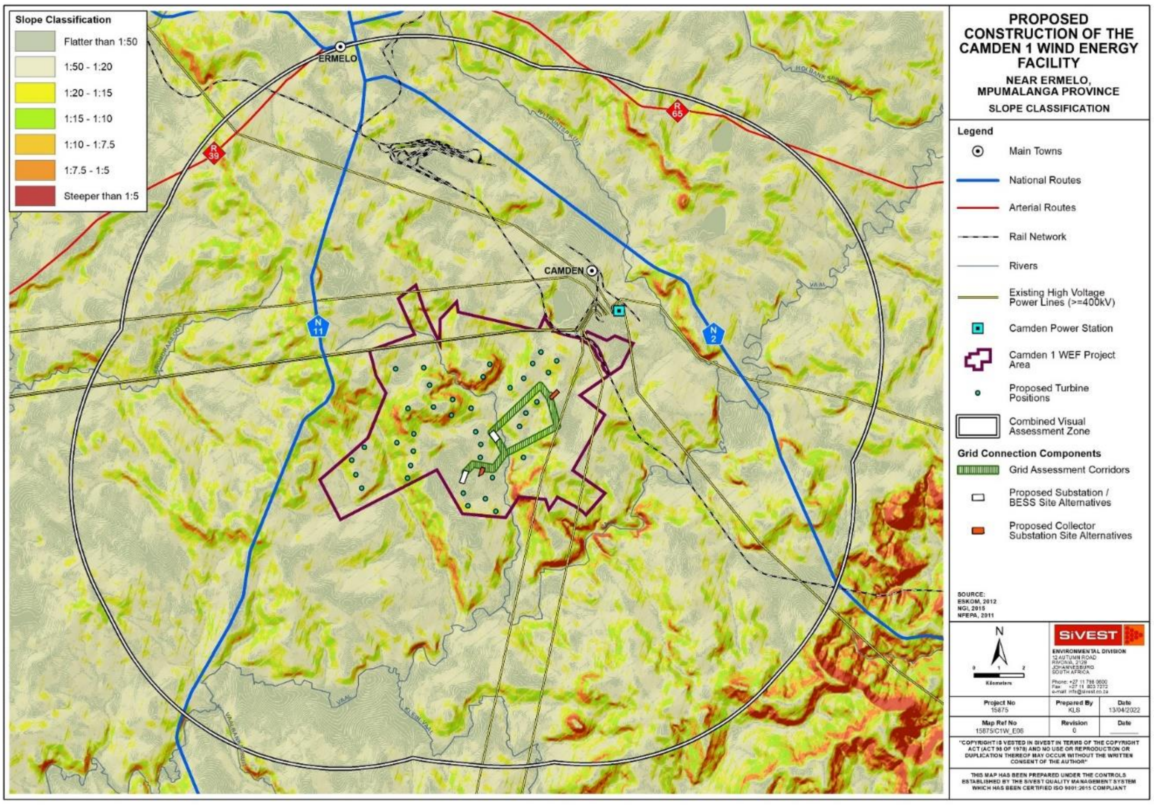

Figure 7-6: Slope classification of Project Area (SiVest, 2022)

7.1.3 GEOLOGY

In accordance with the 1:250 000 Geological Maps 2628 East Rand and 2630 Mbabane, published by the Council of Geoscience, the study area is underlain by stratigraphic units of the Ecca Group, Karoo Supergroup which is extensively intruded by post-Karoo dolerite.

VRYHEID FORMATION, ECCA GROUP

The proposed development area is underlain by lithological units of the Ecca Group which is represented by sandstones, shales and coal seams of the Vryheid Formation, all deposited in a shallow marine environment. The Vryheid Formation has been extensively intruded by Jurassic aged dolerite, becoming relatively more prevalent further east of the proposed study area.

Sandstones comprise a larger portion of the Karoo sediments and are generally closely intercalated with mudrocks, resulting in alternating bands of arenaceous and argillaceous sediments. The Vryheid Formation sandstones may typically occur as arkosic to greywacke, ranging from a generally coarse grained, poorly sorted material to a fine grained, well sorted material, with an abrupt upward transition.

Of significant economic importance is the presence of coal seams located stratigraphically between the sandstone and mudrock bedding partings, at the base of the Vryheid Formation. The lower coal seams attain thicknesses of approximately 18 m which progressively diminishes upwards through the formation, due to various depositional and post-depositional factors (Brink, 1983).

POST-KAROO DOLERITE

The development area is predominantly underlain by post-Karoo dolerite. Dolerite is an intrusive, hyperbyssal igneous rock of post-Karoo age that has intruded the sedimentary host rocks, mainly in the form of concordant sills and to a lesser extent as discordant dykes. It is a dark grey, crystalline, rock composed mainly of plagioclase feldspar and pyroxene, with accessory amounts of olivine, biotite, amphibole, apatite and iron ore minerals.

Whilst generally of medium grained texture, the dolerite adjacent to the sedimentary contacts is often of a finer texture due to rapid cooling of the magma. The intrusions have also frequently resulted in the formation of an alteration or “baked” zone in the sedimentary rocks adjacent to the contacts. The joints in the dolerite are in most cases filled or coated by secondary calcite and chlorite, deposited by the subsequent circulation of magmatic fluids (Brink, 1983).

7.1.4 SOILS AND AGRICULTURAL POTENTIAL

Based on the Land Type information, the site is located in Land Types Ca3 and BA51. Approximately half of both land types comprise deep, red and yellow, reasonably-drained, loamy soils of the Avalon, Hutton, Glencoe, and other soil forms that are good for crop production. The other half comprises other soils that have various limitations for crop production, which are predominantly the result of poor drainage or limited depth due to underlying clay or bedrock. These soils are of the Mispah and Glenrosa soil forms (shallow bedrock) and the Kroonstad, Estcourt Valsrivier, Longlands, and other soil forms (poor drainage and underlying clay).

The site is located in a grain and cattle farming agricultural region, but the soils vary in their suitability for crop production. Crops in the area include mainly maize and soya beans. Farmers generally utilise all suitable soil as cropland. Only soil that is not suitable for crop production is used for grazing of cattle and sheep. Limitations that render the soil unsuitable for crop production are poor drainage and depth limitations due to rock or dense clay in the subsoil.

Due to the favourable climate and suitable soils on the croplands, crop yields are fairly high with average maize yields of around 7 to 8 tons per hectare according to the farmers on site. The long-term grazing capacity of the area is fairly high at 4.5 hectares per large stock unit (DAFF, 2018).

7.1.5 SURFACE WATER

HYDROLOGICAL CACHMENT

In terms of surface water, the study area is located within the western portion of C11B Quaternary Catchment (Vaal River) of the Highveld Ecoregion in the Vaal Water Management Area (WMA). Most of the aquatic features and unknown tributary of the Vaal River within the study area are located within the riverine valleys and upper catchment areas (pans) of this quaternary catchment (**Figure 7-7**).

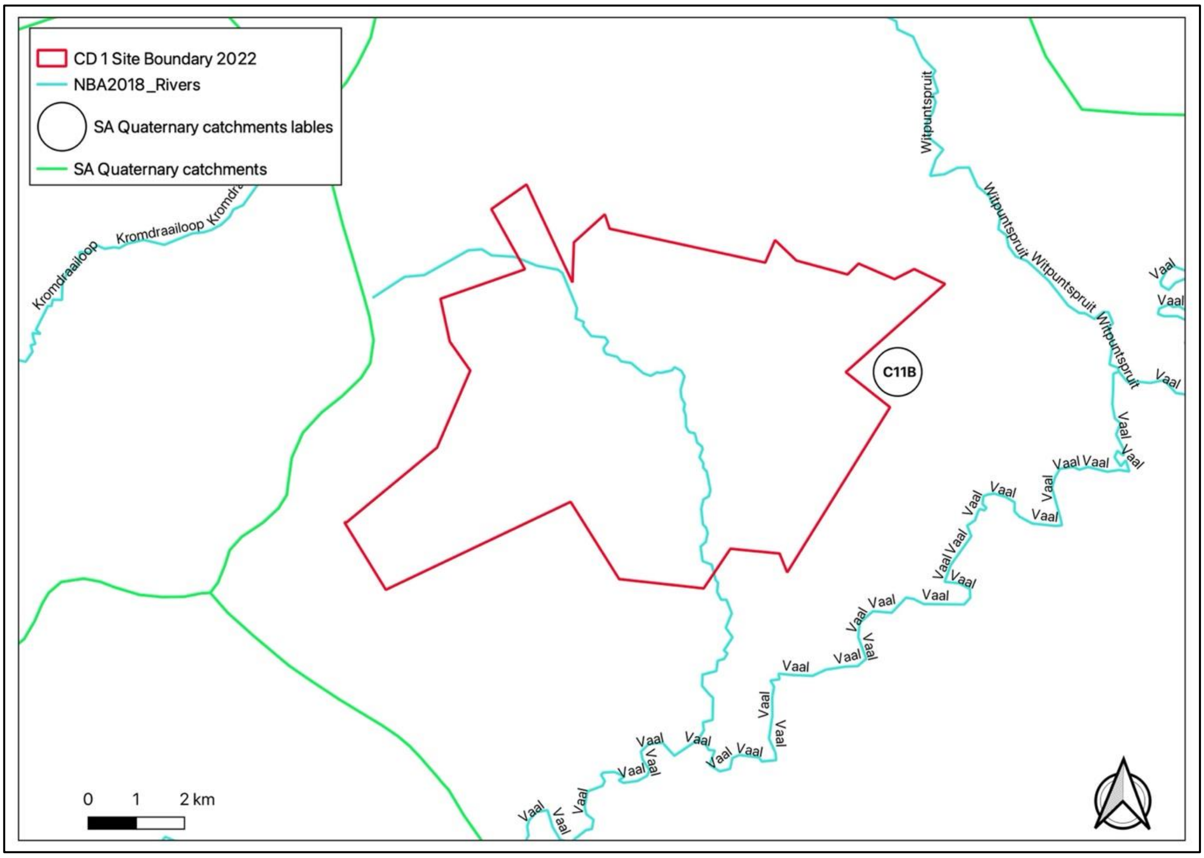

Figure 7-7: Mainstream rivers associated with the Project Area (EnviroSci, 2022)

LOCAL AQUATIC FEATURES

According to the EIA Phase Aquatic Assessment Report (EnviroSci, 2022) (**Appendix H-5**), the study area is dominated by a variety of aquatic features, characterised as follows:

— Mainstem Rivers **-** Floodplain dominated systems with oxbow wetlands (**Figure 7-8**). A few reaches did contain very narrow riparian zones, consisting mostly of a single row of willow trees associated with the unknown tributary of the Vaal River

— Valley Bottom Wetlands (Channelled and Unchannelled) (**Figure 7-9**)

— Endorheic pans (**Figure 7-10**)

— Seep wetlands (**Figure 7-11**)

— One minor watercourse (**Figure 7-12**), that was previously part of a wetland systems, but now contains severe head cut and has eroded into a channel / watercourse.

Figure 7-8: Wetlands associated with the unknown tributary that bisects the study area

Figure 7-9: Channelled Valley Bottom wetland

Figure 7-10: Endorheic Pan, one of three such large systems within the study area

Figure 7-11: A medium sized seep wetland within the central portion of the site

Figure 7-12: A view of a minor water course, with a view of an earth wall farm dam upstream

The DFFE identified the aquatic environment for the study area as having a Very High Sensitivity, based on the fact the following criteria are present within the site or the associated catchment, namely:

— Presence of Wetlands
— Aquatic Critical Biodiversity Areas (CBA)
— Freshwater Ecosystem Priority Area quinary catchments (NFEPA)
— Wetland clusters
— Eastern Highveld Grassland a listed Threatened Ecosystem under NEMA.

The presence of these Very High Sensitivity features, although to a finer mapping scale were confirmed during this assessment. The study area is however not located within an International Bird Area (IBA) or a Strategic Water Resource Area.

This ground-truthed delineations were then compared to current wetland inventories (van Deventer *et al.*, 2020), 1: 50 000 topocadastral surveys mapping and the site. These inventories include wetland spatial data based on landcover 2007 data, previous assessments and wetland information retained by the Provincial authorities, combined into one database that formed part of the updated National Spatial Biodiversity Assessment, 2018.

A baseline map was then developed and refined using the August 2020 survey data, noting that due to the complex nature of the topography and geology, the features were digitised at a scale of 1:4000 **(Figure 7-13**).

Coupled to the aquatic delineations, information was collected on potential species that could occur within the wetlands and water courses, especially any areas that would contain open water for long periods and or conservation worthy species (Listed or Protected).

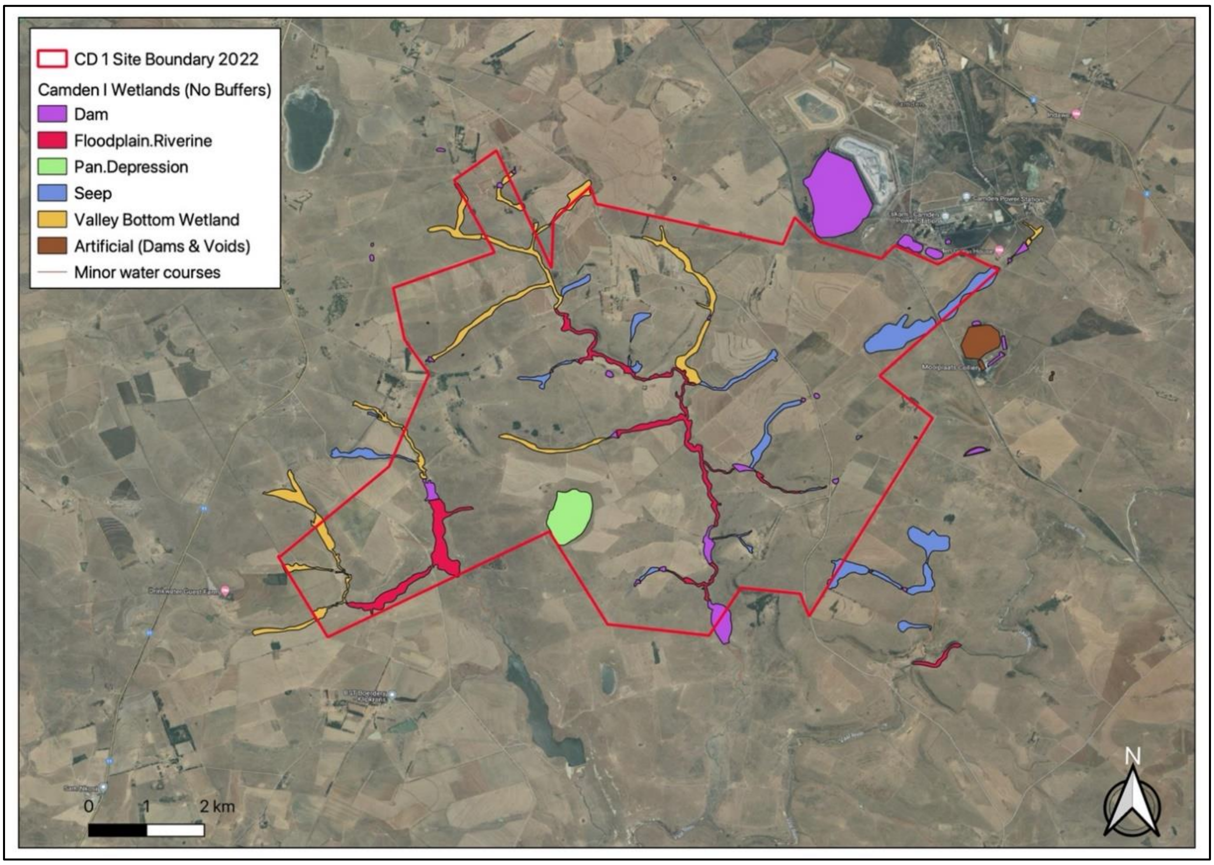

Figure 7-13: Delineated Wetlands within Project footprint based on ground-truthing information collected

PRESENT ECOLOGICAL STATE AND CONSERVATION IMPORTANCE

The Present Ecological State (PES) of a river, watercourse or wetland represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habit and biota, as well as ecosystem functioning (Category E).

The PES scores have been revised for the country and based on the new models, aspects of functional importance as well as direct and indirect impacts have been included (DWS, 2014). The new PES system incorporates Ecological Importance (EI) and Ecological Sensitivity (ES) separately as opposed to Ecological Importance and Sensitivity (EIS) in the old model, although the new model is still heavily centred on rating rivers using broad fish, invertebrate, riparian vegetation and water quality indicators. The Recommended Ecological Category (REC) is still contained within the new models, with the default REC being B, when little or no information is available to assess the system or when only one of the above-mentioned parameters are assessed or the overall PES is rated between a C or D.

All of the systems assessed by DWS (2014) on a Subquaternary level within the study area were rated as PES = C or Moderately Modified and PES = D or Largely Modified. While these were also rated as High in terms of Ecological Sensitivity and Ecological Importance respectively.

Based on the information collected during the field investigations, these ratings are verified and upheld for the riverine / wetland systems. The natural wetlands were however rated independently and achieved PES scores of C and D, while the EIS was rated as HIGH. The High EIS rating for both natural water courses and wetlands, is further substantiated by the fact that the affected catchments are included in both the National Freshwater Priority Atlas and the provincial Biodiversity Spatial Plan Critical Biodiversity Area spatial layers (**Figure 7-14** and **Figure 7-15**). These areas are also highlighted as important ecological support areas along the Vaal River.

Overall, these catchment areas and subsequent rivers / watercourses are largely functional with localised impacts in some areas, which include the following:

— Erosion and sedimentation associated with road crossings;
— Impeded water flow due to several in channel farm dams; and
— Sedimentation and scour of channels due to undersized culverts within present day road crossings.

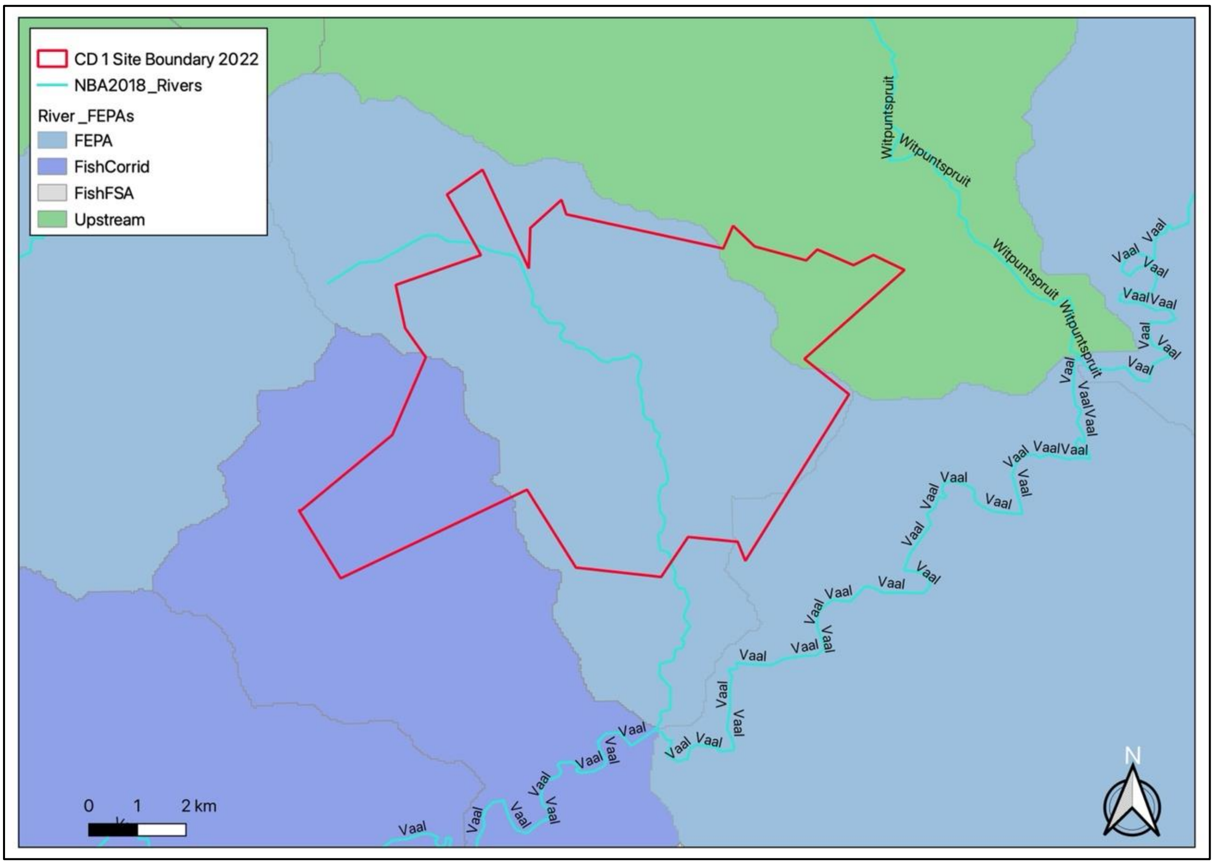

Figure 7-14: The Freshwater Ecosystem Priority Areas for the study site (Nel et al, 2011)

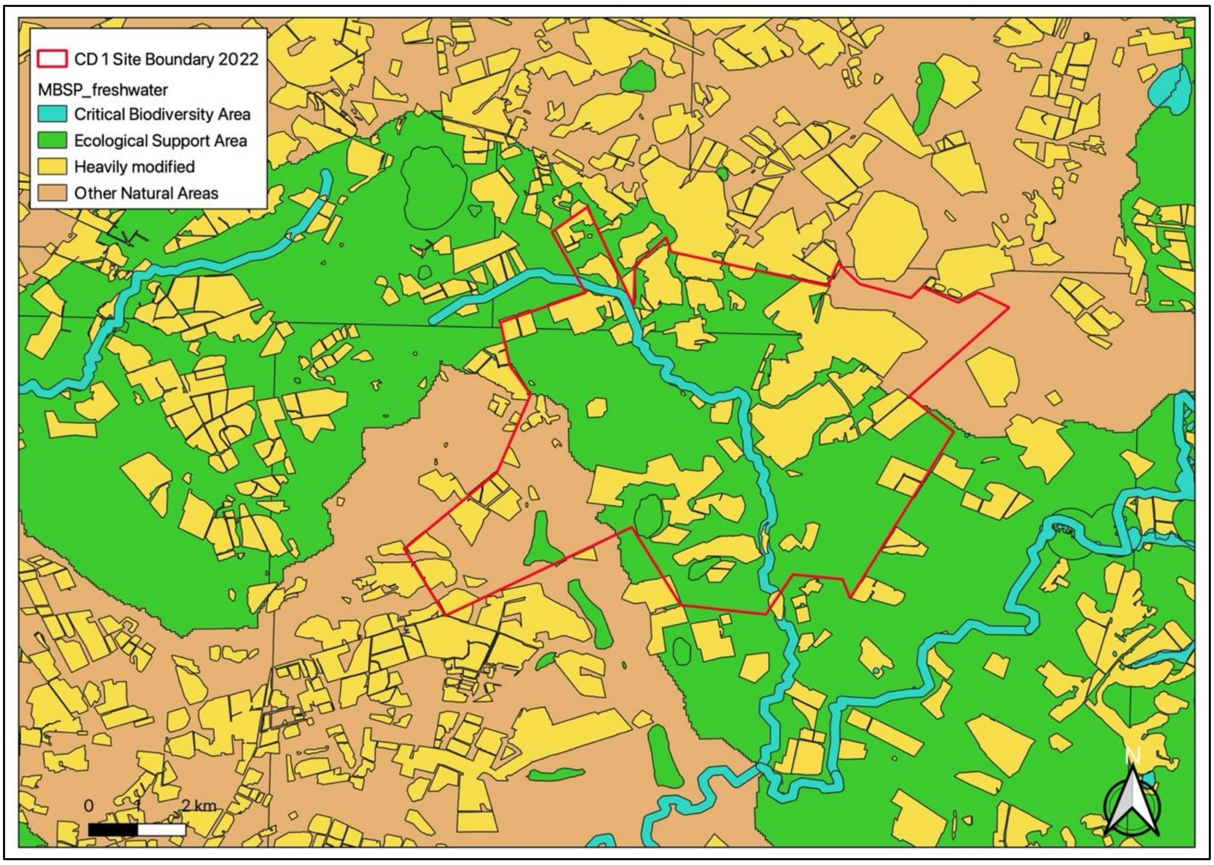

Figure 7-15: The Critical Biodiversity Areas as per the Mpumalanga Biodiversity Spatial Plan (Nel et al, 2011) issued 2014

SITE SENSITIVITY

Using the baseline description and field data while considering the current disturbances and site characteristics, the following features were identified, then categorised into one of number pre-determined sensitivity categories to provide protect and/or guide the layout planning and design processes of the corridor and a suitable alignment for the grid within. **Table 7-2** outlines the Aquatic sensitivity mapping categories used to categorise features or areas (with their buffers).

Table 7-2: Sensitivity Categories

No Go	Legislated "no go" areas or setbacks and areas or features that are considered of such significance that impacting them may be regarded as fatal flaw or strongly influence the project impact significance profile Therefore areas or features that are considered to have a high sensitivity or where project infrastructure would be highly constrained and should be avoided as far as possible. Infrastructure located in these areas are likely to drive up impact significance ratings and mitigations
Medium	Buffer areas and or areas that are deemed to be of medium sensitivity but should still be avoid as this would minimise impacts and or the need for additional Water Use Authorisation
Low	Areas of low sensitivity or constraints, such as artificial systems
Neutral	Unconstrained areas (left blank in mapping)

Table 7-3 below provides an overview of the sensitivity of various aquatic features (with buffers distances included) as it relates to the main project component types for the project. The features are shown spatially in

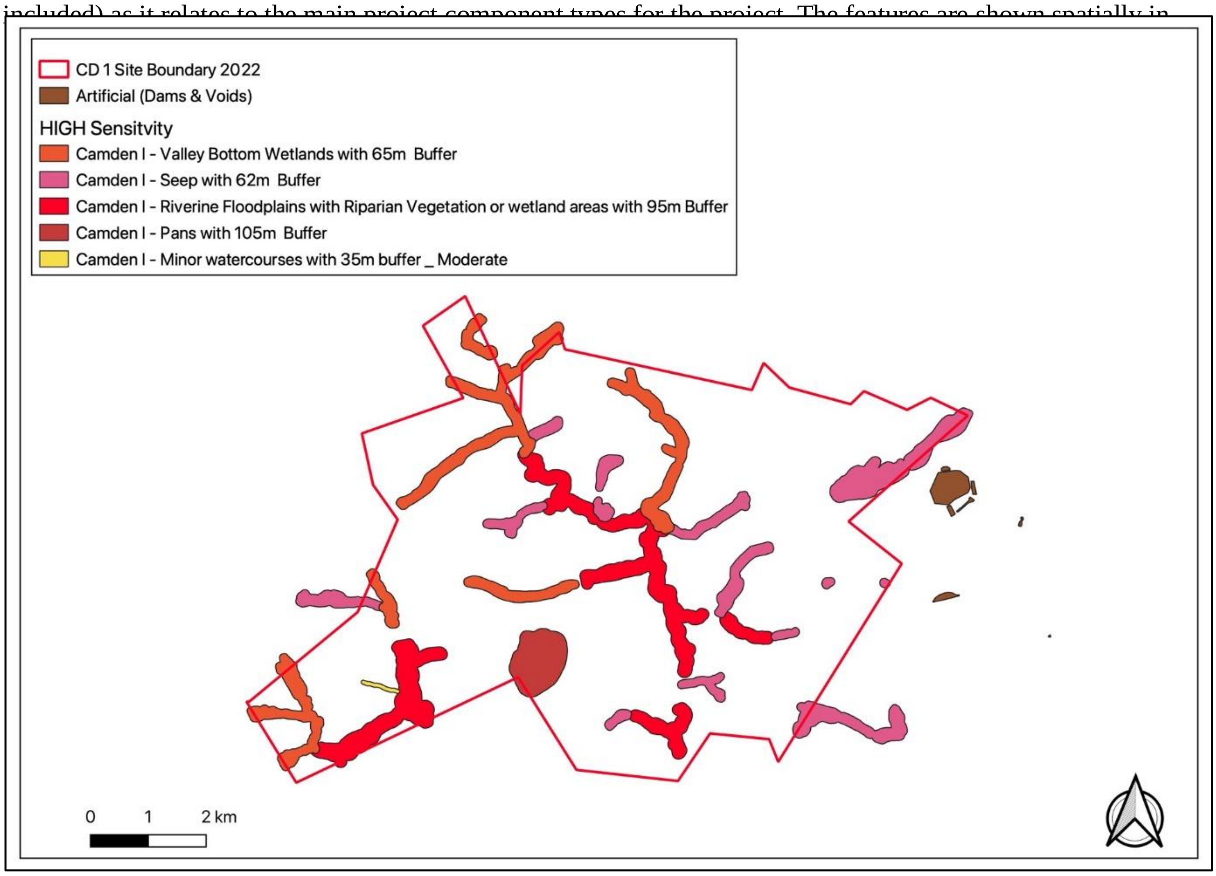

Figure 7-16. The sensitivity ratings of No go, Medium and Low were determined through an assessment of the aquatic habitat sensitivity and related constraints. However, these No-Go areas (with buffers) relate in general terms to the project and there are areas where encroachment on these areas would occur (i.e. existing road crossings within wetlands) but this is considered acceptable since these areas have already been impacted.

These proposed constraints / buffers do not include bird and or bat specialist buffers / constraints as theirs buffers along aquatic features are at times far larger around aquatic features, than those required for the known aquatic species within this region.

Table 7-3: Results of the sensitivity rating / constraints assessment

DEVELOPMENT COMPONENT	WATERBODY TYPE	SENSITIVITY RATING OF THE RESPECTIVE WATERBODY TYPE AGAINST THE DEVELOPMENT TYPE AND THE REQUIRED BUFFER	SENSITIVITY RATING OVERRIDE, IF AN IMPACT SUCH AS A ROAD ALREADY OCCURS WITHIN THE PROPOSED FOOTPRINT
WTG	Riverine Floodplains with Riparian Vegetation or wetland areas	No-Go with 95m buffer	
	Valley Bottom Wetlands	No-Go with 65m buffer	
	Endorheic Pans	No-Go with 105m buffer	
	Seepage Wetlands	No-Go with 62m buffer	
	Artificial dams or mine works		
Buildings / Substations & BESS	Riverine Floodplains with Riparian Vegetation or wetland areas	No-Go with 95m buffer	
	Valley Bottom Wetlands	No-Go with 65m buffer	

	Endorheic Pans	No-Go with 105m buffer	
	Seepage Wetlands	No-Go with 62m buffer	
	Artificial dams or mine works		
Roads & Hardstands	Riverine Floodplains with Riparian Vegetation or wetland areas	No-Go with 95m buffer	Moderate if an existing crossing / road or impact is already present, that must then be included in the potential road or crossing network. However if the road or pipeline network can't be aligned with existing impacted areas, then any such crossings must be evaluated prior to construction on a case by case basis, by the aquatic specialist, preferably with the engineers and a site visit.
	Valley Bottom Wetlands	No-Go with 65m buffer	
	Endorheic Pans	No-Go with 105m buffer	
	Seepage Wetlands	No-Go with 62m buffer	
	Artificial dams or mine works		
Overhead Lines	Riverine Floodplains with Riparian Vegetation or wetland areas	Assumption is that the overhead lines could span these areas, but the towers/pylons should adhere to the buffer distances as indicated as far as possible. Where areas are too large to span (buffers) then these tower positions must be evaluated on a case by case basis prior to construction.	
	Valley Bottom Wetlands		
	Endorheic Pans		
	Seepage Wetlands		
	Artificial dams or mine works		

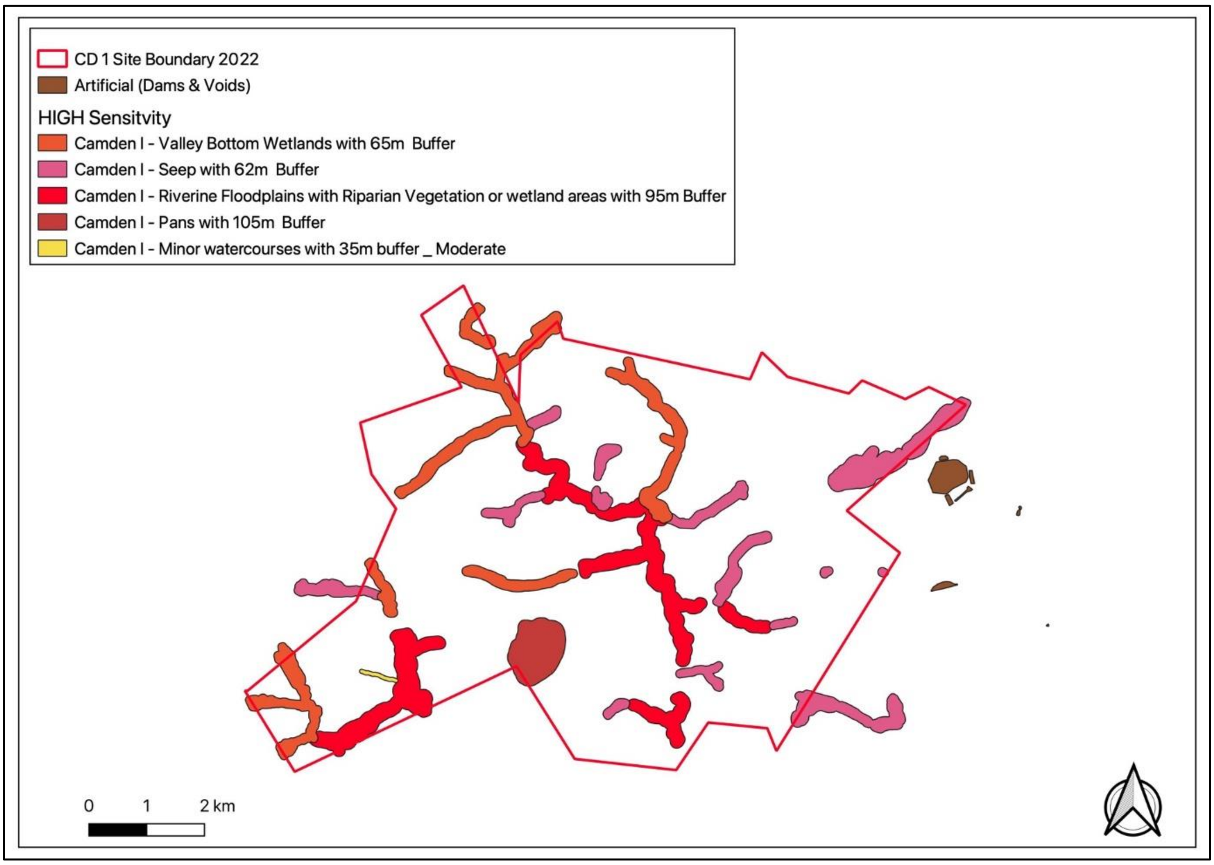

Figure 7-16: The delineated waterbodies inclusive of the respective buffer distances

7.1.6 GROUNDWATER

According to Aquifer Classification of South Africa (DWAF, 2012), the area is underlain by a Minor Aquifer with groundwater occurrence controlled by presence of fractures, faults and weathered zones within Karoo sediments, and dominated within the upper and lower contacts of the dolerite dykes and sills. Groundwater in the area is moderately vulnerable to contaminants when continuously discharged or leached (DWAF, 2013). The regional groundwater is of good quality with electrical conductivity typically <70mS/m (DWAF, 2012).

Based on the Geotechnical Desk Study (SLR, 2022) (**Appendix H-13**), the Camden I Wind Energy Facility is underlain by Karoo sedimentary rocks and dolerite intrusions, as mentioned in Section 7.1.4, and the hydrogeological characteristics of the study area are a function of the geological formations. The aquifers of the Karoo Supergroup display characteristics of intergranular and fractured rock. The borehole yielding potential of the aquifer is classified as D2, which implies an average borehole yield varying between 0.1 and 0.5 l/s.

According to Barnard (2000), there are typically six different modes of groundwater occurrence associated with these formations:

— Weathered and fractured sedimentary rocks not associated with dolerite intrusions.
— Indurated and jointed sedimentary rocks alongside dykes.
— Narrow weathered and fractured dolerite dykes.
— Basins of weathering in dolerite sills and highly jointed sedimentary rocks enclosed by dolerite.
— Weathered and fractured upper contact zones of dolerite sills.
— Weathered and fractured lower contact zones of dolerite sills.

Numerous springs occur at lithological contacts such as where sandstone overlies an impervious shale horizon, along fault zones or along impermeable dolerite dykes. Groundwater seepage in lower lying areas contributes substantially to sustaining the dry season flow in the stream systems that drain these landscapes.

7.2 BIOLOGICAL ENVIRONMENT

7.2.1 REGIONAL VEGETATION

Based on desktop and site specific field study for the Terrestrial Biodiversity Assessment Report (David Hoare Consulting, July 2022) (**Appendix H-4**), there is one regional vegetation type occurring in the study area, namely Eastern Highveld Grassland (Figure 7-17). There is one additional unit that occurs in nearby areas, namely Eastern Temperate Freshwater Wetlands. It is probable that terrestrial vegetation patterns reflect the major vegetation type, namely Eastern Highveld Grassland.. The vegetation types that occur in the study area and nearby areas are briefly described below.

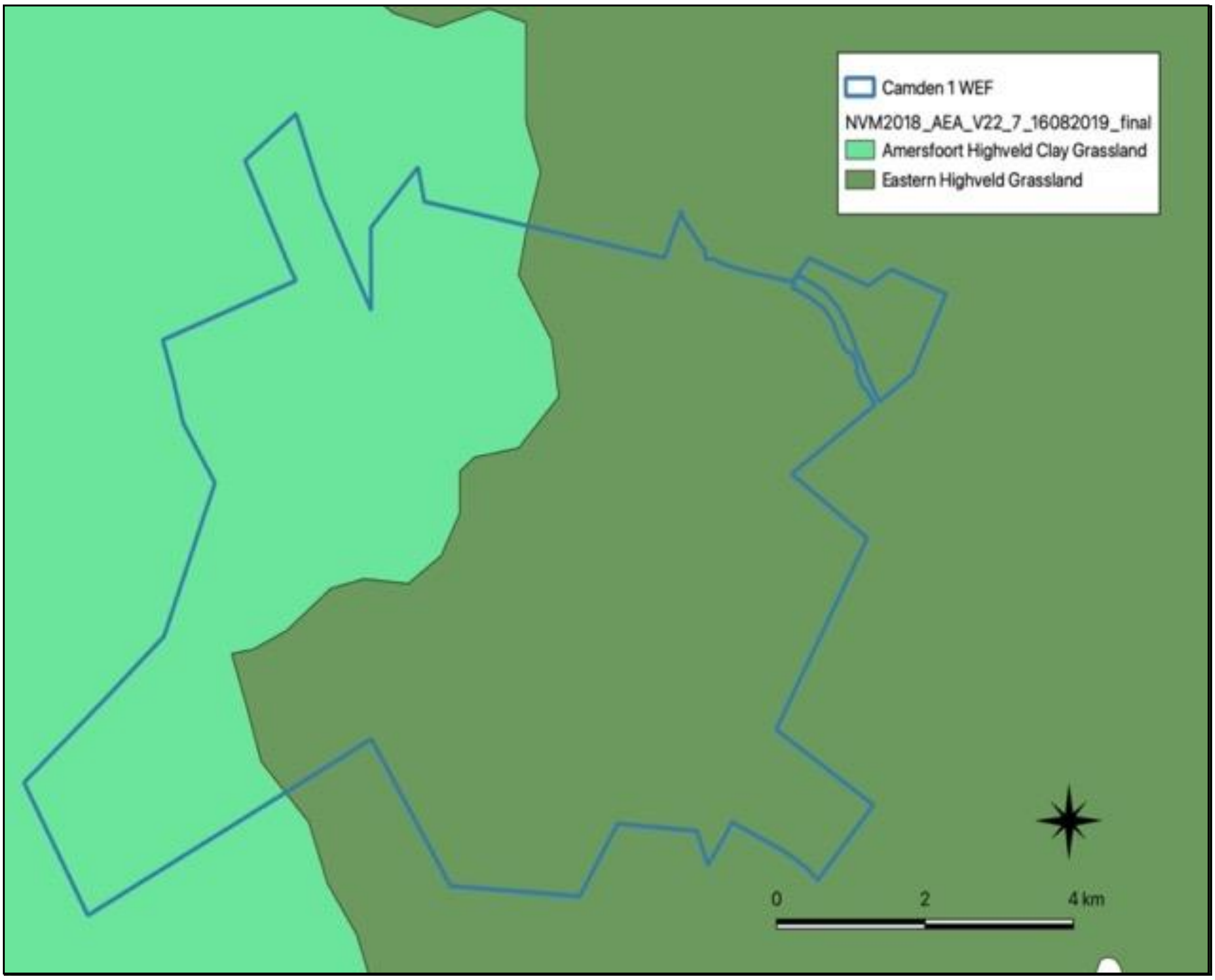

Figure 7-17: Regional Vegetation Types of the Study Area

EASTERN HIGHVELD GRASSLAND

DISTRIBUTION

Found in Mpumalanga and Gauteng Provinces, on the plains between Belfast in the east and the eastern side of Johannesburg in the west and extending southwards to Bethal, Ermelo and west of Piet Retief. The vegetation type occurs at an altitude of between 1 520–1 780 m.

VEGETATION & LANDSCAPE FEATURES

The vegetation occurs on slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual highveld grass composition (*Aristida*, *Digitaria*, *Eragrostis*, *Themeda*, *Tristachya*, etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra*, *Celtis africana*, *Diospyros lycioides* subsp *lycioides*, *Parinari capensis*, *Protea caffra*, *P. welwitschii* and *Searsia magalismontanum*).

GEOLOGY & SOILS

Red to yellow sandy soils of the Ba and Bb land types found on shales and sandstones of the Madzaringwe Formation (Karoo Supergroup). Land types Bb (65%) and Ba (30%).

CLIMATE

Strongly seasonal summer rainfall, with very dry winters. MAP 650–900 mm (overall average: 726 mm), MAP relatively uniform across most of this unit, but increases significantly in the extreme southeast. The coefficient of variation in MAP is 25% across most of the unit, but drops to 21% in the east and southeast. Incidence of frost from 13–42 days, but higher at higher elevations.

IMPORTANT TAXA

Low Shrubs	*Anthospermum rigidum* subsp. *pumilum*, *Stoebe plumosa*..
Herbs	*Berkheya setifera* (d), *Haplocarpha scaposa* (d), *Justicia anagalloides* (d), *Pelargonium luridum* (d), *Acalypha angustata*, *Chamaecrista mimosoides*, *Dicoma anomala*, *Euryops gilfillanii, E. transvaalensis* subsp. *setilobus, Helichrysum aureonitens*, *H. caespititium*, *H. callicomum*, *H. oreophilum*, *H. rugulosum*, *Ipomoea crassipes*, *Pentanisia prunelloides* subsp. *latifolia*, *Selago densiflora*, *Senecio coronatus*, *Vernonia oligocephala*, *Wahlenbergia undulata*.
Geophytic Herbs	*Gladiolus crassifolius*, *Haemanthus humilis* subsp. *hirsutus*, *Hypoxis rigidula* var. *pilosissima*, *Ledebouria ovatifolia*.
Succulent Herbs	*Aloe ecklonis*
Graminoids	*Aristida aequiglumis* (d), *A. congesta* (d), *A. junciformis* subsp. *galpinii* (d), *Brachiaria serrata* (d), *Cynodon dactylon* (d), *Digitaria monodactyla* (d), *D. tricholaenoides* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), *E. curvula* (d), *E. plana* (d), *E. racemosa* (d), *E. sclerantha* (d), *Heteropogon contortus* (d), *Loudetia simplex* (d), *Microchloa caffra* (d), *Monocymbium ceresiiforme* (d), *Setaria sphacelata* (d), *Sporobolus africanus* (d), *S. pectinatus* (d), *Themeda triandra* (d), *Trachypogon spicatus* (d), *Tristachya leucothrix* (d), *T. rehmannii* (d), *Alloteropsis semialata* subsp. *eckloniana*, *Andropogon appendiculatus*, *A. schirensis*, *Bewsia biflora*, *Ctenium concinnum*, *Diheteropogon amplectens*, *Eragrostis capensis*, *E. gummiflua*, *E. patentissima*, *Harpochloa falx*, *Panicum natalense*, *Rendlia altera*, *Schizachyrium sanguineum*, *Setaria nigrirostris*, *Urelytrum agropyroides*.

AMERSFOORT HIGHVELD CLAY GRASSLAND

DISTRIBUTION

Mpumalanga and KwaZulu-Natal Provinces: This unit extends in a north-south band from just south of Ermelo, down through Amersfoort to the Memel area in south. Altitude 1 580–1 860 m.

VEGETATION & LANDSCAPE FEATURES

Comprised of undulating grassland plains, with small scattered patches of dolerite outcrops in areas. The vegetation is comprised of a short closed grassland cover, largely dominated by a dense *Themeda triandra* sward, often severely grazed to form a short lawn.

GEOLOGY & SOILS

Restricted to vertic clay soils derived from dolerite that is intrusive in the Karoo sediments of the Madzaringwe Formation in the north and the Volksrust Formation and the Adelaide Subgroup in the south. Dominant land type Ca, while Ea land type is of subordinate importance.

CLIMATE

Rainfall mainly in early summer, from 620 mm in the west to 830 mm in the east (MAP 694 mm). MAT 14ºC, with temperatures higher in the west than the east. Winters are cold and summers are mild. Incidence of frost very high.

IMPORTANT TAXA

Graminoids	*Andropogon appendiculatus (d), Brachiaria serrata (d), Digitaria monodactyla (d), D. tricholaenoides (d), Elionurus muticus (d), Eragrostis capensis (d), E. chloromelas (d), E. plana (d), E. racemosa (d), Harpochloa falx (d), Heteropogon contortus (d), Microchloa caffra (d), Panicum natalense (d), Setaria nigrirostris (d), S. sphacelata (d),*

	Themeda triandra (d), Trichoneura grandiglumis (d), Tristachya leucothrix (d), Abildgaardia ovata, Andropogon schirensis, Aristida bipartita, A. congesta, A. junciformis subsp. galpinii, A. stipitata subsp. graciliflora, Bulbostylis contexta, Chloris virgata, Cymbopogon caesius, C. pospischilii, Cynodon dactylon, Digitaria diagonalis, D. ternata, Diheteropogon amplectens, Eragrostis curvula, Koeleria capensis, Panicum coloratum, Setaria incrassata.
Herbs	*Berkheya setifera (d), Vernonia natalensis, V. oligocephala (d), Acalypha peduncularis, A. wilmsii, Berkheya insignis, B. pinnatifida, Crabbea acaulis, Cynoglossum hispidum, Dicoma anomala, Haplocarpha scaposa, Helichrysum caespititium, H. rugulosum, Hermannia coccocarpa, H. depressa, H. transvaalensis, Ipomoea crassipes, I. oblongata, Jamesbrittenia silenoides, Pelargonium luridum, Pentanisia prunelloides subsp. latifolia, Peucedanum magalismontanum, Pseudognaphalium luteo-album, Rhynchosia effusa, Salvia repens, Schistostephium crataegifolium, Sonchus nanus, Wahlenbergia undulata.*
Herbaceous climber	*Rhynchosia totta.*
Geophytic Herbs	*Boophone disticha, Eucomis autumnalis subsp. clavata, Hypoxis villosa var. obliqua, Zantedeschia albomaculata subsp. macrocarpa.*
Tall Shrubs	*Diospyros austro-africana, D. lycioides subsp. guerkei.*
Low shrubs	*Anthospermum rigidum subsp. pumilum (d), Helichrysum melanacme (d), Chaetacanthus costatus, Euphorbia striata var. cuspidata, Gnidia burchellii, G. capitata, Polygala uncinata, Rhus discolor.*
Succulent shrubs	*Euphorbia clavarioides var. truncata.*

REMARKS

Overgrazing leads to increase in cover of *Seriphium plumosum* (an indigenous species that has low grazing value). Parts of this unit were once cultivated and now lie fallow and have been left to re-vegetate with pioneer species. These transformed areas are not picked up by satellite for transformation coverage and the percentage of grasslands still in a natural state may be underestimated.

EASTERN TEMPERATE FRESHWATER WETLANDS

DISTRIBUTION

Northern Cape, Eastern Cape, Free State, North-West, Gauteng, Mpumalanga and KwaZulu-Natal Provinces as well as in neighbouring Lesotho and Swaziland: Around water bodies with stagnant water (lakes, pans, periodically flooded vleis, edges of calmly flowing rivers) and embedded within the Grassland Biome. Altitude ranging from 750–2 000 m.

VEGETATION & LANDSCAPE FEATURES

Flat landscape or shallow depressions filled with (temporary) water bodies supporting zoned systems of aquatic and hygrophilous vegetation of temporarily flooded grasslands and ephemeral herblands.

GEOLOGY & SOILS

Found on younger Pleistocene to recent sediments overlying fine-grained sedimentary rocks of the Karoo Supergroup (on sediments of both Ecca and Beaufort Groups due to the large extent of the area of occurrence) as well as of the much older dolomites of the Malmani Subgroup of the Transvaal Supergroup in the northwest. Especially the areas built by Karoo Supergroup sediments are associated with the occurrence of Jurassic Karoo dolerite dykes having a profound influence on run-off. Soils are peaty (Champagne soil form) to vertic (Rensberg soil form). The vleis form where flow of water is impeded by impermeable soils and/or by erosion resistant features, such as dolerite intrusions. Many vleis and pans of this type of freshwater wetlands are inundated and/or saturated only during the summer rainfall season, and for some months after this into the middle of the dry winter season, but they may remain saturated all year round. Surface water inundation may be present at any point while the wetland is saturated and some plant species will be present only under inundated conditions, or under permanently saturated conditions. The presence of standing water should not be taken as a sign of permanent wet conditions.

CLIMATE

Exclusively summer-rainfall region (MAP range 421–915 mm). Cool-temperate pattern with MAT ranging between 12.6°C and 16.7°C. Due to high elevation, frost is a frequent phenomenon

IMPORTANT TAXA

Megagraminoids	*Cyperus congestus* (d), *Phragmites australis* (d), *Schoenoplectus corymbosus* (d), *Typha capensis* (d), *Cyperus immensus*..
Graminoids	*Agrostis lachnantha* (d), *Carex acutiformis* (d), *Eleocharis palustris* (d), *Eragrostis plana* (d), *E. planiculmis* (d), *Fuirena pubescens* (d), *Helictotrichon turgidulum* (d), *Hemarthria altissima* (d), *Imperata cylindrica* (d), *Leersia hexandra* (d), *Paspalum dilatatum* (d), *P. urvillei* (d), *Pennisetum thunbergii* (d), *Schoenoplectus decipiens* (d), *Scleria dieterlenii* (d), *Setaria sphacelata* (d), *Andropogon appendiculatus, A. eucomus, Aristida aequiglumis, Ascolepis capensis, Carex austro-africana, Carex cernua, C. schlechteri, Cyperus cyperoides, C. distans, C. longus, C. marginatus, Echinochloa holubii, Eragrostis micrantha, Ficinia acuminata, Fimbristylis complanata, F. ferruginea, Hyparrhenia dregeana, H. quarrei, Ischaemum fasciculatum, Kyllinga erecta, Panicum schinzii, Pennisetum sphacelatum, Pycreus macranthus, P. nitidus, Setaria pallide-fusca, Xyris gerrardii*.
Herbs	*Centella asiatica* (d), *Ranunculus multifidus* (d), *Berkheya radula, B. speciosa, Berula erecta* subsp. *thunbergii, Centella coriacea, Chironia palustris, Equisetum ramosissimum, Falckia oblonga, Haplocarpha lyrata, Helichrysum difficile, H. dregeanum, H. mundtii, Hydrocotyle sibthorpioides, H. verticillata, Lindernia conferta, Lobelia angolensis, L. flaccida, Marsilea farinosa* subsp. *farinosa, Mentha aquatica, Monopsis decipiens, Pulicaria scabra, Pycnostachys reticulata, Rorippa fluviatilis* var. *fluviatilis, Rumex lanceolatus, Senecio inornatus, S. microglossus, Sium repandum, Thelypteris confluens, Wahlenbergia banksiana*.
Carnivorous herb	*Utricularia inflexa*.
Geophytic Herbs	*Cordylogyne globosa, Crinum bulbispermum, Gladiolus papilio, Kniphofia ensifolia, K. fluviatilis, K. linearifolia, Neobolusia tysonii, Nerine gibsonii* (only in Eastern Cape), *Satyrium hallackii* subsp. *hallackii*
Aquatic Herbs	*Aponogeton junceus, Ceratophyllum demersum, Lagarosiphon major, L. muscoides, Marsilea capensis, Myriophyllum spicatum, Nymphaea lotus, N. nouchali* var. *caerulea, Nymphoides thunbergiana, Potamogeton thunbergii*.

ENDEMIC TAXA

Herbs	*Disa zuluensis, Kniphofia flammula* (northern KwaZulu-Natal), *Nerine platypetala*
Succulent herb	*Crassula tuberella*

REMARKS

Vegetation patterning in the form of concentric belts (‘rings’) is often found in pans. Pan size and depth may be a factor limiting vegetation, as large water bodies with shallow water may experience wave action. This limits the presence of species with floating leaves as well as some submerged and marginal macrophytes. The situation is more complex in vleis as these often have variable microtopography and soil types within a single wetland. It is possible for seasonally inundated zones to occur embedded inside the permanently inundated zone of a vlei, if this zone is present.

CONSERVATION STATUS OF THE REGIONAL VEGETATION TYPES

On the basis of a scientific approach used at national level by SANBI (Driver *et al.*, 2005), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. The original extent of a vegetation type is as presented in the most recent national vegetation map (Mucina, Rutherford & Powrie 2005) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale the thresholds are as depicted in **Figure 7-18**, as determined by best available scientific approaches (Driver *et al*., 2005). The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver *et al*., 2005).

According to scientific literature (Driver *et al*., 2005; Mucina *et al*., 2006), as shown in **Table 7-4**, Eastern Highveld Grassland is listed as Endangered, Amersfoort Highveld Clay Grassland as Vulnerable and Eastern Temperate Freshwater Wetlands as Least Threatened.

Determining ecosystem status (Driver *et al.*, 2005). *BT = biodiversity target (the minimum conservation requirement).

Habitat remaining (%)		
80–100	least threatened	LT
60–80	vulnerable	VU
*BT–60	endangered	EN
0–*BT	critically endangered	CR

Figure 7-18: Ecosystem Status (Driver et al. 2005)

Table 7-4: Conservation status of different vegetation types occurring in the study area

VEGETATION TYPE	TARGET (%)	CONSERVED (%)	TRANSFORMED (%)	CONSERVATION STATUS	
				DRIVER *ET AL.* 2005; MUCINA *ET AL.*, 2006	**NATIONAL ECOSYSTEM LIST (NEM:BA)**
Eastern Highveld Grassland	24	0.3	44	Endangered	Vulnerable
Amersfoort Highveld Clay Grassland	27	0	25	Vulnerable	Not listed
Eastern Temperate Freshwater Wetlands	24	5	15	Least threatened	Vulnerable
Chrissiesmeer Panveld				*Not regarded as a vegetation type by Mucina et al.*	Endangered

The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists national vegetation types, and other ecosystems defined in the Act, that are afforded protection on the basis of rates of transformation. The thresholds for listing in this legislation are higher than in the scientific literature, which means there are fewer ecosystems listed in the National Ecosystem List versus in the scientific literature. Eastern Highveld Grassland and Eastern Temperate Freshwater Wetlands are both listed as Vulnerable in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). Eastern Highveld Grassland covers the eastern two-thirds of the site (**Figure 7-19**). Eastern Temperate Freshwater Wetlands are not mapped as occurring on site, but the mapping is at a poor (regional) resolution and all pans and wetlands on site fall within this ecosystem type.

There is an additional listed ecosystem defined under the National Ecosystem List, called Chrissiesmeer Panveld, which is listed as Endangered. This covers more than two-thirds of the site (**Figure 7-19**). It spatially co-incides partially with Eastern Highveld Grassland, but is defined on different criteria.

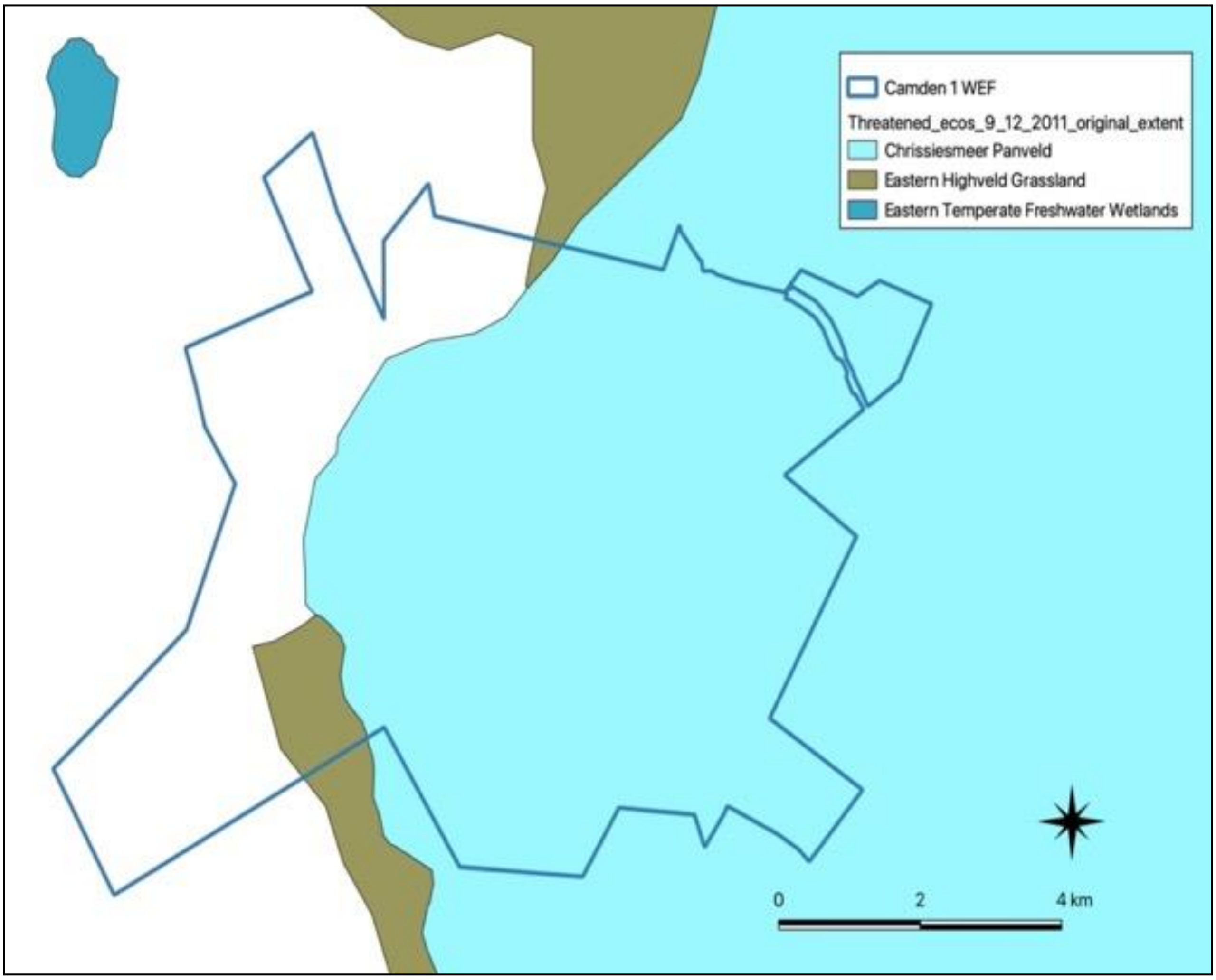

Figure 7-19: Distribution of listed ecosystems relative to the site

7.2.2 BIODIVERSITY CONSERVATION PLANS

The Mpumalanga Biodiversity Sector Plan (MBSP) (Mpumalanga Parks and Tourism Agency 2014) classifies the natural vegetation of the province according to the following categories:

- Protected Areas (sub-divided into three categories);
- Critical Biodiversity Areas (sub-divided into "Irreplaceable" and "Optimal");
- Other natural areas;
- Ecological Support Area (sub-divided into four categories); and
- Modified (sub-divided into Heavily or Moderately modified

Figure 7-20 shows the features in the study area within five of the classes listed above:

- Protected Areas: (National Parks and Nature Reserves):
  - Approximately a third of the site on the south-eastern side is shown as a protected area. This is, however, in the process of change (see discussion below).

— Critical Biodiversity Areas (CBA):
    — Irreplaceable: A sizeable area in the south-eastern part of the site is mapped as a "CBA: Irreplaceable" area. These categorized areas are associated with the Vaal River and all natural areas linked to it.
    — Optimal: A sizeable area in the northern part of the site is mapped as a "CBA: Optimal" area. These categorized areas are associated with the Vaal River and all natural areas adjacent to it.
— Ecological Support Area (ESA):
    — Local Corridor: There is a large wetland area adjacent and to the north of the Vaal River (near the southern part of the site) that is mapped within this class.
    — Protected Area Buffer: There is a 1 km buffer around the designated protected area.
— Other Natural Areas (ONA):
    — There are small areas on the site mapped as ONA.
— Heavily or moderately modified:
    — Remaining areas on site (about 1/3 of the site), associated primarily with cultivation.

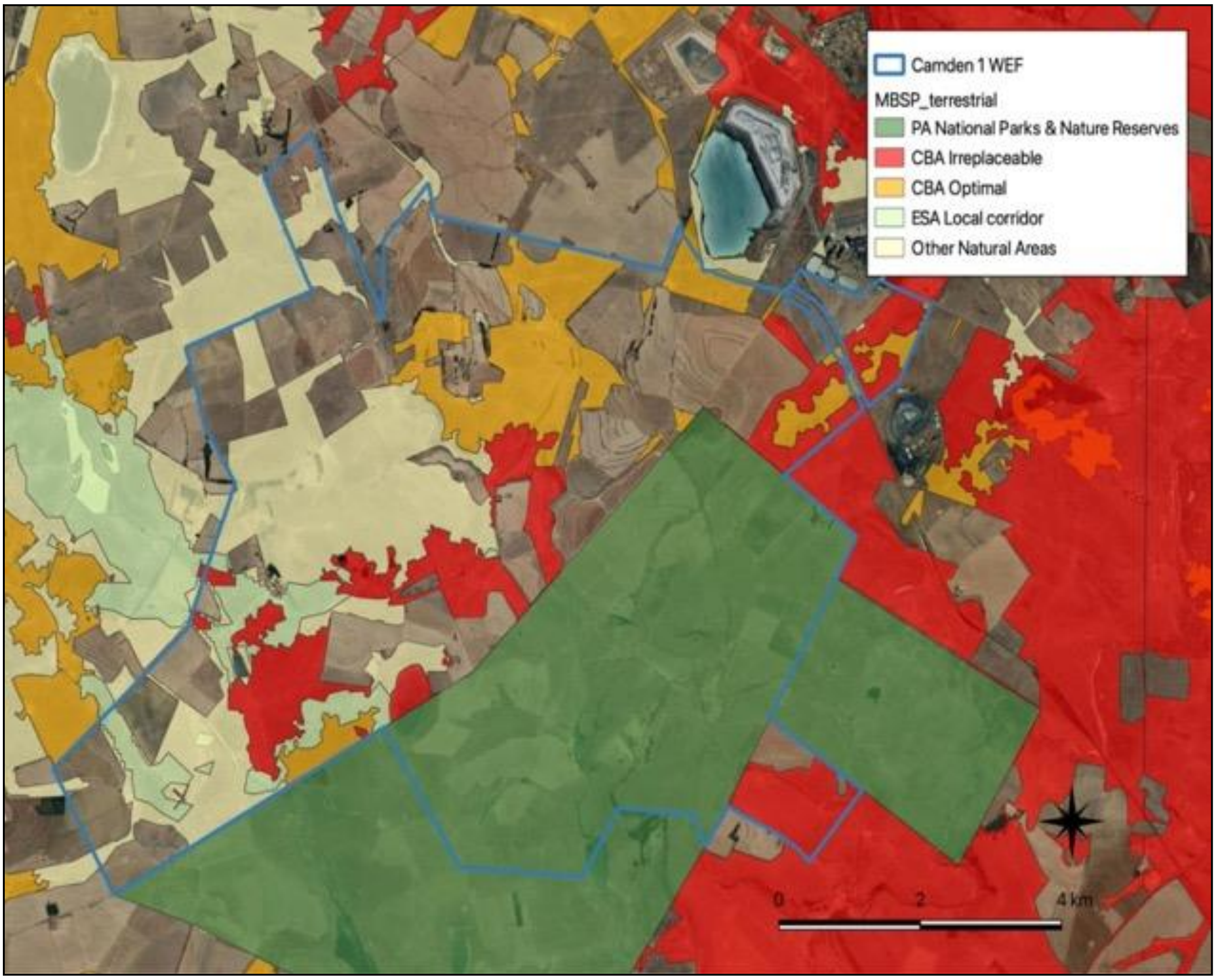

Figure 7-20: Biodiversity Map of the Project Area according to the MBSP (David Hoare Consulting, 2022)

According to the description for the MBSP Terrestrial Assessment categories, Critical Biodiversity Areas are areas that are required to meet biodiversity targets (for biodiversity pattern and ecological process features). The MBSP policy is that they should remain in a natural state. CBAs are areas of high biodiversity value which are usually at risk of being lost and usually identified as important in meeting biodiversity targets, except for Critically Endangered Ecosystems or Critical Linkages.

The part of the site shown as a Protected Area occupies the parts of the site on the Farm Welgelegen 322 IT (green area in **Figure 7-20)**. This is the Langcarel Private Nature Reserve, proclaimed in 1967. This is not being managed as a nature reserve and a separate process is underway to have it (or part thereof) de-proclaimed as part of ongoing province-wide reserve verification efforts by the provincial authorities. No evidence was observed on site of any conservation activities during the field assessment. Assuming that this area would no longer be treated as a conservation area, the landscapes inside this boundary have been allocated here to conservation plan categories that most closely match the surrounding areas and the buffer area would not be applicable. It is therefore assumed that any areas of natural habitat within the “Protected Area” (i.e. excluding any modified areas) would have been designated as CBA1, the next-highest category. This is on the basis that these areas are within two different listed ecosystems (Chrissiesmeer Panveld, listed as Endangered, and Eastern Highveld Grassland, listed as Vulnerable) and it is likely that the conservation planning process.

7.2.3 PROPOSED PROTECTED AREAS (NPAES FOCUS AREAS)

According to the National Protected Areas Expansion Strategy 2008 (NPAES2008), 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. A draft National Protected Areas Expansion Strategy was published for public comment in 2018, but is deliberately not available as a spatial dataset. It does, however, reference the Mpumalanga Protected Area Expansion Strategy, in which priority areas are identified in terms of High, Medium and Low priorities. A map within this PDF document shows areas around Hendrina within the Low priority class that may include the site, but a spatial dataset to confirm this could not be sourced at the time of producing this report. On the basis of the Screening Tool output, which identifies "Protected Areas Expansion Strategy" (**Figure 7-21**) as a factor within the study area, it is assumed that natural areas within the study area fall within this category (Low Priority - Mpumalanga Protected Area Expansion Strategy).

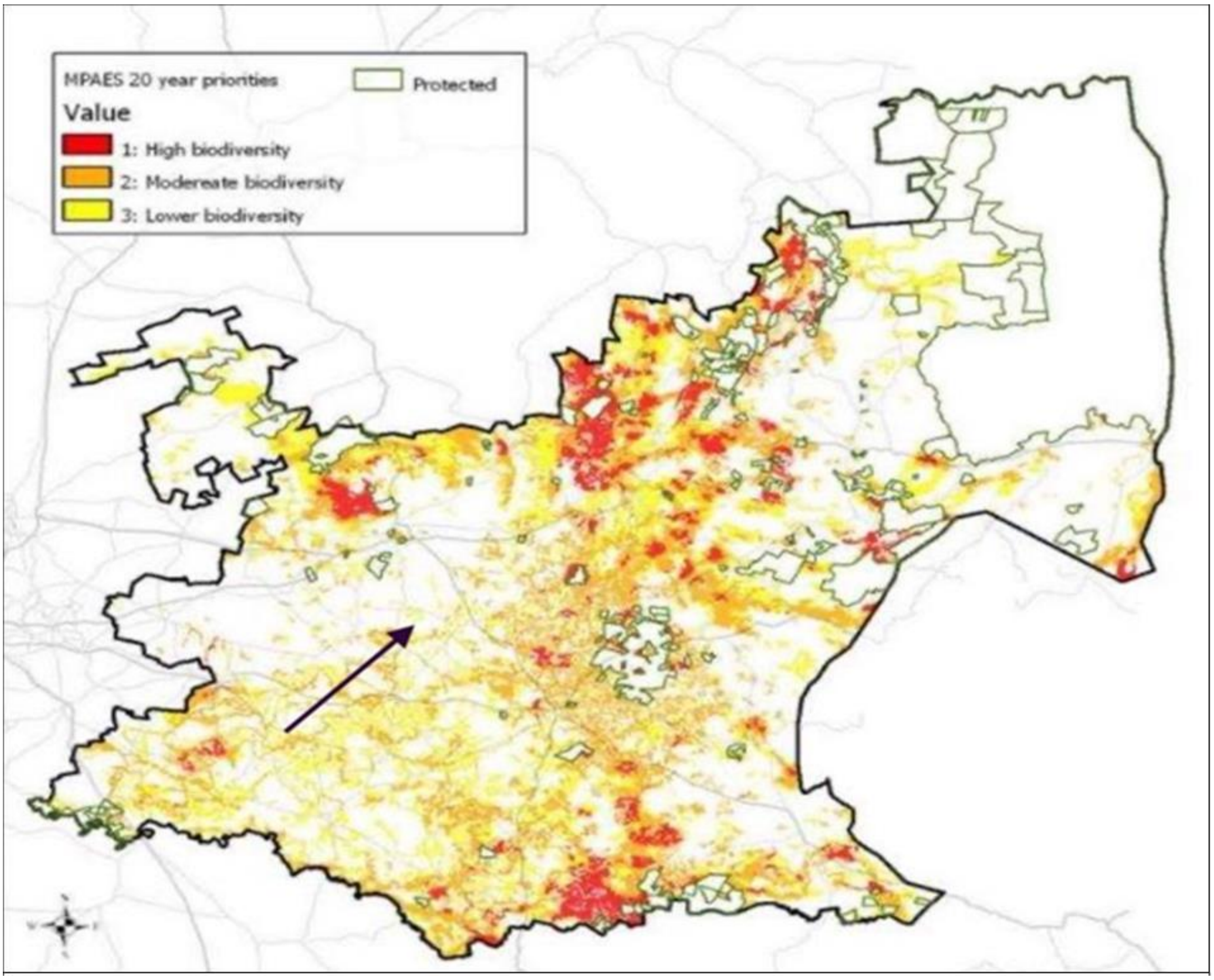

Figure 7-21: Mpumalanga Protected Area Expansion Strategy (Lotter 2015) arrow points to site, (David Hoare Consulting, 2022)

7.2.4 HABITATS

The site is within an area of natural grassland but degraded (from heavily to light). The grassland contains variation due to changes in topography, slope inclination, surface rockiness and the influence of water-flow and water retention in the landscape. A broad classification of the habitat units on site, which also reflects relatively uniform plant species compositional units, is as follows:

- Natural habitats:
  - **Natural grassland** (open grassland on undulating plains – the condition is not indicated in the habitat map although there is a gradient from heavily grazed poor condition to moderate condition);
  - **Wetlands** (permanent and seasonal wetlands in drainage valleys, including channels, where they occur);
  - **Pans** (palustrine wetlands in roundish depressions with flat basin floors, often with no outlet for water flow);

The total amount of natural habitat remaining on site is 48% of the study area (3222 hectares), the low proportion due to loss of habitat from existing land-use, as well as degradation. The largest factor that has led to loss of natural habitat is cultivation – currently the combination of current cultivation and old lands is a total of 45% of the study area (3024 hectares).

Transformed and degraded areas:

- **Old lands** (secondary grasslands on previously cultivated areas);
- **Exotic trees** (stands of exotic trees);
- **Degraded areas** (disturbed areas with bare ground, weeds or waste ground).
- **Current cultivation** (areas currently cultivated and fallow lands);
- **Transformed** (areas such as roads and buildings where there is no vegetation).

A map of habitats within the study area is provided in **Figure 7-22.**

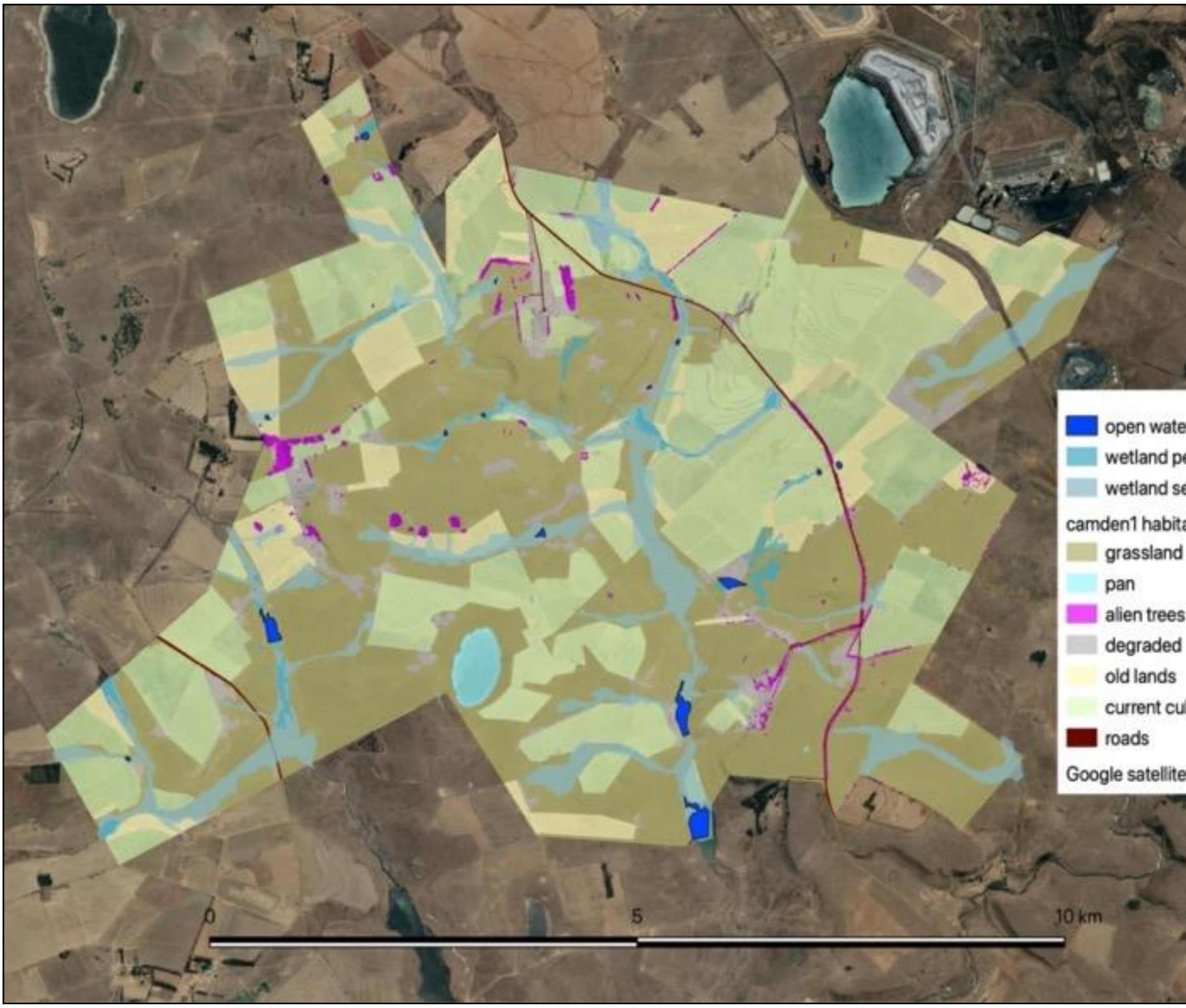

Figure 7-22: Main habitats of the study area (David Hoare Consulting, 2022)

Based on the Biodiversity Assessment (**Appendix H-4**), to determine ecological sensitivity in the study area, site-specific, local and regional factors were taken into account. There are some habitats in the study area that have been described as sensitive in their own right, irrespective of regional assessments. This includes primarily the stream beds and associated riparian zones and adjacent floodplains. A detailed assessment and delineation of these areas was undertaken by an aquatic specialist and they are only considered here in terms of being important habitat for flora and fauna.

At a regional level, the Critical Biodiversity Area (CBA) map for Mpumalanga indicates various parts of the study area as being important for conservation. There are sizeable parts of the study area that fall within CBAs (see Figure 7-20). Much of the remainder of the study area is heavily modified. The CBA map therefore corresponds with the distribution of remaining natural habitat on site. Natural habitats include areas in different condition classes, including those that are heavily grazed.

In terms of other species of concern, including both plants and animals, the preferred habitat of each of these can be determined or has been described. They are, however, distributed amongst different habitats on site, which means that no single habitat is primarily important as habitat for species of concern.

A summary of sensitivities that occur on site and that may be vulnerable to damage from the proposed project are as follows:

CBA "Irreplaceable" areas: The Mpumalanga Biodiversity Sector Plan (MBSP) (Mpumalanga Parks and Tourism Agency 2014) shows areas on site within various conservation planning categories, including areas designated as "CBA: Irreplaceable". These are areas that are required to meet biodiversity targets (for biodiversity pattern and ecological process features), the implication being that there are no other areas that meet the biodiversity criteria for meeting these conservation planning objectives. The Provincial policy is that they should remain in a natural state. **Where possible, impacts on these areas should be minimised.**

Wetlands: These are described here only in terms of being a unique botanical habitat and not in the sense of a formal wetland delineation, which is normally assessed in a separate specialist study. The wetlands must be delineated according to "DWAF, 2003: A Practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones". **Restrictions in terms of infrastructure within these areas should be according to the National Water Act (Act 36 of 1998), except where the wetlands fall within a CBA "Irreplaceable" area, in which case they should be considered to be "No-Go" areas.**

Listed ecosystems: Chrissiesmeer Panveld is listed as Endangered, and Eastern Highveld Grassland and Eastern Temperate Freshwater Wetlands are both listed as Vulnerable in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). **However, the first two are included almost entirely within a CBA: Irreplaceable area on site, so is already discussed in point 1 above. The second is a wetland vegetation type and is covered in point 2 above.**

Grasslands: Grassland vegetation, in a general sense has been identified as threatened nationally as a habitat type. Indications are that loss of any grassland habitat is permanent in an ecological and biodiversity sense, and it is not possible to restore grassland to a natural state after they have been disturbed. They should therefore be treated as sensitive and all efforts made to minimize impacts on any area of grassland. **If possible, the footprint of any proposed infrastructure should be kept to a minimum within any undisturbed, natural grasslands, especially those in a moderate to good condition.**

Plant species of concern: There are a number of listed plant species that could potentially occur on site. The key habitats are grasslands and wetlands. There are also various protected species that could potentially occur on site.

This information was used in conjunction with methodology to calculate Site Ecological Importance, described in the Terrestrial Biodiversity Assessment report (**Appendix H-4**). A map of habitat sensitivity on site is provided in **Figure 7-23**.

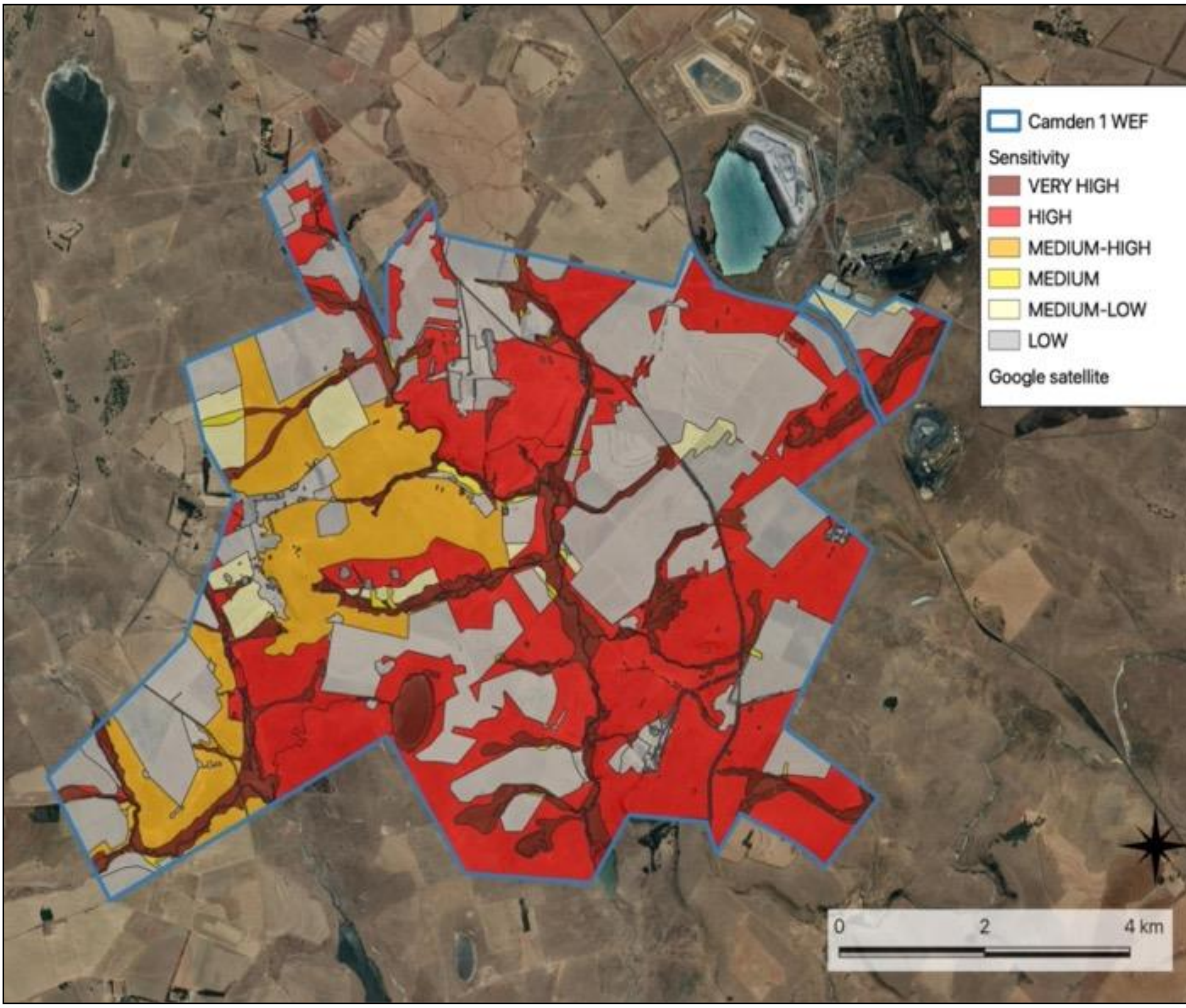

Figure 7-23: Habitat sensitivity of the study area, including consideration of CBAs (David Hoare Consulting, 2022)

7.2.5 PLANT SPECIES

PLANT SPECIES FLAGGED FOR THE STUDY AREA

According to the DFFE online environmental screening tool, four plant species have been flagged as of concern for the area the current project is in. A description of each species is provided.

Sensitive species 1201

Occurs on dolerite outcrops in grasslands at about 2000m altitude, from Dullstroom in the north to Vryheid in the south. This geophyte is fairly restricted and threatened by alien invasive plants, and is therefore listed as Vulnerable on the national Red List. This species is conspicuous when flowering, with attractive pale white flowers in summer. The closest locality at which this species has been observed is Hartebeespruit due south of Campden. It therefore has a MODERATE chance of occurring on the site.

Sensitive species 41

A common and widespread geophyte that is very similar to *Gladiolus crassifolius*, also a widespread and common species with a similar distribution. The main distribution area is Witbank to Lydenburg, and southwards to Piet Retief and Wakkerstroom. It occurs in wetlands or marshes in high altitude grassland that remain wet throughout the year or dry out for only a short period. This species is listed on the South African Red List with a national assessment of Vulnerable, but is currently not recognized by the IUCN as it is regarded as a synonym of *G. crassifolius*. Whereas this species is confined more to wetland habitats, *G. crassofolius* has larger leaves, longer spikes and smaller flowers, and is found in drier, more stony habitats. It flowers from October to January and has a high probability of occurring in wetland areas on the study site. Without flowers, the plant can be recognized as a *Gladiolus*. The closest historical record is approximately 30km from the study site. This species has a MODERATE chance of occurring on the site.

Sensitive species 691

A widespread geophyte distributed in Free State, North West, Gauteng, and in Mpumalanga from Belfast and Ermelo to Wolmaransstad. It is found in wetlands in undulating grasslands. The species is currently listed as Vulnerable. It flowers from January to March but its peak flowering month is February. It could feasibly be found in wet areas on the site but is quite conspicuous in February when if flowers. The closest historical record is approximately 40km from the site. It has a MODERATE chance of occurring on the site.

Sensitive species 851

A small succulent perennial herb with white flowers, growing in marshy areas or shallow vleis. This species is listed as Vulnerable but the confidence in this assessment is low (according to the Red List). Its distribution is uncertain because of its taxonomic confusion with the very similar *Crassula inanis*, but it appears to be restricted to the area between Ermelo and Maseru. The closest known record to the site of the Project is in the Bethal area. It has a MODERATE chance of occurring on the site.

Additional listed plant species for the study area

A database search identified a number of additional plant species of conservation concern that could also occur on site that are not flagged in the Screening Tool output. These include the following:

TAXON	RED LIST STATUS	HABITAT AND DISTRIBUTION	FLOWERING TIME	PROBABILITY OF OCCURRENCE
Alepidea cordifolia APIACEAE	Endangered (SA)	Widespread and extremely common across the eastern highveld of Mpumalanga, the eastern Free State, and north-western KwaZulu-Natal. It occurs along the north and north-eastern borders of Lesotho and is also found in Eswatini, on the Eastern Highlands of Zimbabwe and the Chimanimani Mountains of Mozambique. Forest margins, west and south facing mountain slopes and near drainage lines or islands within wetlands. Open grassland or on forest margins, often amongst rocks and/or along streams.	Summer, mostly February to March	**MODERATE** (within known overall distribution)
Alepidea longeciliata APIACEAE	Endangered	Between Breyten, Lothair, Middelburg and Stoffberg. Recorded from 2 neighbouring grids. Eastern Highveld Grassland. Grassland, Karoo Sandstone, above 1600 m. Possibly associated with edges of pans.	Summer	**MODERATE** (within known overall distribution)

Aspidoglossum xanthosphaerum APOCYNACEAE	Vulnerable	Mpumalanga, Groenvlei and Ermelo. Closest known record is from Breyten and just to the west of Ermelo. Montane grassland, marshy sites, 1800 m.	Unknown	**HIGH**
Bowiea volubilis subsp. volubilis HYACINTHACEAE	Vulnerable (national)	Eastern Cape to Limpopo Province. Widespread elsewhere in southern and eastern Africa. Low and medium altitudes, usually along mountain ranges and in thickly vegetated river valleys, often under bush clumps and in boulder screes, sometimes found scrambling at the margins of karroid, succulent bush in the Eastern Cape. Occurs in bushy kloofs at the coast and inland in KwaZulu-Natal. In Gauteng, Mpumalanga and North West Province it is often found in open woodland or on steep rocky hills usually in well-shaded situations. Tolerates wet and dry conditions, growing predominantly in summer rainfall areas with an annual rainfall of 200-800 mm.		LOW (site within gap in distribution, habitat not suitable)
Brachystelma gerrardii APOCYNACEAE	Endangered	KwaZulu-Natal, Waterberg, Wolkberg and Eswatini. Open grassland, 400-1800 m. Site is within overall distribution range, but plant absent from Mpumalanga highveld.		LOW
Eucomis pallidiflora subsp. polevansii HYACINTHACEAE	Near Threatened	Pilgrim's Rest and Lydenburg to Eswatini to southern Mpumalanga. Wetlands in grassland, often in standing water up to 300 mm deep. Recorded at Ermelo in similar habitat as that found on site.		**HIGH**
Gladiolus robertsoniae IRIDACEAE	Near Threatened	South-eastern Gauteng, northern Free State and south-western Mpumalanga. Moist highveld grasslands, found in wet, rocky sites, mostly dolerite outcrops, wedged in rock crevices.		**HIGH**
Habenaria barbertonii ORCHIDACEAE	Near Threatened	Gauteng and Mpumalanga. Rocky hillsides, in bushveld in association with acacias, 1000-1500 m.	February to March	**MODERATE** (habitat may not be suitable)
Khadia carolinensis AIZOACEAE	Vulnerable	Carolina and Belfast. Eastern Highveld Grassland, Lydenburg Montane Grassland, Rand Highveld Grassland. Well-drained, sandy loam soils among rocky outcrops, or at the edges of sandstone sheets, Highveld Grassland, 1700 m.		HIGH

Kniphofia typhoides ASPHODELACEAE	Near Threatened	Gauteng, Limpopo, Mpumalanga, North West, Parys to Lydenburg to Paulpietersburg to Newcastle. Low lying wetlands and seasonally wet areas in climax Themeda triandra grasslands on heavy black clay soils, tends to disappear from degraded grasslands.		**MODERATE** (habitat may not be suitable)
Merwilla plumbea HYACINTHACEAE	Near Threatened	Widespread in eastern half of South Africa. Also in Eswatini and Lesotho. Montane mistbelt and Ngongoni grassland, rocky areas on steep, well drained slopes. 300-2500 m.		**HIGH**
Miraglossum davyi APOCYNACEAE	Vulnerable	Dullstroom, Middelburg and Standerton. Grassland (Lydenburg Montane Grassland, Soweto Highveld Grassland, Eastern Highveld Grassland).		**HIGH**
Pachycarpus suaveolens APOCYNACEAE	Vulnerable	Gauteng and Mpumalanga to Eswatini. Lydenburg Montane Grassland, Eastern Highveld Grassland, Soweto Highveld Grassland. Short or annually burnt grasslands, 1400-2000 m.		**HIGH**
Riocreuxia aberrans APOCYNACEAE	Near Threatened	Dullstroom to Ermelo. Grassland. Wedged in cracks among rocks on exposed quartzite ridges.		LOW (habitat not suitable)

PROTECTED SPECIES RECORDED IN THE STUDY AREA

None of the tree species protected under the National Forests Act (see Appendix 1 of Plant Species Assessment in Biodiversity Assessment Report (**Appendix H-4**) have been previously recorded in the area in which the site is located. A full list of plants that could occur on site, as well as those actually recorded, is given in Appendix 2 of the Plant Species Assessment.

There are a number of species recorded on site that are protected under the Mpumalanga Nature Conservation Act No. 10 of 1998 (Appendix 3 of Plant Species Assessment). It is a legal requirement to obtain a permit from the provincial authorities for the destruction of any of these species. A comprehensive walk-through survey of the final footprint is required to compile a complete list of these protected species.

7.2.6 TERRESTRIAL FAUNA SPECIES

ANIMAL SPECIES FLAGGED FOR THE STUDY AREA

The following species have been flagged for the site in the DFFE Screening Report:

Sensitive species 2

This is a large bird listed as Vulnerable. They are usually found in grasslands close to bodies of water or vleis. They prefer to nest near bodies of water that provide cover, but often feed in open savannas and grasslands. They can also be found in agricultural lands such as pastures, cropland, or fallow fields. They also often select habitats that include some trees, as they are able to roost in trees. A detailed avifaunal assessment has been undertaken for this project where additional information can be obtained regarding this species.

Geronticus calvus (Southern Bald Ibis)

The Southern Bald Ibis, listed as Vulnerable, is restricted to Lesotho, north-east South Africa and west Eswatini. The core range lies in the north-eastern Free State, Mpumalanga and the KwaZulu-Natal Drakensberg. The site is therefore near to the centre of its relatively restricted global distribution. It prefers high rainfall (>700 mm p.a.), sour and alpine grasslands, characterised by an absence of trees and a short, dense grass sward. It also occurs in lightly wooded and relatively arid country. It forages preferentially on recently burned ground, also using unburnt natural grassland, cultivated pastures, reaped maize fields and ploughed areas (Birdlife International 2022). A detailed avifaunal assessment has been undertaken for this project where additional information can be obtained regarding this species.

Tyto capensis (African Grass Owl)

The African Grass Owl is listed as Vulnerable. It is confined to the higher rainfall areas in the eastern half of South Africa, where it typically roosts and breeds in tall, rank grass or sedges associated with damp substrates, such as permanent and non-perennial wetlands and streams. The Vaal River is an important corridor for the species. A detailed avifaunal assessment has been undertaken for this project where additional information can be obtained regarding this species.

Sagittarius serpentarius (Secretarybird)

The Secretarybird, listed as Endangered, inhabits open landscapes, ranging from open plains and grasslands, to lightly wooded savanna, but is also found in agricultural areas and sub-desert. It is nomadic, but birds living in the moist grassland biome are less likely to be nomadic, although they will travel on average 20-30 km per day while foraging. There are various threats to this species, one of which is that overgrazing degrades favourable habitat. A detailed avifaunal assessment has been undertaken for this project where additional information can be obtained regarding this species.

Crocidura maquassiensis (Maquassie Musk Shrew)

The Maquassie Musk Shrew (Crocidura maquassiensis), listed as Vulnerable, is endemic to South Africa, Eswatini and Zimbabwe, where it is found in moist grassland habitats in Savannah and Grassland Biomes. It appears to tolerate a wide range of habitats, although threats to the species have been inferred as being related to loss or degradation of moist, productive areas, such as rank grassland and wetlands (Taylor et al. 2016). The species is patchily distributed within the north-eastern part of South Africa. The study area is within the known distribution of this species in the sense that there are records in quarter degree grids throughout the Highveld, although not from the current grid or any nearby grids. It is, however, flagged in the DFFE Online Screening Tool as potentially occurring on site. It is therefore considered possible that it could occur on site and individuals could therefore possibly be affected by construction activities.

Ourebia ourebi ourebi (Oribi)

The Oribi (Ourebia ourebi), listed as Endangered in South Africa and Least Concern globally, has a geographical distribution that includes the study area. It is widely distributed in Africa, but the subspecies found in South Africa has a more limited distribution that includes South Africa and Mozambique. The species inhabits savanna woodlands, floodplains and other open grasslands from sea level to 2200 m asl (in Mpumalanga). They reach their highest density on floodplains and moist tropical grasslands. They prefer open grassland in good condition containing a mosaic of short grass for feeding and tall grass for feeding and shelter. It has not been recorded in the grid in which the site is located, which is one of a group of grids in south-western Mpumalanga where the species does not appear to occur. Nevertheless, the area is within the overall distribution range of the species. Based on the gap in the distribution of the species, there is a low likelihood that it could occur on site within any suitable habitat, although it is flagged for the project in the Screening Tool.

OTHER LISTED SPECIES FOR THE STUDY AREA

Vertebrate species (mammals, reptiles, amphibians) with a geographical distribution that includes the study area are listed in Appendix 1 of the Animal Species Assessment in Biodiversity Assessment Report (**Appendix H-4**). All threatened (Critically Endangered, Endangered or Vulnerable) or near threatened vertebrate animals that could occur in the study area and have habitat preference that includes habitats available in the study area are discussed further.

Grey Rhebok

The Grey Rhebok (Pelea capreolus), listed as Near Threatened, is endemic to South Africa, Lesotho and parts of Eswatini. They are predominantly browsers, feeding on ground-hugging forbs, and largely water independent, obtaining most of their water requirements from their food. Local declines in their population have been attributed to increased densities of natural predators, such as Black-backed Jackal, Caracals and Leopards. It has not been recorded in the grid in which the site is located, but has been recorded in areas to the north-east and many areas further to the south, therefore the site is within the overall distribution range of the species. There is a moderate likelihood that it could occur on site within any suitable habitat. However, it is a relatively mobile species and not necessarily dependent on any particular habitat. It is likely to move away from the path of any construction and development of parts of the study area.

Black-footed Cat

The Black-footed Cat (Felis nigripes), listed as Vulnerable, has been previously recorded in the grid in which the project is located, as well as in four surrounding grids. Its known distribution is inland throughout South Africa, except within the winter-rainfall part of the country. It also occurs in Botswana and Namibia. The current project area is towards the edge of the distribution range of the species. The species is nocturnal and carnivorous, favouring any vegetation cover that is low and not too dense. They make use of dens in the daytime, which can be abandoned termite mounds, or dens dug by other animals, such as aardvark, springhares or cape ground squirrels. Local declines in their population have been attributed to increased densities of natural predators, such as Black-backed Jackal, Caracals and Leopards. They are highly vulnerable to domestic carnivores. The study area is suited to this species and it has a high probability of occurring there.

Leopard

The Leopard (*Panthera pardus*), listed as Vulnerable, has a wide habitat tolerance, but with a preference for densely wooded areas and rocky areas. They have large home ranges, but do not migrate easily, males having ranges of about 100 km^2 and females 20 km^2. It has not been recorded in any of the adjacent or nearby grids and the overall distribution shows a gap in its distribution that includes the current study area. There is therefore a low probability of this species occurring on site, and if it did occur there it would probably be at very low densities.

African Marsh Rat

The African Marsh Rat (*Dasymys robertsii*), listed as Vulnerable, is patchily distributed in northern South Africa and Zimbabwe. Within South Africa it is found primarily in savanna and lowveld areas, where it is dependent on river and wetland systems. Its distribution coincides with the Limpopo watershed. Distribution records suggest that the species is not likely to occur in the study area.

Spotted-necked Otter

The Spotted-necked Otter (*Hydrictus maculicollis*), listed as Vulnerable, is widely but patchily distributed in the higher parts of the eastern half of South Africa. It is also found in lakes and large rivers throughout much of Africa south of 10ºN. They are restricted to areas of permanent fresh water where there is good shoreline cover and an abundant prey base (small fishes). They prefer water that is not silt-laden and is unpolluted, although have been known to occur in polluted rivers. The site is within the known distribution of this species and there are historical records for one nearby grid to the north-east, although not from the current grid. There is potentially suitable habitat for this species on site within the small dams.

Cape Clawless Otter

The Cape Clawless Otter (Aonyx capensis), listed as Near Threatened, is widely but patchily distributed throughout South Africa, and is also the most widely found otter in Africa. It is aquatic and seldom found far from permanent water, which needs to be fresh. The site is within the known distribution of this species and there are historical records for one adjacent grid to the north-east, although not from the current grid. There is potentially suitable habitat for this species on site, although water quality may be an issue. It is therefore considered possible that it occurs on site.

African Striped Weasel

The African Striped Weasel (Poecilogale albinucha), listed as Near Threatened, is found throughout most of South Africa, except for the arid interior, and into central Africa. It has not been recorded in the grid in which the site is located, but has been recorded in two adjacent grids, and the site is within the overall distribution range for the species. It is found primarily in moist grasslands and fynbos, where adequate numbers of prey may be found. It is considered likely that it could occur on site.

Brown Hyaena

The Brown Hyaena (Parahyaena brunnea), listed as Near Threatened, is found in a band running down the centre of the country, expanding into the entire northern parts of the country. There is a gap in the distribution around the current study area, but there is a possibility that vagrant individuals could extend into this area. The species is found in desert areas, particularly along the west coast, semi-desert, open scrub and open woodland savannah (Mills & Hes 1997). It is a solitary scavenger that travels vast distances every day in search of food. It has a medium chance of occurring in the study area since the distribution range includes the study area, however there are no historical records from nearby. It is a mobile animal that is likely to move away from the path of any construction and development of parts of the site is therefore highly unlikely to have any negative effect on the species. It is considered that there is a low likelihood of it occurring on site.

South African Hedgehog

The South African Hedgehog (Atelerix frontalis), listed as Near Threatened, is found in a large part of the central part of South Africa, extending down to the south-eastern coast, and is also found in Namibia, Botswana, Zimbabwe, Lesotho and Eswatini. It requires ample ground cover for cover, nesting and foraging and prefers dense vegetation and rocky outcrops. The site is well-within the known distribution of this species and there are historical records for nearby grids in all directions, and it has been recorded from the current grid. There is therefore a high probability of the study area being suitable for this species. It is considered likely that it could occur on site.

Swamp Musk Shrew

The Swamp Musk Shrew (Crocidura mariquensis), listed as Near Threatened, is found in the north-eastern part of South Africa, extending down to the south-eastern coast. It occurs in wetlands and waterlogged grasslands, predominantly in KwaZulu-Natal, Mpumalanga, Limpopo, Gauteng and North West Provinces. The site is well-within the known distribution of this species and there are historical records for nearby grids in all directions, and it has been recorded from the current grid. There is therefore a high probability of the study area being suitable for this species. It is considered likely that it could occur on site.

Highveld Golden Mole

The Highveld Golden Mole (Amblysomus septentrionalis), listed as Near Threatened, is found across the Mpumalanga Highveld from Wakkerstroom northwards to Ermelo and Barberton and westwards through Standerton to north-eastern Free State. It occurs within meadows and edges of marshes in high-altitude grassland in Mpumalanga. They are restricted to friable soils in valleys and on mountainsides. The site is within the known distribution of this species, although higher densities of records occur further east. There are historical records for an adjacent grid to the south-west, but it has not been recorded from the current grid. There is therefore a medium probability of the study area being suitable for this species. It is considered possible that it could occur on site and individuals could be affected by construction activities, if suitable habitat is damaged.

White-tailed Rat

The White-tailed Rat (Mystromys albicaudatus), listed as Vulnerable, is endemic to South Africa and Lesotho, where it is found primarily in Highveld grasslands, but extending into adjacent Fynbos and Karoo areas. It is terrestrial, but never found in soft, sandy substrates, rocks, wetlands or river banks, and do not occur in transformed habitat. The study area is on the edge of the known distribution of this species, with most of Mpumalanga appearing to be a gap in the occurrence of the species. There is therefore a low probability of the study area being suitable for this species. It is considered unlikely that it would occur on site.

Vlei Rat

The Vlei Rat (Grassland-type) (Otomys auratus), listed as Near Threatened, is near-endemic to South Africa, occurring in the north-eastern half of the country, associated with mesic grasslands and wetlands within alpine, montane and sub-montane regions. It is likely to be associated with sedges and grasses in densely-vegetated wetlands with wet soils. The study area is well within the known distribution of this species and there are historical records for the grid in which the study area is located, as well as two adjacent grids. There is therefore a high probability of the study area being suitable for this species. It is considered likely that it occurs on site and the proposed development could therefore affect this species.

Coppery grass lizard

The Coppery Grass Lizard (Chamaesaura aenea), listed as Near Threatened, is endemic to South Africa, where it is found in western Eswatini, Limpopo, Mpumalanga, Gauteng, KwaZulu-Natal, north-eastern Free State and Eastern Cape. It is found on grassy slopes and plateau of the eastern escarpment and Highveld, where it probably shelters in the base of grass tussocks. The study area is within the known distribution of this species and there are historical records for two adjacent grids to the north and south, although not from the current grid. There is therefore a moderate probability of the study area being suitable for this species, including suitable habitat within the project area.

Large-scaled grass lizard

The Large-scaled Grass Lizard (Chamaesaura macrolepis), listed as Near Threatened, is endemic to South Africa, Eswatini and Zimbabwe. In South Africa it is found in Limpopo, Mpumalanga, and KwaZulu-Natal. It is found in grassland, especially rocky, grassy hillsides. Its main distribution is within the Indian Ocean Coastal Belt part of KwaZulu-Natal, but there are scattered records on the Highveld. The study area is marginally within the known distribution of this species in the sense that there are records in quarter degree grids up to Gauteng and there are historical records for one nearby grid to the north-east, although not from the current grid. There is therefore a moderate to low probability of the study area being suitable for this species, including suitable habitat within the project area. It is considered a low likelihood that it could occur on site.

Breyer's Long-tailed Seps

The Breyer's Long-tailed Seps (Tetradactylus breyeri), listed as Vulnerable, is endemic to South Africa, where it is found in Free State, Mpumalanga, and KwaZulu-Natal. It is found in montane and Highveld grassland. The study area is marginally within the known distribution of this species in the sense that there are records in quarter degree grids throughout the Highveld, extending from Blyde River Canyon to the Drakensberg, although not from the current grid or any nearby grids. There is therefore a low probability of the study area being suitable for this species, including suitable habitat within the project area. It is considered unlikely that it would occur on site.

Striped Harlequin Snake

The Striped Harlequin Snake (Homoroselaps dorsalis), listed as Near Threatened, is endemic to South Africa, where it is found in western Eswatini, Limpopo, Mpumalanga, Gauteng, KwaZulu-Natal, and Free State. It is partly fossorial and known to inhabit old termitaria in grassland habitat. Most of its range is at moderately high elevations, but it also occurs close to sea level in KwaZulu-Natal. The study area is within the known distribution of this species and there are historical records for one adjacent grid to the north, although not from the current grid. There is therefore a moderate probability of the study area being suitable for this species, including suitable habitat within the project area. It is considered likely that it could occur on site.

The Giant Bull Frog

The Giant Bull Frog (Pyxicephalus adspersus) previously listed as Near Threatened, is found in seasonal shallow grassy pans, vleis and other rain-filled depressions in open flat areas of grassland or savanna and, at the limits of its distribution, in Nama Karoo and thicket. For most of the year the species remains buried up to 1 m underground. They emerge only during the peak of the rainy season to forage and breed. If conditions are extremely dry, they may remain cocooned underground for several years. Long distances often separate suitable breeding sites. In order to breed, they require shallow, rain-filled depressions that retain water long enough for the tadpoles to metamorphose. Before and after breeding, bullfrogs forage in open grassland, feeding mostly on insects, but also on other frogs, lizards, snakes, small birds and rodents. After breeding males generally bury themselves within 100 m of the breeding site, but females may disperse up to 1 km away. Based on habitat requirements, there is a medium probability that this species occurs in the study area.

PROTECTED ANIMALS

There are a number of animal species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (see Appendix 3 of Animal Species Assessment). According to this Act, "a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7". Such activities include any that are "of a nature that may negatively impact on the survival of a listed threatened or protected species". This implies that any negative impacts on habitats in which populations of protected species occur or are dependent upon would be restricted according to this Act.

Those species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that have a geographical distribution that includes the site are listed in Appendix 3 of Animal Species Assessment, marked with the letter "N". This includes the following species:

:

- Black Wildebeest (doesn’t occur on site),
- Oribi (unlikely to occur on site),
- White Rhinoceros (doesn’t occur on site),
- Black-footed Cat,
- Serval,
- Leopard (probably does not occur on site),
- Cape Clawless Otter,
- Spotted-necked Otter,
- Cape Fox,
- Honey Badger,
- South African Hedgehog,
- Brown Hyena,and
- Giant Bullfrog.

There are additional species protected under the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) (see Appendix 2 of the Animal Species Assessment in Biodiversity Assessment Report (**Appendix H-4**)). These include the following that have a geographical distribution that includes the site:

- Giant Bullfrog,
- South African Hedgehog,
- Honey Badger,
- Aardwolf,
- Brown Hyaena,
- Mountain Reedbuck,
- Black Wildebeest,
- Klipspringer,
- Orbi,
- Steenbok,
- Eland,
- Cape Clawless Otter
- Spotted-necked Otter,
- All species of reptiles, except the water leguaan, rock leguaan and all species of snakes, of which the following have a geographical distribution that includes the site:
  - Marsh terrapin
  - Leopard tortoise
  - Common dwarf gecko
  - Spotted dwarf gecko
  - Van Son’s gecko
  - Delalande’s sandveld lizard
  - Burchell’s sand lizard
  - (Spotted sand lizard)
  - Coppery grass lizard
  - Cape grass lizard
  - Large-scaled grass lizard
  - Common girdled lizard
  - Common crag lizard
  - Yellow-throated plated lizard

- Breyer’s long-tailed seps
- Short-headed legless skink
- Thin-tailed legless skink
- Wahlberg’s snake-eyed skink
- Cape skink
- Red-sided skink
- Speckled rock skink
- Variable skink
- Montane dwarf burrowing skink
- Common flap-necked chameleon
- Eastern ground agama
- Southern rock agama.

7.2.7 AVIFAUNA

IMPORTANT BIRD AREAS

The project site is not located in an Important Bird Area (IBA), but it is located between three IBAs. The closest IBA to the project site is the Amersfoort-Bethal-Carolina IBA SA018, which is located within 1.5km from the site to the west. The Grasslands IBA SA020 is located 6-7km to the east of the site. The Chrissies Pans IBA SA019 is located 16-17km to the north-east of the site. Due to the close proximity of the site to the IBAs, it is possible that some highly mobile priority species which are also IBA trigger species, and which occur either permanently or sporadically in the IBAs, might be impacted by the project when they leave to forage or breed beyond the borders of the IBA. Species that were recorded in the broader areas (but not necessarily within the Camden development area) and fall within this category are the following:

- Secretarybird
- Pied Avocet
- Denham's Bustard
- Blue Crane
- Grey Crowned Crane
- Wattled Crane
- White-backed Duck
- Yellow-billed Duck
- Martial Eagle
- Lanner Falcon
- Greater Flamingo
- Lesser Flamingo
- Black-necked Grebe
- Little Grebe
- African Marsh Harrier
- Black Harrier
- Southern Bald Ibis
- African Grass Owl
- Southern Pochard
- Cape Shoveler
- White-winged Tern

BIRD HABITAT

Whilst much of the distribution and abundance of the bird species in the project site can be explained by the dominant biomes and vegetation types, it is also important to examine the modifications which have changed the natural landscape, and which may have an effect on the distribution of avifauna. These are sometimes evident at a much smaller spatial scale than the biome or vegetation types and are determined by a host of factors such as topography, land use and man-made infrastructure.

The following bird habitat classes were identified in the project site:

GRASSLAND

The majority of the habitat in the project site comprises grassland. The grassland varies from dense stands of relatively high grass to areas of heavily grazed short grass. The priority species which could potentially use the natural grassland in the project site on a regular basis are the following:

- Secretarybird
- White-bellied Bustard
- Common Buzzard
- Jackal Buzzard
- Buff-streaked Chat
- Blue Crane
- Grey Crowned Crane
- Black-chested Snake Eagle
- Long-crested Eagle
- Spotted Eagle-Owl
- Amur Falcon
- Lanner Falcon
- Grey-winged Francolin
- African Harrier-Hawk
- Southern Bald Ibis
- Black-winged Kite
- Blue Korhaan
- Black-winged Lapwing
- African Grass Owl
- Marsh Owl
- Black Sparrowhawk
- White Stork

The priority species which could occasionally use the natural grassland in the project site are the following:

- Black-bellied Bustard
- Denham's Bustard
- Brown Snake Eagle
- Martial Eagle
- Peregrine Falcon
- African Marsh Harrier
- Black Harrier
- Montagu's Harrier
- Northern Black Korhaan
- Cape Vulture

DRAINAGE LINES AND WETLANDS

There are several wetlands in the project area, most of which are associated with drainage lines. Wetlands are characterised by static or slow flowing water and are extensively covered by tall emergent wetland vegetation. The priority species which could potentially use the wetlands in the project site on a regular basis are the following:

- Blue Crane
- Grey Crowned Crane
- African Grass Owl
- Marsh Owl

The priority species which could occasionally use the wetlands in the project site are the following:

- African Marsh Harrier
- Wattled Crane

AGRICULTURAL LANDS

The project site contains a patchwork of agricultural fields. Some fields are lying fallow or are in the process of being re-vegetated by grass. The priority species which could potentially use the agricultural fields in the project site on a regular basis are the following:

- Blue Crane
- Grey Crowned Crane
- Common Buzzard
- Spotted Eagle-Owl
- Amur Falcon
- Lanner Falcon
- Southern Bald Ibis
- Black-winged Kite

The priority species which could occasionally use the agricultural lands in the project site are the following:

- Peregrine Falcon
- African Marsh Harrier
- Montagu's Harrier
- Wattled Crane
- Black Harrier
- Black-bellied Bustard
- Denham's Bustard
- Brown Snake Eagle
- Martial Eagle
- Northern Black Korhaan
- Cape Vulture

ALIEN TREES

The project site contains few trees. Most trees are alien species, particularly Eucalyptus, Australian Acacia (Wattle), and Salix (Willow) species. Trees are often planted as wind breaks next to agricultural lands and around homesteads. Some of the drainage lines also have trees growing in them. The priority species which could potentially use the alien trees in the project site on a regular basis are the following:

- Grey Crowned Crane
- Common Buzzard
- Spotted Eagle-Owl
- Amur Falcon
- Lanner Falcon

- Southern Bald Ibis
- Black-winged Kite
- Jackal Buzzard
- Black-chested Snake Eagle
- Long-crested Eagle
- African Harrier-Hawk
- Black Sparrowhawk
- African Fish Eagle

The priority species which could occasionally use the alien trees in the project site are the following:

- Peregrine Falcon
- Brown Snake Eagle
- Martial Eagle
- Cape Vulture

DAMS

There are numerous ground dams at the project site, located in drainage lines. The priority species which could potentially use the dams in the project site on a regular basis are the following:

- African Fish Eagle

The priority species which could occasionally use the dams in the project site are the following:

- Western Osprey

PANS

The project site contains one large pan, and another large pan is located approximately one kilometre south of the site. These pans are a potential drawcard for many priority species. Lesser and Greater Flamingos could use these pans for foraging and roosting. Large raptors and vultures could use the pans for bathing and drinking, and Blue Cranes could roost there on occasion. The priority species which could potentially use the pans in the project site on a regular basis are the following:

- Common Buzzard
- Jackal Buzzard
- Blue Crane
- Black-chested Snake Eagle
- Long-crested Eagle
- Lanner Falcon
- Greater Flamingo
- Lesser Flamingo
- African Harrier-Hawk

The priority species which could occasionally use the pans in the project site are the following:

- Brown Snake Eagle
- Martial Eagle
- Peregrine Falcon
- African Marsh Harrier
- Montagu's Harrier
- Black Harrier
- Cape Vulture
- Black-bellied Bustard
- Denham's Bustard
- Wattled Crane

— Northern Black Korhaan
— Western Osprey

PRIORITY SPECIES

The South African Bird Atlas Project 2 (SABAP2) data indicates that a total of 234 bird species could potentially occur within the broader area. Appendix 1 of the Avifauna Impact Assessment Report (**Appendix H-2**) provides a comprehensive list of all the species. Of these, 37 species are classified as priority species (see definition of priority species in section 4) and 16 of these are South African Red List species. Of the priority species, 25 are likely to occur regularly in the development area.

Table 7-5 lists all the priority species that are likely to occur regularly and the possible impact on the respective species by the proposed wind farm (including the BESS). The following abbreviations and acronyms are used:

— NT = Near threatened
— VU = Vulnerable
— EN = Endangered

Table 7-5: Priority species potentially occurring at the project area

SPECIES NAME	SCIENTIFIC NAME	SABAP2 REPORTING RATE		STATUS					HABITAT							IMPACTS				
		Full protocol	Ad hoc protocol	Global status	Regional status	IBA trigger species	RECORDED DURING MONITORING	LIKELIHOOD OF REGULAR OCCURRENCE	Grassland	Drainage lines & Wetlands	Alien trees	Pans	Agriculture	Dams	HV lines	Collision with turbines	Displacement - habitat transformation	Displacement - disturbance	Electrocution MV lines	Collision MV lines
African Fish Eagle	*Haliaeetus vocifer*	12.12	0.88	-	-		x	H			x			x	x	x			x	
African Grass Owl	*Tyto capensis*	2.42	0.00	-	VU	x	x	M	x	x						x	x	x	x	x
African Harrier-Hawk	*Polyboroides typus*	11.52	1.76	-	-		x	M	x		x	x				x			x	
African Marsh Harrier	*Circus ranivorus*	0.61	0.00	-	EN	x		L	x	x		x				x			x	
Amur Falcon	*Falco amurensis*	29.09	6.61	-	-		x	H	x		x		x		x	x				
Black Harrier	*Circus maurus*	0.00	0.88	EN	EN	x		L	x			x				x			x	
Black Sparrowhawk	*Accipiter melanoleucus*	12.12	0.88	-	-		x	M	x		x					x			x	
Black-bellied Bustard	*Lissotis melanogaster*	0.61	0.00	-	-			L	x							x	x	x		x

Black-chested Snake Eagle	*Circaetus pectoralis*	3.03	0.44	-	-		x	M	x		x	x			x	x			x	
Black-winged Kite	*Elanus caeruleus*	60.61	12.78	-	-		x	H	x		x		x		x	x			x	
Black-winged Lapwing	*Vanellus melanopterus*	14.55	0.00	-	-		x	H	x							x	x			
Blue Crane	*Grus paradisea*	11.52	0.44	VU	NT	x	x	H	x	x		x	x			x	x	x		x
Blue Korhaan	*Eupodotis caerulescens*	6.06	0.00	NT	LC	x	x	M	x							x	x	x		x
Brown Snake Eagle	*Circaetus cinereus*	1.82	0.00	-	-			L	x		x	x			x	x			x	
Buff-streaked Chat	*Campicoloides bifasciatus*	5.45	0.44	-	-	x		M	x								x	x		
Cape Vulture	*Gyps coprotheres*	0.00	0.00	EN	EN		x	L	x		x	x			x	x			x	x
Common Buzzard	*Buteo buteo*	27.88	9.25	-	-		x	H	x		x	x	x		x	x			x	
Denham's Bustard	*Neotis denhami*	1.82	0.00	NT	VU	x		L	x							x	x	x		x
Greater Flamingo	*Phoenicopterus roseus*	3.64	4.41	-	NT	x	x	M				x				x				x
Grey Crowned Crane	*Balearica regulorum*	5.45	0.00	EN	EN	x	x	M	x	x	x		x		x	x	x	x	x	x
Grey-winged Francolin	*Scleroptila afra*	27.27	2.20	-	-		x	H	x							x	x	x		
Jackal Buzzard	*Buteo rufofuscus*	19.39	2.20	-	-		x	H	x		x	x				x			x	

Lanner Falcon	*Falco biarmicus*	7.27	0.00	-	VU	x	x	M	x		x	x	x		x	x			x	
Lesser Flamingo	*Phoeniconaias minor*	3.64	1.32	NT	NT	x	x	M				x				x				x
Long-crested Eagle	*Lophaetus occipitalis*	6.67	9.25	-	-		x	M	x		x	x			x	x			x	
Marsh Owl	*Asio capensis*	5.45	0.44	-	-		x	H	x	x						x	x	x	x	x
Martial Eagle	*Polemaetus bellicosus*	2.42	0.00	EN	EN	x	x	L	x		x	x			x	x			x	
Montagu's Harrier	*Circus pygargus*	1.21	0.00	-	-			L	x	x		x				x			x	
Northern Black Korhaan	*Afrotis afraoides*	0.61	0.00	-	-			L	x							x	x	x		x
Peregrine Falcon	*Falco peregrinus*	1.21	0.00	-	-		x	L	x		x	x	x		x	x			x	
Secretarybird	*Sagittarius serpentarius*	13.33	0.00	EN	VU	x	x	H	x							x	x			x
Southern Bald Ibis	*Geronticus calvus*	23.03	3.08	VU	VU	x	x	H	x		x		x		x	x			x	x
Spotted Eagle-Owl	*Bubo africanus*	9.09	0.88	-	-		x	H	x		x		x			x		x	x	x
Wattled Crane	*Grus carunculata*	0.61	0.00	VU	CR	x		L		x						x				x
Western Osprey	*Pandion haliaetus*	0.61	0.00	-	-			L						x		x			x	
White Stork	*Ciconia ciconia*	7.27	1.32	-	-		x	M	x							x				x
White-bellied Bustard	*Eupodotis senegalensis*	7.88	0.00	-	VU	x	x	M	x							x	x	x		x

AVIFAUNA SENSITIVITY

The following specific environmental sensitivities have been identified from an avifaunal perspective:

- **A 100m all infrastructure exclusion zone must be implemented around drainage lines and associated wetlands (except essential road and gridline crossings).** Wetlands are important breeding, roosting and foraging habitat for a variety of SCC, most notably for African Grass Owl (SA status Vulnerable), Grey Crowned Crane (SA status Endangered) and African Marsh Harrier (SA status Endangered). Where unavoidable, road and grid line crossings across these features should be restricted to the immediate footprint of the infrastructure only.
- **1km turbine exclusion zone around large pans.** A 1km turbine exclusion zone must be implemented around large pans (other infrastructure allowed). The most significant landscape features from a collision risk perspective are the large pans. Pans attract many birds, including SCC such as Greater Flamingo (SA status Near-threatened), Lesser Flamingo (SA status near-threatened), Martial Eagle (SA Status Endangered), Cape Vulture (SA Status Endangered) and Secretarybird (SA status Vulnerable).
- **High sensitivity grassland - Limited infrastructure zone.** Development in the remaining high sensitivity grassland must be limited as far as possible (limited infrastructure zone). Where possible, infrastructure must be located near margins, with shortest routes taken from the existing roads. The grassland is vital breeding, roosting and foraging habitat for a variety of SCC. These include Blue Crane (SA status near-threatened), Blue Korhaan (Global status near -threatened), White-bellied Bustard (SA Status Vulnerable), Denham's Bustard (SA Status Vulnerable).
- **A 5km no turbine exclusion zone around the Martial Eagle nest.** Following completion of the pre-construction bird monitoring programme (August 2020 – September 2021 for Camden I WEF and July 2020 – May 2021 for Camden II WEF), and after the closure and conclusion of the draft EIA report Public Participation period for the Camden Renewable Energy complex (07 September 2022 to 10 October 2022), the Avifaunal Specialist was informed of a potential Martial Eagle (*Polemaetus bellicosus*) nest located near the Camden II Wind Energy Facility. The presence of the nest was confirmed by the avifaunal specialists at the location of -26.694075° (latitude) and 30.091790° (longitude) on 12 October 2022. Detailed information on the Martial Eagle nest finding is included as **Annexure 1** of the Avifauna Impact Assessment (**Appendix H-2**). In accordance with best practice and in alignment with the buffer distance recommended by BirdLife South Africa, **a 5km no-turbine exclusion zone around the Martial Eagle nest finding must therefore be implemented**.

Figure 7-24 indicates the avifauna sensitivity zones identified in the course of the study, relevant to the Camden I WEF. The location of the nest and associated 5km buffer is indicated in the consolidated environmental sensitivity map (**Figure 10-13**).

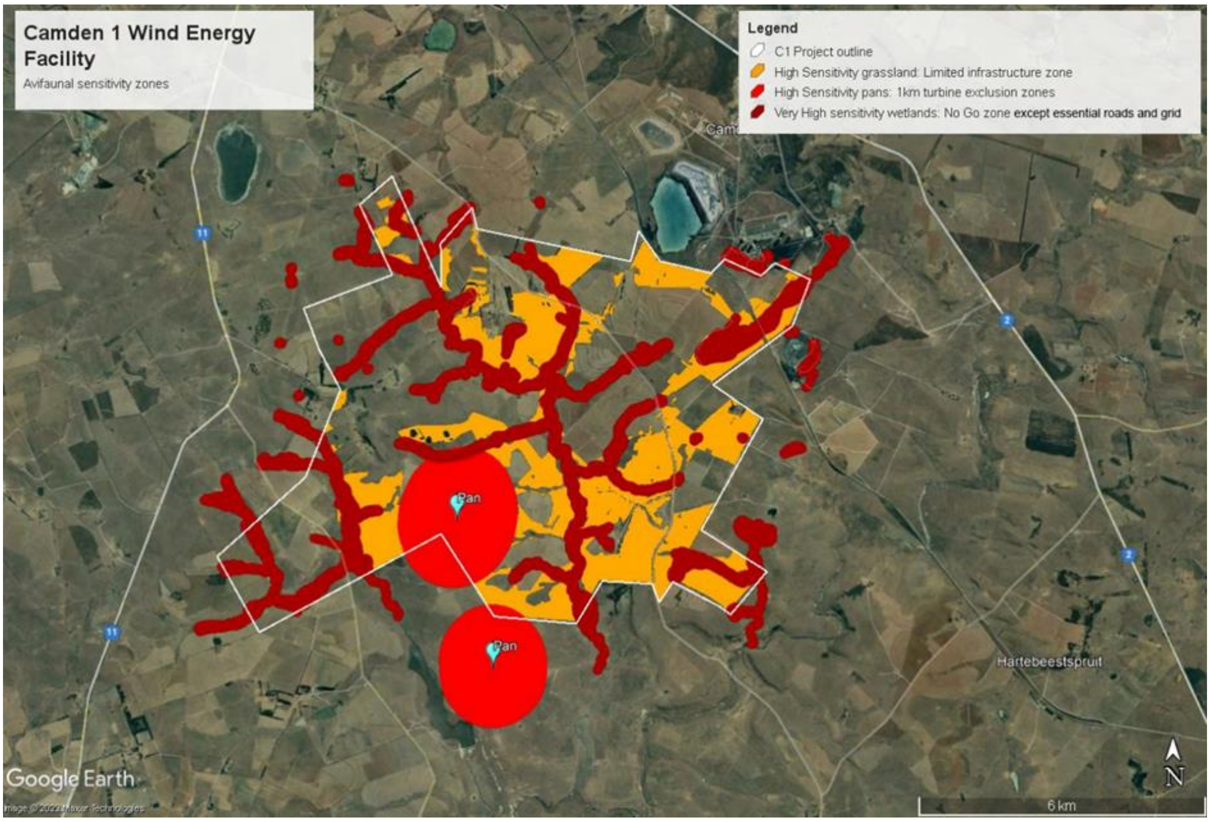

Figure 7-24: Avifauna Sensitivity Zones at the Camden I WEF (Chris van Rooyen Consulting, 2022).

7.2.8 BATS

Table 7-6 indicates the species of bat which have been confirmed to occur on site, those unconfirmed species which may potentially occur on site, as well as those occurring in the broader area of the site based on literature review. For each species, the risk of impact by wind energy infrastructure was assigned by MacEwan et al. (2020) based on their distributions, altitudes at which they fly, and foraging ecology.

There are several bat species in the vicinity of the site that occur commonly in the area. Some of these species are of special importance based on their likelihood of being impacted by the proposed WEF, due to high abundances and certain behavioural traits. They have also been dominating records of fatalities at wind energy facilities in South Africa. The relevant species are discussed below.

TADARIDA AEGYPTIACA

The Egyptian free-tailed bat, *Tadarida aegyptiaca,* is a Least Concern species (SANBI Red List 2016) as it has a wide distribution and high abundance throughout South Africa, and is part of the free-tailed bat family (Molossidae). It occurs from the Western Cape of South Africa, north through to Namibia and southern Angola; and through Zimbabwe to central and northern Mozambique (Monadjem et al. 2020). This species is protected by national legislation in South Africa (ACR 2020).

Egyptian free-tailed bats roost communally in small (dozens) to medium-sized (hundreds) groups in caves, rock crevices, under exfoliating rocks, in hollow trees and behind the bark of dead trees. It has also adapted to roosting in buildings, in the roofs of houses in particular (Monadjem et al. 2020). Thus, man-made structures and large trees on the site would be important roosts for this species.

Tadarida aegyptiaca forages over a wide range of habitats, flying above the vegetation canopy. It appears that the vegetation has little influence on foraging behaviour as the species forages over desert, semi-arid scrub, savannah, grassland and agricultural lands. Its presence is strongly associated with permanent water bodies due to concentrated densities of insect prey (Monadjem et al. 2020).

After a gestation of four months, a single pup is born, usually in November or December, when females give birth once a year. In males, spermatogenesis occurs from February to July and mating occurs in August. Maternity colonies are apparently established by females in November.

The Egyptian free-tailed bat is considered to have a high risk of fatality on wind energy facilities due to turbine collisions (MacEwan et al. 2020). Due to the high abundance and widespread distribution of this species, high mortality rates due to wind turbines would be a cause for concern as these species have more significant ecological roles than the rarer bat species, and are currently displaying moderate to high numbers of mortalities at nearby operating wind farms.

LAEPHOTIS CAPENSIS

Laephotis capensis is commonly called the Cape serotine (formerly *Neoromicia capensis*) and has a conservation status of Least Concern (SANBI Red List 2016) as it is found in high numbers and is widespread over much of Sub-Saharan Africa. High mortality rates of this species due to wind turbines would be a cause for concern as precisely because of its abundance. As such, it has a more significant role to play within local ecosystems than the rarer bat species, since they can consume larger numbers of nocturnal insects.

The Cape serotine roosts individually or in small groups of two to three bats in a variety of shelters, such as under the bark of trees, at the base of aloe leaves, and under the roofs of houses. They will use most man-made structures as day roosts which can be found throughout the site and surrounding areas (Monadjem et al. 2020). They do not undertake migrations and thus are considered residents of the site.

Mating takes place from the end of March until the beginning of April. Spermatozoa are stored in the uterine horns of the female from April until August, when ovulation and fertilisation occur. They give birth to twins during late October and November, but single pups, triplets and quadruplets have also been recorded (van der Merwe 1994 and Lynch 1989).

They are tolerant of a wide range of environmental conditions as they survive and prosper across arid and semi-arid areas to montane grasslands, forests, and savannas; indicating that they may occupy several habitat types across the site, and are amenable towards habitat changes. They are however clutter-edge foragers, meaning they prefer to hunt on the edge of vegetation clutter, but can occasionally forage in open spaces. They are thought to have a medium to high likelihood of fatality due to wind turbines (MacEwan et al. 2020) and are currently displaying moderate to high numbers of mortalities at operational wind farms in South Africa.

MINIOPTERUS NATALENSIS

Miniopterus natalensis, commonly referred to as the Natal long-fingered bat, occurs widely across the country but mostly within the southern and eastern regions, and is listed as Least Concern (Monadjem et al. 2020). This bat is a cave-dependent species and identification of suitable roosting sites may be more important in determining its presence in an area than the presence of surrounding vegetation. It occurs in large numbers when roosting in caves with approximately 260 000 bats observed making seasonal use of the De Hoop Guano Cave in the Western Cape, South Africa. Culverts and mines have also been observed as roosting sites for either single bats or small colonies. Separate roosting sites are used for winter hibernation activities and summer maternity behaviour, with the winter hibernacula generally occurring at higher altitudes in more temperate areas and the summer hibernacula occurring at lower altitudes in warmer areas of the country (Monadjem et al. 2020).

Mating and fertilisation usually occur during March and April and is followed by a period of delayed implantation until July/August. Birth of a single pup usually occurs between October and December as the females congregate at maternity roosts (Monadjem et al. 2020 & van de Merwe 1979).

The Natal long-fingered bat undertakes short migratory journeys between hibernaculum and maternity roosts. Due to this migratory behaviour, they are considered to be at high risk of fatality from wind turbines if a wind farm is placed within a migratory path (MacEwan et al. 2020). The mass movement of bats during migratory periods could result in mass casualties if wind turbines are positioned over a mass migratory route and such turbines are not effectively mitigated. Very little is known about the migratory behaviour and paths of M. natalensis in South Africa with migration distances exceeding 150 kilometres. If the site is located within a migratory path, the bat detection systems should detect higher numbers and activity of the Natal long-fingered bat in spring and autumn; this will be examined over the course of the 12-month monitoring survey.

A study by Vincent et al. (2011) on the activity and foraging habitats of Miniopteridae found that the individual home ranges of lactating females were significantly larger than that of pregnant females. It was also found that the bats predominately made use of urban areas (54%) followed by open areas (19.8%), woodlands (15.5%) orchards and parks (9.1%) and water bodies (1.5%) when selecting habitats. Foraging areas were also investigated with the majority again occurring in urban areas (46%), however a lot of foraging also occurred in woodland areas (22%), crop and vineyard areas (8%), pastures, meadows and scrubland (4%) and water bodies (4%).

MacEwan et al. (2020) advise that *M. natalensis* faces a medium to high risk of fatality due to wind turbines. This evaluation was based on broad ecological features and excluded migratory information. The species is currently displaying low to moderate numbers of mortalities at operational wind farms in South Africa.

Table 7-6: Species currently confirmed on site, previously recorded in the area, or potentially occurring. Roosting and foraging habitats in the study area, conservation status and risk of impact are also briefly described per species (Monadjem et al. 2020)

SPECIES	COMMON NAME	OCCURRENCE IN AREA*	CONSERVATION STATUS (SANBI & EWT, 2016)	POSSIBLE ROOSTING HABITAT ON SITE	POSSIBLE FORAGING HABITAT UTILISED ON SITE	RISK OF IMPACT (MACEWAN ET AL. 2020 FOR WIND)
Tadarida aegyptiaca	Egyptian free-tailed bat	Confirmed on site	Least Concern (2016 Regional Listing)	Hollows in trees, and behind the bark of dead trees. The species has also taken to roosting in roofs of buildings.	It forages over a wide range of habitats; its preferences of foraging habitat seem independent of vegetation. It seems to forage in all types of habitats.	High
Mops midas	Midas free-tailed bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Hollows in trees, and behind the bark of dead trees. The species has also taken to roosting in roofs of buildings.	It forages over a wide range of habitats; its preferences of foraging habitat seem independent of vegetation. It seems to forage in all types of habitats.	High
Mops (Chaerephon) pumilus	Little free-tailed bat	Confirmed on site	Least Concern (2016 Regional Listing)	Hollows in trees, and behind the bark of dead trees. The species has also taken to roosting in roofs of buildings.	It forages over a wide range of habitats; its preferences of foraging habitat seem independent of vegetation. It seems to forage in all types of habitats.	High
Laephotis (Neoromicia) capensis	Cape serotine	Confirmed on site	Least Concern (2016 Regional Listing)	Roosts in the roofs of houses and buildings, and also under the bark of trees.	It appears to tolerate a wide range of environmental conditions from arid semi-desert areas to montane grasslands, forests, and savannahs. Predominantly a medium height clutter edge forager on site.	High
Laephotis zuluensis	Zulu serotine	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Roosts under the bark of trees, and possibly roofs of buildings.	Predominantly a medium height clutter edge forager on site.	Medium – High

SPECIES	COMMON NAME	OCCURRENCE IN AREA*	CONSERVATION STATUS (SANBI & EWT, 2016)	POSSIBLE ROOSTING HABITAT ON SITE	POSSIBLE FORAGING HABITAT UTILISED ON SITE	RISK OF IMPACT (MACEWAN ET AL. 2020 FOR WIND)
Laephotis nanus	Banana bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Roosts under the bark of trees, and in the folded leaves of banana trees in the larger area.	Predominantly a medium height clutter edge forager on site.	Medium – High
Pipistrellus hesperidus	Dusky pipistrelle	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Roosts under the bark of trees, and possibly roofs of buildings.	Prefers vegetation edges and clutter with open water sources.	Medium – High
Miniopterus natalensis	Natal long-fingered bat	Confirmed on site	Least Concern (2016 Regional Listing)	Caves and mine tunnels present in the larger area, may also take residence in suitable hollows such as culverts under roads.	Clutter-edge forager. May forage in more open terrain during suitable weather.	High
Miniopterus fraterculus	Lesser long-fingered bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Caves and mine tunnels present in the larger area.	Clutter-edge forager. May forage in more open terrain during suitable weather.	High
Eptesicus hottentotus	Long-tailed serotine	Confirmed on site	Least Concern (2016 Regional Listing)	It is a crevice dweller roosting in rock crevices in the larger area, as well as other crevices in buildings.	It generally seems to prefer woodland habitats, and forages on the clutter edge. But may still forage over open terrain occasionally.	Medium – High
Myotis tricolor	Temmink's myotis	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Caves and mine tunnels present in the larger area, may also take residence in suitable hollows such as culverts under roads.	Clutter-edge forager. May forage in more open terrain during suitable weather.	Medium – High
Rhinolophus blasii	Blasius's horseshoe bat	Confirmed in 100km radius	Near Threatened (2016 Regional Listing)	Caves and mine tunnels present in the larger area.	Vegetation clutter forager, clumps of trees on site.	Low

SPECIES	COMMON NAME	OCCURRENCE IN AREA*	CONSERVATION STATUS (SANBI & EWT, 2016)	POSSIBLE ROOSTING HABITAT ON SITE	POSSIBLE FORAGING HABITAT UTILISED ON SITE	RISK OF IMPACT (MACEWAN ET AL. 2020 FOR WIND)
Rhinolophus clivosus	Geoffroy's horseshoe bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Caves and mine tunnels present in the larger area.	Vegetation clutter forager, clumps of trees on site.	Low
Rhinolophus swinnyi	Swinny's horseshoe bat	Confirmed in 100km radius	Vulnerable (2016 Regional Listing)	Caves and mine tunnels present in the larger area.	Vegetation clutter forager, clumps of trees on site.	Low
Rhinolophus simulator	Bushveld horseshoe bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Caves and mine tunnels present in the larger area.	Vegetation clutter forager, clumps of trees on site.	Low
Scotophilus dinganii	Yellow-bellied house bat	Confirmed on site	Least Concern (2016 Regional Listing)	Roofs of buildings and other suitable hollows.	Clutter-edge forager. May forage in more open terrain during suitable weather.	High
Cloeotis percivali	Percival's short-eared trident bat	Confirmed in 100km radius	Endangered (2016 Regional Listing)	Caves and mine tunnels present in the larger area.	Vegetation clutter forager, clumps of trees on site.	Low
Epomophorus wahlbergi	Wahlberg's epauletted fruit bat	Confirmed in 100km radius	Least Concern (2016 Regional Listing)	Roosts in dense foliage of large, leafy trees in the larger area, and may travel several kilometres each night to reach fruiting trees.	Feeds on fruit, nectar, pollen and flowers. If and where available on or near site.	High
Eidolon helvum	African straw-coloured fruit bat	Possible as migrant	Least Concern (2016 Regional Listing) (Globally Near threatened)	Non-breeding migrant with sparse scattered records.	Feeds on fruit, nectar, pollen and flowers, if and where available on site.	High

BAT SENSITIVITY

Google Earth satellite imagery and verifications during site visits were used to spatially demarcate areas of the site with high and medium sensitivities relating to bat species ecology and habitat preferences, where high sensitivities and their buffers are no-go zones for turbines and turbine blade overhang (**Table 7-7** and **Table 7-8)**. In other words, no turbine blades may intrude into high sensitivity buffers.

Medium sensitivities indicate areas of probable increased risk due to seasonal fluctuations in bat activity, but turbines are allowed to be constructed in medium sensitivity areas.

Figure 7-25 depicts the sensitive areas of the site, based on features identified to be important for foraging and roosting of the species that are most likely to occur on site. The layout depicted adheres to the sensitivities identified in **Table 7-8**.

Table 7-7: Description of parameters used in the development of the sensitivity map

LAST REVISION	NOVEMBER 2021
High sensitivities and 200m buffers	Valley bottom wetlands
	Pans and depressions
	Dams
	Drainage lines capable of supporting riparian vegetation which in turn increases localised insect abundance
	Other water bodies and other sensitivities such as manmade structures, buildings, houses, barns, sheds, stands of tall trees.
Moderate sensitivities and 150m buffers	Seasonal wetlands
	Seasonal drainage lines

Table 7-8: The significance of sensitivity map categories for each infrastructure component for the Camden I WEF

SENSITIVITY	TURBINES	ROADS AND CABLES	INTERNAL OVERHEAD TRANSMISSION LINES	BUILDINGS (INCLUDING SUBSTATION, BATTERY STORAGE FACILITY AND CONSTRUCTION CAMP/YARDS)
High Sensitivity	These areas are 'no-go' zones and turbines may not be placed in these areas. Turbine blades (blade overhang) may not intrude into these areas.	Preferably keep to a minimum within these areas where practically feasible.	Allowed inside these areas.	Avoid these areas.
High Sensitivity buffer	These areas are 'no-go' zones and turbines may not be placed in these areas. Turbine blades (blade overhang) may not intrude into these areas.	Allowed inside these areas.	Allowed inside these areas.	Preferably keep to a minimum within these areas where practically feasible.
Moderate Sensitivity	Turbines may be placed within these areas, however, may require priority (not excluding all other turbines) during post-construction studies, and in some instances, there is a higher likelihood that mitigation measures may need to be applied to them.	Allowed inside these areas.	Allowed inside these areas.	Allowed inside these areas.
Moderate Sensitivity buffer	Turbines may be placed within these areas, however, may require priority (not excluding all other turbines) during post-construction studies, and in some instances, there is a higher likelihood that mitigation measures may need to be applied to them.	Allowed inside these areas.	Allowed inside these areas.	Allowed inside these areas.

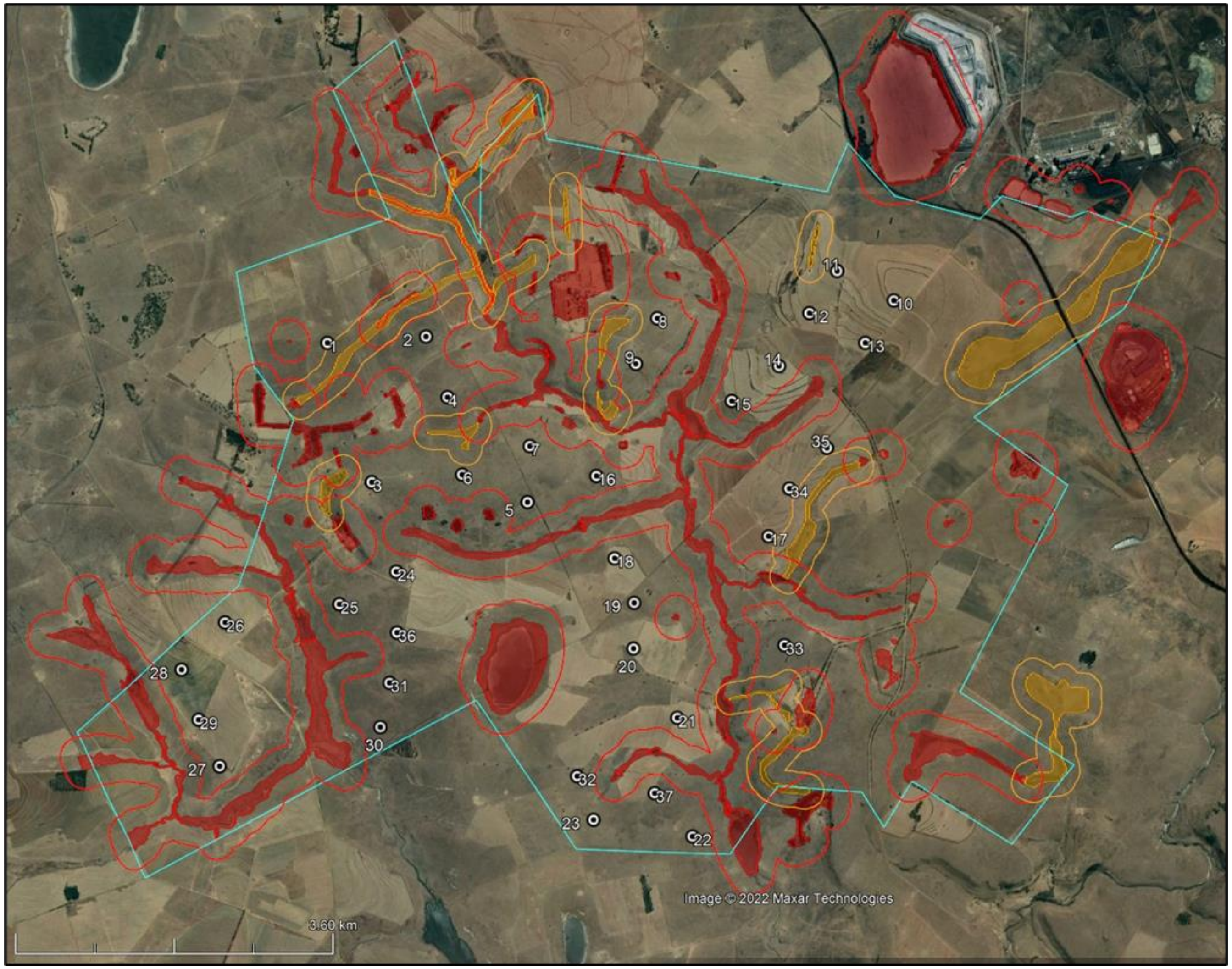

Figure 7-25: Bat sensitivity map of the wind energy facility site. Shaded red = high sensitivity; Red line = 200m high sensitivity buffer; Shaded orange = medium sensitivity; Orange line = 150m medium sensitivity buffer (Animalia, 2022)

7.3 SOCIAL ENVIRONMENT

7.3.1 LAND USE

DEVELOPMENT SITE

The site is used for cultivation and for the grazing of both cattle and sheep. Cultivated crops include maize, soya beans and the fodder crop, weeping love grass, *Eragrostis curvula*.

In terms of the South African National Land Cover dataset, the site is classified as Grassland interspersed with cultivation areas, small sections of forested land and numerous wetlands/water bodies throughout the project site (**Figure 7-26**).

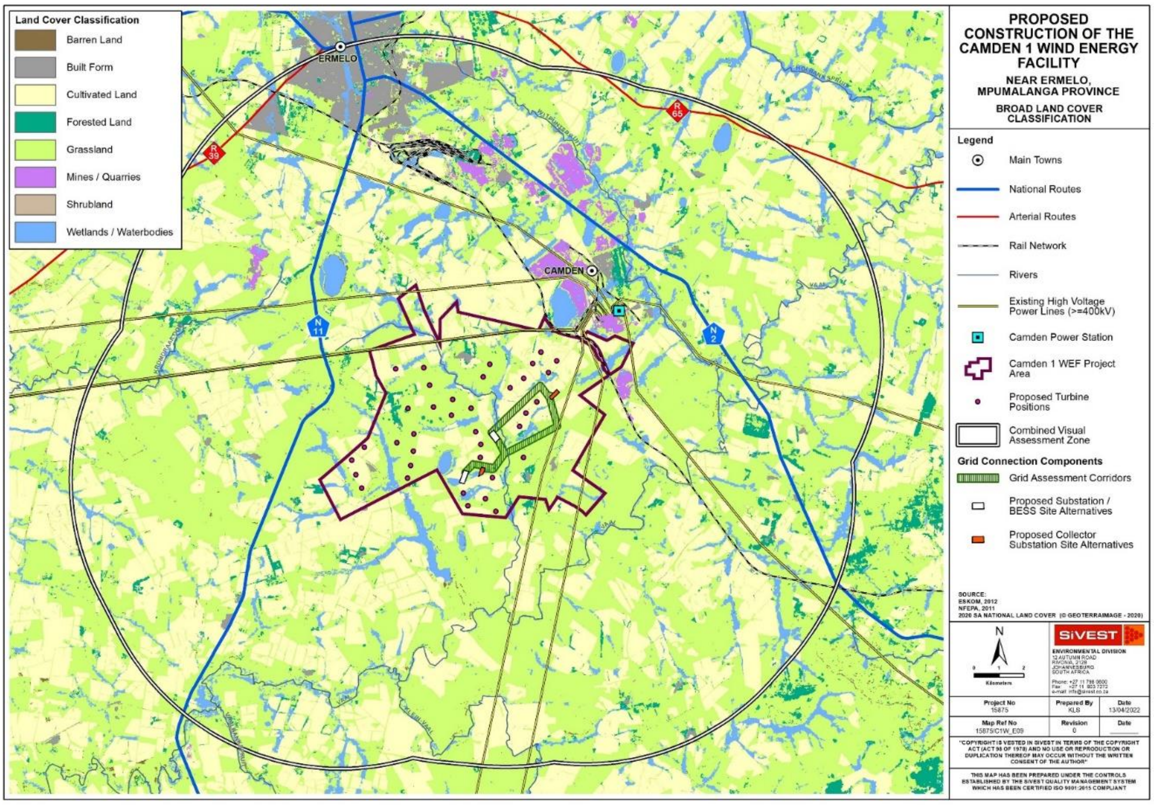

Figure 7-26: Broad land cover classification (SiVest, 2022)

SURROUNDING AREAS

The proposed WEF is located approximately 13km south east of the town of Ermelo. The small settlement of Camden associated with Camden Power station (located 2.3 km north of the project site), is the only other urban area located in significant proximity. The other settlement located within relatively close proximity to the site is the rural settlement of Sheepmore, located approximately 20 km to the east of the proposed project site.

Commercial agriculture is the dominant activity in the study area, with the main focus being maize cultivation, soybean cultivation and livestock grazing. There are multiple farm portions in the study area, resulting in a relatively moderate density of rural settlement with many scattered farmsteads in evidence. Built form in much of the study area comprises farmsteads, ancillary farm buildings and workers' dwellings, gravel access roads, telephone lines, fences and windmills.

High levels of human influence are however visible in the northern / north-eastern sector of the study area. Much of the town of Ermelo encroaches into the study area and peri-urban areas stretching southwards from Ermelo along the N2 national route are dominated by mining activity and associated infrastructure, including Mooiplaats and Vunene Collieries. Also located in this area is the Camden Power Station with associated high voltage power lines, and the adjacent Camden residential area.

Other evidence of significant human influence includes a sizeable quarry (Rietspruit Crushers) located to the west of the N11 national route, as well as road, rail, telecommunications and high voltage electricity infrastructure.

7.3.2 NOISE CLIMATE

The existing noise climate surrounding the Camden I WEF is predominantly rural with very low baseline noise levels anticipated. Noise sources may include birds, insects, livestock and activities of resident farmers. Anthropogenic influences may include traffic on local roads and on the nearby N2 and N11 National roads as well as train activity along the railway line located just northeast of the study area. A distinctive hum from the nearby Camden power station may also be evident at receptors in close proximity to the power station.

Sensitive receptors are identified as areas that may be impacted negatively due to noise associated with the proposed WEF. Examples of receptors include, but are not limited to, schools, shopping centres, hospitals, office blocks and residential areas. Being such a remotely located site, dominant receptors in the area surrounding the site include small farmsteads and farmhouses. The specific sensitive receptors (farmhouses) considered in this study are presented in **Figure 7-27**.

Table 7-9: Sensitive receptors surrounding the project site

ID	DESCRIPTION	LATITUDE (°S)	LONGITUDE (°E)	NEAREST TURBINE	DISTANCE FROM NEAREST TURBINE (M)	DIRECTION FROM NEAREST TURBINE
C1_Rec 01	Farmhouse	26.634611	30.033396	WTG08	930	NW
C1_Rec 02	Farmhouse	26.632051	30.078345	WTG10	940	ENE
C1_Rec 03	Farmhouse	26.670771	30.069023	WTG33	1,195	E
C1_Rec 04	Farmhouse	26.673473	30.069255	WTG33	1,255	ESE
C1_Rec 05	Farmhouse	26.678195	30.058971	WTG33	875	SSE
C1_Rec 06	Farmhouse	26.686489	30.060385	WTG22	1,445	ENE
C1_Rec 07	Farmhouse	26.678784	29.997393	WTG27	700	NE
C1_Rec 08	Farmhouse	26.678657	29.995743	WTG27	600	NE
C1_Rec 09	Farmhouse	26.675015	29.995617	WTG29	685	NE
C1_Rec 10	Farmhouse	26.658901	30.006440	WTG03	665	SW
C1_Rec 11	Farmhouse	26.650513	29.995569	WTG03	1,480	WNW
C1_Rec 12	Farmhouse	26.644297	30.012122	WTG04	635	W

Figure 7-27: Sensitive receptors surrounding the Camden I WEF

Noise from wind turbines can be classified into two categories, namely mechanical noise generated from the turbine's mechanical components and aerodynamic noise, produced by flow of air over the turbine blades.

MECHANICAL NOISE

The mechanical noise generated by a wind turbine is predominantly tonal (dominated by a narrow range of frequencies), but may also be broadband in character, displaying a wide range of frequencies (Council of Canadian Academics, 2015). Such noise is produced by the physical movement of the following components:

— Gearbox;
— Generator;
— Yaw drives;
— Cooling fans; and
— Auxiliary equipment.

Over time, appropriate design and manufacturing have reduced the mechanical noise produced from wind turbines. As such, the aerodynamic noise from the blades has become the dominant source of noise for modern turbines, however, low frequency tones associated with mechanical sources are audible for some turbines (Hau, 2006; Manwell et al., 2009; Oerlemans, 2011).

AERODYNAMIC NOISE

Aerodynamic noise is typically broadband in nature and is generated by the interaction between air flow and different parts of the turbine blades. These interactions depend on the speed and turbulence of the wind; the shape of the blade; the angle between the blade and relative wind velocity flowing over the blade; and the distance from the hub. The noise levels produced are relative to the velocity of the air flow, with higher rotor speeds resulting in higher noise levels. Specifically, parts of the blade closer to the tips move faster than those closer to the hub, resulting in faster relative air velocities and create higher aerodynamic noise levels. As such, most of the aerodynamic noise is produced near (but not at) the blade tips. This is partly why turbines with longer blades have a higher sound power level (Oerlemans, 2011).

Aerodynamic noise from wind turbines also has a strong directional component, projecting primarily downward, upward, or even perpendicular depending on the dominant mechanism (Oerlemans, 2011). As such, noise levels measured at a particular location can vary depending on the direction, speed and turbulence of the prevailing wind. Furthermore, as the rotor turns, the orientation of each blade changes in relation to a stationary receiver. As such, the noise levels at the receiver will vary as the blades rotate, resulting in periodic regular changes in noise levels over time (Renewable UK, 2013).

As wind speed increases, the aerodynamic noise of the turbines also increases. At low speeds the noise created is generally low and increases to a maximum at a certain speed (around 10 m/s) where it either remains constant or can even slightly decrease.

LOW FREQUENCY NOISE AND INFRASOUND

In addition to the noise discussed above, wind turbines also produce some steady, deep, low frequency sounds (between 1 – 100 Hz), particularly under turbulent wind conditions. Sound waves below 20 Hz are called infrasound. These infrasound levels are only audible at very high sound pressure levels. Older wind turbines that had downwind rotors created noticeable amounts of infrasound. Levels produced by modern-day, up-wind style turbines are below the hearing threshold for most people (Jakobsen, 2005).

The human ear is substantially less sensitive to sound at very low or very high frequencies. For most people, a very low pitch sound (20 Hz) must have a sound pressure level of 70 dB to be audible. Levels of infrasound near modern commercial wind turbines are far below this level and are generally not perceptible to people (Leventhall, 2006).

Low frequency sound, like all other sound, decreases as it travels away from the source. Siting wind turbines further away from sensitive receptors will therefore decrease the risk of infrasound. It is, however, important to note that in flat terrain, low frequency sound can travel more effectively than high frequency sound. Most environmental sound measurements and noise regulations are based on the A-weighed decibel scale (dB(A)), which under-weights low frequency sounds in order to mimic the human ear. Thus, noise limits based on the dB(A) levels do not fully regulate infrasound. The dB(C) scale offers an alternative of measuring sound that provides more weight to lower frequencies (Jakobsen, 2005; Bolin et al., 2011).

SANS 10103 proposes a methodology to identify whether low frequency noise could be an issue. The method suggests that if the difference between LAeq and LCeq is greater than 10 dB, then a predominant low frequency component may be present. However, in all cases the existing acoustic energy in low frequencies associated with wind must be considered.

SUBSTATION AND TRANSFORMER NOISE

In addition to the noise from wind turbines, wind farms require a substation and transformers, which produce a characteristic "hum" or "crackle" noise. Utility companies have experience with building and siting such sources to minimise their impact. Substation-related noise is relatively easy to mitigate should this be required, based on the use of acoustic shielding and careful planning regarding placement away from sensitive receptors. As such, noise associated with this source is not considered in this assessment.

7.3.3 TRANSPORT NETWORK

The local road network consists of the National Road N2 to the north and northeast of the project site, and the N11 to the west and south of the site. The N2 is the primary road link between Ermelo and Richards Bay and south to Durban. In the vicinity of the site, the N2 is a single carriageway with 1 lane per direction and gravel shoulders. The N11 is the primary road link between Ladysmith and Newcastle in Kwa-Zulu-Natal, through Ermelo to Middelburg and beyond. In the vicinity of the site, the N11 is a single carriageway with 1 lane per direction and gravel shoulders.

The site is traversed by two district roads, refer to **Figure 7-28** for the alignment of these roads as shown on the Mpumalanga Road network map.

— The D260 is a district collector from the N11 and follows a roughly southerly alignment beyond its intersection with the D1264. It is a single carriageway 2-way unsurfaced road (1 lane per direction), with no shoulders. It has a priority Stop controlled T-junction on the N11.

— The D1107 is a district collector between the N11 and Road D1329/D261. It is a single carriageway 2-way unsurfaced road (1 lane per direction), with no shoulders. It has a priority Stop controlled T-junction on the N11.

In addition, the D1264 is a district collector between the D260 and the N2, located to the south of the site. It is a single carriageway 2-way unsurfaced road (1 lane per direction), with no shoulders. It has a priority Stop controlled T-junction on the N2, and a grade separated crossing (road over rail), over the main railway line between Mpumalanga and Richards Bay. The Richards Bay railway line traverse the site to the south of the Camden Power station site.

There are 3 landing strips within Msukaligwa municipality one municipal landing strip in Ermelo with tarred runaway for various activities, one at Warburton and Woodstock farms respectively used for fire-fighting purposes by forestry companies.

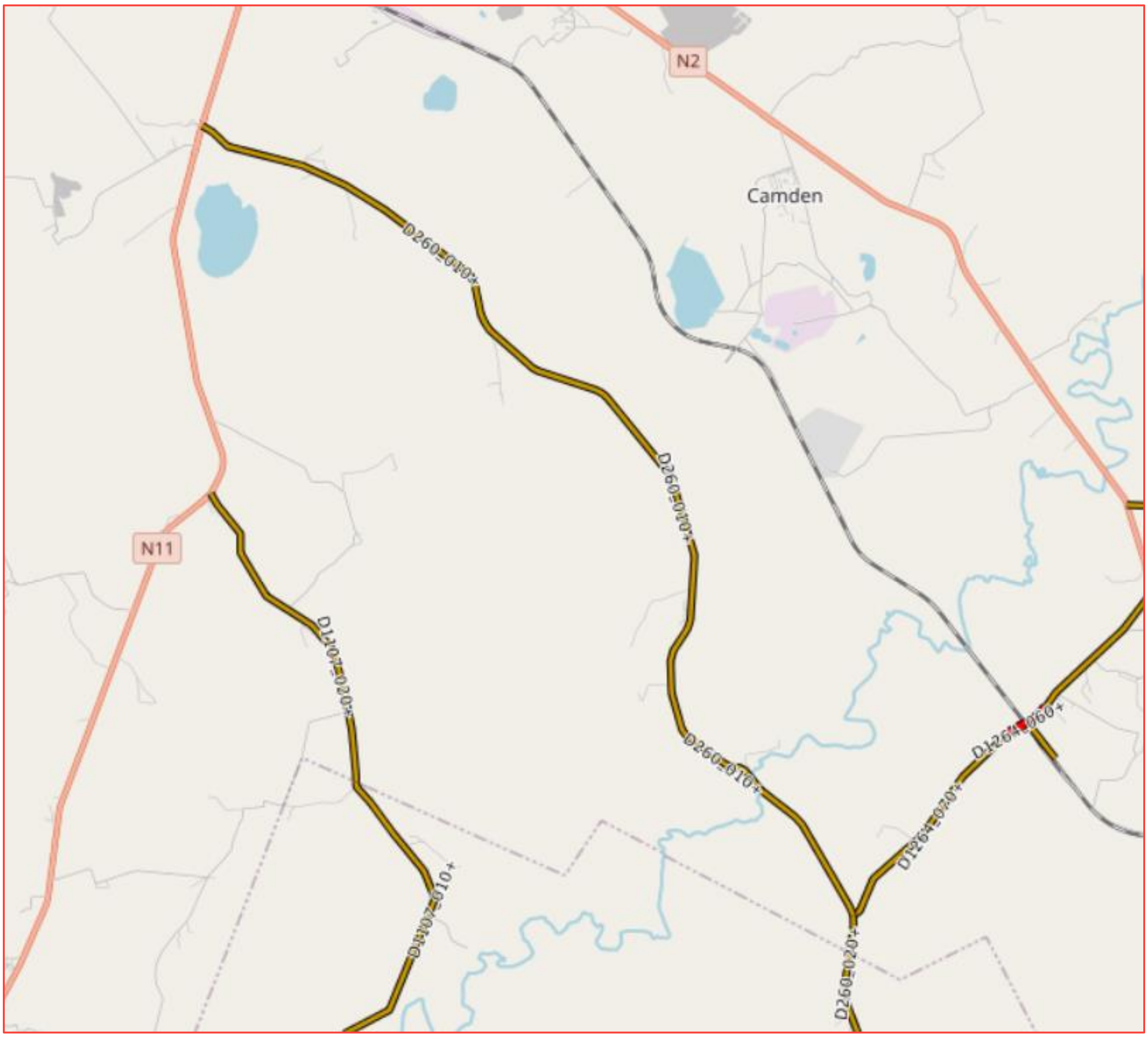

Figure 7-28: Mpumalanga Province Road network relative to the site (Source: Mpumalanga Road Assess Management)

7.3.4 HERITAGE AND CULTURAL RESOURCES

The Camden power station and associated small town is situated 16km south from Ermelo in Mpumalanga. The archaeological record for the greater study area consists of the Stone Age and Iron Age.

STONE AGE

The Stone Age of southern Africa starts when hominins (ancestral to modern-day humans) first started to produce crude tools made with stone. The Earlier Stone Age (2 million - 200 000 years ago) is associated with hominins such as Homo habilis and Homo erectus (Dusseldorp et al. 2013). Mpumalanga currently does not have an extensive ESA archaeological record, at Maleoskop on the farm Rietkloof, only a few ESA artefacts have been found and stone tools consisted of choppers (Oldowan), hand axes, and cleavers (Acheulean) (Esterhuysen & Smith 2007) and some surface scatters have been recorded near Piet Retief (Nel & Karodia 2013).

Middle Stone Age artefacts represents archaic and modern humans that occupied the landscape between 300 000 to 40 000 before present. Later Stone Age occupational sequences reflect San and Khoisan communities from 40 000 years ago until recently (Dusseldorp et al. 2013). Although the MSA and LSA has not been extensively studied in Mpumalanga, evidence for these periods has been excavated from Bushman Rock Shelter in the Ohrigstad District (Esterhuysen & Smith 2007; Lombard et al. 2012) and it is known that San communities lived near Lake Chrissie as recently as the 1950s (e.g., Schlebusch et al. 2016). MSA and LSA surface scatters have also been investigated in the vicinity of Piet Retief, and De Wittekrans nearby Camden is a Later Stone Age archaeological rock art site complex (Nel & Karodia 2013).

IRON AGE

The archaeology of farming communities of southern Africa encompasses three phases. The Early Iron Age (200-900 CE) represents the arrival of Bantu-speaking farmers in southern Africa. Living in sedentary settlements often located next to rivers, these farmers cultivated sorghum, beans, cowpeas, and kept livestock. The Middle Iron Age (900-1300 CE) is mostly confined to the Limpopo Valley in southern Africa with Mapungubwe Hill probably representing the earliest ‘state’ in this region (Huffman 2007).

The Late Iron Age (1300-1840s CE) marks the arrival and spread of ancestral Eastern Bantu-speaking Nguni and Sotho-Tswana communities into southern Africa. The location of Late Iron Age settlements is usually on or near hilltops for defensive purposes. The Late Iron Age as an archaeological period ended by 1840 CE, when the Mfecane caused major socio-political disruptions in southern Africa (Huffman 2007).

Dates from Early Iron Age sites indicated that by the beginning of the 5th century CE Bantu-speaking farmers had settled in the Mpumalanga lowveld. Subsequently, farmers continued to move into and between the lowveld and highveld of Mpumalanga. Iron Age sites such as Welgelegen Shelter, Robertsdrift and Tafelkop situated 50-100 km west of Camden dates from the 12th to the 18th century (Derricourt & Evers 1973; Esterhuysen & Smith 2007).

During the mid-17th century Europeans started to settle in modern-day Cape Town. During and after the conflict caused by the Mfecane (1820-1840), during the reign of king kaSenzangakhona Zulu, known as Shaka, Dutch-speaking farmers started to migrate to the interior regions of South Africa. A period that is marked by various skirmishes and battles between the local inhabitants, Dutch settlers and the British (Giliomee & Mbenga 2007).

HISTORICAL CONTEXT OF CAMDEN

Camden power station was commissioned in 1967 (Gaigher 2011; Matenga 2020). However, the nearby town of Ermelo has a rich history. The earliest record for settlers in Ermelo is from 1860, when the area was under the jurisdiction of Zulu-speaking Nhlapo communities (Nhlapo 1945). The construction of the town of Ermelo was initiated by the Dutch Reform Church, which purchased the eastern part of the farm Nooitgedacht on 26 May 1879. The town was officially proclaimed on 12 February 1880 by William Owen Lanyon, the Administrator of the Transvaal (Greyling 2017).

BATTLEFIELDS AND WAR HISTORY

Due to the proximity of Ermelo to the Nederlandsche Zuid-Afrikaansche Spoorweg-Maatskappij railway line linking Pretoria with Lourenço Marques (Maputo), the area was subject to various skirmishes during the Anglo-

Boer War of 1899-1902. At the time there were about 100 families residing in the town and many women and children were sent to British concentration camps. In 1901, British troops burnt the town down due to their scorched earth policy, and Ermelo was rebuilt in 1903 (Moody 1977; Pretorius 2000; Van Schalkwyk 2012; Greyling 2017).

GRAVES AND BURIAL SITES

No graves are indicated by the Genealogical Society of the South Africa for the study area. The Klipbank cemetery with 21 graves is indicated 3,6 km to the south of the Project.

CULTURAL LANDSCAPE

The study area is in a rural setting and characterised by cultivation and agricultural activities with a historical layering consisting of burial sites and the remnants of stone packed structures/ settlements. A more recent industrial element is introduced by the Camden Power Station that was commissioned in 1967, along with the development of coal-mining in the broader region.

PALAEONTOLOGICAL HERITAGE

According to the SAHRA Paleontological map the study area is of zero to very high paleontological significance and an independent study was conducted for this aspect. The Palaeontological Assessment (Bamford, 2022) (**Appendix H-7**) concluded that based on the fossil record but confirmed by the site visit and walk through, there are NO FOSSILS of the Glossopteris flora even though fossils have been recorded from rocks of a similar age and type in South Africa. It is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary. There is a very small chance that fossils may occur below the ground surface in the shales of the Vryheid Formation (Ecca Group, Karoo Supergroup) so a Fossil Chance Find Protocol should be added to the EMPr.

7.3.5 VISUAL CHARATER AND SENSITIVITY

VISUAL CHARACTER AND CULTURAL VALUE

The physical and land use-related characteristics of the study area as described above contribute to its overall visual character. Visual character largely depends on the level of change or transformation from a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural, undisturbed landscape. Visual character is also influenced by the presence of built infrastructure including buildings, roads and other objects such as telephone or electrical infrastructure. The visual character of an area largely determines the sense of place relevant to the area. This is the unique quality or character of a place, whether natural, rural or urban which results in a uniqueness, distinctiveness or strong identity.

The predominant land use in the area (maize and soybean cultivation) has significantly transformed the natural landscape across much of the study area. In addition, the landscape becomes progressively more transformed towards the north-eastern boundary of the study area where Camden Power Station, mine dumps, industrial development and the urban infrastructure of Ermelo have resulted in a high degree of visual degradation. The more industrial character of the landscape is an important factor in this context, as the introduction of the proposed WEF would result in less visual contrast where other anthropogenic elements are already present, especially where the scale of those elements is similar to that of the proposed development.

The scenic quality of the landscape is also an important factor that contributes to the visual character or inherent sense of place. Visual appeal is often associated with unique natural features or distinct variations in form. As such, the pastoral landscape and rolling hills in parts of the study area are important features that could increase the visual appeal and visual interest in the area.

Cultural landscapes are becoming increasingly important concepts in terms of the preservation and management of rural and urban settings across the world. The concept of 'cultural landscape' is a way of looking at a place that focuses on the relationship between human activity and the biophysical environment (Breedlove, 2002). In this instance, the rural / pastoral landscape represents how the environment has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction. The presence of small towns, such as Ermelo, engulfed by an otherwise rural / pastoral environment, form an integral part of the wider landscape.

In light of this, it is important to assess whether the introduction of a WEF into the study area would be a degrading factor in the context of the prevailing character of the cultural landscape. Broadly speaking, visual impacts on the cultural landscape in the area around the proposed development would be reduced by the fact that the visual character in much of the area has been significantly transformed and degraded by urban, industrial, mining and infrastructural development.

VISUAL SENSITIVITY

Visual sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (i.e. topography, landform and land cover), the spatial distribution of potential receptors, and the likely value judgements of these receptors towards a new development (Oberholzer: 2005). A viewer's perception is usually based on the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational or nature-based tourism) which may be based on this aesthetic appeal. The areas identified as visually sensitive to WEF development are shown in **Figure 7-29**. It is important to note that receptors identified within the WEF project are landowners and supportive of the development proceeding and would not view the project in a negative light.

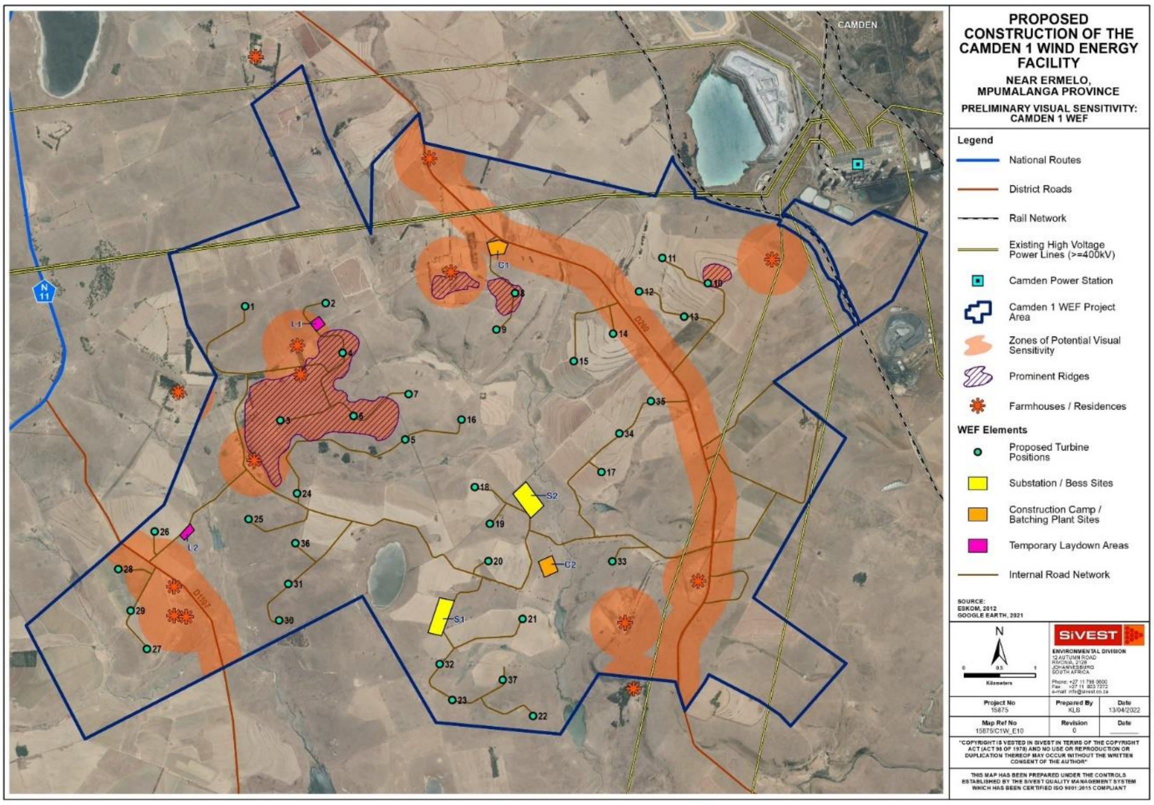

Figure 7-29: Zones of potential visual sensitivity on the Camden I WEF Site

7.3.6 SOCIO-ECONOMIC

SOCIAL OVERVIEW OF THE STUDY AREA

The study area is located ~ 10 km to the south-east of the town of Ermelo, which is the administrative centre of the Msukaligwa Local Municipality. Ermelo is also known as the garden city of Mpumalanga and the gateway to the province. The small settlement of Camden associated with Camden Power station (located 2.3 km north of the project site), is the only other urban area located in significant proximity.

Three national highways, namely the N2, N11 and the N17 intersect at Ermelo. The N2 freeway connects Ermelo with Richards Bay on the KwaZulu Natal coastline. The N11 South connects the town to Newcastle to the south and then onto the Ladysmith before linking up with the N3 to Durban. The N11 north connects to Middelburg and the N4 freeway west to Pretoria. The N17 West connects the town to the southern suburbs of Johannesburg and N17 East to eSwatini.

Ermelo is also a major railway junction between Mpumalanga and KwaZulu-Natal. The rail junction connects to Machadodorp which is on the Pretoria and Maputo railway line. The town also lies on the railway line that connects the Mpumalanga coalfields with the export Port of Richards Bay on the Indian Ocean.

The study area is flanked by the N2 to the north and north-east of the site, and the N11 to the west and southwest of the site. The Richards Bay railway line traverse the site to the south of the Camden Power station site. The Eskom Camden Coal Power station is located immediately to the north and northeast of the site (**Figure 7-30**). Construction of the 1600 MW power station commenced in November/December 1962 and the first turbogenerator was commissioned in April 1967. The last of the eight units was commissioned in 1969. The Camden Power station became the starting point of the national power grid, consisting of a series of 400 kV lines which today interconnect the entire country. The power station has six 111.86m high cooling towers and four 154m high chimney (smoke stacks) that serve 8 boilers.

Between 1990 and 2006 the station was mothballed, but South Africa's energy crisis in the early 21st century prompted Eskom to recommission the station, starting with unit 6 in July 2005 and completing with unit 1 in July 2008.

The development of the Camden Power station also involved the construction of 356 permanent houses to the north of the power station to accommodate administration, operating and maintenance personnel. Community facilities including a community hall, sports facilities, included four tennis courts, a bowling green, swimming bath, shooting range, rugby, hockey, soccer, and cricket fields and jukskei, and the associated clubhouses and changerooms were also established. Several parks, situated throughout the residential property, provided playgrounds for some 500 children at Camden. Schooling was provided in Ermelo for these children, with a regular bus service operating between Camden and Ermelo11.

The other land uses in the study area include coal mining and commercial agriculture. Commercial agriculture in the area between the N2 and N11 to the south and west of the Camden Power Station includes livestock and grain farming.

[11] https://www.eskom.co.za/sites/heritage/Pages/Camden.aspx

Figure 7-30: Camden Power Station

The Camden I WEF site consists of 9 properties. Turbines are proposed on 7 of the properties and the substation site alternatives are located on the same property. All the site properties are primarily used for dryland cropping and grazing and consist of a patchwork of cropped areas and veld used as rangeland. Essentially all the high potential agricultural land is used for crop cultivation. Four of the properties consist of primary dwellings, small clusters of farm workers' houses and outbuildings belonging to people with tenure rights or those only residing on the property during contracted work periods. The study area is primarily accessed off three public gravel roads which intersect with the N11 or N2, viz. the De Emigratie-(N11), Familiehoek-(N11) and Overvaal (N2) roads.

The views towards the site from urban receptors in Ermelo (>9 km) and Camden (>3.9 km) are impacted by the infrastructure associated with the Camden Power station. The area north of the railway line and N2 east of Ermelo has also been transformed by historic and active coal mining operations. The area to the south of the railway line is rural, with the relatively sparse settlement pattern concentrated along or near major public roads.

In terms of residential receptors in the area to the south a number of turbines are within a 500 m to 1 km range of farmsteads and dwellings. The nearest affected dwellings are located on Klipfontein, Zeelie (630 m), Klipfontein, De Jager (670 m), Uitkomst (860 m), and Welgelegen (930 m). The farmsteads on these properties are to some extent screened by the natural topography and or vegetation. Drinkwater Guest Farm (2.7 km) and Die Oogappel venue (5.4 km) are the nearest tourism/ hospitality receptors in the area south of the railway line. However, as indicated, local tourism is largely based on stop-over and essential travel, i.e., less sensitive to visual impacts. The substation site alternatives are not located in significant proximity to any residential, tourism or urban receptors. All are located at distances of 2 km or more from the relevant receptors. The details of the potential sensitive receptors, from a social perspective, are provided in **Table 7-10**.

Table 7-10: Distance of proposed turbine and associated substation alternatives to most proximate urban, residential and tourism receptors

RECEPTOR	TURBINE	SS ALT 1	SS ALT 2	COMMENT
Ermelo built edge	9 km	13.6 km	12.4 km	Across coal mining area

Camden residential	3.9[12]	9.6 km	7.7 km	Existing Tx 470 m Across Camden PS
Welgelegen (main)	930 m	4.2 km	2 km	Camden I WEF site; Existing Tx 490 m
Welgelegen (labour)	1.1 km	3.3 km	2.2 km	Camden I WEF site; Existing Tx 140 m
Camden Guest House	3.1 km	8.4 km	6.6 km	Existing Tx 100 m Adjacent to Camden PS
Indawo Game Lodge	6.5 km	12.2 km	10.3 km	Across Camden PS
Overvaal Guest House	9.8 km	12 km	11 km	Property between N2 and KZN railway line
Adrianople (Saaiman)	5.7 km	7.6 km	6.7 km	Existing Tx 2.2 km Camden II WEF site
Klipbank (Mabuza)	4 km	5.6 km	5.2 km	Existing Tx 950 m
Klipkrans	2.4 km	4.7 km	6.8 km	Existing Tx 6.4 km
Drinkwater Guest Farm	2.7 km	6.6 km	8.1 km	Existing Tx 5.6 km 1 km from N11
Klipfontein (Zeelie)	630 m	3.3 km	3.7 km	Camden I WEF site; Existing Tx 3 km
Klipfontein (De Jager)	670 m	3.7 km	3.4 km	Camden I WEF site; Existing Tx 1.9 km
Uitkomst (De Jager)	860 m	4.4 km	3 km	Camden I WEF site; Existing Tx 790 m
Die Oogappel venue	5.4 km	10.3 km	9.6 km	Existing Tx 1.9 km

The Camden I WEF site is not located within a designated Renewable Energy Development Zone (REDZ). No operational REFs are currently located within significant proximity of the site. The DFF&E's Renewable Energy applications interactive viewer (last updated February 2022) indicates no historic applications within a 35 km radius of the site.

[12] Shaded entries indicate distances of less than 5 km (for purposes of reference).

ADMINISTRATIVE CONTEXT

The study area is located within the Msukaligwa Local Municipality within the Mpumalanga Province. The MM is one of the seven Local Municipalities that make up the Gert Sibande District Municipality (**Figure 7-31**). The town of Ermelo is the administrative seat of the Msukaligwa Local Municipality.

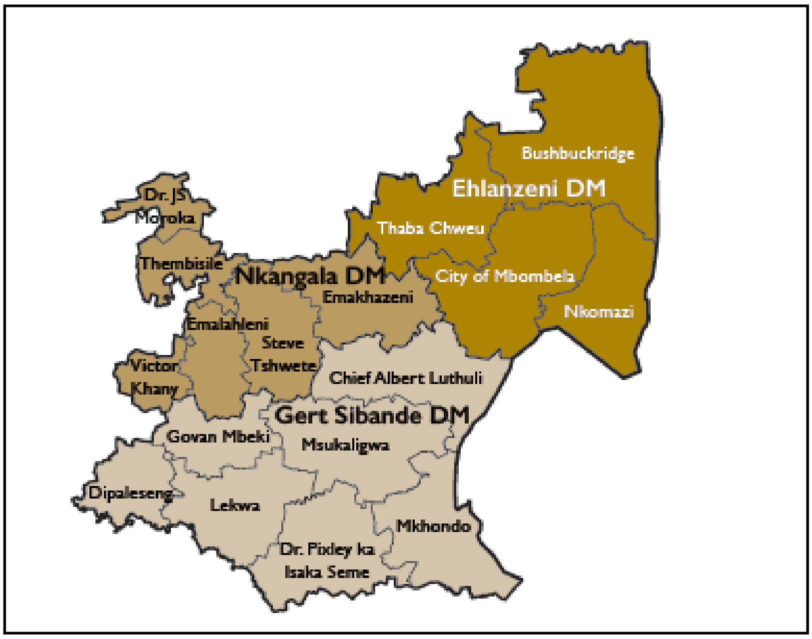

Figure 7-31: Location of Msukaligwa Municipality within the Gert Sibande District Municipality and Mpumalanga Province

DEMOGRAPHIC OVERVIEW

POPULATION

The population of the Msukaligwa Local Municipality in 2016 was 164 608 (Community Household Survey 2016). Of this total, 35.4% were under the age of 18, 60.4% were between 18 and 64, and the remaining 4.1% were 65 and older. The MM therefore had a high percentage of the population that fall within the economically active group of 18-65. The figures are higher than the figures for the GSDM and Mpumalanga (57.7% and 56.6% respectively). This is likely to be due to the employment opportunities associated with the mining and manufacturing activities in the Msukaligwa Local Municipality.

The dependency ratio is the ratio of non-economically active dependents (usually people younger than 15 or older than 64) to the working age population group (15-64). The higher the dependency ratio the larger the percentage of the population dependent on the economically active age group. This in turn translates to reduced revenue for local authorities to meet the growing demand for services. The traditional approach is based people younger than 15 or older than 64. The information provided provides information for the age group under 18. The total number of people falling within this age group will therefore be higher than the 0-15 age group. However, most people between the age of 15 and 17 are not economically active (i.e., they are likely to be at school).

Using information on people under the age of 18 is therefore likely to represent a more accurate reflection of the dependency ratio. Based on these figures, the dependency ratios for the Msukaligwa Local Municipality, the GSDM and Mpumalanga in 2016 were 65.4%, 73.5% and 77% respectively. The high dependency ratios reflect the limited employment and economic opportunities in the area and the province as a whole. As indicated above, a high dependency ratio also places pressure on local authorities in terms of service delivery.

In terms of race groups, Black Africans made up 91.6% of the population on the MM, followed by Whites, 6.9% and Asian or Indians, 0.9%, and Coloureds, 0.6%. This figures for the GSDM are similar. The main first language spoken in the Msukaligwa Local Municipality was isizulu, 79.1%, followed by Siswati, 7.3% and Afrikaans, 6.2%.

HOUSEHOLDS AND HOUSE TYPES

The total number of households in the Msukaligwa Local Municipality in 2016 was 51 090, which constituted approximately 20% of the total number of households in the GSDM. Of these 66.2% were formal houses, 9.1% flats in backyards, 6.6% traditional dwellings, and 9.4% shacks or informal dwellings. The figures for the GSDM were 67.2%, 4.6%, 6.7% and 13.4% respectively. The majority of dwellings in the Msukaligwa Local Municipality are therefore formal structures. A relatively large percentage of the properties in the MM (43.3%), while 5.9% were owned and in the process of being paid off. 22.1% of the households rented their properties, while 10.6% occupied their properties rent free. The rent-free figure is likely to be associated with farm workers. The relatively high number of properties that are owned and or in the process of being paid off reflects a relatively stable and established community.

In terms of household heads, approximately 38.9% of the households in the Msukaligwa Local Municipality and 39.1% of the households in the GSDM were headed by women. These figures similar to the provincial figure of 39.71%. The high percentage of households headed by women reflects the likelihood that the men have left the area in search of employment opportunities in Gauteng. Women headed households tend to be more vulnerable.

HOUSEHOLD INCOME

Based on the data from the 2011 Census, 12.6% of the population of the Msukaligwa Local Municipality had no formal income, 4.1% earned less than R 4 800, 7.1% earned between R 5 000 and R 10 000 per annum, 17.7% between R 10 000 and R 20 000 per annum and 20.9% between R 20 000 and 40 000 per annum (2016). The poverty gap indicator produced by the World Bank Development Research Group measures poverty using information from household per capita income/consumption. This indicator illustrates the average shortfall of the total population from the poverty line. This measurement is used to reflect the intensity of poverty, which is based on living on less than R3 200 per month for an average sized household (~ 40 000 per annum). Based on this measure, in the region of 62.4% of the households in the Msukaligwa Local Municipality and 65.2% in the GSDM live close to or below the poverty line.

The low-income levels reflect the rural nature of the local economy and the limited formal employment opportunities outside in the urban areas. This is also reflected in the high unemployment rates. The low-income levels are a major concern given that an increasing number of individuals and households are likely to be dependent on social grants. The low-income levels also result in reduced spending in the local economy and less tax and rates revenue for the Msukaligwa Local Municipality. This in turn impacts on the ability of the Msukaligwa Local Municipality to maintain and provide services.

Household income levels are likely to have been impacted by the COVID-19 pandemic. The number of households in the Msukaligwa Local Municipality and GSDM that live close to or below the poverty line is likely to have increased over the last 18 months. This, coupled with the high dependency ratio, is a major cause of concern for the area.

EMPLOYMENT

The official unemployment rate in the Msukaligwa Local Municipality in 2016 was 15.6%, while 42.6% were employed, and 36.4% were regarded as not economically active. However, the COVID-19 pandemic is likely to have resulted in an increase in unemployment rates in both the ULM and Ward 3. Recent figures released by Stats South Africa also indicate that South Africa’s unemployment rate is in the region of 36%, the highest formal unemployment rate in the world.

EDUCATION

In terms of education levels, the percentage of the population over 20 years of age in the Msukaligwa Local Municipality and GSDM with no schooling was 10.6% (2016), compared to 10.8% and 11.3% for the GSDM and Mpumalanga Cape Province. The percentage of the population over the age of 20 with matric was 34.12%, compared to 34.3% and 36.1% for the GSDM and Mpumalanga. The education levels for the Msukaligwa Local Municipality are therefore similar to the DM and Provincial figures.

MUNICIPAL SERVICES

ELECTRICITY

Based on 2016 survey, 87% of households in the Msukaligwa Local Municipality had access to electricity, compared to 90% for the GSDM and 93% for Mpumalanga.

ACCESS TO WATER

Based on the 2016 survey information, 81.7% of households in the Msukaligwa Local Municipality were supplied by a service provider, while 5.8% relied on their own service or natural sources (4%). The reliance on own services or natural sources reflects the rural nature of large parts the Msukaligwa Local Municipality.

SANITATION

72.3% of the households in the Msukaligwa Local Municipality had access to flush toilets (2016), while 18.8% relied on pit toilets and 3.2% had no access to formal sanitation. The high percentage of households that rely on pit toilets is linked to the relatively high percentage (9.4%) of households that live in shacks.

REFUSE COLLECTION

Only 59.4% of the households in the Msukaligwa Local Municipality had access to regular refuse removal service, while 16.5% disposed of their waste at their own dump and 7.1% had not access to facilities. The low percentage of households that have access to regular refuse removal services is linked to the relatively high percentage (9.4%) of households that live in shacks. The relatively higher percentage that dispose of their waste at their own dump reflects the rural nature of the area and the difficulty of providing municipal services to areas located at a distance from the main towns in the area.

HEALTH, EDUCATION AND COMMUNITY FACILITIES

HEALTH SERVICES

The Msukaligwa Local Municipality IDP indicates that there is 1 government and 1 private hospital in the Msukaligwa Local Municipality, 10 primary health care clinics, and 4 mobile clinics (**Table 7-11**).

Table 7-11: Health services in Msukaligwa Local Municipality

FACILITIES	NUMBER
Private Hospitals	1
Primary Health Care Clinics	10
Mobile Clinics	4
Government hospitals	1
Infectious Hospital (TB)	1
Dentists	4
Gynaecologist	1
Social Workers	12
Private Doctors	20

EDUCATIONAL FACILITIES

The Msukaligwa Local Municipality IDP indicates that there are 71 primary schools, 6 high schools, 12 combined schools and 11 secondary schools in the Msukaligwa Local Municipality . There is 1 FET College, but no tertiary facility (**Table 7-12**). The IDP notes that given the growth in the area there is a need for at least a tertiary institution within the GSDM. Development within Ermelo has also created a need for more primary and high schools.

Table 7-12: Educational Facilities in Msukaligwa Local Municipality

FACILITY	NUMBER
No. of Primary Schools	71
No. of High School	6
No. of Combined Schools	12
No. of Secondary Schools	11
No. of Tertiary Education Facilities	0
No. of FET Colleges	1
No. of Training Centres/Adult Education	9
No. of Private Schools	3
Day Care Centres	40

COMMUNITY FACILITIES

Table 7-13 lists the community facilities in the Msukaligwa Local Municipality. As indicated in the table, Ermelo as the administrative centre is relatively well catered for in terms of community facilities, including police stations, sports facilities, libraries, community halls and pension pay out points. However, Sheepmore, which is the closest rural settlement to the development area does not have a library and the sports facility is an informal soccer field.

Table 7-13: Community facilities

AREA / TOWN	POLICE STATION	PUBLIC SPORT FACILITIES	PUBLIC LIBRARIES	COMMUNITY HALLS	MPCC/TSC	POST OFFICE	PENSION PAY POINTS	COMMENTS
Breyton / KwaZanele	1	4	2	2	1	1	1	There is one informal soccer field at Breyton
Ermelo, Wesselton, Cassim Park and Thusiville	2	9	4	5	-	1	2	There are five informal soccer fields at Wesselton. The Thusiville library is completed but not yet operating
Chrissiesmeer / Kwachibikhulu	1	1	1	1	-	1	1	There is one informal soccer field as Chrissiesmeer
Davel / Kwadela	1	2	1	1	-	1	1	There is one informal soccer field at KwaDela. There is a complaint that the existing library at Davel is far from the majority of users who reside at KwaDela
Lothair / Silindile	1	1	1	1	1	1	1	The TSC is almost completed and postal services run by agency at Lothair
Sheepmoor	1	1	-	1	-	1	1	There is one informal soccer field at Sheepmoor. No library at Sheepmoor
Warburton / Nganga	-	1	-	-	-	1	-	Postal services run at agency at Warburton. The sport facility is an informal soccer field. No library at Warburton

ECONOMIC OVERVIEW

The economic growth rate for Msukaligwa Local Municipality was at 3.0% per annum on average over the period 1996 to 2017 and forecasted average annual GDP growth for 2017-2022 relatively low at 1.3%. The contribution of Msukaligwa Local Municipality to the Mpumalanga economy was around 4.3%, making it the fifth largest local economy in the province. It is the second largest economy in the District, contributing around 15.5%.21

The key economic sectors in the Msukaligwa Local Municipality in 2017 in terms of contribution to GDP were mining (20.3%), community services (18.5%), trade (including industries such as tourism) (18.2%) and finance (14.2%) (**Table 7-14**). Despite the importance of agriculture, it only contributed 6% to GDP in 2017. The IDP notes that the Msukaligwa Local Municipality has a comparative advantage in economic sectors such as agriculture, transport, and mining.

Table 7-14: Contribution of sectors to Msukaligwa Local Municipality GDP

ECONOMIC SECTOR	2014	2017	CHANGE
Agriculture	5,3%	6,0%	0,7%
Community Services	18,4%	18,5%	0,1%
Construction	2,7%	2,7%	0,0%
Finance	13,3%	14,2%	0,9%

ECONOMIC SECTOR	2014	2017	CHANGE
Manufacturing	5,1%	5,1%	0,0%
Mining	20,8%	20,3%	-0,5%
Trade	18,5%	18,2%	-0,3%
Transport	11,3%	11,3%	0,0%
Utilities	4,5%	3,8%	-0,7%

Finance and Agriculture achieved the highest, although slight, growth in contribution from 2014 to 2017. The contribution of utilities, mining and trade declined slightly. In terms of employment, the trade sector (20.6%) was the most important sector in terms of employment, followed by community services (15.3%), mining (12.8%), finance (11.6%) and manufacturing (10.1%) (**Table 7-15**).

Table 7-15: Contribution to employment of sectors in Msukaligwa Local Municipality

EMPLOYMENT SECTOR	2014	2017	CHANGE
Agriculture	6%	6,3%	0,3%
Community Services	14,5%	15,3%	0,8%
Construction	7,9%	8,5%	0,6%
Finance	11,2%	11,6%	0,4%
Manufacturing	9,9%	10,1%	0,2%
Mining	14,7%	12,8%	-1,9%
Trade	21,1%	20,6%	-0,5%
Transport	4,5%	4,7%	0,2%
Utilities	2,5%	2,4%	-0,1%

In terms of unemployment, the Msukaligwa Local Municipality unemployment rate was the 6th lowest among all the municipal areas of Mpumalanga. The unemployment rate deteriorated slightly from 23.1% in 2014 to 24.1% in 2017. Unemployment rates are higher for females at 29.8% and for males at 24.1%. However, youth unemployment at 34.5% is a key concern.

The IDP notes that in terms of future economic development, coal mining can be expected to remain an important sector for the short to medium term. However, the role of this sector is expected to decline in the medium to long term due to limited coal resources, and a move away from a coal-based economy locally and globally due the impact on climate. The current transport and logistics sector is also likely to be impacted on by a decline in coal mining.

7.4 HEALTH AND SAFETY

A high-level Safety Health and Environmental Risk Assessment was conducted by ISHECON for the proposed Solid-State Lithium (SSL) or Vanadium Redox Flow (VRF) BESS systems at the proposed Camden I WEF.

7.4.1 VANADIUM REDOX FLOW BATTERY HAZARDS

HAZARD – TOXICITY AND CORROSIVITY

The electrolyte in the VRF system is corrosive. It is composed of a sulphuric acid-based solution similar to common automotive lead acid batteries. Unlike traditional lead-acid batteries, VRBs do not include lead.

Therefore, VRBs do not have the toxicity issues of lead that conventional car batteries have. The only potential source of human toxicity in a VRB is Vanadium.

Vanadium in various physio-chemical states can have a relatively high aquatic and human toxicity. Acute oral exposure to high doses can lead to hemorrhaging, while chronic exposure leads to adverse effects on the digestive system, kidneys and blood (diarrhea, cramps etc.).

Inhalation hazards lead to irritation of the respiratory tract, bronchospasm, pulmonary congestion. There is little evidence that vanadium compounds are reproductive toxics or teratogens. There is also no evidence that it is carcinogenic (Source USA EPA Risk Assessment Information Systems, Toxicity Profiles, Vanadium 1998).

In the electrolyte the concentration levels of Vanadium are so low that when it is mixed into liquid form in the final product and put into operation, the VRB is deemed non-toxic. In addition, VRBs have a lower concentration of sulfuric acid than traditional lead-acid batteries. Vanadium poses a hazard when it is in powder form, i.e. when making up the electrolyte solution. The Camden facilities will purchase electrolyte already made up and there will be no solid vanadium powder on site.

Toxicity or corrosion risks may be present from off-gassing produced by over-heating aqueous or vaporized electrolytes. In addition, flow batteries in fire scenarios may generate toxic gas from the combustion of hydrocarbons, plastics, or acidic electrolytes. Refer to sections on fire below for mitigation measures.

HAZARD – ELECTRICAL SHOCK/ARC

Electrical shock presents a risk to workers and emergency responders, if the energy storage system cannot be "turned off". This is referred to as "stranded energy" and presents unique hazards. Arc flash or blast is possible for systems operating above 100 V. Li-ion systems operate from 48 - 1000 V, depending on the battery design.

In the area of shock hazard, a flow battery produces voltage only when electrolytes are in a cell stack. For most designs, if the motors are turned off and fluids drained from the cell stack, then the cell stacks have no measurable voltage at the terminals. This happens not only when the battery is forcible turned off but also in the standby mode as vanadium batteries do not include any metal plates to hold the chemical reactions / charges / voltages and can be fully drained when not in use.

If not fully drained, vanadium flow batteries are also unique in terms of short circuiting in that the internal dynamics of the battery are such that the energy discharge is limited to the fluid in the battery at any given time and the is typically less than 1% of the total stored energy. Therefore, together with the relatively low energy density of the vanadium electrolyte, the immediate release of energy, which occurs as a result of electrical shorting, is somewhat limited. The high heat capacity of the aqueous electrolyte is also beneficial in limiting the temperature rise.

Vanadium flow batteries have been tested under dead-short conditions resulting in normal operation with no danger to either equipment or personnel.

HAZARD – FIRE / DEFLAGRATION

Over 50% of the electrolyte solution is made up of water, which gives the electrolyte a non-flammable property. In the event of short circuiting, intense heat or high pressure, it is unlikely for the battery to catch fire. There is no "thermal runaway" risk when compared to other battery technologies.

Whilst some heat may be discharged from the battery, it will not be at a level that is deemed unsafe. Like all other RFBs, VRFs also have a battery management system. A battery management system ensures optimum and safe conditions for battery operation. Often a heat management system is integrated to avoid too high or too low temperatures.

HAZARD - HYDROGEN GENERATION

As with all other aqueous batteries, aqueous energy storage media from redox flow batteries are also subject to water limitations. In case of too high voltages or more precisely too high or too low half-cell potentials, the water is decomposed into its components, hydrogen and oxygen. The generation of hydrogen in particular is often present as a very small but undesirable side reaction and causes a charge carrier imbalance between positive and negative half-cells, which leads to a slow loss of capacity. It also presents a fire / explosion hazard.

With VRF, due to the flowability of the energy storage medium, the reaction products that would normally remain in the half-cell can be transported out of the cell and stored in separate tanks thus allowing the capability for a higher capacity than that attainable with conventional batteries. In addition, any deviations from safe operating parameter will trigger the shutdown of the system pumps ceasing to charge the electrolyte and thereby reducing the changes of accidental H2 generation. In addition, the thermal mass of the electrolyte tanks can provide an additional barrier to overcharging conditions by allowing ambient temperature during the discharge times to cool the VRF for the next charge cycle.

HAZARD – WASTE ELECTROLYTE

Unfortunately, pentavalent vanadium ions have a tendency to react with each other, which leads to the formation of larger molecules which precipitate as solids and can thus damage the system. The reaction depends on the temperature and the concentration of VO2+ (state of charge) but is also a function of the proton concentration. Temperature and concentrations therefore need to be controlled within specified ranges.

Should the concentration of undesirable components increase in the electrolyte, a part may need to be purged and replaced with fresh electrolyte.

HAZARD - ELECTROLYTE LEAKS

Leaks must be expected in any hazardous-fluid handling equipment. Secondary containment is typically designed into the system and standard corrosive PPE is required for handling liquid. Reliable leak detection, annunciation, and containment is paramount.

As with any chemicals plant a suitable design with detection, alarm and trip instrumentation that has been subject to thorough Hazop study should be in place, e.g. detection of dry running of pumps, detection of dead heading of pumps, prevention of reverse flow, detection of drop in tank levels etc.

7.4.2 SOLID STATE LITHIUM BATTERY CHEMICAL HAZARDS

HAZARD - THERMAL DECOMPOSITION

Upon heating of the contents of a battery due to shorting, contaminants, external heat or exposure to water and reaction heat, the lithium salts in batteries begin to break down exothermically to release either oxygen (oxidants) that enhances combustion, possibly leading to explosion, or fumes such as hydrogen fluoride or chlorine that are toxic.

These exothermic break down reactions are self-sustaining above a certain temperature (typically 70 deg C) and can lead to thermal run away. In this process the battery gets hotter and hotter, the decomposition reactions happen faster and faster and excessive hot fumes are generated in the battery. Eventually the pressure in the battery builds up to the point where those gases need to vented, usually via the weakest point in the system. These vented fumes can be flammable due to vaporization of the electrolyte and can ignite as a flash fire or fire ball (if large amounts) leading to the fire spreading to any surrounding combustible materials, e.g. plastic insulation on cables, the electrolyte, the electrodes and possibly even the plastic parts of the battery casing etc. If the vented flammable vapours do not ignite immediately, they can accumulate within the surrounding structures. If this flammable mixture is ignited later, e.g. due to a spark, this can lead to a violent explosion of the module, cabinet, room, container etc. In addition to being flammable the vented gases will contain toxic components. These could include:

- The products of combustion such as carbon dioxide/monoxide, hydrogen cyanide
- VOCs like benzene and ethylene,
- Decomposition products such as hydrogen fluoride, hydrogen chloride, phosphorous pentafluoride, phosphoryl fluoride and oxides of aluminium, cobalt, copper etc.

The temperature in the batteries and of these vented gases can be extremely high, e.g. > 600 deg C.

In the situation where oxygen is released internally as part of the decomposition (e.g. lithium perchlorate) the oxygen is available to react with the combustible electrolyte and if all this happens extremely fast in a self-sustaining manner within the confines of the device, an explosion of the device can result.

HAZARD - PROPAGATION

A BESS is composed of individual batteries which are combined into different size packs such as modules, racks. The very high temperature generated by one battery cell in thermal run away could lead to overheating of adjacent cells. This cell in turn then starts thermal decomposition and so the process propagates through the entire system. In order to prevent propagation, there are separation requirements between cells, modules etc. Separation could be with physical space or insulating materials etc.

HAZARD - ELECTROLYTE LEAKS

Although extremely unlikely due to the structure of the batteries, should electrolyte liquid leak out of the batteries, it can be potentially flammable as well as corrosive etc. If ignited as fire, or explosion, the smoke would contain toxic components. If unignited it can still be extremely harmful especially if its decomposition products include hydrofluoric acid.

7.4.3 OTHER CHEMICALS OR HAZARDS

The BESS is composed not only of the batteries. There are electrical connections, switches, power converters, cooling systems etc.

COOLING SYSTEMS

Due to the need to keep the batteries within a specified temperature range most of the containerized modular system have built-in air-conditioning systems while the VRF building systems may have cooling water systems. Some have only fans for air cooling with filters to remove dust prior to cooling. Others, particularly those in hot environments requiring more cooling, may have refrigerant-based systems. These would have a refrigerant circuit usually containing non-flammable non-toxic refrigerant such as R134a (simple asphyxiant) etc as well as a low hazard circulating medium such as an ethylene glycol-based coolant. At high temperatures above 250 deg C R134 may decompose and may generate hydrogen fluoride and other toxic gases. Ethylene glycol is really only harmful if swallowed. In the environment it breaks down quickly and at low concentrations that would typically occur from occasional small spills, it has no toxicity.

FIRE SUPPRESSION SYSTEMS

Although these are only effective for some fire scenarios, some of the solid-state containerized systems come fitted with “Clean agent” fire suppressant systems. These are pressurized containers of powder/gases that are released into the container to snuff a fire and do not leave a residue on the equipment.

Some containers have water sprinkler systems installed to quench thermal run-away reactions.

VRF batteries do not present a high fire risk. However, on any chemical plant there is always the risk of fires with electrical equipment and other materials used on site. Fire systems would typically consist of local strategically placed extinguishers as well as a fire water hose/hydrant system.

In general fire fighters may respond with water cannons/hydrants, foam systems etc. Such responses may generate large amount of contaminated and hazardous water runoff. A system to contain as much of this as possible should be in place.

GENERAL ELECTRICAL AND ELECTRONIC EQUIPMENT

Whatever the configuration of the battery containers/ buildings there will be electrical and electronic equipment in the battery compartment, the battery building as well as outside. In some installations the main electrical equipment such as the power conversion system is in a separate compartment separated by a fire wall. In others it can be in a separate container.

Wherever there is electrical equipment there is a possibility of shorting and overheating and fire.

8 IMPACT ASSESSMENT

The EIA phase of the S&EIR process has determined potential impacts associated with the proposed Camden I WEF. The anticipated environmental and social impacts have been identified and assessed by the various specialists according to the phases of the project's development. For the purpose of this project, these phases have been generically defined below.

Construction Phase:

The construction phase includes the preparatory works/activities typically associated with the creation of surface infrastructure, access and electrical power. The activities most relevant to this phase include:

— Topsoil stripping;
— Cut and fill activities associated with site preparation (if required); and
— Construction of the surface infrastructure including turbine foundations, turbines, invertors, site substation and internal powerlines.

Operational Phase:

The operational phase includes the daily activities associated with the wind energy facility.

Decommissioning Phase:

The decommissioning phase includes the activities associated with the removal/dismantling of machinery/equipment/infrastructure no longer necessary to the operation.

The impact assessment findings outlined in this section represent a summary of the detailed specialist findings/assessments contained in the relevant specialist reports (**Appendix H**)

The impacts below have been assessed according to environmental categories.

8.1 ACITIVITY MATRIX

The impacts below have been assessed according to environmental categories. **Table 8-1** provides an indication of how these environments are linked to the various NEMA listed activities outlined in **Section 2.1**.

Table 8-1: Activities Matrix (C – Construction; O – Operation; D – Decommissioning)

ACTIVITY DESCRIPTION	CLIMATE	AIR QUALITY	TOPOGRAPHY	GEOLOGY	SOIL AND AGRICULTURE POTENTIAL	SURFACE WATER	GROUNDWATER	REGIONAL VEGETATION	FAUNA	AVIFAUNA	SOCIAL	HERITAGE AND PALEONTOLOGY	VISUAL	TRAFFIC
GNR 983- Listing Notice 1														
Activity 11(i)	C, D	C, D	O	C, D	C, D	C, D	C, D	C, D	C, O, D	C, O, D	C, O, D	C, D	C, O, D	C
Activity 12(ii)(a)(c)	C, D	C	C, D	C, D	C, O, D	C, O, D	C, D	C, D	C, O, D	C, O, D	C, D	C, D	C, O, D	N/A
Activity 14	N/A	N/A	N/A	C	C, D	C, D	C, D	C, D	C, D	C, D	C, D	C, D	C, D	N/A
Activity 19	C, D	C, D	C, D	C, D	C, D	C, O, D	C, D	C, D	C, O, D	C, O, D	C, D	C, D	C, O, D	N/A
Activity 24(ii)	C, D	C, D	C, D	C	C, D	C, D	N/A	C, D	C, O, D	C, O, D	C, O, D	C, D	C, O, D	C, O, D
Activity 28(ii)	N/A	N/A	C, D	C, O, D	C, O, D	C, D	C, D	C, O, D	C, O, D	C, O, D	C, O, D	C, D	C, O, D	C, D
Activity 30	C, D	C, D	C, D	N/A	C, D	N/A	N/A	C, D	C, D	C, D	N/A	C, D	N/A	N/A
Activity 48(i)(a)(c)	C, D	C, D	C, D	C, D	C, D	C, D	N/A	C, D	C, O, D	C, O, D	C, O, D	C, D	C, O, D	C, O, D
Activity 56(ii)	C, D	C, D	C, D	C, D	C, D	C, D	N/A	C, D	C, O, D	C, O, D	C, O, D	C, D	C, O, D	C, O, D
GNR 984- Listing Notice 2														

ACTIVITY DESCRIPTION	CLIMATE	AIR QUALITY	TOPOGRAPHY	GEOLOGY	SOIL AND AGRICULTURE POTENTIAL	SURFACE WATER	GROUNDWATER	REGIONAL VEGETATION	FAUNA	AVIFAUNA	SOCIAL	HERITAGE AND PALEONTOLOGY	VISUAL	TRAFFIC
Activity 1	O	N/A	C, D	C, O, D	C, O, D	C, O, D	C, D	C, O, D	C, O, D	C, O, D	C, O, D	C, D	C, O, D	C, D
Activity 15	N/A	N/A	N/A	N/A	C	C	C	C,	C	C	N/A	C	C	N/A
GNR 985- Listing Notice 3														
Activity 4(f)(i)(aa)(bb)(cc)(ee)(gg)	N/A	N/A	C, D	C, D	C, D	C, D	N/A	C, D	C, O, D	C, O, D	C, O, D	C, D	C, O, D	C, O, D
Activity 12(f)(i)(ii)(iii)	C, D	C, D	N/A	N/A	C	C	C	C	C	C	N/A	C	C	N/A
Activity 14(ii)(a)(c)(f)(i)(aa)(bb)(dd)(ff)(hh)	N/A	N/A	C, D	C, D	C, O, D	C, D	C, D	C, D	C, D	C, D	C, D	C, D	C, O, D	C, D
Activity 15 (d)(ii)	C, D	C, D	N/A	N/A	C	C	C	C	C	C	C,O	C	C	N/A
Activity 18(f)(i)(aa)(bb)(cc)(ee)(gg)	N/A	N/A	C, D	C, D	C, D	C, D	C	C, D	C, O, D	C, D	C, O, D	C, D	C, O, D	C, O, D
Activity 23(ii)(a)(c)(f)(i)(aa)(bb)(cc)(ee)(gg)	N/A	N/A	C, D	C, D	C, D	C, D	C, D	C, D	C, D	C, D	C, D	C, D	C, O, D	C, D

8.2 AIR QUALITY

8.2.1 CONSTRUCTION PHASE

Emissions during construction are associated with land clearing, drilling, and blasting, ground excavation, cut and fill operations and the movement of heavy construction vehicles on temporary roads. Pollutants associated with construction activities are typically Total Suspended Particulates (TSP), PM10 and PM2.5 with lesser contributions of CO, NO_2, SO_2 and C_6H_6 from vehicle exhausts.

PM refers to solid or liquid particles suspended in the air. PM varies in size from particles that are only visible under an electron microscope to soot or smoke particles that are visible to the human eye. Particles can be classified by their aerodynamic properties into coarse particles, PM10 (particulate matter with an aerodynamic diameter of less than 10 µm) and fine particles, PM2.5 (particulate matter with an aerodynamic diameter of less than 2.5 µm). In addition to reduced visibility, particulate air pollution poses health risks associated with the respiratory system.

Heavy construction activity is a source of dust emissions that can have a significant but transient impact on local air quality. The amount of dust emitted from construction operations depends on the area of land being worked, the proportion of land lying exposed at any time, the clearing and dozing equipment used, the number and type of vehicles on temporary roads, and the duration of the construction phase. The majority proportion of dust emissions result from heavy vehicle traffic movement on temporary gravel roads at the construction site.

Although the increased dust and emissions from construction activities may not significantly impact air quality, increased dust can be a nuisance to the nearby receptors and site workers. Considering the temporary nature of construction and the nature of the proposed activities, impact on air quality is not anticipated to be high. Furthermore, none of the sensitive receptors are within 200m of an area of activity causing dust. With the implementation of appropriate control measures, the impact on neighbouring sensitive receptors will be reduced further but is still assessed to be low.

The impact of the construction phase on the generation of dust and particulate matter (PM) is shown in **Table 8-2**.

Table 8-2: Construction Impact on Generation of Dust and PM

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Generation of Dust and PM									
Without Mitigation	1	2	1	2	5	**35**	**Moderate**	(-)	High
With Mitigation	1	1	1	2	5	**25**	**Low**	(-)	
Mitigation and Management Measures	— Limit the duration of the construction phase to as short a timeframe as possible. — Where possible, minimise the area under construction. — Make use of wet suppression techniques to minimise dust entrainment along unpaved roads and during periods of high wind speeds. — Where possible, minimise speed limits, vehicle weights and the number of vehicles using unpaved roads. — Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and soil/material stockpiles especially. This includes wetting of exposed soft soil surfaces and not conducting activities during high wind periods which will increase the likelihood of dust being generated; — All stockpiles (if any) must be restricted to designated areas and may not exceed a height of two (2) metres;								

	— Ensure that all vehicles, machines and equipment are adequately maintained to minimise emissions; — It is recommended that the clearing of vegetation from the site should be selective, be kept to the minimum feasible area, and be undertaken just before construction so as to minimise erosion and dust potential; — All materials transported to, or from, site must be transported in such a manner that they do not fly or fall off the vehicle. This may necessitate covering or wetting friable materials. — No burning of waste, such as plastic bags, cement bags and litter is permitted; and — All issues/complaints must be recorded in the complaints register. — Once construction is complete, initiate rehabilitation (e.g. re-vegetation) procedures to reduce wind speed across exposed surfaces.

8.2.2 OPERATIONAL PHASE

Dust and emission generation applicable to the operational phase of Camden I WEF is expected to occur as a result of maintenance vehicles along the gravel. However, this is expected to be intermittent trips and the impacts minimal. Operational phase dust and emissions impacts are not considered further.

8.2.3 DECOMISSIONING PHASE

The impacts associated with the decommissioning phase will be the same as that of the construction phase.

8.3 NOISE AND VIBRATIONS

8.3.1 CONSTRUCTION PHASE

Unlike general industry, construction activities are not always stationary and in one location. Construction activities at the proposed site will include civil works (including surveying), reinforced concrete works, masonry works, façade works, floor works, general construction activities including mechanical, electrical, and plumbing installation works. Due to the erratic and transient nature of such construction activities as well as the fact that detailed construction phase plans have not yet been developed for the proposed Project, noise impacts from the construction phase of the facility could not be quantified.

During the construction phase of the facility various noise sources will be present onsite including earth-moving equipment (trucks, cranes, scrapers and loaders), compressors and generators, pumps, rotary drills, concrete mixers and materials handling activities among others. All of these sources will generate substantial amounts of noise and may impact on neighbouring sensitive receptors. As such, mitigation interventions are advised during the construction phase. The impact of the construction phase on noise and mitigation recommendations are indicated in **Table 8-3**.

Table 8-3: Construction Impact on Noise

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Noise									
Without Mitigation	3	2	1	1	3	**21**	**Low**	(-)	High
With Mitigation	2	2	1	1	2	**12**	**Very Low**	(-)	
Mitigation and Management Measures	— Planning construction activities in consultation with local communities so that activities with the greatest potential to								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
Noise								
	generate noise are planned during periods of the day that will result in least disturbance. Information regarding construction activities should be provided to identified and nearby receptors likely to be affected. Such information includes: — Proposed working times. — Anticipated duration of activities. — Explanations on activities to take place and reasons for activities. — Contact details of a responsible person on site should complaints arise. — When working near a potential sensitive receptor, limit the number of simultaneous activities to a minimum, as far as possible; — Using noise control devices, such as temporary noise barriers and deflectors for high impact activities, and exhaust muffling devices for combustion engines. — Selecting equipment with the lowest possible sound power levels whilst still being suitable for the specific task. — Ensuring equipment is well-maintained to avoid additional noise generation.							

8.3.2 OPERATIONAL PHASE

Principal sources of noise in wind energy facilities include mechanical noise generated from the turbine's mechanical components and aerodynamic noise produced by flow of air over the turbine blades. Mechanical noise is produced by the physical movement of components such as gearbox, generator, yaw drives, cooling fans and auxillary equipment. Over time, appropriate design and manufacturing have reduced the mechanical noise produced from wind turbines. As such, the aerodynamic noise from the blades has become the dominant source of noise for modern turbines. Aerodynamic noise is typically broadband in nature and is generated by the interaction between air flow and different parts of the turbine blades.

In addition to the noise from wind turbines, wind farms require a substation and transformers, which produce a characteristic "hum" or "crackle" noise. Utility companies have experience with building and siting such sources to minimise their impact. Substation-related noise is relatively easy to mitigate should this be required, based on the use of acoustic shielding and careful planning regarding placement away from sensitive receptors. As such, noise associated with this source is not considered in this assessment.

Results of the Acoustic Impact Assessment on the predicted noise levels from 37 turbines (with a hub height of 200 m and sound power level of 106.0 dB(A)) are presented **Table 8-4**. The preliminary model was run taking the surrounding terrain into account. Results indicate that predicted L_{A90} noise levels during both day and night are below the 35 dB(A) threshold, as stipulated in the IFC EHS guidance, at four of the twelve receptors. Noise levels at C1_Rec 01, C1_Rec 02, C1_Rec 05, C1_Rec 07, C1_Rec 08, C1_Rec 09, C1_Rec 10 and C1_Rec 12 are predicted to be above the threshold indicating that noise from the turbines could create a nuisance or impact at these locations.

However, being a low noise environment, with reference to the ETSU daytime limit range of 35 – 40 dB(A), L_{A90} noise levels at seven of the twelve receptor locations are below this threshold. Additionally, at night, L_{A90} levels at all receptor locations are below the ETSU 43 dB(A) threshold. It is, however, understood that all of the surrounding receptors (except for C1_Rec 06 and C1_Rec 11, which are both below the 35 dB(A) threshold anyway) have direct interest and are vested in the Project, thus a blanket threshold value of 45 dB(A) (day and night) applies. Predicted noise levels at all receptor locations are below this 45 dB(A) threshold, and complaints are not anticipated.

Table 8-4: Predicted noise levels at sensitive receptors

ID	DESCRIPTION	PREDICTED L_{AEQ} NOISE LEVEL	PREDICTED L_{A90} NOISE LEVEL	L_{A90} BELOW 35 DB(A)	L_{A90} BELOW 45 DB(A)*
C1_Rec 01	Farmhouse	38.7	36.7	No	Yes
C1_Rec 02	Farmhouse	37.4	35.4	No	Yes
C1_Rec 03	Farmhouse	33.6	31.6	Yes	Yes
C1_Rec 04	Farmhouse	31.8	29.8	Yes	Yes
C1_Rec 05	Farmhouse	37.8	35.8	No	Yes
C1_Rec 06	Farmhouse	34.5	32.5	Yes	N/A**
C1_Rec 07	Farmhouse	42.6	40.6	No	Yes
C1_Rec 08	Farmhouse	43.8	41.8	No	Yes
C1_Rec 09	Farmhouse	43.4	41.4	No	Yes
C1_Rec 10	Farmhouse	43.1	41.1	No	Yes
C1_Rec 11	Farmhouse	33.9	31.9	Yes	N/A**
C1_Rec 12	Farmhouse	43.3	41.3	No	Yes

Note: L_{A90} calculation based on guidance from the ETSU-R-97 report.

* L_{A90} below 45 dB(A) if potential receptors have financial investment in the facility.

** These receptors are outside of the project boundary and therefore do not have any financial incentives in the project.

Outcomes of the acoustic impact assessment are contained within **Table 8-5** outlining the impact of each parameter and the resulting risk level. It is noted that such an impact assessment is based on the ETSU limits for receptors with a financial interest in the Project, hence the assessment is slightly less stringent than the IFC methodology.

Table 8-5: Operational Phase Impacts of noise on sensitive receptors

Potential Impact:	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Operational phase impacts of noise on sensitive receptors									
Without Mitigation	2	1	1	4	3	**24**	**Low**	(-)	High
With Mitigation	2	1	1	4	2	**16**	**Low**	(-)	
Mitigation and Management Measures	N/A								

8.3.3 DECOMISSIONING PHASE

The impacts associated with the decommissioning phase will be the same as that of the construction phase.

8.4 GEOLOGICAL ENVIRONMENT

8.4.1 CONSTRUCTION PHASE

The levelling of areas to create building platforms will result in the displacement and exposure of subsoils. These impacts will have a negative visual impact on the environment, which in some cases can be remediated. The risk of soil erosion is also increased during construction activities, by the removal of vegetation and by possible disturbance to the natural drainage environment, subsequently leading to the prevention of infiltration of rainwater and increased surface run-off. Areas of concentrated surface flow can be anticipated at the energy facilities, resulting in gradual erosion of unconsolidated soil during the operational life of the facilities. This can result in the creation of preferential drainage features, unless remediated through proper engineering design (i.e., stormwater drainage).

Areas with steep slope inclinations are not favoured for the proposed developments due to the earthworks requirements and the potential need for advanced foundations. The topography of the site is relatively gentle and significant earthworks are not anticipated (although some minor earthworks are anticipated where local undulations occur). The soils and topography render the site moderately susceptible to soil erosion.

The Karoo Supergroup is known for its fossil bearing units, however no fossils or potential sites for fossils were identified during the Palaeontological survey of the proposed Camden I WEF. The removal of rock which contains fossils will result in the destruction of these fossils. The impact on fossils is assessed in Section 8.12.

The impacts of construction phase on the topography and geology are outlined in **Table 8-6**.

Table 8-6: Construction Impact on Topography and Geology

Potential Impact — **Displacement and exposure of subsoils, resulting in visual impact** — **Increased risk of soil erosion**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Ease of mitigation**
Without Mitigation	3	2	3	2	3	**30**	**Low**	(-)	High
With Mitigation	2	2	2	2	3	**24**	**Low**	(-)	High
Mitigation and Management Measures	— Implementation of erosion management measures in line with the Erosion Management Plan and Rehabilitation Plan included in the EMPr. — All cleared areas must be revegetated with indigenous vegetation. — Implement an effective stormwater runoff control system, including runoff control features to direct and dissipate water flow from roads and other hardened surfaces. — Progressive rehabilitation will be essential to reduce the potential for soil erosion and sedimentation.								

8.4.2 OPERATIONAL PHASE

Based on a preliminary assessment, the impact of the development from a geotechnical perspective will be restricted to the possible presence of undermined areas as well as the removal and displacement of soil, boulders and bedrock referred to in the Geotechnical Desk Study report (**Appendix H-13**) as "subsoils". The presence of undermined areas will have a negative effect on foundations, resulting in subsidence of the ground and potential collapse of both lightly and heavily loaded structures. As discussed in the Geotechnical Desk Study (**Appendix**

H-13), the likelihood of undermined areas within the proposed development area is low, as the site is predominantly underlain by dolerite. To confirm this assumption, the retrieval of mining plans must be arranged prior to the detailed geotechnical investigation and design. As this information is generally confidential, application by the relevant environmental assessment practitioner will be necessary.

The impact of the development from a preliminary geotechnical perspective are outlined in **Table 8-7.**

Table 8-7: Undermined areas impact on foundations

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Undermined areas impact on foundations									
Without Mitigation	4	2	5	4	2	**30**	**Low**	(-)	Low
With Mitigation	3	2	3	4	2	**24**	**Low**	(-)	
Mitigation and Management Measures	— Retrieval of mining plans must be arranged prior to the detailed geotechnical investigation and design. — Undertake a detailed geotechnical investigation prior to construction.								

8.5 SOILS, LAND CAPABILITY AND AGRICULTURAL POTENTIAL

8.5.1 ALL PHASES

The purpose of the agricultural component in the Environmental Authorisation 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.

When the agricultural impact of a development involves the permanent or long term non-agricultural use of potential agricultural land, as it does in this case, the focus and defining question of the agricultural impact assessment is to determine the importance, from an agricultural production point of view, of that land not being utilised for the development and kept solely for agriculture.

There is ultimately only ever a single agricultural impact of a development and that is a change to the future agricultural production potential of the land. This impact occurs by way of different mechanisms some of which lead to a decrease in production potential and some of which lead to an increase. It is the net sum of positive and negative effects that determines the overall agricultural impact.

Two direct mechanisms have been identified that lead to decreased agricultural potential by:

1. **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. This is relevant only in the construction phase. No further occupation of agricultural land occurs in subsequent phases. As has been discussed above, the small and widely distributed nature of the agricultural footprint of the facility means that only an insignificant proportion of the available agricultural land is impacted in this way.
2. **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, and through the disturbance of existing contour bank systems that control erosion. Soil erosion is completely preventable. The storm water management that will be an inherent part of the road engineering on site and standard, best practice erosion control measures recommended and included in the EMPr, are likely to be effective in preventing soil erosion. Loss of topsoil can result from poor topsoil management during construction related excavations.

Three indirect mechanisms have been identified that lead to increased agricultural potential through:

1 **increased financial security for farming operations -** Reliable income will be generated by the farming enterprises through the lease of the land to the energy facility. This is likely to increase their cash flow and financial security and could improve farming operations and productivity through increased investment into farming.
2 **improved security against stock theft and other crime** due to the presence of security infrastructure and security personnel at the energy facility.
3 **an improved road network**, with associated storm water handling system. The wind farm will construct turbine access roads of a higher standard than the existing farm roads which will give farming vehicles better access to farmlands. This will be especially relevant during wet periods when access to croplands for spraying etc is limited by the current farm roads.

The extent to which any of these mechanisms is likely to actually affect levels of agricultural production is small and the overall impact of a change in agricultural production potential is therefore small.

According to the Agricultural Impact Assessment (**Appendix H-1**), there is only one agricultural impact and it occurs for the duration of the project life time. To differentiate between the different phases of the project does not really make sense, but for compliance purposes the impact, as assessed below (**Table 8-8**), can be considered to be identical across the construction, operation and decommissioning phases of the project.

Table 8-8: Impact on Agricultural Production Potential

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Decrease in agricultural production potential									
Without Mitigation	1	1	1	4	2	**14**	**Very Low**	(-)	High
With Mitigation	1	1	1	4	2	**14**	**Very Low**	(-)	High
Mitigation and Management Measures	— No mitigation measures required.								

Mitigation measures to prevent soil degradation are all inherent in the project design and / or are standard, best-practice for construction sites.

— A system of storm water management, which will prevent erosion, will be an inherent part of the road engineering on site. As part of this system, the integrity of the existing contour bank systems of erosion control on croplands, where they occur on steeper slopes, must be kept in tact. 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.

— Any excavations during the construction phase, in areas that will be rehabilitated to agricultural land 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. 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. On areas that are only cleared, like construction lay down areas, it is much better to leave the topsoil in place.

8.6 AQUATIC IMPACT ASSESSMENT

Based on the findings of the Aquatic Impact Assessment (**Appendix H-5**), the overall layout of the proposed Camden I WEF (i.e., proposed WEF, BESS and associated substation options, the proposed construction laydown areas) has avoided the delineated aquatic systems inclusive of the calculated buffers and the recommended 100m buffer. The only exception being the required road crossings that have been specifically designed to use existing tracks and or roads (i.e. areas that are already impacted). The section below indicates the resultant impact assessment should these recommendations be approved, although **no preference** is given to the construction camps or substation alternatives as these have all the potential to avoid the aquatic environments encountered.

8.6.1 CONSTRUCTION PHASE

The potential loss of Very High Sensitivity systems, namely the wetlands through physical disturbance is anticipated during construction. The proposed layout has avoided these systems with the exception of with the exception of one of the buffer areas near the southern entrance. The construction impact along with mitigation measures are outlined in **Table 8-9.**

Table 8-9: Construction Impact on very high sensitivity systems

<table>
<tr><td>Potential Impact</td><td rowspan="2">Magnitude</td><td rowspan="2">Extent</td><td rowspan="2">Reversibility</td><td rowspan="2">Duration</td><td rowspan="2">Probability</td><td rowspan="2" colspan="2">Significance</td><td rowspan="2">Character</td><td rowspan="2">Ease of mitigation</td></tr>
<tr><td>Loss of Very High Sensitivity Systems</td></tr>
<tr><td>Without Mitigation</td><td>4</td><td>4</td><td>5</td><td>4</td><td>2</td><td>34</td><td>Moderate</td><td>(-)</td><td rowspan="2">Moderate</td></tr>
<tr><td>With Mitigation</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>16</td><td>Low</td><td>(-)</td></tr>
<tr><td>Mitigation and Management Measures</td><td colspan="9">— All alien plant re-growth must be monitored as per the Alien Plant Management Plan and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
— Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts.
— No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes. Suitable measures must be implemented to prevent such runoff, i.e. stormwater detention pond (or similar appropriate measure).
— Strict use and management of all hazardous materials used on site.
— Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas.
— Containment of all contaminated water by means of careful run-off management on site, as per the specifications provided in the stormwater management plan.
— Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. These must be situated outside of any delineated watercourses and pans/depressions or the buffers provided.
— Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Environmental Management Plan (EMPr) for the project and strictly enforced in the applicable phase/s.
— In the instances where facility roads are required on the present road / track crossings already installed by local landowners / public works entities, install properly sized culverts with erosion protection measures.</td></tr>
</table>

Table 8-10 outlines the assessed impact of the physical removal of riparian zones within watercourses, however this would be localised as the number of watercourses is of moderate sensitivity and located in areas with minimal vegetation (riparian) and/ or previously disturbed areas.

Table 8-10: Construction Impacts on riparian and/or riverine systems

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Damage or loss of riparian and or riverine systems									
Without Mitigation	4	4	5	4	2	34	Moderate	(-)	Moderate
With Mitigation	2	2	2	2	2	16	Low	(-)	
Mitigation and Management Measures	— Where these crossings are upgraded the following must be considered: — The final design should take cognisance of typical baseflows and should not create any impedance of flows. — Natural river levels upstream and downstream of the site should be maintained, thus allowing for continuity within the riverbed, i.e. not create any obstruction limiting any fauna from moving up or downstream. — Bed and bank erosion protection should be included in the designs to prevent bank instability and sedimentation. — Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts. — All alien plant re-growth must be monitored as per the Alien Plant Management Plan and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor. — It is further recommended that a comprehensive rehabilitation / monitoring plan be implemented from the project onset i.e. during the preconstruction phase, to ensure a net benefit to the environment within all areas that will remain undisturbed.									

During both construction and, to a limited degree, the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities, as well as maintenance activities, could be washed downslope via the watercourses, consequently impacting water quality. The assessed impact and recommended measures is outlined in **Table 8-11.**

Table 8-11: Construction Impact on water quality

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Potential Impact on water quality									
Without Mitigation	4	4	5	4	2	34	Moderate	(-)	Moderate
With Mitigation	2	2	2	2	2	16	Low	(-)	
Mitigation and Management Measures	— No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes. Suitable measures must be implemented to prevent such runoff, i.e. stormwater detention pond (or similar appropriate measure).								

Potential Impact Potential Impact on water quality	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation

	— Strict use and management of all hazardous materials used on site.
	— Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas.
	— Containment of all contaminated water by means of careful run-off management on site, as per the specifications provided in the stormwater management plan.
	— With regard the prevention of water quality changes to the aquatic environment the following must be monitored / implemented:
	  — Chemicals used for construction must be stored safely on site and surrounded by bunds.
	  — Chemical storage containers must be regularly inspected so that any leaks are detected early.
	  — Littering and contamination of water sources during construction must be prevented by effective construction camp management.
	  — Emergency plans must be in place in case of spillages onto road surfaces and water courses.
	  — No stockpiling should take place within the delineated extent of a water course.
	  — All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds.
	  — Stockpiles must be located away from river channels.
	  — The construction camp and necessary ablution facilities meant for construction workers must be beyond the proposed buffers.
	— Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. These must be situated outside of any delineated watercourses and pans/depressions or the buffers provided.									

The construction of the project will result in an increase in hard surface areas, and roads that require stormwater management will increase through the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the aquatic systems, which are currently ephemeral, i.e. aquatic vegetation species composition changes, which then results in habitat change / loss. The assessed impact and recommended measures is outlined in **Table 8-12.**

Table 8-12: Construction Impact on habitat change and fragmentation

Potential Impact Impact on habitat change and fragmentation related to hydrological regimes	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	4	4	5	4	2	**34**	**Moderate**	(-)	Moderate
With Mitigation	2	2	2	2	2	**16**	**Low**	(-)	

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Impact on habitat change and fragmentation related to hydrological regimes									
Mitigation and Management Measures	— Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts. — All alien plant re-growth must be monitored as per the Alien Plant Management Plan and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor. — It is further recommended that a comprehensive rehabilitation / monitoring plan be implemented from the project onset i.e. during the preconstruction phase, to ensure a net benefit to the environment within all areas that will remain undisturbed. — A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks.								

8.6.2 OPERATIONAL PHASE

The proposed Camden I WEF will result in an increase in hard surface areas, and or roads that require stormwater management increases runoff from a site through the concentration of surface water flows. These higher volume flows, with increased velocity can result in downstream erosion and sedimentation if not managed. The operation impact on increased run off is outlined in **Table 8-13**.

Table 8-13: Operational Impact on increased runoff

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Impact of increased run off leading to erosion and sedimentation									
Without Mitigation	2	4	5	4	2	**30**	**Low**	(-)	Moderate
With Mitigation	1	2	2	2	2	**14**	**Very Low**	(-)	
Mitigation and Management Measures	— A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks. The effectiveness of the								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
Impact of increased run off leading to erosion and sedimentation								
	stormwater / energy dissipation structures will then be inspected on an annual basis and maintained / improved as required during this the operational phase, especially where any erosion or sedimentation has become evident in the operational phase. — No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes, i.e. stormwater detention pond. — Install properly sized culverts with erosion protection measures at the present road / track crossings where already installed by local landowners / public works entities.							

8.6.3 DECOMISSIONING PHASE

The impacts associated with the decommissioning phase are expected to be the same as the construction phase.

8.7 BIODIVERSITY

8.7.1 CONSTRUCTION PHASE

The main biodiversity impacts associated with construction of the proposed Camden I WEF infrastructure include:

LOSS OF INDIGENOUS NATURAL VEGETATION DUE TO CLEARING

The regional vegetation type in the broad study area is Eastern Highveld Grassland, classified in the scientific literature as Endangered (Mucina *et al.*, 2008) and listed as Vulnerable in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). Any areas of natural habitat (specifically natural grassland, as described) within this regional vegetation type are therefore considered to have high conservation value.

Vegetation on site is within the Grassland Biome. Mesic grasslands in South Africa have a life-form composition that includes a high number of resprouting sub-terranean species that constitute more than 50% of the species richness at any single location and a higher proportion, if counted across a wider area. Secondary grassland that develops in previously cleared areas (for example, cultivated lands) usually develop a perennial grass cover, but the resprouting component of the flora almost never recovers. This means that any clearing of grassland vegetation, even if temporary, results in permanent loss of the local species composition. Clearing of natural grassland is therefore a permanent impact.

Habitat loss refers to physical disturbance of habitats through clearing, grading and other permanent to semi-permanent loss or degradation. Loss of habitat on site could lead to loss of biodiversity as well as habitat important for the survival of populations of various species. The impact assessment for loss of indigenous natural vegetation is included in **Table 8-14**.

Table 8-14: Construction Impact on indigenous natural vegetation

Potential Impact Loss of indigenous natural vegetation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	2	1	3	5	5	55	Moderate	(-)	Moderate
With Mitigation	1	1	3	5	5	55	Moderate	(-)	
Mitigation and Management Measures	— Restrict impact to development footprint only and limit disturbance in surrounding areas. — The disturbance of natural vegetation should be minimised and disturbances outside that of the facilities and road network must be rehabilitated with indigenous vegetation. — Prior to commencement of construction, compile a Rehabilitation Plan including monitoring specifications, to be included into the EMPr during final approval. — Prior to commencement of construction, compile an Alien Plant Management Plan, to be included into the EMPr during final approval.								

IMPACT ON INTEGRITY OF CRITICAL BIODIVERSITY AREAS

CBAs on site are scattered in patches. Only a small amount of proposed infrastructure is within CBAs (CBA1 or CBA2). There are 5 (of the 37 WTGs) that are within CBA1 or CBA2 areas. The total footprint area (5 WTGs and associated roads) of this infrastructure component (including an approximate 3m buffer around all proposed infrastructure) is small (estimated at 4.3 hectares within CBA1 areas and 4.5 hectares within CA2 areas). This is a fraction of the total area of CBA1 and CBA2 areas on site. The impact on CBAs is outlined in **Table 8-15**.

Table 8-15: Construction Impact on CBAs

Potential Impact Impact on integrity of Critical Biodiversity Areas	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	1	1	3	5	5	50	Moderate	(-)	Moderate
With Mitigation	1	1	3	5	5	50	Moderate	(-)	
Mitigation and Management Measures	— Restrict impact to development footprint only and limit disturbance in surrounding areas. — Prior to commencement of construction, compile a Rehabilitation Plan including monitoring specifications, to be included into the EMPr during final approval. — Prior to commencement of construction, compile an Alien Plant Management Plan, to be included into the EMPr during final approval.								

ESTABLISHMENT AND SPREAD OF DECLARED WEEDS AND ALIEN INVADER PLANTS DUE TO THE CLEARING AND DISTURBANCE OF INDIGENOUS VEGETATION

Major factors contributing to invasion by alien invader plants includes *inter alia* high disturbance (such as clearing for construction activities) and negative grazing practices. Exotic species are often more prominent near infrastructural disturbances than further away. Consequences of this may include:

— loss of indigenous vegetation;

— change in vegetation structure leading to change in various habitat characteristics;

— change in plant species composition;

- change in soil chemical properties;
- loss of sensitive habitats;
- loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
- fragmentation of sensitive habitats;
- change in flammability of vegetation, depending on alien species;
- hydrological impacts due to increased transpiration and runoff; and
- impairment of wetland function.

Low existing populations of alien plants were see on site, but areas of farm infrastructure were not investigated in detail during the field survey. There is a high possibility that alien plants could be introduced to areas within the footprint of the proposed activities from surrounding areas in the absence of control measures. The potential consequences may be of moderate seriousness for affected natural habitats. Control measures could prevent the impact from occurring. These control measures are relatively standard and well-known. Known alien invasive species recorded in the general geographical area that includes the site are as follows (in order of frequency observed):

- *Campuloclinium macrocephalum*
- *Acacia mearnsii*
- *Verbena bonariensis*
- *Solanum mauritianum*
- *Datura stramonium*
- *Cirsium vulgare*
- *Rumex acetosella*
- *Acacia dealbata*
- *Solanum sisymbriifolium*
- *Cortaderia selloana*
- *Arundo donax*
- *Sesbania punicea*
- *Ipomoea purpurea*
- *Melia azedarach*
- *Nicotiana glauca*
- *Eucalyptus camaldulensis*
- *Solanum elaeagnifolium*
- *Phytolacca octandra*
- *Robinia pseudoacacia*
- *Ailanthus altissima*
- *Xanthium spinosum*
- *Myriophyllum aquaticum*
- *Araujia sericifera*
- *Nasturtium officinale*
- *Verbena rigida*
- *Acacia melanoxylon*
- *Xanthium strumarium*
- *Azolla filiculoides*
- *Pinus taeda*
- *Alisma plantago-aquatica*
- *Rubus niveus*
- *Agave americana*
- *Acacia podalyriifolia*

- *Carduus nutans*
- *Ligustrum lucidum*
- *Ageratum houstonianum*
- *Spathodea campanulata*
- *Verbena brasiliensis*
- *Salvia tiliifolia*
- *Solanum pseudocapsicum*
- *Argemone ochroleuca*
- *Pinus patula*
- *Paspalum quadrifarium*
- *Austrocylindropuntia subulata*
- *Rumex usambarensis*

The impact assessment on the establishment and spread of alien plants is outlined in **Table 8-16**.

Table 8-16: Construction Impact on increased alien plant invasion

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Establishment and spread of declared weeds and alien invader plants									
Without Mitigation	2	2	3	1	3	**24**	**Low**	(-)	High
With Mitigation	2	1	3	1	2	**12**	**Very Low**	(-)	
Mitigation and Management Measures	— Prior to commencement of construction, compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control, including monitoring specifications. — Undertake regular monitoring within areas affected by construction activities to detect alien invasions early so that they can be controlled. — Implement control measures.								

8.7.2 OPERATIONAL PHASE

CONTINUED DISTURBANCE TO NATURAL HABITATS DUE TO GENERAL OPERATIONAL ACTIVITIES AND MAINTENANCE

During the operational phase of the project, there will be continuous activity on site, including normal operational activities, maintenance and monitoring. There may also be minor additional construction. Rehabilitation of various sites, such as the construction camps, will also take place. These activities all have the potential to cause additional direct and/or indirect damage to natural habitat and vegetation. This operational impact assessment is outlined in **Table 8-17**.

Table 8-17: Operational Impact on natural habitat and vegetation

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Continued disturbance to natural habitats due to general operational activities and maintenance									
Without Mitigation	2	2	3	5	3	**36**	**Moderate**	(-)	Moderate
With Mitigation	1	1	3	5	2	**20**	**Low**	(-)	

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Continued disturbance to natural habitats due to general operational activities and maintenance									
Mitigation and Management Measures	— Restrict impact to development footprint only and limit disturbance in surrounding areas. — Prior to commencement of construction, compile a Rehabilitation Plan including monitoring specifications, to be included into the EMPr during final approval. — Prior to commencement of construction, compile an Alien Plant Management Plan, to be included into the EMPr during final approval.								

CONTINUED ESTABLISHMENT AND SPREAD OF ALIEN INVASIVE PLANT SPECIES DUE TO THE PRESENCE OF MIGRATION CORRIDORS AND DISTURBANCE VECTORS

The presence of disturbed surfaces on site creates ecological edges and corridors along which alien species can travel and become established. This operational impact assessment is outlined in **Table 8-18**.

Table 8-18: Operational Impact on increased alien plant invasion

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Establishment and spread of declared weeds and alien invader plants									
Without Mitigation	3	2	3	4	3	36	Moderate	(-)	Moderate
With Mitigation	1	1	3	2	2	14	Very Low	(-)	
Mitigation and Management Measures	— Prior to commencement of construction, compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. — Undertake regular monitoring within areas affected by operation activities to detect alien invasions early so that they can be controlled. — Implement control measures								

RUNOFF AND EROSION DUE TO THE PRESENCE OF HARD SURFACES THAT CHANGE THE INFILTRATION AND RUNOFF PROPERTIES OF THE LANDSCAPE (SUBSTATION ONLY)

Increased erosion (water and wind) and water run-off will be caused by the clearing of indigenous vegetation, creation of new hard surfaces and compaction of soil. The substation will be the main source of disturbance and erosion if not properly constructed and provided with water run-off structures. The substation site will be levelled and compacted causing run-off that may lead to erosion. Increased run-off and erosion could affect hydrological processes in the area and will change water and silt discharge into drainage lines and streams. The operational impact on continued runoff and erosion is outlined in **Table 8-19**.

Table 8-19: Operational Impact on continued run-off and erosion

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Continued runoff and erosion									
Without Mitigation	3	1	3	5	3	**36**	**Moderate**	(-)	Moderate
With Mitigation	2	1	3	5	2	**22**	**Low**	(-)	
Mitigation and Management Measures	— Prior to commencement of construction, compile and implement a stormwater management plan including monitoring specifications. — Monitor surfaces for erosion, repair and/or upgrade, where necessary.								

8.7.3 DECOMMISSIONING PHASE

It is expected that the project will operate for a minimum of twenty to twenty-five years (a typical planned life-span for a project of this nature). Decommissioning will probably require a series of steps resulting in the removal of equipment from the site and rehabilitation of footprint areas. It is possible that the site could be returned to a rural nature, but it is unlikely that natural vegetation would become established at disturbed locations on site for a very long time thereafter. The reality is that it is not possible to determine at this stage whether rehabilitation measures will be implemented or not or what the future plans for the site would be nor is it possible at this stage to determine what surrounding land pressures would be. These uncertainties make it difficult to undertake any assessment to determine possible impacts of decommissioning. It is recommended that a closure and rehabilitation plan be compiled near to the decommissioning stage but in advance of when decommissioning is planned, and that this would be required to be implemented prior to closure of the project. The closure and rehabilitation plan must be in compliance with the regulatory requirements at the time of decommissioning. Possible impacts are described below.

LOSS AND DISTURBANCE OF NATURAL VEGETATION DUE TO THE REMOVAL OF INFRASTRUCTURE AND NEED FOR WORKING SITES

During the decommissioning phase of the project, there will be a flurry of activity on site over a period of time, similar to during the construction phase, including dismantling and removal of equipment and rehabilitation. There may also be minor additional construction. Rehabilitation of various sites will also take place. These activities all have the potential to cause additional direct and/or indirect damage to natural habitat and vegetation. The anticipated decommissioning phase impact on natural vegetation is outlined in **Table 8-20**.

Table 8-20: Decommissioning Impact on natural vegetation

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites									
Without Mitigation	1	1	3	5	2	**20**	**Low**	(-)	Moderate
With Mitigation	1	1	3	5	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— Prior to decommissioning commencing, compile a Rehabilitation Plan in compliance with the regulatory requirements at the time of decommissioning.								

CONTINUED ESTABLISHMENT AND SPREAD OF ALIEN INVASIVE PLANT SPECIES DUE TO THE PRESENCE OF MIGRATION CORRIDORS AND DISTURBANCE VECTORS

The presence of disturbed surfaces on site creates ecological edges and corridors along which alien species can travel and become established. The anticipated decommissioning phase impact on increased alien plant invasion is outlined in **Table 8-21**.

Table 8-21: Decommissioning Impact on increased alien plant invasion

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Establishment and spread of declared weeds and alien invader plants									
Without Mitigation	2	2	3	4	4	44	Moderate	(-)	High
With Mitigation	1	1	3	4	3	27	Low	(-)	
Mitigation and Management Measures	— Rehabilitate disturbed areas in accordance with the specifications of a Rehabilitation Plan.								

8.8 ANIMAL SPECIES

8.8.1 CONSTRUCTION PHASE

Construction activities will require clearing of natural habitat, to be replaced by the infrastructure. This will result in permanent local loss of habitat. The construction impact is outlined in in **Table 8-22.**

Table 8-22: Construction impact on faunal habitat

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Loss of faunal habitat									
Without Mitigation	2	1	3	5	4	44	Moderate	(-)	Moderate
With Mitigation	2	1	3	5	3	30	Low	(-)	
Mitigation and Management Measures	— No driving of vehicles off-road outside of construction areas. — Apply mitigation measures recommended in the Terrestrial Biodiversity Assessment to minimize loss of natural vegetation.								

Construction activities will require use of heavy machinery and vehicles, as well as placement of various obstructions that may be hazardous and can directly impact on the faunal communities in the area. The construction impact is outlined in in **Table 8-23.**

Table 8-23: Construction impact on faunal mortality

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Direct mortality of fauna									
Without Mitigation	2	1	1	2	3	18	Low	(-)	Moderate
With Mitigation	1	1	1	2	3	10	Very low	(-)	
Mitigation and Management Measures	— It is a legal requirement to obtain permits for specimens or protected species that will be lost due to construction of the project. — Conduct a pre-construction walk-through of natural habitat within the development fooprint, undertaken where possible (considering all								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Direct mortality of fauna									
	administrative and legal processes and requirements) in the correct season (October to March), prior to construction activities commencing in order to move any individual animals, such as tortoises, where required. — Personnel on site should undergo environmental induction training, including the need to abide by speed limits, to minimise risk of collisions with wild animals on roads in rural areas. — Proper waste management must be implemented, ensuring no toxic or dangerous substances are accessible to wildlife. This should also apply to stockpiles of new and used materials to ensure that they do not become a hazard. — No collecting, hunting or poaching of any animal species. — Personnel to be educated about protection status of species, including distinguishing features, to be able to identify protected species. — Appropriate lighting should be installed to minimize impacts on nocturnal animals, as per visual specialist assessment.								

8.8.2 OPERATIONAL PHASE

Direct mortality of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure. The operational impact is outlined in in **Table 8-24.**

Table 8-24: Operational impact on faunal mortality

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Direct mortality of fauna									
Without Mitigation	2	1	1	4	3	**24**	**Low**	(-)	Moderate
With Mitigation	1	1	1	4	2	**14**	**Very low**	(-)	
Mitigation and Management Measures	— It is a legal requirement to obtain permits for specimens or protected species that will be lost due to construction of the project. — Conduct a pre-construction walk-through of natural habitat within the development fooprint, undertaken where possible (considering all administrative and legal processes and requirements) in the correct season (October to March), prior to construction activities commencing in order to move any individual animals, such as tortoises, where required. — Personnel on site should undergo environmental induction training, including the need to abide by speed limits, the increased risk of collisions with wild animals on roads in rural areas. — Proper waste management must be implemented as per the conditions stipulated in the EMPr, ensuring no toxic or dangerous substances are accessible to wildlife. This should also apply to stockpiles of new and used materials to ensure that they do not become a hazard. — No collecting, hunting or poaching of any plant or animal species. — During operation, personnel to be educated about protection status of species, including distinguishing features, to be able to identify protected species. — Appropriate lighting should be installed to minimize impacts on nocturnal animals, as per visual specialist assessment.								

8.8.3 DECOMISSIONING PHASE

The decommissioning impacts are identical in nature and rating to that of the construction phase impacts.

8.9 PLANT SPECIES

8.9.1 CONSTRUCTION PHASE

During the construction phase, the loss of individuals of Species of Conservation Concern due to clearing will be highly likely. The construction impact is outlined in **Table 8-25.**

Table 8-25: Construction impact on plant habitat

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Loss of individuals of Species of Conservation Concern									
Without Mitigation	2	2	5	5	3	**42**	**Moderate**	(-)	Moderate
With Mitigation	2	2	5	5	1	**14**	**Very low**	(-)	
Mitigation and Management Measures	— Where significant populations of SCC are found, collect the data for any flora permits or micro-siting of infrastructure that may be required. — In the event where Conservation important plant species must be rescued from the development footprint it should be replanted at a suitable site on the same farms. A plant specialist should be appointed and a register kept. The necessary permits must be obtained from MTPA. — Prior to construction commencing, compile a Plant Rescue Plan, including monitoring specifications (timeframe, frequency etc). — Undertake monitoring (as per the Plant Rescue Plan specifications) to evaluate whether further measures would be required to manage impacts. — It is a legal requirement to obtain permits for specimens or protected species that will be lost due to construction of the project. — A detailed pre-construction walk-through survey will be required during a favourable season where possible, to locate any individuals of protected plants, as well as for any populations of threatened plant species. This survey must cover the footprint of all approved infrastructure, including internal service roads and footprints of tower structures (final infrastructure layout). The best season is early to late Summer if possible, taking administrative processes into account, but will be influenced by recent rainfall and vegetation growth. — It is possible that some plants lost to the development can be rescued and planted in appropriate places in rehabilitation areas, but the description and appropriateness of such measures must be included in a Plant Rescue Plan. Any such measures will reduce the irreplaceable loss of resources as well as the cumulative effect. Note that Search and Rescue is only appropriate for some species and that a high mortality rate can be expected from individuals of species that are not appropriate to transplant. — Prior to construction commencing, a Plant Rescue Plan must be compiled to be approved by the appropriate authorities as part of the EMPr approval.									

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
Loss of individuals of Species of Conservation Concern								
	— For any plants that are transplanted, annual monitoring should take place to assess survival. This should be undertaken as per the frequency specified in the management plan and be undertaken by a qualified botanist. The monitoring programme must be designed prior to translocation of plants and should include control sites (areas not disturbed by the project) to evaluate mortality relative to wild populations. — No collecting or poaching of any plant species must be allowed. — The location of all transplanted rescued plants must be recorded, along with the identity of the plant. — The health / vigour of each transplanted individual should be monitored as per the frequency and duration specified in the management plan. — As a scientific control, an equal number of non-transplanted individuals of the same species, within similar habitats, should be monitored in the same way as the transplanted specimens. This will provide comparative data on the survival of wild populations relative to transplanted plants. — If populations of threatened plant species are found to occur on site, annual monitoring of population health should take place. This should be appropriate to the species concerned.								

8.9.2 OPERATIONAL PHASE

There are no operational impacts associated with the proposed development.

8.9.3 DECOMMISSIONING PHASE

The decommissioning impacts are expected to be the same as the construction phase.

8.10 AVIFAUNA

The effects of a wind farm on birds are highly variable and depend on a wide range of factors, including the specification of the development, the topography of the surrounding land, the habitats affected and the number and species of birds present. With so many variables involved, the impacts of each wind farm must be assessed individually. The principal areas of concern with regard to effects on birds are listed below. Each of these potential effects can interact with each other, either increasing the overall impact on birds or, in some cases, reducing a particular impact (for example where habitat loss or displacement causes a reduction in birds using an area which might then reduce the risk of collision):

— Mortality of priority avifauna due to collisions with the wind turbines
— Displacement of priority avifauna due to disturbance during construction and operation of the wind farm
— Displacement of priority avifauna due to habitat change and loss at the wind farm
— Mortality of priority avifauna due to electrocution on the medium voltage overhead lines
— Mortality of priority avifauna due to collisions with the medium voltage overhead lines

It should be noted that the assessment is made on the status quo as it is currently on site. The possible change in land use in the broader development site is not taken into account because the extent and nature of future developments (not only wind energy development) are unknown at this stage. It is possible that there could be changes in the foreseeable future in the form of mining.

8.10.1 CONSTRUCTION PHASE

WIND ENERGY FACILITY

DISPLACEMENT DUE TO DISTURBANCE

The displacement of birds from areas within and surrounding wind farms due to visual intrusion and disturbance in effect can amount to habitat loss. Displacement may occur during both the construction and operation phases of wind farms and may be caused by the presence of the turbines themselves through visual, noise and vibration impacts, or as a result of vehicle and personnel movements related to site maintenance. The scale and degree of disturbance will vary according to site- and species-specific factors and must be assessed on a site-by-site basis (Drewitt & Langston 2006).

Unfortunately, few studies of displacement due to disturbance are conclusive, often because of the lack of before- and-after and control-impact (BACI) assessments. Indications are that Great Bustard *Otis tarda* could be displaced by wind farms up to one kilometre from the facility (Langgemach 2008). An Austrian study found displacement for Great Bustards up to 600m (Wurm & Kollar as quoted by Raab *et al.* 2009). However, there is also evidence to the contrary; information on Great Bustard received from Spain points to the possibility of continued use of leks at operational wind farms (Camiña 2012b). The same situation seems to prevail at wind farms in the Eastern Cape where Denham’s Bustard are still using wind farm sites as leks.[13] Research on small grassland species in North America indicates that permanent displacement is uncommon and very species specific (e.g. see Stevens et.al 2013, Hale et.al 2014). There also seems to be little evidence for a persistent decline in passerine populations at wind farm sites in the UNITED KINGDOM (despite some evidence of turbine avoidance), with some species, including Skylark, showing increased populations after wind farm construction (see Pierce-Higgins et. al 2012). Populations of Thekla Lark *Galerida theklae* were found to be unaffected by wind farm developments in Southern Spain (see Farfan *et al.* 2009).

The consequences of displacement for breeding productivity and survival are crucial to whether or not there is likely to be a significant impact on population size. However, studies of the impact of wind farms on breeding birds are also largely inconclusive or suggest lower disturbance distances, though this apparent lack of effect may be due to the high site fidelity and long life-span of the breeding species studied. This might mean that the true impacts of disturbance on breeding birds will only be evident in the longer term, when new recruits replace existing breeding birds. Few studies have considered the possibility of displacement for short-lived passerines (such as larks), although Leddy *et al.* (1999) found increased densities of breeding grassland passerines with increased distance from wind turbines, and higher densities in the reference area than within 80m of the turbines. A review of minimum avoidance distances of 11 breeding passerines were found to be generally <100m from a wind turbine ranging from 14 – 93m (Hötker *et al.* 2006). A comparative study of nine wind farms in Scotland (Pearce-Higgens *et al.* 2009) found unequivocal evidence of displacement: Seven of the 12 species studied exhibited significantly lower frequencies of occurrence close to the turbines, after accounting for habitat variation, with equivocal evidence of turbine avoidance in a further two. No species were more likely to occur close to the turbines. Levels of turbine avoidance suggest breeding bird densities may be reduced within a 500m buffer of the turbines by 15– 53%, with Common Buzzard *Buteo buteo*, Hen Harrier *Circus cyaneus*, Golden Plover *Pluvialis apricaria*, Snipe *Gallinago gallinago*, Curlew *Numenius arquata* and Wheatear *Oenanthe oenanthe* most affected. In a follow-up study, monitoring data from wind farms located on unenclosed upland habitats in the United Kingdom were collated to test whether breeding densities of upland birds were reduced as a result of wind farm construction or during wind farm operation. Red Grouse *Lagopus lagopus scoticus*, Snipe *Gallinago gallinago* and Curlew *Numenius arquata* breeding densities all declined on wind farms during construction. Red Grouse breeding densities recovered after construction, but Snipe and Curlew densities did not. Post-construction Curlew breeding densities on wind farms were also significantly lower than reference sites. Conversely, breeding densities of Skylark *Alauda arvensis* and Stonechat *Saxicola torquata* increased on wind farms during construction. Overall, there was little evidence for consistent post-construction

[13] Personal communication by Wessel Rossouw, bird monitor based in Jeffreys Bay, from personal observations in the Kouga municipal area.

population declines in any species, suggesting that wind farm construction can have greater impacts upon birds than wind farm operation (Pierce-Higgens *et al.* 2012).

It is inevitable that a measure of displacement will take place for all priority species during the construction phase, due to the disturbance factor associated with the construction activities. This is likely to affect ground nesting species in the remaining high quality grassland, wetlands and wetland fringes the most, as this could temporarily disrupt their reproductive cycle. Some species might be able to recolonise the area after the completion of the construction phase, but for some species, this might only be partially the case, resulting in lower densities than before once the WEF is operational, due to the disturbance factor of the operational turbines, and the habitat fragmentation. In summary, the following species could be impacted by disturbance during the construction phase: Blue Crane, Black-bellied Bustard, White-bellied Bustard, Denham's Bustard, Grey Crowned Crane, Spotted Eagle-Owl, Grey-winged Francolin, Northern Black Korhaan, Blue Korhaan, Marsh Owl and African Grass Owl.

The impact assessed due to disturbance associated the construction of the WEF is outlined in **Table 8-26**.

Table 8-26: Construction Impact on disturbance of priority species

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of Mitigation
Displacement of priority species due to disturbance associated with the construction of the wind turbines and associated infrastructure.									
Without Mitigation	4	2	4	2	5	**60**	**Moderate**	(-)	Moderate
With Mitigation	3	2	3	2	4	**40**	**Moderate**	(-)	
Mitigation and Management Measures	— Conduct a pre-construction inspection to identify SCC that may be breeding within the project footprint to ensure that the impacts on breeding species (if any) are adequately managed. — Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible. — Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum — Measures to control noise and dust should be applied according to current best practice in the industry. — A 100m **all infrastructure exclusion zone** must be implemented around drainage lines and associated wetlands (except essential road, pipeline and gridline crossings). Wetlands are important breeding, roosting and foraging habitat for a variety of SCC, most notably for African Grass Owl (SA status Vulnerable), Grey Crowned Crane (SA status Endangered) and African Marsh Harrier (SA status Endangered). Where unavoidable, road and grid line crossings across these features should be restricted to the immediate footprint of the infrastructure only.									

DISPLACEMENT DUE TO HABITAT LOSS

The scale of permanent habitat loss resulting from the construction of a wind farm and associated infrastructure depends on the size of the project but, in general, it is likely to be small per turbine base. Typically, actual habitat loss amounts to 2–5% of the total development site (Fox *et al.* 2006 as cited by Drewitt & Langston 2006), though effects could be more widespread where developments interfere with hydrological patterns or flows on wetland or peatland sites (unpublished data). Some changes could also be beneficial. For example, habitat changes following the development of the Altamont Pass wind farm in California led to increased mammal prey availability for some species of raptor (for example through greater availability of burrows for Pocket Gophers *Thomomys bottae* around turbine bases), though this may also have increased collision risk (Thelander *et al.* 2003 as cited by Drewitt & Langston 2006).

However, the results of habitat transformation may be more subtle, whereas the actual footprint of the wind farm may be small in absolute terms, the effects of the habitat fragmentation brought about by the associated infrastructure (e.g. power lines and roads) may be more significant. Sometimes Great Bustard can be seen close to or under power lines, but a study done in Spain (Lane *et al.* 2001 as cited by Raab *et al.* 2009) indicates that the total observation of Great Bustard flocks was significantly higher further from power lines than at control points. Shaw (2013) found that Ludwig's Bustard generally avoid the immediate proximity of roads within a 500m buffer. Bidwell (2004) found that Blue Cranes select nesting sites away from roads. This means that power lines and roads also cause loss and fragmentation of the habitat used by the population in addition to the potential direct mortality. The physical encroachment increases the disturbance and barrier effects that contribute to the overall habitat fragmentation effect of the infrastructure (Raab *et al.* 2010). It has been shown that fragmentation of natural grassland in Mpumalanga (in that case by afforestation) has had a detrimental impact on the densities and diversity of grassland species (Allan *et al.* 1997).

The network of roads is likely to result in significant habitat fragmentation. This, together with the disturbance factor of the operating turbines, could have an effect on the density of several species, particularly larger terrestrial species which would utilise the remaining high quality grassland, wetlands and wetland fringes as breeding habitat. Given the conceptual turbine layout and associated road infra-structure, it is not expected that any priority species will be permanently displaced from the development site, but densities may be reduced. In summary, the following species are likely to be affected by habitat transformation: Blue Crane, Black-bellied Bustard, White-bellied Bustard, Denham's Bustard, Grey Crowned Crane, Grey-winged Francolin, Northern Black Korhaan, Blue Korhaan, Marsh Owl, African Grass Owl, Black-winged Lapwing and Secretarybird.

The impact assessed due to disturbance associated the construction of the WEF is outlined in Table 8-27.

Table 8-27: Construction Impact on habitat transformation

Potential Impact	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Ease of Mitigation**
Displacement of priority species due to habitat transformation associated with the construction of the wind turbines and associated infrastructure.									
Without Mitigation	3	2	4	4	4	**52**	**Moderate**	(-)	Moderate
With Mitigation	3	2	3	4	3	**36**	**Moderate**	(-)	
Mitigation and Management Measures	— Conduct a pre-construction inspection to identify SCC that may be breeding within the project footprint to ensure that the impacts on breeding species (if any) are adequately managed. — Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible. — Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum — Development in the remaining high sensitivity grassland must be limited as far as possible (limited infrastructure zone). Where possible, infrastructure must be located near margins, with shortest routes taken from the existing roads. The grassland is vital breeding, roosting and foraging habitat for a variety of SCC. These include Blue Crane (SA status near-threatened), Blue Korhaan (Global status near -								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of Mitigation
Displacement of priority species due to habitat transformation associated with the construction of the wind turbines and associated infrastructure.								
	threatened), White-bellied Bustard (SA Status Vulnerable), Denham's Bustard (SA Status Vulnerable).							

BATTERY ENERGY STORAGE FACILITY

The impact that is associated with the construction of the BESS is the potential displacement of priority avifauna due to disturbance associated with the construction of the facility and habitat transformation in the footprint of the facility.

DISPLACEMENT DUE TO HABITAT DESTRUCTION AND DISTURBANCE

During the construction of the BESS, habitat destruction/transformation will inevitably take place. The construction activities will constitute the following:

— Site clearance and preparation.
— Construction of the infrastructure related to the BESS.
— Transportation of personnel, construction material and equipment to the site, and personnel away from the site.
— Removal of vegetation for the proposed infrastructure line, stockpiling of topsoil and cleared vegetation.
— Excavations for infrastructure.

These activities will impact on birds breeding, foraging and roosting in or in close proximity of the proposed facility through transformation of habitat, which could result in temporary or permanent displacement. Unfortunately, very little mitigation can be applied to reduce the significance of this impact as the total permanent transformation of the natural habitat within the construction footprint of the facility is unavoidable. The loss of habitat for priority species due to direct habitat transformation associated with the construction of the 5 ha proposed facility is likely to be relatively insignificant due to the relatively small size of the footprint (only 0.07% of the total project area, and 2.5% of the buildable area).
Apart from direct habitat destruction, the above-mentioned activities also impact on birds through **disturbance**; this could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. Construction activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. A potential mitigation measure is the timeous identification of nests and the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle, although in practice that can admittedly be challenging to implement.

The priority species which are potentially most vulnerable to the impact of displacement due to disturbance and habitat transformation linked to the BESS are terrestrial species and owls. Priority species that could be affected are the following: African Grass Owl, Black-bellied Bustard, Black-winged Lapwing, Blue Crane, Blue Korhaan, Buff-streaked Chat, Denham's Bustard, Grey Crowned Crane, Grey-winged Francolin, Marsh Owl, Northern Black Korhaan, Secretarybird and White-bellied Bustard.

The impact assessed due to disturbance associated the construction of the BESS is outlined in **Table 8-28**.

Table 8-28: Construction Impact on disturbance of priority species associated with the BESS

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of Mitigation
Displacement of priority species due to disturbance associated with the construction of the BESS									
Without Mitigation	2	1	1	2	3	**18**	**Low**	(-)	Moderate
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)	
Mitigation and Management Measures	— Conduct a pre-construction inspection to identify SCC that may be breeding within the project footprint to ensure that the impacts on breeding species (if any) are adequately managed. — Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible. — Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum — Measures to control noise and dust should be applied according to current best practice in the industry.								

The impact due to habitat transformation during the construction of the BESS is outlined in **Table 8-29.**

Table 8-29: Construction Impact on priority species due to habitat destruction/transformation associated with the BESS

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of Mitigation
Displacement of priority species due to habitat transformation associated with the construction of the BESS									
Without Mitigation	2	1	5	4	2	**24**	**Low**	(-)	Moderate
With Mitigation	2	1	5	4	2	**24**	**Low**	(-)	
Mitigation and Management Measures	— Conduct a pre-construction inspection to identify SCC that may be breeding within the project footprint to ensure that the impacts on breeding species (if any) are adequately managed. — Construction activity should be restricted to the immediate footprint of the infrastructure as far as possible. — Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.								

8.10.2 OPERATIONAL PHASE

COLLISION MORTALITY ON WIND TURBINES

The proposed Camden I Wind Energy Facility will pose a collision risk to several priority species which could occur regularly at the site. Species exposed to this risk are large terrestrial species and occasional long distance fliers i.e., bustards, cranes, flamingos, storks, Southern Bald Ibis and Secretarybird, although bustards and cranes generally seem to be not as vulnerable to turbine collisions as was originally anticipated (Ralston-Paton & Camagu 2019). Soaring priority species, i.e., species such as Cape Vulture and a variety of raptors, including several species of eagles, are highly vulnerable to the risk of collisions. In summary, the following priority species could be at risk of collisions with the turbines: Common Buzzard, Jackal Buzzard, Blue Crane, Brown Snake Eagle, Black-chested Snake Eagle, Long-crested Eagle, Martial Eagle, Peregrine Falcon, Lanner Falcon, Greater Flamingo, Lesser Flamingo, Montagu's Harrier, African Marsh Harrier, Black Harrier, African Harrier-Hawk, Cape Vulture, Secretarybird, Black-bellied Bustard, White-bellied Bustard, Denham's Bustard, Wattled Crane, Grey Crowned Crane, African Fish Eagle, Spotted Eagle-Owl, Amur Falcon, Grey-winged Francolin, Southern Bald Ibis, Black-winged Kite, Northern Black Korhaan, Blue Korhaan, Black-winged Lapwing, Western Osprey, Marsh Owl, African Grass Owl, Black Sparrowhawk and White Stork. The operational impact assessed due to collision with the turbines is outlined in **Table 8-30**.

Table 8-30: Operational Impact on mortality due to collisions with wind turbines

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of Mitigation
Mortality of priority species due to collisions with the wind turbines									
Without Mitigation	4	3	4	4	4	**60**	**Moderate**	(-)	Moderate
With Mitigation	3	3	3	4	2	**26**	**Low**	(-)	
Mitigation and Management Measures	— It is recommended that shutdown on demand (SDoD) is implemented at all turbines for a trial period of two years to monitor the frequency and duration of shutdown events. Based on the result of the trail period, the need for the continuation of the SDoD, or the implementation of other proven mitigation measures if available at the time, must be evaluated by the avifaunal specialist. — Live-bird monitoring and carcass searches to be implemented in the operational phase, as per the most recent edition of the Best Practice Guidelines at the time (Jenkins et al., 2015) to compare the abundance of avifauna during the pre-construction monitoring with the abundance post-construction. Operational monitoring and carcass searches to be implemented for a minimum of two years, and then again in Year 5 and every fifth year after that. — If estimated annual collision rates indicate unacceptable mortality levels of priority species, i.e., if it exceeds the pre-determined threshold determined by the avifaunal specialist, additional measures will have to be implemented which could include shut down on demand or other proven measures.									

ELECTROCUTION ON THE MEDIUM VOLTAGE NETWORK

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2000). The electrocution risk is largely determined by the design of the electrical hardware.

While the intention is to place the medium voltage reticulation network underground where possible, there are areas where the lines might have to run above ground, for technical reasons. In these instances, the electricity could potentially pose an electrocution risk to several priority species that could on occasion perch on these poles. In summary, the following priority species are potentially vulnerable to electrocution in this manner: Grey Crowned Crane, Marsh Owl, African Grass Owl, Spotted Eagle-Owl, Common Buzzard, Peregrine Falcon, Black Harrier, Jackal Buzzard, Brown Snake Eagle, Black-chested Snake Eagle, Long-crested Eagle, Martial Eagle, Lanner Falcon, Montagu's Harrier, African Marsh Harrier, African Harrier-Hawk, Cape Vulture, African Fish Eagle, Southern Bald Ibis, Black-winged Kite, Western Osprey and Black Sparrowhawk.

The operational impact assessed on mortality due to electrocution on the medium voltage infrastructure is outlined in **Table 8-31**.

Table 8-31: Operational Impact on mortality due to electrocution

Potential Impact **Electrocution of priority species on the medium voltage infrastructure.**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Ease of Mitigation**
Without Mitigation	4	3	4	4	4	**60**	**Moderate**	(-)	Moderate
With Mitigation	1	3	2	4	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— The medium voltage cable should be buried as far as possible. Overhead lines should only be considered if technical constraints to trenching are present. — Bird flight diverters should be installed on all overhead medium voltage power lines according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). — Live-bird monitoring and carcass searches to be implemented in the operational phase, as per the most recent edition of the Best Practice Guidelines at the time (Jenkins et al., 2015) to compare the abundance of avifauna during the pre-construction monitoring with the abundance post-construction. Operational monitoring and carcass searches to be implemented for a minimum of two years, and then again in Year 5 and every fifth year after that. — The mitigation measures proposed by the vegetation specialist must be strictly enforced, including rehabilitation of disturbed areas.								

COLLISION WITH THE MEDIUM VOLTAGE NETWORK

Collisions are one of the biggest threat posed by overhead lines to birds in southern Africa (Van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes, and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines (Van Rooyen 2004, Anderson 2001).

Power line collisions are generally accepted as a key threat to bustards (Raab et al. 2009; Raab et al. 2010; Jenkins & Smallie 2009; Barrientos et al. 2012, Shaw 2013). In one study, carcass surveys were performed under high voltage transmission lines in the Karoo for two years, and low voltage distribution lines for one year (Shaw 2013). Ludwig’s Bustard was the most common collision victim (69% of carcasses), with bustards generally comprising 87% of mortalities recovered. Total annual mortality was estimated at 41% of the Ludwig’s Bustard population, with Kori Bustards Ardeotis kori also dying in large numbers (at least 14% of the South African population killed in the Karoo alone). Karoo Korhaan was also recorded, but to a much lesser extent than Ludwig's Bustard. The reasons for the relatively low collision risk of this species probably include their smaller size (and hence greater agility in flight) as well as their more sedentary lifestyles, as local birds are familiar with their territory and are less likely to collide with power lines (Shaw 2013).

Using a controlled experiment spanning a period of nearly eight years (2008 to 2016), the Endangered Wildlife Trust (EWT) and Eskom tested the effectiveness of two types of line markers in reducing power line collision mortalities of large birds on three 400kV transmission lines near Hydra substation in the Karoo. Marking was highly effective for Blue Cranes, with a 92% reduction in mortality, and large birds in general with a 56% reduction in mortality, but not for bustards, including the endangered Ludwig's Bustard. The two different marking devices were approximately equally effective, namely spirals and bird flappers, they found no evidence supporting the preferential use of one type of marker over the other (Shaw et al. 2017).

Distribution lines i.e. 11kV to 88kV are often overlooked in collision studies, but given their far greater extent they can represent a serious source of mortality (Shaw et al. 2010a, 2010b).

While the intention is to place the medium voltage reticulation network underground where possible, there are areas where the lines might have to run above ground, for technical reasons. These spans could pose a collision risk to virtually all powerline sensitive avifauna, depending on where those spans are located. Species potentially at risk are African Black Duck, African Darter, African Grass Owl, African Sacred Ibis, African Spoonbill, Black Heron, Black-bellied Bustard, Black-crowned Night Heron, Black-headed Heron, Black-necked Grebe, Blue Crane, Blue Korhaan, Blue-billed Teal, Cape Shoveler, Cape Teal, Cape Vulture, Denham's Bustard, Egyptian Goose, Fulvous Whistling Duck, Glossy Ibis, Goliath Heron, Great Egret, Greater Flamingo, Grey Crowned Crane, Grey Heron, Hadada Ibis, Hamerkop, Intermediate Egret, Lesser Flamingo, Little Egret, Little Grebe, Mallard, Marsh Owl, Northern Black Korhaan, Purple Heron, Red-billed Teal, Red-knobbed Coot, Reed Cormorant, Secretarybird, South African Shelduck, Southern Bald Ibis, Southern Pochard, Spotted Eagle-Owl, Spur-winged Goose, Squacco Heron, Wattled Crane, Western Barn Owl, Western Cattle Egret, White Stork, White-backed Duck, White-bellied Bustard, White-breasted Cormorant, White-faced Whistling Duck, Yellow-billed Duck.

The operational impact assessed due to collision with the medium voltage overhead powerlines is outlined in **Table 8-32.**

Table 8-32: Operational impact on mortality due to collision with medium voltage infrastructure

Potential Impact	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Ease of Mitigation**
Mortality of priority species due to collisions with the medium voltage infrastructure									
Without Mitigation	4	3	4	4	3	**45**	**Moderate**	(-)	Moderate
With Mitigation	3	3	3	4	2	**26**	**Low**	(-)	
Mitigation and Management Measures	— A bird-friendly pole design must be employed for all medium voltage overhead lines. The avifaunal specialist must approve the final design prior to construction commencing. — Bird flight diverters should be installed on all overhead medium voltage power lines according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). — Live-bird monitoring and carcass searches to be implemented in the operational phase, as per the most recent edition of the Best Practice Guidelines at the time (Jenkins et al., 2015) to compare the abundance of avifauna during the pre-construction monitoring with the abundance post-construction. Operational monitoring and carcass searches								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of Mitigation
Mortality of priority species due to collisions with the medium voltage infrastructure									
	to be implemented for a minimum of two years, and then again in Year 5 and every fifth year after that. — If estimated annual collision rates indicate unacceptable mortality levels of priority species, i.e., if it exceeds the pre-determined threshold determined by the avifaunal specialist, additional measures will have to be implemented which could include shut down on demand or other proven measures. — The mitigation measures proposed by the vegetation specialist must be strictly enforced, including rehabilitation of disturbed areas.								

8.10.3 DECOMMISSIONING PHASE

The de-commissioning of the Camden II WEF and associated infrastructure, including the on-site medium voltage overhead lines, and BESS, will result in a significant amount of movement and noise, which will lead to temporary displacement of avifauna from the site.

The impact is likely to be similar in nature and extent to the construction phase of the proposed WEF. The impact is rated as moderate pre-mitigation and it will decrease to low post-mitigation (**Table 8-33**).

Table 8-33: Decommissioning Impact on priority species

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Displacement of priority species due to disturbance associated with the dismantling of the wind turbines and associated infrastructure.									
Without Mitigation	4	2	3	2	4	44	Moderate	(-)	High
With Mitigation	3	2	2	2	3	27	Low	(-)	High
Mitigation and Management Measures	— Decommissioning activity should be restricted to the immediate footprint of the infrastructure as far as possible. — Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. — Measures to control noise and dust should be applied according to current best practice in the industry. — Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum. — The mitigation measures proposed by the vegetation specialist must be strictly enforced, including rehabilitation of disturbed areas.								

8.11 BATS

8.11.1 CONSTRUCTION PHASE

The following impacts on Bats, during the construction phase of the proposed Camden I WEF, were identified:

LOSS OF FORAGING HABITAT BY CLEARING OF VEGETATION

Foraging habitat supporting bat insect prey will be lost by construction of turbines, crane pads, as well as temporary and long-term construction yards. This construction impact as well as possible mitigation measures are outlined in **Table 8-34.**

Table 8-34: Construction Impact on bat foraging habitat

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Loss of foraging habitat by clearing of vegetation.									
Without Mitigation	2	1	2	4	4	**36**	**Moderate**	(-)	Easy
With Mitigation	2	1	1	4	3	**24**	**Low**	(-)	
Mitigation and Management Measures	— Adhere to the bat sensitivity map criteria. — Rehabilitate cleared vegetation where possible at areas such as laydown yards. — Vegetation should be allowed to recover where it was cleared after the construction and decommissioning of the facility. — All lights on turbines and at substation and/or Operations and Management (O&M) buildings (excluding aviation lights), should be down-hooded and connected to motion sensors (while still adhering to safety and security requirement), to minimise light pollution. Light pollution can attract bats that readily forage on insects attracted to light sources, significantly increasing the likelihood of collisions with turbines.								

ROOST DESTRUCTION DURING EARTHWORKS

Construction activities may possibly disturb or destroy bat roosts underground, and roosts in tall trees. Forcing bats to find alternative roosts. This construction impact as well as possible mitigation measures are outlined in **Table 8-35.**

Table 8-35: Construction Impact on bat roosts

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Roost destruction during earthworks.									
Without Mitigation	3	1	3	4	3	**36**	**Moderate**	(-)	Easy
With Mitigation	3	1	3	4	1	**11**	**Very Low**	(-)	
Mitigation and Management Measures	— Adhere to the bat sensitivity map criteria. — Vegetation should be allowed to recover where it was cleared after the construction and decommissioning of the facility. — All lights on turbines and at substation and/or Operations and Management (O&M) buildings (excluding aviation lights), should be down-hooded and connected to motion sensors (while still adhering to safety and security requirement), to minimise light								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Roost destruction during earthworks.									
	pollution. Light pollution can attract bats that readily forage on insects attracted to light sources, significantly increasing the likelihood of collisions with turbines.								

8.11.2 OPERATIONAL PHASE

The following impacts on Bats, during the operational phase of the proposed Camden I WEF, were identified:

BAT MORTALITIES DURING FORAGING

Foraging bats can be killed by colliding with turbine blades, or by suffering barotrauma during foraging activities. This operational impact as well as possible mitigation measures are outlined in **Table 8-36**.

Table 8-36: Operational Impact on bat mortalities during foraging

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Bat mortalities during foraging.									
Without Mitigation	4	2	4	4	5	70	High	(-)	Hard
With Mitigation	4	2	4	4	3	42	Moderate	(-)	
Mitigation and Management Measures	— Adhere to the bat sensitivity map criteria. — Turbine layout adjustments to adhere to the sensitivity maps, and where needed reducing blade movement at selected turbines and high-risk bat activity times/weather conditions as informed by operational monitoring results. — Bat mortality impact during operation should be measured and ensure that the WEF impacts remain within sustainable levels. — Acoustic deterrents: This technology is being experimented with on wind farms in South Africa, and thus far yielded positive results that may indicate effectiveness of the devices in the correct scenarios. These deterrents are theoretically most effective on species with a low frequency echolocation call, such as *T.* aegyptiaca, which dominated the species composition in turbine rotor swept heights during the preconstruction study. However, current data on the SA trials is still limited to a small sample set, and the technology will not necessarily be effective in all mitigation scenarios and on all species. Therefore, it should be considered and tested on a case specific basis, and the effect on reducing bat mortalities must be adequately monitored to determine the level of effectiveness. However, development is progressed far enough for deterrents to be trialled, if the operational study indicates above threshold mortalities. — Curtailment may be implemented during operation if the results of the operational bat mortality monitoring indicate that bats are being killed above sustainable thresholds. These thresholds are advised on during the operational study. — It is recommended that all turbines be curtailed below generator cut-in speed for every night, commencing on the commercial operational date.									

BAT MORTALITIES DURING MIGRATION

Migrating bats influence several ecosystems since they are cave dwelling species, also over a larger area due to the distances that may be travelled. If turbines are placed within a migration path, a larger area and higher diversity of ecosystems may be impacted. This operational impact as well as possible mitigation measures are outlined in **Table 8-37**.

Table 8-37: Operational Impact on bat mortalities during migration

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Bat mortalities during migration.									
Without Mitigation	4	3	4	4	4	60	Moderate	(-)	Hard
With Mitigation	4	3	4	4	2	30	Low	(-)	
Mitigation and Management Measures	— Reducing blade movement at selected turbines if a migration route is discovered as informed by operational monitoring results. — Bat mortality impact during operation should be measured and ensure that the WEF impacts remain within sustainable levels. — Acoustic deterrents are developed well enough to be trialled, if the operational study indicates above threshold mortalities.								

INCREASED BAT MORTALITIES DUE TO LIGHT ATTRACTION AND HABITAT CREATION

Floodlights and other lights at turbine bases or nearby buildings, will attract bats preying on insects and therefore significantly increase the likelihood of these bats being impacted on by moving turbine blades. Habitat creation in the roofs of nearby buildings can cause a similar increased risk factor. This operational impact as well as possible mitigation measures are outlined in **Table 8-38**.

Table 8-38: Operational Impact on bat mortalities due to light attraction

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Increased bat mortalities due to light attraction and habitat creation.									
Without Mitigation	4	1	4	4	5	65	High	(-)	Easy
With Mitigation	4	1	4	4	2	26	Low	(-)	
Mitigation and Management Measures	— Only use lights with low sensitivity motion sensors that switch off automatically when no persons are nearby while still adhering to safety and security requirements, to prevent the creation of regular insect gathering pools. This will be at turbine bases (if applicable, and other infrastructure buildings). — For buildings, avoid tin roofs and roof structures that offer entrance holes into the roof cavity.								

8.12 VISUAL AND LANDSCAPE

8.12.1 CONSTRUCTION PHASE

Large construction vehicles, equipment and construction material stockpiles will alter the natural character of the study area and expose visual receptors to impacts associated with construction. Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.

Dust emissions and dust plumes from increased traffic on the gravel roads serving the construction site may evoke negative sentiments from surrounding viewers.

Surface clearance for cable trenches, access roads, laydown areas and other on-site infrastructure may result in the increased visual prominence of these features, thus increasing the level of contrast with the surrounding landscape. Potential visual pollution could also result from littering on the construction site.

The construction visual impact as well as mitigation measures are indicated in **Table 8-39**.

Table 8-39: Construction Impact on the visual receptors of the Camden I WEF

Potential Impact **Visual impact due to construction**	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**		**Significance**	**Character**	**Ease of mitigation**
Without Mitigation	3	2	3	4	3	**40**	**Moderate**	(-)	Moderate
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)	

Mitigation and Management Measures	— Carefully plan to minimise the construction period and avoid construction delays.
	— Where possible, restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
	— Inform receptors within 1km of the WEF development area of the construction programme and schedules.
	— Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
	— Maintain a neat construction site by removing rubble, litter and waste materials regularly.
	— Position storage / stockpile areas in unobtrusive positions in the landscape, where possible.
	— Make use of existing gravel access roads where possible.
	— Limit the number of vehicles and trucks travelling to and from the construction site, where possible.
	— Ensure that dust suppression techniques are implemented:
	    — on all access roads;
	    — in all areas where vegetation clearing has taken place;
	    — on all soil stockpiles.								

8.12.2 OPERATIONAL PHASE

Internationally, studies have demonstrated that there is a direct correlation between the number of turbines and the degree of objection to a wind farm, with less opposition being encountered when fewer turbines are proposed (Devine-Wright, 2005). Certain objectors to wind farms also mention the "sky space" occupied by the rotors of a turbine, this being the area in which the rotors would rotate.

The visual prominence of wind turbines would be exacerbated within natural settings, in areas of flat terrain or if located on ridge tops. Given the height of the turbines, even dense stands of wooded vegetation are only likely to offer partial visual screening.

SHADOW FLICKER

Shadow flicker may occur when the sun is low on the horizon and shines through the rotating blades of a wind turbine, resulting in a moving shadow. The rotating blades repeatedly cast a shadow which will be perceived as a "flicker" and this flicker effect can potentially impact on residents located near the wind turbines.

The effect of shadow flicker is however only likely to be experienced by people situated directly within the shadow cast by the blade of the wind turbine. As such, shadow flicker is only expected to have an impact on, and cause health risks to, people residing in houses located relatively close to a wind turbine and at a specific orientation, particularly in areas where there is little screening present. Shadow flicker may also be experienced by and impact on motorists if a wind turbine is located in close proximity to an existing road.

The impact of shadow flicker can be effectively mitigated by choosing the correct site and layout for the wind turbines, taking into consideration the orientation of the turbines relative to the nearby houses and the latitude of the site. Hence appropriate development restriction zones around residences will reduce the adverse effects of shadow flicker, while tall structures and trees will also obstruct shadows and prevent the effect of shadow flicker from impacting on surrounding residents. In this instance, appropriate restriction zones have been recommended as indicated in **Figure 7-29**, and trees planted around many of the nearby farmsteads will reduce the likelihood of flicker impacts.

MOTION-BASED VISUAL INTRUSION

An important component of the visual impacts associated with wind turbines is the *movement* of the rotors. Labelled as motion-based visual intrusion, this refers to the tendency of the viewer to focus on discordant, moving features when scanning the landscape. Evidence from surveys of public attitudes towards wind farms suggest that the viewing of moving blades is not necessarily perceived negatively (Bishop and Miller, 2006). The authors of the study suggest two possible reasons for this; firstly, when the turbines are moving they are seen as being 'at work', 'doing good' and producing energy. Conversely, when they are stationary they are regarded as a visual intrusion that has no evident purpose. Such instances are however likely to be quite rare as inoperative turbines are not considered advantageous and the facility operators would seek to avoid this situation wherever possible

More interestingly, the second theory regarding this perception is related to the intrinsic value of wind in certain areas and how turbines may be an expression or extension of an otherwise 'invisible' presence. Famous winds across the world include the Mistral of the Camargue in France, the Föhn in the Alps, or the Bise in the Lavaux region of Switzerland. The wind, in these cases, is an intrinsic component of the landscape, being expressed in the shape of trees or drifts of sands, but being otherwise invisible. Bishop and Miller (2006) argue that wind turbines in these environments give expression, when moving, to this quintessential landscape element. In a South African context, this phenomenon may well be experienced if wind farms are developed in areas where typical winds, like berg winds, or the south-easter in the Cape are an intrinsic part of the environment. In this way, it may even be possible that wind farms will, through time form part of the cultural landscape of an area, and become a representation of the opportunities presented by the natural environment.

ASSOCIATED ON-SITE INFRASTRUCTURE

The infrastructure associated with the proposed Camden I WEF will include the following:

- A new IPP on-site substation;
- Medium voltage (33kV) cables, buried underground wherever technically feasible;
- A Battery Energy Storage System (BESS) located next to the onsite substation, comprising batteries, power conversion system and transformer which will all be stored in various rows of containers;
- Internal roads;
- A construction laydown / staging area;
- Operation and Maintenance (O&M) buildings; and
- A temporary cement batching plant.

Substations are generally large, highly visible structures which are more industrial in character than many other components of a WEF. As they are not features of the natural environment, but are representative of human (anthropogenic) alteration, substations will be perceived to be incongruous when placed in largely natural landscapes. Conversely, the presence of other anthropogenic objects associated with the built environment, especially other substations or power lines, may result in the visual environment being considered to be 'degraded' and thus the introduction of a substation into this setting may be less of a visual impact than if there was no existing built infrastructure visible. In this instance, the substation is intended to serve the proposed Camden I WEF project and as such, is likely to be perceived as part of the greater WEF development. Thus, the visual impact of the substation will be relatively minor when compared to the visual impact associated with the WEF development as a whole.

Surface clearance for cable trenches, access roads, laydown areas and other on-site infrastructure may result in the increased visual prominence of these features, thus increasing the level of contrast with the surrounding landscape. Buildings, BESS containers and associated infrastructure placed in prominent positions such as on ridge tops may break the natural skyline, drawing the attention of the viewer. In addition, security lighting on the site may impact on the nightscape.

The visual impact of the on-site infrastructure associated with a WEF is generally not regarded as a significant factor when compared to the visual impact associated with wind turbines. The infrastructure would however increase the visual "clutter" within the WEF project area and magnify the visual prominence of the development if located on ridge tops or flat sites in natural settings where there is limited tall wooded vegetation to conceal the impact. Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers. The night time visual environment will be altered as a result of operational and security lighting at the proposed WEF.

The impact assessment for the above-mentioned impacts is outlined in **Table 8-40**.

Table 8-40: Operational Impact on the visual receptors of the Camden I WEF

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Visual impact of wind turbines and associated infrastructure									
Without Mitigation	3	3	3	4	4	**52**	**Moderate**	(-)	Moderate
With Mitigation	3	3	3	4	4	**52**	**Moderate**	(-)	
Mitigation and Management Measures	— Turbine colours should adhere to CAA requirements. Bright colours and logos on the turbines should be kept to a minimum. — Inoperative turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011). — If turbines need to be replaced for any reason, they should be replaced with turbines of similar height and scale to lessen the visual impact. — As far as possible, limit the number of maintenance vehicles which are allowed to access the site. — Ensure that dust suppression techniques are implemented on all gravel access roads. — As far as possible, limit the amount of security and operational lighting present on site whilst adhering to relevant safety standards. — Light fittings for security at night should reflect the light toward the ground and prevent light spill. — Lighting fixtures should make use of minimum lumen or wattage whilst adhering to relevant safety standards. — Mounting heights of lighting fixtures should be limited, or alternatively foot-light or bollard level lights should be used. — If possible, make use of motion detectors on security lighting. — Where possible, the operation and maintenance buildings should be consolidated to reduce visual clutter. — Non-reflective surfaces should be used where possible.								

8.12.3 DECOMMISSIONING PHASE

In terms of visual impact the decommissioning process is anticipated to be broadly similar to that of the construction phase. Vehicles and equipment required for decommissioning will alter the natural character of the study area and expose visual receptors to visual impacts. Dust emissions and dust plumes from increased traffic on the gravel roads serving the decommissioning site may evoke negative sentiments from surrounding viewers. Surface disturbance during decommissioning would expose bare soil resulting in visual scarring of the landscape and increasing the level of visual contrast with the surrounding environment. Temporary stockpiling of soil during decommissioning may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.

Decommissioning activities may be perceived as an unwelcome visual intrusion. The impact assessment for the above-mentioned decommissioning impacts is outlined in **Table 8-41**.

Table 8-41: Decommissioning Impact on the visual receptors

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Visual impact due to decommissioning									
Without Mitigation	3	2	3	4	3	**40**	**Moderate**	(-)	Moderate
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)	
Mitigation and Management Measures	— All infrastructure that is not required for post-decommissioning use should be removed. — Carefully plan to minimize the decommissioning period and avoid delays. — Maintain a neat decommissioning site by removing rubble and waste materials regularly. — Position storage / stockpile areas in unobtrusive positions in the landscape, where possible. — Ensure that dust suppression procedures are maintained on all gravel access roads throughout the decommissioning phase. — All cleared areas should be rehabilitated as soon as possible. — Rehabilitated areas should be monitored post-decommissioning and remedial actions implemented as required in compliance with the regulatory requirements at the time of decommissioning								

8.13 HERITAGE AND CULTURAL RESOURCES

Several ruins and graves are recorded in the Project area. Based on the current layout, CA001 (located ~ 18 meters west of a proposed road) and CA004 (located ~ 7 meters west of a proposed road) could be impacted on by the proposed Camden 1 WEF. No direct impact is expected on the recorded burial sites in the Project area. The heritage significance of the recorded ruins at CA001 is medium and CA004 is of low significance. The ruins at CA001 are assumed to be older than 60 years based on historical maps dating to 1968 and will need to be recorded prior to application for a destruction permit if impacted on. After mitigation the impacts on the recorded features will be very low. Impacts to heritage resources without mitigation within the project footprint will be permanent and negative and occur during the construction activities.

Any additional effects to subsurface heritage resources can be successfully mitigated by implementing a Chance Find Procedure. All known sites should be avoided and additional recommendations in this report should be implemented during all phases of the project. With the implementation of the recommended mitigation measures impacts of the project on heritage resources is acceptable.

8.13.1 CONSTRUCTION PHASE

The construction phase will entail the removal of topsoil and vegetation as well as the establishment of infrastructure. These activities can have a negative and irreversible impact on heritage features if any occur. Impacts include destruction or partial destruction of non-renewable heritage resources.

The construction impacts are outlined in **Table 8-42** and **Table 8-43**.

Table 8-42: Construction Impact on heritage ruins

Potential Impact Destruction or damage to recorded ruins	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	1	5	5	2	**28**	**Low**	(-)	Moderate
With Mitigation	3	1	5	5	1	**14**	**Very Low**	(-)	
Mitigation and Management Measures	— Implementation of a Chance Find Procedure for the Project during construction. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below. — If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. — It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find and confirm the extent of the work stoppage in that area. — The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA. — The study area should be monitored by the ECO during construction. — Prior to construction commencing, the ruins at CA001 should be recorded before a destruction permit can be applied for if impacted on. — Recorded heritage features should be indicated on development plans and avoided with a 30 m buffer. — Prior to construction commencing, the final layout should be subjected to a heritage walkthrough.									

Table 8-43: Construction Impact on graves

Potential Impact Destruction or damage to recorded graves	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	4	2	5	5	4	**64**	**High**	(-)	Moderate
With Mitigation	4	2	5	5	1	**16**	**Low**	(-)	
Mitigation and Management Measures	— Implementation of a Chance Find Procedure for the Project during construction. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below. — If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. — It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find and confirm the extent of the work stoppage in that area. — The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then									

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Destruction or damage to recorded graves									
	contact a professional archaeologist for an assessment of the finds who will notify the SAHRA. — The study area should be monitored by the ECO during construction. — Prior to construction commencing, the ruins at CA001 should be recorded before a destruction permit can be applied for if impacted on. — Recorded heritage features should be indicated on development plans and avoided with a 30 m buffer. — Prior to construction commencing, the final layout should be subjected to a heritage walkthrough.								

8.13.2 OPERATIONAL PHASE

No impacts on heritage are anticipated for the operational phase.

8.13.3 DECOMMISSIONING PHASE

No impacts on heritage are anticipated for the decommissioning phase.

8.14 PALAEONTOLOGY

The Camden I WEF area was walked through in April 2022. The area has been cultivated for crops over the past few decades and so the land is fairly flat and rocks have been removed. There were no rocky outcrops, no exposures of shale and no fossils present on the land surface.

It is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary. There is a very small chance that fossils may occur below the ground surface in the shales of the Vryheid Formation (Ecca Group, Karoo Supergroup) so a Fossil Chance Find Protocol should be added to the EMPr.

Once fossils have been removed there will be not further impact on the palaeontological heritage. Therefore, the impact is only applicable to the construction phase. The operation and de-commissioning phases will NOT impact the palaeontology.

If fossils are recovered, removed and placed in a recognised institution such as a museum or university palaeontology collection this will be a positive impact because the fossils will be available for research. Otherwise, they would have remained unknown to science.

8.14.1 CONSTRUCTION PHASE

The Palaeontological Impact of the proposed Camden I WEF project with turbines, BESS and IPP is outlined in **Table 8-44.**

Table 8-44: Construction Impact on fossils

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Loss of fossils									
Without Mitigation	2	1	3	4	2	**20**	**Low**	(-)	Easy
With Mitigation	1	1	3	1	6	**6**	**Very low**	(+)	
Mitigation and Management Measures	— If fossils occur in the footprint of any section of WEF footprint, associated grid infrastructure, access roads or all other associated								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
Loss of fossils								
	infrastructure, they can be removed, and the project can continue. The Fossil Chance Find Protocol must be followed during removal as follows: — When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (trace fossils, fossils of plants, insects, bone or coalified material) should be put aside in a suitably protected place. This way the project activities will not be interrupted. — Photographs of similar fossils must be provided to the contractor to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (example included in Figure 7 of Palaeontological Assessment). This information will be built into the EMP's training and awareness plan and procedures. — Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment. — If there is any possible fossil material found by the contractor environmental officer (or similar staff member) then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible. — Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits. — If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the construction has been completed and only if there are fossils. — If no fossils are found and the excavations have finished then no further monitoring is required. — If fossils are found by the environmental officer, or other responsible person once excavations and drilling for foundations and amenities have commenced, then they should be rescued and a palaeontologist called to assess and collect a representative sample.								

8.14.2 OPERATIONAL PHASE

The operational phase will not impact the palaeontology.

8.14.3 DECOMMISSIONING PHASE

The decommissioning phase will not impact the palaeontology.

8.15 TRANSPORT

8.15.1 CONSTRUCTION PHASE

The construction phase of the facility will generate the only notable traffic that requires assessment. Construction traffic will include vehicles for material and component deliveries, construction staff and all other associated personnel. Trips will include the delivery of over-sized components such as the rotor blades, mast sections and generators. The route/s between the origin of the material and components and the facility may be National, Provincial or Local roads, and each authority will be required to provide the necessary permits for the transportation of any oversized or weight components.

Table 8-45 indicates the expected combined trip generation for the facility during construction.

Table 8-45: Total maximum peak hour trip generation[14]

CAMDEN I WEF	Vehicle Trips per Peak hour								
	Staff			Material deliveries			Total		
	In	Out	Total	In	Out	Total	In	Out	Total
Total	32	15	**47**	2	1	**3**	34	16	**50**

Due to the numerous accesses off the National roads that can be utilised during construction, the traffic impact during the workday AM and PM peak hours are expected to be negligible during the construction phase.

The construction impact of noise, dust and exhaust pollution due to vehicle trips on site is outlined in **Table 8-46**.

Table 8-46: Construction Impact due to vehicle trips on site

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Noise, dust & exhaust pollution due to vehicle trips on-site.									
Without Mitigation	2	1	1	1	5	**25**	**Low**	(-)	Easy
With Mitigation	1	1	1	1	2	**8**	**Very Low**	(-)	
Mitigation and Management Measures	— All unsurfaced roads must be regularly sprayed with water to prevent dust generation — All vehicles that travel on-site must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby minimising noise/exhaust pollution — All vehicles that travel on-site must not be overloaded, and abnormal vehicles must comply to relevant legislation for overweight loads, to ensure lowest possible road surface damage.								

The construction impact of noise, dust and exhaust pollution due to additional trips on the national and district roads is outlined **Table 8-47**.

Table 8-47: Construction Impact due to additional trips on the national and district roads

[14] Engineers opinion: The trip generation calculation representation is fairly conservative (high)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Noise, dust & exhaust pollution due to additional trips on the national and district roads.									
Without Mitigation	2	2	1	1	5	30	Low	(-)	Easy
With Mitigation	1	2	1	1	2	10	Very Low	(-)	
Mitigation and Management Measures	— All unsurfaced roads must be regularly sprayed with water to prevent dust generation — All vehicles that travel on-site must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby minimising noise/exhaust pollution — All vehicles that travel on-site must not be overloaded, and abnormal vehicles must comply to relevant legislation for overweight loads, to ensure lowest possible road surface damage.								

The overall significance of each impact during the Construction Phase of the Camden I facility as detailed in **Table 8-46** and**Error! Reference source not found. Table 8-47** is Low without mitigation, and Very Low with mitigation. The impacts are limited to the peak construction period only, site only/local or regional, and fully reversible.

The proposed mitigating measures are easy to implement and will assist to either prevent or reduce the impacts of increased vehicle engine and tyre noise, exhaust fumes and generation of dust on unsurfaced roads and unnecessary road damage.

8.15.2 OPERATIONAL PHASE

The operational phase of the facility will require a negligible number of temporary or permanent staff. The vehicle trips that will be generated by the personnel accessing the site will therefore be negligible, and the associated transport impact on the surrounding road network will be negligible. The Operational phase traffic impact was therefore not assessed.

8.15.3 DECOMMISIONING PHASE

Following the initial 20-year operational period of the facility, its continued economic viability will be investigated. If it is still deemed viable its life may be extended; if not, it will be decommissioned. If it is completely decommissioned, all the components will be disassembled, reused and recycled or disposed of.

It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It is however expected that the volumes will be lower than during the construction phase, and the resultant transportation impact on the local road network will be lower than during the Construction phase.

8.16 SOCIAL

8.16.1 CONSTRUCTION PHASE

CREATION OF LOCAL EMPLOYMENT, TRAINING, AND BUSINESS OPPORTUNITIES

The construction phase will extend over a period of approximately 18-24 months and create in the region of 100-150 employment opportunities that will benefit members from the local communities in the area, specifically Ermelo. These opportunities will include opportunities for low, semi and highly workers. Most of the employment opportunities will accrue to Historically Disadvantaged (HD) members of the community. A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in the local towns in the area, specifically Ermelo. Given relatively high local unemployment levels and limited job opportunities in the area, this will represent a significant, if localised, social benefit. Based on information from similar projects the total wage bill will be in the region of R 25 million (2022 Rand values). A percentage of the wage bill will be spent in the local economy which will also create opportunities for local businesses in the local towns in the area.

The capital expenditure will be approximately R 2-3 billion (2022 Rand value) and will create opportunities for local businesses. Due to the presence of the mining and energy sector, there are likely to suitably qualified companies in Ermelo that can provide the required services and products. The local service sector will also benefit from the construction phase. The potential opportunities would be linked to accommodation, catering, cleaning, transport, and security, etc. associated with the construction workers on the site. The hospitality industry in the area will also benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project. Experience from other construction projects indicates that the potential opportunities are not limited to on-site construction workers but also to consultants and product representatives associated with the project. The construction impact of employment, training and business creation opportunities is outlined in **Table 8-48.**

Table 8-48: Construction Impact of employment, skills development, and business creation opportunities

Potential Impact	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**	**Ease of mitigation**
Creation of employment and business opportunities									
Without Mitigation	3	2	N/A	2	3	**21**	**Low**	(+)	Easy
With Mitigation	3	3	N/A	2	4	**32**	**Moderate**	(+)	
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area. — Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. — Before the construction phase commences the proponent should meet with representatives from the MM to establish the existence of a skills database for the area. If such as database exists, it should be made available to the contractors appointed for the construction phase. — The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project. — Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. — The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. — The proponent should liaise with the MM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction service providers. These companies should be notified of the tender process and invited to bid for project-related work.									

IMPACT OF CONSTRUCTION WORKERS ON LOCAL COMMUNITIES

The presence of construction workers poses a potential risk to family structures and social networks. While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The most significant negative impact is associated with the disruption of existing family structures and social networks. This risk is linked to potentially risky behaviour, mainly of male construction workers, including:

- An increase in alcohol and drug use.
- An increase in crime levels.
- The loss of girlfriends and/or wives to construction workers.
- An increase in teenage and unwanted pregnancies.
- An increase in prostitution.
- An increase in sexually transmitted diseases (STDs), including HIV.

The objective will be to source as many of the low and semi-skilled workers locally. These workers will be from the local community and form part of the local family and social networks. This will reduce the risk and mitigate the potential impacts on the local community. While it is possible to reduce the risks associated with construction workers it is not possible to totally avoid the potential impacts. The construction impact on local communities due to construction workers in the area is outlined in **Table 8-49**.

Table 8-49: Construction Impact of the presence of construction workers in the area on local communities

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Impacts on family structures and social networks associated with the presence of construction workers									
Without Mitigation	3	2	3	2	3	30	Moderate	(-)	Moderate
With Mitigation	2	1	3	2	3	24	Low	(-)	
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — The SEP and CHSSP should include a Grievance Mechanism that enables stakeholders to report resolve incidents. — Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories. — The proponent should consider the option of establishing a Monitoring Committee (MC) for the construction phase that representatives from local landowners, farming associations, and the local municipality. This MC should be established prior to commencement of the construction phase and form part of the SEP. — The proponent and the contractor should implement an HIV/AIDS, COVID-19 and Tuberculosis (TB) awareness programme for all construction workers at the outset of the construction phase. The programmes should form part of the CHSSP. — No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.								

INFLUX OF JOB SEEKERS

Large construction projects tend to attract people to the area in the hope that they will secure a job, even if it is a temporary job. These job seekers can in turn become “economically stranded” in the area or decide to stay on irrespective of finding a job or not. While the proposed project on its own does not constitute a large construction project, the establishment of a number of renewable energy projects in the area may attract job seekers to the area. As in the case of construction workers employed on the project, the actual presence of job seekers in the area does not in itself constitute a social impact. However, the way in which they conduct themselves can impact on the local community. The main areas of concern associated with the influx of job seekers include:

— Impacts on existing social networks and community structures.
— Competition for housing, specifically low-cost housing.
— Competition for scarce jobs.
— Increase in incidences of crime.

These issues are similar to the concerns associated with the presence of construction workers and are discussed above. The findings of the SIA indicate that the potential for economically motivated in-migration and subsequent labour stranding is likely to be negligible. The risks associated with the influx of job seekers are therefore likely to be low. The construction impact of job seekers on local communities is outlined in **Table 8-50.**

Table 8-50: Construction Impact of job seekers on local communities

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Influx of job seekers into local community									
Without Mitigation	2	2	3	2	3	**27**	**Low**	(-)	Moderate
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)	
Mitigation and Management Measures	It is impossible to stop people from coming to the area in search of employment. However, as indicated above, the proponent should ensure that the employment criteria favour residents from the area. In addition: — Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — The proponent should implement a “locals first” policy, specifically with regard to unskilled and low skilled opportunities. — The proponent should implement a policy that no employment will be available at the gate.								

RISK TO SAFETY, LIVESTOCK, AND FARM INFRASTRUCTURE

The presence on and movement of construction workers on and off the site poses a potential safety threat to local famers and farm workers in the vicinity of the site. In addition, farm infrastructure, such as fences and gates, may be damaged and stock losses may also result from gates being left open and/or fences being damaged, or stock theft linked either directly or indirectly to the presence of farm workers on the site. The potential risks (safety, livestock, and farm infrastructure) can be effectively mitigated by careful planning and managing the movement of construction on and off the site workers during the construction phase. The construction impact if risk to safety, livestock, and damage to farm infrastructure is outlined in **Table 8-51**.

Table 8-51: Construction Impact of risk to safety, livestock and damage to farm infrastructure

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Risk to safety, livestock and damage to farm infrastructure									
Without Mitigation	3	2	3	2	3	**30**	**Moderate**	(-)	Easy
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)	
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. — All farm gates must be closed after passing through. — Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. — The proponent should establish a CoC for workers (see above). — The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors, and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below). — The proponent should implement a Grievance Mechanism that provides local farmers with an effective and efficient mechanism to address issues related to report issues related to damage to farm infrastructure, stock theft and poaching etc. — The Environmental Management Plan (EMP) must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested. — Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms. — Contractors appointed by the proponent must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the CoC. All dismissals must be in accordance with South African labour legislation. — It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.									

NUISANCE IMPACTS ASSOCIATED WITH CONSTRUCTION RELATED ACTIVITIES

The construction activities on site and movement of heavy construction vehicles during the construction phase has the potential to create noise and dust impacts, damage local roads and create safety impacts for other road users. Based on the findings of the SIA the potential dust and noise impacts associated with the construction phase are likely to be limited. The traffic related impacts associated with the transport of materials to the site can also be effectively managed if the required mitigation measures are implemented.

In terms of impacts to local roads, construction traffic for all projects would need to be co-ordinated with farming activities in order to avoid harvesting periods when unimpeded access to silos at Ermelo and Overvaal is required. The De Emigratie Road and Overvaal Road are of key importance. The critical period is from May to August. The relevant roads also serve as primary access to and link between a number of study area farms, i.e., are used on a daily basis. The assessment of the nuisance impacts associated with construction related activities is outlined in **Table 8-52.**

Table 8-52: Construction Impact of noise, dust and safety

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Noise, dust and safety impacts associated with movement of construction related activities and movement of traffic to and from the site									
Without Mitigation	2	2	1	2	3	21	Low	(-)	Easy
With Mitigation	2	1	1	2	2	12	Very Low	(-)	
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — Timing of construction activities should be planned to avoid / minimise impact on access to the silos at Ermelo and Overvaal, specifically access along the De Emigratie Road and Overvaal Road. The critical period is from May to August. — Ongoing communication with land owners and road users during construction period. This should be outlined in the SEP. — The proponent should implement a Grievance Mechanism that provides local farmers and other road users with an effective and efficient mechanism to address issues related to construction related impacts, including damage to local gravel farm roads. — Implementation of a road maintenance programme throughout the construction phase to ensure that the affected roads maintained in a good condition and repaired once the construction phase is completed. — Repair of all affected road portions at the end of construction period where required. — Dust suppression measures must be implemented on un-surfaced roads, such as wetting on a regular basis and ensuring that vehicles used to transport building materials are fitted with tarpaulins or covers. — All vehicles must be roadworthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.									

INCREASED RISK OF GRASS FIRE

The presence of construction workers and construction-related activities on the site poses an increased risk of grass fires that could, in turn pose, a threat to livestock, crops, wildlife and farm infrastructure. The local landowners indicated that the area is very susceptible to grass fires during the winter months (May-October) and that the veld can take up to 3 years to recover to full productivity. The construction impact of veld fires to livestock, farm infrastructure and grazing is outlined in **Table 8-53**.

Table 8-53: Construction Impact of risk posed by veld fires

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Loss of livestock and grazing and damage to farm infrastructure associated with increased incidence of grass fires									
Without Mitigation	3	2	3	2	3	**30**	**Moderate**	(-)	Easy
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)	
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Preparation and implementation of a Community Health, Safety and Security Plan (CHSSP) prior to and during the construction phase. — The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc., during the construction phase will be compensated for. The agreement should be signed before the construction phase commences. — Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas. — Smoking on site should be confined to designated areas. — Contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy summer months. — Contractor should provide adequate fire-fighting equipment on-site, including a fire fighting vehicle. — Contractor should provide fire-fighting training to selected construction staff. — No construction staff, with the exception of security staff, to be accommodated on site overnight. — As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire-fighting costs borne by farmers and local authorities.									

IMPACTS ASSOCIATED WITH LOSS OF FARMLAND

The activities associated with the construction phase and establishment of the proposed project and associated infrastructure will result in the disturbance and loss of land available for crops and grazing. However, experience from other WEFs in the Western Cape is that impact on farming operations can be effectively mitigated by the careful planning in the final layout of the proposed WEF and associated components, where possible. The final disturbance footprint can be reduced by careful site design and management of operation. The impact on farmland associated with the construction phase can also be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. Recommended mitigation measures are outlined below.

Affected landowners interviewed indicated that loss of productive farmland should as far as possible be minimised. The establishment of turbines and pylons in cropped areas also has the potential to impact on movement of machinery (planting and harvesting) and aerial crop spraying operations (aircraft). However, as indicated above the use of drones for crop spraying provides an effective alternative. The potential loss of productive farmland will also be offset by compensation paid to the affected landowners.

Local landowners also indicated that the timing / phasing on construction activities should where possible be planned to avoid and or minimise disruption to planning and harvesting operations. Affected land owners should be involved in planning of timing of construction activities. Harvests are typically marketed in advance and farmers are committed to deliver contracted yields. This requires advance planning to determine how much land needs to be cultivated during the season. Consideration should also be given to planning the construction activities so as to ensure arable areas remain productive for as long as possible, i.e., are not withdrawn from production months in advance. Ideally, construction should start after harvesting and be planned to reduce disruptions to the following planting season. The construction impact on farmlands is outlined in **Table 8-54**.

Table 8-54: Construction Impact on farmlands

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Impact on productive farmland									
Without Mitigation	3	2	3	2	4	**40**	**Moderate**	(-)	Easy
With Mitigation	2	1	3	2	3	**24**	**Low**	(-)	
Mitigation and Management Measures	— The loss of high-quality agricultural land should be avoided and or minimised by careful planning in the final layout of the proposed WEF facilities, where possible. — Affected landowners should be notified about the timing of construction related activities in advance. — The footprint associated with the construction related activities (access roads, construction platforms, workshop etc.) should be minimised. — An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase. — All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. — The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up by the Environmental Consultants appointed to manage the EIA. — The implementation of the Rehabilitation Programme should be monitored by the ECO.									

8.16.2 OPERATIONAL PHASE

IMPROVE ENERGY SECURITY AND SUPPORT THE RENEWABLE ENERGY SECTOR

The primary goal of the proposed project is to improve energy security in South Africa by generating additional energy. The proposed WEF also reduces the carbon footprint associated with energy generation. The project should therefore be viewed within the context of the South Africa's current reliance on coal powered energy to meet the majority of its energy needs, and secondly, within the context of the success of the REIPPPP. The operational impact of the development of infrastructure to improve energy security and support the renewable energy sector is outlined in **Table 8-55**.

Table 8-55: Operational Impact of development of infrastructure to improve energy security and support the renewable sector

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Improve energy security and support renewable sector									
Without Mitigation	4	4	N/A	4	4	**48**	**Moderate**	(-)	Easy
With Mitigation	4	4	N/A	4	5	**60**	**Moderate**	(+)	
Mitigation and Management Measures	— Maximise the number of employment opportunities for local community members. — Implement training and skills development programs for members from the local community.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Improve energy security and support renewable sector									
	— Maximise opportunities for local content and procurement.								

CREATION OF EMPLOYMENT AND BUSINESS OPPORTUNITIES

The proposed development will create in the region of 20 full time employment opportunities during the operational phase. Based on similar projects the annual operating budget will be in the region of R 24 million (2022 Rand values), including wages. The operational impact of employment, skills development and business creation opportunities is outlined in **Table 8-56**.

Table 8-56: Operational Impact of employment, skills development and business opportunities

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Creation of employment, skills development and business opportunities									
Without Mitigation	2	1	N/A	4	2	**14**	**Low**	(+)	Easy
With Mitigation	3	2	N/A	4	4	**36**	**Moderate**	(+)	
Mitigation and Management Measures	— Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase. — Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area. — Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. — Before the construction phase commences the proponent should meet with representatives from the MM to establish the existence of a skills database for the area. If such as database exists, it should be made available to the contractors appointed for the construction and operation phase. — The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project. — Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. — The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. — The proponent should liaise with the MM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction service providers. These companies should be notified of the tender process and invited to bid for project-related work. — The proponent should investigate providing training and skills development to enable locally based service providers to provide the required services for the operational phase.									

GENERATE INCOME FOR AFFECTED LANDOWNERS

The proponent will be required to either purchase the land or enter into a rental agreement with the affected landowners for the use of the land for the establishment of the proposed WEF. Based on the findings of the SIA the area is prone to droughts and farming operations can be challenging. Any additional source of income therefore represents a significant benefit for the affected landowner(s). The additional income would assist to reduce the risks to their livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as fuel, feed etc. The additional income would improve economic security of farming operations, which in turn would improve job security of farm workers and benefit the local economy. The operational impact of benefits associated with income generated for affected farmers is outlined in **Table 8-57**.

Table 8-57: Operational Impact of benefits associated with income generated for affected farmers

Potential Impact Generation of additional income for affected farmers	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	2	1	N/A	4	3	**21**	**Low**	(+)	Easy
With Mitigation	3	2	N/A	4	5	**45**	**Moderate**	(+)	
Mitigation and Management Measures	— Implement agreements with affected landowners. — The loss of high-quality agricultural land should be avoided and or minimised by careful planning in the final layout of the proposed WEF facilities, where possible.								

BENEFITS ASSOCIATED WITH THE SOCIO-ECONOMIC DEVELOPMENT CONTRIBUTIONS

The REIPPPP has been designed not only to procure energy but has also been structured to contribute to the broader national development objectives of job creation, social upliftment and broadening of economic ownership. Socio-economic development (SED) contributions are an important focus of the REIPPPP and are aimed at ensuring that local communities benefit directly from the investments attracted into the area. These contributions are linked to Community Trusts and accrue over the project operation life and, in so doing, create an opportunity to generate a steady revenue stream over an extended period. This revenue can be used to fund development initiatives in the area and support the local community. The long-term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. The revenue from the proposed WEF can be used to support a number of social and economic initiatives in the area, including:

- Creation of jobs.
- Education.
- Support for and provision of basic services.
- School feeding schemes.
- Training and skills development.
- Support for SMME's.

The assessment of benefits associated with socio-economic development contributions during the operational phase is outlined in **Table 8-58**.

Table 8-58: Operational Impact of benefits associated with SED contributions

Potential Impact Benefits associated with support for local community's from SED contributions	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	2	N/A	4	4	**36**	**Moderate**	(+)	Easy
With Mitigation	4	3	N/A	4	5	**55**	**Moderate**	(+)	

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
Benefits associated with support for local community's from SED contributions								
Mitigation and Management Measures	To maximise the benefits and minimise the potential for corruption and misappropriation of funds the following measures should be implemented: — The proponents should liaise with the LM and GSDM to identify projects that can be supported by SED contributions. — Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community. — Strict financial management controls, including annual audits, should be instituted to manage the SED contributions.							

VISUAL IMPACT AND IMPACT ON SENSE OF PLACE

The proposed WEF will impact on the areas existing rural sense of place. However, the impact on the areas sense of place should be viewed within the context of the impact of the Camden Power Station and associated transmission lines on areas sense of place. The areas sense of place has also been impacted by large-sale coal mining operations. The potential visual impact on the areas sense place is therefore likely to be limited.

Despite the proximity of some turbines to farmsteads, none of the affected landowners interviewed raised concerns about potential visual impacts associated with the proposed project. Most of the local farmsteads are also screened by the rolling topography or trees.

The visual impact and impact on sense of place associated with the proposed facility and associated infrastructure is outlined in **Table 8-59**.

Table 8-59: Visual impact and impact on sense of place during the operational phase

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Visual impact and impact on the areas rural sense of place									
Without Mitigation	2	2	3	4	2	**26**	**Low**	(-)	Easy
With Mitigation	2	2	3	4	2	**26**	**Low**	(-)	
Mitigation and Management Measures	— The recommendations contained in the Visual Impact Assessment should also be implemented. — Install radar activated civil aviation light system.								

POTENTIAL IMPACT ON PROPERTY VALUES

A literature review was undertaken as part of the SIA. It should be noted that the review does not constitute a property evaluation study and merely seeks to comment on the potential impact of wind farms on property values based on the findings of studies undertaken overseas. The assessment rating is based on the findings of the review. Based on the findings of the literature review the potential impact of WEFs on rural property values is likely to be low, specifically for farms that are farmed as productive farms. As indicated above, the potential loss of productive land and the associated potential impact on property values can also be minimised by careful planning and siting of wind turbines. The operational impact on property values is outlined in **Table 8-60**.

Table 8-60: Operational impact on property values

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Visual impact and impact on property values									
Without Mitigation	2	2	N/A	4	2	**16**	**Low**	(-)	Easy
With Mitigation	2	1	N/A	4	2	**14**	**Very Low**	(-)	
Mitigation and Management Measures	— The recommendations contained in the Visual Impact Assessment should be implemented.								

POTENTIAL IMPACT ON TOURISM

A review of international literature in the impact of wind farms was undertaken as part of the SIA. Based on the findings of the review there is limited evidence to suggest that the proposed WEF would impact on the tourism in the area. The area has also been impacted by the Camden Power Station and associated transmission lines and large-scale coal mining. The operational impact on tourism is outlined in **Table 8-61**.

Table 8-61: Operational Impact on tourism

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Impact of the WEF on local tourism operations and activities									
Without Mitigation	1	2	N/A	4	2	**14**	**Very Low**	(-)	Easy
With Mitigation	1	2	N/A	4	2	**14**	**Very Low**	(-)	
Mitigation and Management Measures	— The recommendations contained in the Visual Impact Assessment should be implemented.								

8.17 CLIMATE CHANGE

Climate change is regarded as the greatest environmental threat facing the world and keeping our planet's temperature at sustainable levels has become one of the major concerns of policy makers. The energy sector is considered the largest single source of emissions; accounting for approximately 40% of Carbon dioxide emissions and approximately 25% of overall emissions. Wind energy does not emit any climate inducing carbon dioxide or any other air pollutants. According to the Department of Energy[15], within 3 to 6 months of operation, a wind turbine has offset all emissions caused by its construction, to run virtually carbon free for the remainder of its approximate 20 year life.

8.17.1 CONSTRUCTION PHASE

Climate change associated impacts during construction relate to emissions of air pollutants. Air emissions impacts associated with the construction phase are expected to be the same as those discussed in **Section 8.2.1.**

[15] http://www.energy.gov.za/files/windEnergyCampaign/ImpactofwindenergyFactSheet2.pdf

8.17.2 OPERATIONAL PHASE

Carbon dioxide is one of the major greenhouse gases (GHGs) under the UN Framework Convention on Climate Change, and a priority GHG in terms of the National Environmental Management: Air Quality Act - Declaration of Greenhouse Gases as Priority Air Pollutants (GN. R710, 2017). Carbon dioxide is emitted from the combustion of fossil fuels. There will be no GHG emissions directly associated with power generation from the facility in the operational phase due to the nature of the technology.

Furthermore, the project may be regarded as having a positive impact in terms of GHG emissions associated with the development of power generation capacity in South Africa i.e. less GHG emissions per unit of power contributed when compared to conventional fossil fuel derived power. In light of the targeted decommissioning of Eskom's coal-fired power stations, particularly Camden Power Station, the power generated from the WEF can replace the power generated by the Camden Power Station and minimise carbon dioxide emission; thereby assisting in combating climate change. The operational impact on climate change is outlined in **Table 8-62**.

Table 8-62: Operational Impact on combating climate change and contributing cleaner energy

Potential Impact Reduced GHGs and contribution of cleaner energy to the National grid	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	4	5	3	4	4	64	High	(+)	Easy
With Mitigation	4	5	3	4	4	64	High	(+)	
Mitigation and Management Measures	— The implementation of the project can be regarded as having a mitigatory effect in terms of contributing to the curbing of South African's CO2 emission increases.								

8.17.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase will be the same as that of the construction phase discussed in **Section 8.2.1.**

8.18 HAZARDOUS SUBSTANCES AND POLLUTANTS

8.18.1 CONSTRUCTION PHASE

Potential exists for soil, groundwater and surface water contamination associated with potential releases of small quantities of environmental contaminants and hazardous substances. Sources of pollutants and release mechanisms include:

— Leakages of hydrocarbons (diesel and oil) from construction vehicles and heavy machinery (e.g. excavators and bulldozers).

— Loss of containment and accidental spillage associated with storage and handling of hydrocarbons, chemicals, and concrete.

Runoff creates a preferential pathway and exposure of the above contaminants into the subsurface and water resources leading to a deterioration in water quality and secondary health impacts on aquatic ecosystems and water users.

The construction impact assessment for the abovementioned impact is included in **Table 8-63**.

Table 8-63: Construction Impact of contaminants on soil, groundwater and surface water

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Soil, groundwater and surface water contamination									
Without Mitigation	3	2	3	2	3	**30**	**Low**	(-)	Easy
With Mitigation	3	2	3	2	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— Avoid identified sensitive areas (watercourses and associated buffers) as far as possible. — Chemicals, hydrocarbon materials and hazardous substances maintained onsite must be managed in accordance with the Hazardous Substances Act (No. 15 of 1973) and its relevant regulations. — All machinery and equipment should be inspected regularly for faults and possible leaks; these should be serviced off-site or in appropriately bunded areas. — Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. — All contaminated soil shall be treated in situ or removed and be placed in containers. — Provide secure storage for fuel, oil, chemicals and other waste materials to prevent contamination of stormwater runoff. — Spill kits must be available at all locations where hazardous substances are stored, handled or used, and spills must be cleaned up immediately in accordance with an established protocol applicable to the material.									

8.18.2 OPERATIONAL PHASE

The anticipated contamination impacts during the operational phase of the project include spillage of oils, fuel, grease (from site operational and maintenance vehicles) and permanent onsite sewage systems. The operational impact of potential land contamination from hazardous substances is outlined in **Table 8-64.**

Table 8-64: Operational Impact due to hazardous substances

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Soil, groundwater and surface water contamination									
Without Mitigation	2	2	3	4	2	**22**	**Low**	(-)	Easy
With Mitigation	2	2	3	4	2	**22**	**Low**	(-)	
Mitigation and Management Measures	— Chemicals, hydrocarbon materials and hazardous substances maintained onsite must be managed in accordance with the Hazardous Substances Act (No. 15 of 1973) and its relevant regulations. — The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and proper upkeep of machinery and vehicles. A complete spill kit must be onsite at all times.									

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
Soil, groundwater and surface water contamination								
	— Implement site inspections on the effectiveness and integrity of the stormwater management systems.							

8.18.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase are expected to be the same as the construction phase.

8.19 WASTE MANAGEMENT

8.19.1 CONSTRUCTION PHASE

GENERATION OF GENERAL AND HAZARDOUS WASTE

The table below provides a summary of the typical general and hazardous waste types that are likely to be generated on site during construction. The presence of construction workers has the potential to increase litter on site in the absence of adequate waste receptacles. This results in an unsightly working environment and possible entry into surrounding environment. Furthermore, waste materials may attract pest species / vectors into working areas leading to potential health implications for construction staff and community members.

Spoil material unsuitable for reuse as backfill and bedding material has the potential to disrupt land use and habitats if inappropriately manage or disposed illegally.

Waste generation (domestic waste, mixed industrial and metal waste) and a lack of appropriate separation, temporary storage and recycling (i.e. not aligned with the Waste Hierarchy) has the potential to result in unnecessary waste material to landfill.

Hazardous waste generation and inappropriate management and disposal has the potential to lead to contamination of soil, groundwater and surface water.

Waste Category	Waste Type	Typical Constituents
General Waste	Domestic Waste	Paper and cardboard packaging, empty plastic and metal containers (non-hazardous original contents) etc.
	Organic Waste	Canteen, food and cooking waste
	Mixed Industrial	Wood, plastic, packaging etc.
	Metal Waste	Ferrous and non-ferrous scrap and stainless steel, metal cuttings, electrode stubs from welding.
	Spoil Material	Excavations, trenching and terracing will result in the generation of spoil material
	Building rubble	Wasted flooring material, paint containers, wall tiles, timber, piping etc.
	Biomass	Cleared vegetation
Hazardous Waste	Oily Waste	Used lubricant and hydraulic oils and hydrocarbon-based solvents

	Oil Contaminated Waste	Solid material (rags etc.) that has come into contact with and contains traces of oil or grease
	Hazardous Chemical Containers	From temporary storage and use of chemicals on site
	Sanitary Waste	Sewerage / faecal matter generated at the contractor's camp

The construction impact of waste generation is outlined in **Table 8-65**.

Table 8-65: Construction Impact of waste generation

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Generation of general and hazardous waste									
Without Mitigation	3	3	3	2	3	**33**	**Moderate**	(-)	Easy
With Mitigation	2	2	2	2	2	**16**	**Low**	(-)	
Mitigation and Management Measures	— Despite the modest volumes of waste anticipated to be generated by the Project, recycling opportunities should be sought in order to reduce the volume of waste to landfill and harness commercial benefits for both the project team and local community. — General waste (i.e. construction waste, building rubble, plastic, metal, excavated material, packaging material, paper and domestic waste etc.) generated during the construction phase should be stored in a designated area within suitable waste collection bins and skips (or similar). — Provisions of suitable waste receptacles for temporary storage of hazardous waste (in compliance with Material Safety Data Sheets). — Collection and disposal of hazardous waste at appropriately licences landfills and proof of disposal to be retained by contractors and facility operators. — Bins/skips must be emptied regularly and collected by a licensed contractor for disposal at an appropriate, licensed facility. Bins/skips must not be allowed to overflow. — Solid waste must be managed to avoid risk to local fauna and to avoid attracting animals to the site and to ensure containment and regular collection for disposal at a licenced landfill site. — Maintain good housekeeping on site and minimise the generation of waste.									

SANITATION WASTE

Sanitation services are required to accommodate workers on site, contractor's yard and at site camps. Temporary ablution facilities (chemical toilets) are proposed to appropriately contain and treat waste for offsite disposal. The incorrect siting of chemical toilets (i.e. within 100m of a watercourse or stream) and loss of containment could lead to pollution of the receiving environment (soil, groundwater and surface water), leading to secondary health impact to ecosystems and communities (ground and surface water users).

Sanitary waste, if not correctly contained, has the potential to enter surface water via runoff and increase organic matter loading in water systems.

The construction impact associate with sanitation waste generation is outlined in **Table 8-66**.

Table 8-66: Construction Impact associated with sanitation waste

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Generation of sanitation waste									
Without Mitigation	3	3	3	2	3	**33**	**Moderate**	(-)	Easy
With Mitigation	2	2	2	2	2	**16**	**Low**	(-)	
Mitigation and Management Measures	— Chemical toilet facilities are to be supplied and serviced by an approved contractor. — Ablution facilities must be located in a specific area agreed to by the ECO prior to placement and must be located away from sensitive environments. — Spillages must be prevented during cleaning or servicing. — Ablution facilities must be effectively secured to prevent toppling or being wind-blown — Ablution facilities must be maintained in a hygienic state and serviced regularly								

8.19.2 OPERATIONAL PHASE

It is noted that only small volumes of waste are anticipated to be generated by the facility during operations. The Operational phase waste generation impact was therefore not assessed.

8.19.3 DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase are expected to be the same as the construction phase.

8.20 SAFETY, HEALTH AND ENVIRONMENTAL RISK

A high-level Safety Health and Environmental Risk Assessment was undertaken for the proposed Solid-State Lithium or Vanadium Redox Flow Battery Energy Storage Systems at the proposed Camden I WEF.

8.20.1 CONSTRUCTION PHASE

SOLID STATE LITHIUM-ION BATTERY ENERGY STORAGE SYSTEMS

HUMAN HEALTH - CHRONIC EXPOSURE TO TOXIC CHEMICAL OR BIOLOGICAL AGENTS

Exposure to materials such as cement, paints, solvents, welding fumes, truck fumes etc. during construction can result in employee / contractor illness. The construction impact associated with chronic exposure to toxic chemical or biological agents is outlined in **Table 8-67**.

Table 8-67: Construction Impact on Human Health chronic exposure to toxic chemical or biological agents

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Chronic exposure to toxic chemical or biological agents									
Without Mitigation	3	1	3	4	4	**44**	**Moderate**	(-)	Moderate
With Mitigation	1	1	3	4	2	**18**	**Low**	(-)	
Mitigation and Management Measures	— The construction phase must be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993 specifically the Construction Regulations.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Chronic exposure to toxic chemical or biological agents									
	— A SHEQ policy and procedure must be compiled and implemented. — A detailed construction risk assessment must be undertaken prior to construction work. — The necessary Personal Protective Equipment (PPE) must be provided and worn at the required working areas. — Ensure that relevant SHE appointees are in place. — Contractor's safety files must be in place and kept up to date. — All necessary health controls/ practices must be in place, e.g. ventilation of welding and painting areas. — SHE monitoring and reporting programs must be in place and implemented. — An emergency response plan must be compiled prior to construction, which must include aspects such as appointment of emergency controller, provision of first aid, first responder contact numbers.								

HUMAN HEALTH - EXPOSURE TO NOISE

Exposure to drilling, piling, generators, air compressors during construction could lead to an adverse impact on hearing of workers as well as a possible nuisance factor in near-by areas. The construction impact associated with exposure to noise is outlined in **Table 8-68.**

Table 8-68: Construction Impact on human health - exposure to noise

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to noise									
Without Mitigation	3	1	5	5	4	56	Moderate	(-)	Easy
With Mitigation	2	1	5	5	2	26	Low	(-)	
Mitigation and Management Measures	— A health risk assessment must be undertaken to determine if equipment continuous noise exceeds 85dB at workstation and 61dB at the boundary of the site. — Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.								

HUMAN HEALTH - EXPOSURE TO TEMPERATURE EXTREMES AND/OR HUMIDITY

During construction workers will be exposed to heat during the day and cold in winter. This could result in heat stroke or Hypothermia. The construction impact associated with exposure to temperature extremes and/or humidity is outlined in in **Table 8-69.**

Table 8-69: Construction Impact on human health - exposure to temperature extremes

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health -exposure to temperature extremes and/or humidity									
Without Mitigation	3	2	3	1	2	18	Low	(-)	Easy
With Mitigation	2	2	3	1	1	8	Very low	(-)	
Mitigation and Management Measures	— Construction site facilities to comply with Occupational Health and Safety Act 85 of 1993, specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. — Adequate potable water to be provided for employees during all phases of the project. Bore hole, bowser and tank or small water								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health -exposure to temperature extremes and/or humidity									
	treatment plant may be required to provide potable water for the BESS installation staff during all phases of the project.								

HUMAN HEALTH - CHRONIC EXPOSURE TO PSYCHOLOGICAL STRESS

The construction of large projects brings many contractor workers into a small, isolated community. This may lead to a lack of sufficient accommodation, entertainment etc, resulting in an increase in alcohol abuse and violence. The construction impact associated with psychological stress is outlined in **Table 8-70**.

Table 8-70: Construction Impact on human health – exposure to psychological stress

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to psychological stress									
Without Mitigation	2	3	3	2	2	**20**	**Low**	(-)	Easy
With Mitigation	2	3	3	2	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— Refer to Social Impact Assessment for this project (**Section 8.16**).								

HUMAN HEALTH - CHRONIC EXPOSURE TO ERGONOMIC STRESS

Lifting of heavy equipment and movement at awkward angles during construction may result in back and other injuries. The construction impact associated with ergonomic stress is outlined in **Table 8-71.**

Table 8-71: Construction impact on human health – exposure to ergonomic stress

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to ergonomic stress									
Without Mitigation	4	1	3	2	3	**30**	**Low**	(-)	Moderate
With Mitigation	4	1	3	2	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— Training in lifting techniques must be provided. — Ensure that despite the isolated location, all the necessary equipment is available (and well maintained) during construction. Otherwise, employees may revert to unsafe practices. The necessary equipment must be available prior to the commencement of the project. — Isolated location, maintenance of construction equipment to ensure safe operation is critical. Ensure this is in place prior to project beginning. — Consider supporting the development of local service providers when sourcing and maintaining equipment. — First aid provision on site.								

HUMAN AND EQUIPMENT SAFETY – EXPOSURE TO FIRE RADIATION

The construction phase could result in activities that pose a fire risk. This includes fire involving fuels used in construction vehicles or vehicles themselves (e.g. tyre fire), fire due to uncontrolled welding or other hot-work. This will result in injuries due to radiation especially amongst first responders and bystanders. Fatalities are unlikely from the heat radiation as not highly flammable nor massive fire. The construction impact associated with exposure to fire radiation is outlined in **Table 8-72.**

Table 8-72: Construction impact on human and equipment safety – exposure to fire radiation

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to fire radiation									
Without Mitigation	4	2	3	5	4	56	Moderate	(-)	Complex
With Mitigation	4	2	3	5	2	28	Low	(-)	

Mitigation and Management Measures	— Fuels stored on site must be situated in dedicated, demarcated and bunded areas.
	— Suitable fire-fighting equipment must be available on site near source of fuel, e.g. diesel tank, generators, mess, living quarters, workshops etc
	— The company responsible for the facility at this stage is to have:
	  — An emergency plan must be in place prior to commencement of construction.
	  — Fuel spill containment procedures and equipment must be provided for and in place.
	  — Hot-work permit and management system must be in place.								

Solid state battery containers damaged on route e.g. dropped in port (drops do happen about 1/2000 containers) and importing of possibly approximately 100 containers for the site. With this it is possible, although unlikely, that one will be dropped, or a traffic accident may occur on-route. This includes involvement in an external fire e.g. at the port or on route. Data indicates installed facility events are 0.001/year. Transport of 100 units per installation is assumed to take 4 weeks each so f= 0.008 once in 125 years, so the likelihood is very low. A consequence of this could be injuries due to radiation especially amongst first responders and bystanders. Fatalities are unlikely from the heat radiation as it is not highly flammable nor massive. The construction impact on human and equipment safety - exposure to fire radiation is outlined in **Table 8-73**.

Table 8-73: Construction Impact on human and equipment safety - exposure to fire radiation for SSL BESS

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to fire radiation									
Without Mitigation	5	2	5	5	2	34	Moderate	(-)	Complex
With Mitigation	5	2	5	5	1	17	Low	(-)	

Mitigation and Management Measures	— Solid state battery design must include abuse tests such as drop test, impact, rapid discharge etc. Propagation tests for systems, e.g. heat insulating materials between cells/modules must be conducted. Factory acceptance test prior to leaving manufacture must be conducted. Batteries are usually stored at 50% charge to prolong life but may be shipped fully discharged. This level of detail should be understood so as to assess the risk during transport and storage.
	— The appointed contractor should ensure suitably competent transport companies are appointed. The company responsible for transportation should ensure:
	  — Compliance with National Road Traffic Act Regulation 8 – dangerous goods.
	  — Port Authorities should be alerted to the overall project and the hazardous nature of the contents of battery containers being imported. Note. If, as per one of the typical suppliers (Tesla) indications, the containers are classified as IMDG Class 9 – the containers will not receive any special care in the ports and may be stored next to flammables. Port								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to fire radiation									
	emergency response in particular need training on mitigating battery hazards. — Prior to bringing any containers into the country a full Emergency response plan should be in place for the full route from the ship to the site. Drivers must be trained in the hazards of containerized batteries. The emergency plan to determine and address: — What gases would be released in a fire and are there inhalation hazards. — Extinguishing has two important elements, put out fire and to provide cooling. Different approaches may be needed for small fire – e.g. put out, and for large fires e.g. cool with copious quantities of water. Note inert gases and foam may put out the initial fire but fail to control thermal runaway or to cool the batteries resulting in reignition. — What initial fire extinguishing medium should be used? — Are there any secondary gases or residues from use of extinguishers? — If water is appropriate, may need outside connections to inside sprinklers. — First responders need to know what media to use, especially if water totally unsuitable and if there are no connection points for water etc. — PPE to be specified including possible exposure to chemicals and fumes as well as radiate heat. — Containment of residues/water/damaged equipment. — Compile and implement a disposal plan that manages the handling of partially and/or fully charged damaged units, contaminated surfaces (e.g. HF residues) and other associated dangerously charged components.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO EXPLOSION OVER PRESSURES

With solid state lithium containers, flammable gases generated by thermal run away reach explosive limits. The consequence of this is potential fatalities amongst first responders; damage to container, transport truck or other nearby items, e.g. other containers in the port. The construction impact on human and equipment safety - exposure to explosion over pressures is outlined in **Table 8-74**.

Table 8-74: Construction Impact on human and equipment safety - exposure to explosion over pressures

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to explosion over pressures									
Without Mitigation	5	4	5	5	3	57	Moderate	(-)	N/A
With Mitigation	5	4	5	5	1	19	Low	(-)	
Mitigation and Management Measures	— Develop and implement an emergency response plan that deals with all emergency responses applicable to the BESS, including during transportation. — For simplicity one transport route would be preferable. The route needs to be assessed in terms of responding local services, rest places for drivers, refuelling if required, break down services available etc.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to explosion over pressures									
	— Once an import route has been chosen, e.g. Richards Bay or Durban and along N2/N3/N11 etc, then the appointed transport company should ensure key emergency services on route could be given awareness training in battery fire/accident response. — Emergency response planning and training referred to above may be important for key locations such as the mountain passes / tunnels.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO ACUTE TOXIC CHEMICAL AND BIOLOGICAL AGENTS

Human pathogens and diseases, sewage, food waste as well as snakes, insects, wild and domesticated animals and harmful plants can cause illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc. The construction impact on human and equipment safety - exposure to acute toxic chemical and biological agents is outlined in **Table 8-75.**

Table 8-75: Construction Impact on human and equipment safety - exposure to acute toxic chemical and biological agents

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents									
Without Mitigation	4	2	3	2	3	33	Moderate	(-)	Complex
With Mitigation	3	2	3	2	2	20	Low	(-)	
Mitigation and Management Measures	— All necessary good hygiene practices to be in place, e.g. provision of toilets, eating areas, infectious disease controls. — Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others must be developed and implemented. — Conduct awareness training for persons on site, safety induction to include animal hazards. — First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. — Due to isolated locations and distance from town, the ability to treat with anti-venom and extreme allergic reactions on site is critical to mitigate the impacts.								

Damaged solid-state batteries release fumes, leak electrolyte, are completely broken exposing hazardous chemicals and thermal runaway and hazardous fumes released can cause mild skin irritation from exposure to small leaks to serious corrosive burns or lung damage. The construction impact on human and equipment safety - exposure to acute toxic chemical and biological agents is outlined in **Table 8-76**.

Table 8-76: Construction Impact on human and equipment safety - exposure to acute toxic chemical and biological agents for SSL BESS

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents									
Without Mitigation	4	3	3	5	3	45	Moderate	(-)	Complex
With Mitigation	4	3	3	5	2	30	Low	(-)	
Mitigation and Management Measures	— Appointed transport company to ensure transport in accordance with Regulation 8 of the National Road Traffic Act 93 of 1996, Dangerous Goods. The transportation of prescribed goods in manner that is not consistent with the prescriptions, e.g. consignor								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents									
	and consignee responsibilities is not permitted. Prescription are found in SANS 10228/29 and international codes for battery transport etc. — SSL BESS must be transported in sealed packages that are kept upright, protected from movement damage etc. — These must be packaged to ensure no short-circuiting during transport. — Consideration must be taken to prevent excessive vibration as battery internal may be damaged leading to thermal run-away during commissioning. — Pre-assembled containers will most likely be supplied. These will be fitted with the necessary protective measures by the supplier considering marine and road transport as well as lifting, setting down etc. — Route selection to consider possible incidents along the way and suitable response, e.g. satellite tracking, mobile communication, 24/7 helpline response. — Standard dangerous goods requirements for Hazmat labels must be adhered to, Transport Emergency Card (Trem cards) must be carried/held, and the driver/s must be trained on the hazards of the load.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO VIOLENT RELEASE OF KINETIC OR POTENTIAL ENERGY

Exposure to construction moving equipment, heavy loads, elevated loads, and working at heights can cause injury or possibly fatality, as well as damage to equipment, delays in starting the project and financial losses. The construction impact on human and equipment safety **-** exposure to violent release of kinetic or potential energy is outlined in **Table 8-77**.

Table 8-77: Construction Impact on human and equipment safety - exposure to violent release of kinetic or potential energy

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to violent release of kinetic or potential energy									
Without Mitigation	5	1	5	5	4	64	High	(-)	Complex
With Mitigation	5	1	5	5	1	16	Low	(-)	
Mitigation and Management Measures	— The construction phase must be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993 specifically the Construction Regulations. — A SHEQ policy must be compiled and implemented. — Develop a detailed construction risk assessment prior to construction work. — A SHE procedure must be developed and implemented. — The necessary PPE to be worn must specified. — Ensure that relevant SHE appointees are in place. — Contractor's safety files must be in place and kept up to date. — SHE monitoring and reporting programs must be developed and implemented. — Standard construction site rules regarding traffic, reversing sirens, rigging controls, cordoning off excavations etc must be developed and adhered to.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to violent release of kinetic or potential energy									
	— Civil works and building structures must adhere to the National Building Regulations and building Standards Act 103 of 1977 SANS 10400 and other relevant codes. — Other constructions such as roads, sewers etc must also adhere to relevant SANS standards. — All normal procedures for working at heights, hot work permits, confined space entry, cordon off excavations etc must be developed before construction begins. — An emergency response plan must be compiled before construction begins.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO ELECTROMAGNETIC WAVES

Construction activities will include the use of electrical machines, generators etc. Hot dry area static generation is highly likely as well as lightning strikes. This may cause electrocution, ignition, burns, injury and death, as well as damage to electrical equipment. The construction impact on exposure to electromagnetic waves is outlined in **Table 8-78.**

Table 8-78: Construction Impact on human and equipment safety - exposure to electromagnetic waves

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety – exposure to electromagnetic waves									
Without Mitigation	5	2	5	5	3	**51**	**Moderate**	(-)	Complex
With Mitigation	5	2	5	5	1	**17**	**Low**	(-)	
Mitigation and Management Measures	— Implement standard maintenance of condition of electrical equipment and adhere to safe operating instructions. — Consideration should be given, where required, for remote isolation devices or switching measures on equipment, plant and machinery to ensure the ability to shut off power to systems in use on site. — If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. — Lightning strike rate in the study area is very high. Outside work must be stopped during thunderstorms. — Lighting conductors may be required for the final installation, to be confirmed during design phase.								

ENVIRONMENT - EMISSIONS TO AIR

Dust from construction and generally hot dry area may cause adverse impact on employee health. The construction impact of emissions to air is indicated in **Table 8-79**.

Table 8-79: Construction Impact on the environment - emissions to air

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – emissions to air									
Without Mitigation	3	2	1	1	4	**28**	**Low**	(-)	Easy
With Mitigation	2	2	1	1	2	**12**	**Very Low**	(-)	

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – emissions to air									
Mitigation and Management Measures	— Implement dust control measures such as dampening of roads etc., particularly during dry or windy weather conditions, as per normal construction practices. — Construction workers to make use of necessary PPE (dust masks) when required.								

ENVIRONMENT - EMISSIONS TO WATER

The construction phase will make use of diesel for equipment, paints and solvents. There is also a possibility of Transformer oil spills and Sewage and kitchen/mess area wastewater generation. This could lead to environmental damage, particularly to the surface and underground water in the area if not managed correctly. The construction impact on environment due to emissions to water is outlined in **Table 8-80**.

Table 8-80: Construction impact on the environment - emissions to water

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment - emissions to water									
Without Mitigation	2	2	3	2	3	27	Low	(-)	Moderate
With Mitigation	2	2	3	2	2	18	Low	(-)	
Mitigation and Management Measures	— Normal construction site practices for preventing and containing fuels/paint/oil etc spills must be adhered to. — Appropriate bunding under any temporary tanks, curbing under truck offloading areas and sealed surfaces (e.g. concrete) under truck parking area is particularly important and must be provided for. — Spill clean-up procedures to be in place before commencing construction. — Sewage and any kitchen liquids must have containment and suitable treatment/disposal must be followed.								

ENVIRONMENT - EMISSIONS TO EARTH

The construction phase will generate solid waste. Improper management of this waste will result in environmental pollution. The construction impact on waste generation is outlined in **Table 8-81.**

Table 8-81: Construction impact on the environment - emissions to earth

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – emissions to earth									
Without Mitigation	2	2	3	3	3	30	Low	(-)	Easy
With Mitigation	1	2	3	3	2	18	Low	(-)	
Mitigation and Management Measures	— Solid waste, including packaging materials, must be collected and stored within designated areas on site and thereafter removed for disposal at a licensed waste disposal facility on a regular basis, as well as after regular maintenance. — Implement system for waste segregation (e.g. electronic equipment, chemicals) and management on the site.								

ENVIRONMENT – WASTE OF RESOURCES

The construction phase will require the usage of water and power, however if the usage is not controlled it will result in wastages. Furthermore, battery containers may be damaged during handling and/or transportation and may lead to construction delays. The construction impact of waste of resources e.g. water, power etc., is outlined in **Table 8-82.**

Table 8-82: Construction impact on the environment – waste of resources

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment - waste of resources e.g. water, power etc									
Without Mitigation	1	1	1	2	4	**20**	**Low**	(-)	Easy
With Mitigation	1	1	1	2	2	**10**	**Very low**	(-)	
Mitigation and Management Measures	— Water usage to be monitored on site during construction. — Handling protocols must be provided by the battery supplier. — End of Life plan needs to be in place before any battery containers enter the country as there may be damaged battery unit from day 1. — Develop and implement a water management plan and spill containment plan.								

PUBLIC - AESTHETHICS

The construction site will likely have bright surfaces reflecting light and tall structures in a flat area. This is likely to cause irritation/annoyance to the public. The construction impact on public aesthetics is outlined in **Table 8-83.**

Table 8-83: Construction impact on public - aesthetics

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Public - Aesthetics									
Without Mitigation	3	2	3	4	4	**48**	**Moderate**	(-)	Moderate
With Mitigation	1	2	3	4	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— Refer to visual impact assessment (**Section 8.12**).								

INVESTORS - FINANCIAL

The result of possible defective technology and extreme project delays could result in financial loss for investors. The construction impact on investors – financial is outlined in **Table 8-84.**

Table 8-84: Construction impact on Investors - Financial

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Investors - Financial									
Without Mitigation	5	1	3	4	3	**39**	**Moderate**	(-)	Moderate
With Mitigation	3	1	3	4	2	**22**	**Low**	(-)	
Mitigation and Management Measures	— Undertake adequate research during the planning and design phase to select the supplier and/contractor with the best technology that is internationally recognized and proven. — Project management to include deviation monitoring systems.								

EMPLOYEES AND INVESTORS – SECURITY

During the construction phase there is a potential for hi-jacking of valuable but hazardous load while en-route to site. Theft of construction equipment and battery installation facilities is also a possibility on site. Civil unrest or violent strike by employees can also arise. The construction impact of security is outlined in **Table 8-85.**

Table 8-85: Construction impact on employees and investors - security

Potential Impact Employees and investors - Security	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	4	1	3	2	4	40	Moderate	(-)	Complex
With Mitigation	4	1	3	2	4	27	Low	(-)	
Mitigation and Management Measures	— Fencing around the electrical infrastructure to adhere to SANS standard and Eskom Guidelines. — The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g. Skull and Cross Bones or other signs. — Night lighting to be provided both indoors and outdoors where necessary.								

EMERGENCIES

During the construction phase, there is the potential for fires, explosions, noxious smoke, large spills, traffic accidents and equipment/structural collapse. Inadequate emergency response to small event can lead to escalation. Consequences of these include injuries which can turn to fatalities, and small losses become extended down time. The construction impact of emergencies is outlined in **Table 8-86.**

Table 8-86: Construction impact on emergencies

Potential Impact Emergencies	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	4	2	3	5	4	56	Moderate	(-)	Complex
With Mitigation	4	2	3	5	2	28	Low	(-)	
Mitigation and Management Measures	— All safety measures listed in **Table 8-85** must be implemented. — Emergency procedures need to be practiced prior to commencement of construction. — BESS units should not be stored any closer to each other than they would be in the final installation so that propagation is prevented, i.e. laydown area needs to be considered. — The company in charge of the containers at each stage in the transport process needs to be very clear so that responsibility for the integrity of the load and protection of the persons involved in transfer and coordination of emergency response on-route. E.g. if purchased from Tesla where does hand over occur to the South African contractor / owner, at the factory door in USA, at the port in RSA, at the site fence. For example, who will be accountable if there's thermal runway event on a truck with a container that stops in a small town for driver refreshments.								

INVESTORS LEGAL

The battery industry is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. This could result in unknown hazards manifest due to using "cheaper supplier or less developed technology". The construction impact of battery technology on investors is outlined in **Table 8-87.**

Table 8-87: Construction impact on investors - legal

Potential Impact Investors - legal	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	1	3	3	4	40	Moderate	(-)	Moderate

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Investors - legal									
With Mitigation	2	1	3	3	2	18	Low	(-)	
Mitigation and Management Measures	— Use only internationally reputable technology suppliers who comply with all known regulations/guideline at the time of purchasing. — Ensure only latest state of the art technology systems are used and not old technologies prone to fires/explosions etc..								

VRF BESS

HUMAN HEALTH - CHRONIC EXPOSURE TO TOXIC CHEMICAL OR BIOLOGICAL AGENTS

Exposure to materials such as cement, paints, solvents, welding fumes, truck fumes etc. during construction can result in employee / contractor illness. The construction impact associated with chronic exposure to toxic chemical or biological agents is outlined in **Table 8-88**.

Table 8-88: Construction Impact on human health – exposure to toxic chemical or biological agents

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human health - Chronic exposure to toxic chemical or biological agents									
Without Mitigation	3	1	3	4	4	44	Moderate	(-)	Moderate
With Mitigation	1	1	3	4	2	18	Low	(-)	
Mitigation and Management Measures	— The construction phase must be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993 specifically the Construction Regulations. — A SHEQ policy and procedure must be compiled and implemented. — A detailed construction risk assessment must be undertaken prior to construction work. — The necessary Personal Protective Equipment (PPE) must be provided and worn at the required working areas. — Ensure that relevant SHE appointees are in place. — Contractor's safety files must be in place and kept up to date. — All necessary health controls/ practices must be in place, e.g. ventilation of welding and painting areas. — SHE monitoring and reporting programs must be in place and implemented. — An emergency response plan must be compiled prior to construction, which must include aspects such as appointment of emergency controller, provision of first aid, first responder contact numbers.									

HUMAN HEALTH - EXPOSURE TO NOISE

Exposure to drilling, piling, generators, air compressors during construction could lead to an adverse impact on hearing of workers as well as a possible nuisance factor in near-by areas. The construction impact associated with exposure to noise is outlined in **Table 8-89.**

Table 8-89: Construction Impact on human health - exposure to noise

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to noise									
Without Mitigation	3	1	5	5	4	56	Moderate	(-)	Easy
With Mitigation	2	1	5	5	2	26	Low	(-)	

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to noise									
Mitigation and Management Measures	— A health risk assessment must be undertaken to determine if equipment continuous noise exceeds 85dB at workstation and 61dB at the boundary of the site. — Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.								

HUMAN HEALTH - EXPOSURE TO TEMPERATURE EXTREMES AND/OR HUMIDITY

During construction workers will be exposed to heat during the day and cold in winter. This could result in Heat stroke or Hypothermia. The construction impact associated with exposure to temperature extremes and/or humidity is outlined in in **Table 8-90.**

Table 8-90: Construction Impact on human health - exposure to temperature extremes

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health -exposure to temperature extremes and/or humidity									
Without Mitigation	3	2	3	1	2	18	Low	(-)	Easy
With Mitigation	2	2	3	1	1	8	Very low	(-)	
Mitigation and Management Measures	— Construction site facilities to comply with Occupational Health and Safety Act 85 of 1993, specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. — Adequate potable water to be provided for employees during all phases of the project. Bore hole, bowser and tank or small water treatment plant may be required to provide potable water for the BESS installation staff during all phases of the project.								

HUMAN HEALTH - CHRONIC EXPOSURE TO PSYCHOLOGICAL STRESS

The construction of large projects brings many contractor workers into a small, isolated community. This may lead to a lack of sufficient accommodation, entertainment etc, resulting in an increase in alcohol abuse and violence. The construction impact associated with psychological stress is outlined in **Table 8-91**.

Table 8-91: Construction Impact on human health – exposure to psychological stress

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to psychological stress									
Without Mitigation	2	3	3	2	2	20	Low	(-)	Easy
With Mitigation	2	3	3	2	2	20	Low	(-)	
Mitigation and Management Measures	— Refer to Social Impact Assessment for this project (**Section 8.16**).								

HUMAN HEALTH - CHRONIC EXPOSURE TO ERGONOMIC STRESS

Lifting of heavy equipment and movement into awkward angles during construction may result in back and other injuries. The construction impact associated with ergonomic stress is outlined in **Table 8-92.**

Table 8-92: Construction impact on human health – exposure to ergonomic stress

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to ergonomic stress									
Without Mitigation	4	1	3	2	3	**30**	**Low**	(-)	Moderate
With Mitigation	4	1	3	2	2	**20**	**Low**	(-)	
Mitigation and Management Measures	— Training in lifting techniques must be provided. — Ensure that despite the isolated location, all the necessary equipment is available (and well maintained) during construction. Otherwise, employees may revert to unsafe practices. — Isolated location, maintenance of construction equipment to ensure safe operation is critical. Ensure this is in place prior to project beginning. — Ensure First aid provision on site.								

HUMAN AND EQUIPMENT SAFETY – EXPOSURE TO FIRE RADIATION

The construction phase could result in activities that pose a fire risk. This includes fire involving fuels used in construction vehicles or vehicles themselves (e.g. tyre fire), fire due to uncontrolled welding or other hot-work. This will result in injuries due to radiation especially amongst first responders and bystanders. Fatalities are unlikely from the heat radiation as not highly flammable nor massive fire. The construction impact associated with exposure to fire radiation is outlined in **Table 8-93.**

Table 8-93: Construction impact on human and equipment safety – exposure to fire radiation

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to fire radiation									
Without Mitigation	4	2	3	5	4	**56**	**Moderate**	(-)	Complex
With Mitigation	4	2	3	5	2	**28**	**Low**	(-)	

Mitigation and Management Measures	— Fuels stored on site must be situated in dedicated, demarcated and bunded areas.
	— Suitable fire-fighting equipment must be available on site near source of fuel, e.g. diesel tank, generators, mess, living quarters, workshops etc
	— The company responsible for the facility at this stage is to have:
	  — An emergency plan must be in place prior to commencement of construction.
	  — Fuel spill containment procedures and equipment must be provided for and in place.
	  — Hot-work permit and management system must be in place.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO ACUTE TOXIC CHEMICAL AND BIOLOGICAL AGENTS

Human pathogens and diseases, sewage, food waste as well as snakes, insects, wild and domesticated animals and harmful plants can cause illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc. The construction impact on human and equipment safety - exposure to acute toxic chemical and biological agents is outlined in **Table 8-94.**

Table 8-94: Construction Impact on human and equipment safety - exposure to acute toxic chemical and biological agents

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents									
Without Mitigation	4	2	3	2	3	33	Moderate	(-)	Complex
With Mitigation	3	2	3	2	2	20	Low	(-)	
Mitigation and Management Measures	— All necessary good hygiene practices to be in place, e.g. provision of toilets, eating areas, infectious disease controls. — Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others must be developed and implemented. — Conduct awareness training for persons on site, safety induction to include animal hazards. — First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. — Due to isolated locations and distance from town, the ability to treat with anti-venom and extreme allergic reactions on site is critical to mitigate the impacts.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO VIOLENT RELEASE OF KINETIC OR POTENTIAL ENERGY

Exposure to construction moving equipment, heavy loads, elevated loads, and working at heights can cause injury or possibly fatality, as well as damage to equipment, delays in starting the project and financial losses. The construction impact on human and equipment safety - exposure to violent release of kinetic or potential energy is outlined in **Table 8-95**.

Table 8-95: Construction Impact on human and equipment safety - exposure to violent release of kinetic or potential energy

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to violent release of kinetic or potential energy									
Without Mitigation	5	1	5	5	4	64	High	(-)	Complex
With Mitigation	5	1	5	5	1	16	Low	(-)	
Mitigation and Management Measures	— The construction phase must be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993 specifically the Construction Regulations. — A SHEQ policy must be compiled and implemented. — Develop a detailed construction risk assessment prior to construction work. — A SHE procedure must be developed and implemented. — The necessary PPE to be worn must specified. — Ensure that relevant SHE appointees are in place. — Contractor's safety files must be in place and kept up to date. — SHE monitoring and reporting programs must be developed and implemented. — Standard construction site rules regarding traffic, reversing sirens, rigging controls, cordoning off excavations etc must be developed and adhered to. — Civil works and building structures must adhere to the National Building Regulations and building Standards Act 103 of 1977 SANS 10400 and other relevant codes.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to violent release of kinetic or potential energy									
	— Other constructions such as roads, sewers etc must also adhere to relevant SANS standards. — All normal procedures for working at heights, hot work permits, confined space entry, cordon off excavations etc must be developed before construction begins. — An emergency response plan must be compiled before construction begins.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO ELECTROMAGNETIC WAVES

Construction activities will include the use of electrical machines, generators etc. Hot dry area static generation is highly likely as well as lightning strikes. This may cause electrocution, ignition, burns, injury and death, as well as damage to electrical equipment. The construction impact on exposure to electromagnetic waves is outlined in **Table 8-96.**

Table 8-96: Construction Impact on human and equipment safety - exposure to electromagnetic waves

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety – exposure to electromagnetic waves									
Without Mitigation	5	2	5	5	3	51	Moderate	(-)	Complex
With Mitigation	5	2	5	5	1	17	Low	(-)	
Mitigation and Management Measures	— Implement standard maintenance of condition of electrical equipment and adhere to safe operating instructions. — Consideration should be given, where required, for remote isolation devices or switching measures on equipment, plant and machinery to ensure the ability to shut off power to systems in use on site. — If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. — Lightning strike rate in the study area is very high. Outside work must be stopped during thunderstorms. — Lighting conductors may be required for the final installation, to be confirmed during design phase.								

ENVIRONMENT - EMISSIONS TO AIR

Dust from construction and generally hot dry area may cause adverse impact on employee health. The construction impact of emissions to air is indicated in **Table 8-97**.

Table 8-97: Construction Impact on the environment - emissions to air

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – emissions to air									
Without Mitigation	3	2	1	1	4	28	Low	(-)	Easy
With Mitigation	2	2	1	1	2	12	Very Low	(-)	
Mitigation and Management Measures	— Implement dust control measures such as dampening of roads etc., particularly during dry or windy weather conditions, as per normal construction practices.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – emissions to air									
	— Construction workers to make use of necessary PPE (dust masks) when required.								

ENVIRONMENT - EMISSIONS TO WATER

The construction phase will make use of diesel for equipment, paints and solvents. There is also a possibility of Transformer oil spills and Sewage and kitchen/mess area wastewater generation. This could lead to environmental damage, particularly to the surface and underground water in the area if not managed correctly. The construction impact on environment due to emissions to water is outlined in **Table 8-98**.

Table 8-98: Construction impact on the environment - emissions to water

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment - emissions to water									
Without Mitigation	2	2	3	2	3	**27**	**Low**	(-)	Moderate
With Mitigation	2	2	3	2	2	**18**	**Low**	(-)	
Mitigation and Management Measures	— Normal construction site practices for preventing and containing fuels/paint/oil etc spills must be adhered to. — Appropriate bunding under any temporary tanks, curbing under truck offloading areas and sealed surfaces (e.g. concrete) under truck parking area is particularly important and must be provided for. — Spill clean-up procedures to be in place before commencing construction. — Sewage and any kitchen liquids must have containment and suitable treatment/disposal must be followed.								

ENVIRONMENT - EMISSIONS TO EARTH

The construction phase will generate solid waste. Improper management of this waste will result in environmental pollution. The construction impact on waste generation is outlined in **Table 8-99.**

Table 8-99: Construction impact on the environment - emissions to earth

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – waste generation									
Without Mitigation	2	2	3	3	3	**30**	**Low**	(-)	Easy
With Mitigation	1	2	3	3	2	**18**	**Low**	(-)	
Mitigation and Management Measures	— Solid waste, including packaging materials, must be collected and stored within designated areas on site and thereafter removed for disposal at a licensed waste disposal facility on a regular basis, as well as after regular maintenance. — Implement system for waste segregation (e.g. electronic equipment, chemicals) and management on the site.								

ENVIRONMENT – WASTE OF RESOURCES

The construction phase will require the usage of water and power, however if the usage is not controlled it will result in wastages. Furthermore, battery containers may be damaged during handling and/or transportation and may lead to construction delays. The construction impact of waste of resources e.g. water, power etc., is outlined in **Table 8-100.**

Table 8-100: Construction impact on the environment – waste of resources

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment - waste of resources e.g. water, power etc									
Without Mitigation	1	1	1	2	4	20	Low	(-)	Easy
With Mitigation	1	1	1	2	2	10	Very low	(-)	
Mitigation and Management Measures	— Water usage to be monitored on site during construction. — Handling protocols must be provided by the battery supplier. — Develop and implement a water management plan and spill containment plan.								

PUBLIC - AESTHETHICS

The construction site will likely have bright surfaces reflecting light and tall structures in a flat area. This is likely to cause irritation/annoyance to the public. The construction impact on public aesthetics is outlined in **Table 8-101.**

Table 8-101: Construction impact on public - aesthetics

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Public - Aesthetics									
Without Mitigation	3	2	3	4	4	48	Moderate	(-)	Moderate
With Mitigation	1	2	3	4	2	20	Low	(-)	
Mitigation and Management Measures	— Visual impact assessment to include BESS installation when design details become available. Confirm height limitations for VRFB BESS building (if utility scale).								

INVESTORS - FINANCIAL

The result of possible defective technology and extreme project delays could result in financial loss for investors. The construction impact on investors – financial is outlined in **Table 8-102.**

Table 8-102: Construction impact on Investors - Financial

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Investors - Financial									
Without Mitigation	5	1	3	4	3	39	Moderate	(-)	Moderate
With Mitigation	3	1	3	4	2	22	Low	(-)	
Mitigation and Management Measures	— Undertake adequate research during the planning and design phase to select the supplier and/contractor with the best technology that is internationally recognized and proven. — Project management to include deviation monitoring systems.								

EMPLOYEES AND INVESTORS – SECURITY

During the construction phase there is a potential for hi-jacking of valuable but hazardous loads while en-route to site. Theft of construction equipment and battery installation facilities is also a possibility on site. Civil unrest or violent strike by employees can also arise. This may result in theft, injury to burglars, damage to equipment possibly setting off thermal runaway. The construction impact of security is outlined in **Table 8-103.**

Table 8-103: Construction impact on employees and investors - security

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Employees and investors - Security									
Without Mitigation	4	1	3	2	4	40	Moderate	(-)	Complex
With Mitigation	4	1	3	2	4	27	Low	(-)	
Mitigation and Management Measures	— Fencing around the electrical infrastructure to adhere to SANS standard and Eskom Guidelines. — The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g. Skull and Cross Bones or other signs. — Night lighting to be provided both indoors and outdoors where necessary.								

EMERGENCIES

During the construction phase, there is the potential for fires, explosions, noxious smoke, large spills, traffic accidents and equipment/structural collapse. Inadequate emergency response to small event can lead to escalation. Consequences of these include injuries which can turn to fatalities, and small losses become extended down time. The construction impact of emergencies is outlined in **Table 8-104.**

Table 8-104: Construction impact on emergencies

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Emergencies									
Without Mitigation	4	2	3	4	3	39	Moderate	(-)	Complex
With Mitigation	4	2	3	4	2	26	Low	(-)	
Mitigation and Management Measures	— All safety measures listed in **Table 8-103** must be implemented. — Emergency procedures need to be practiced prior to commencement of construction.								

INVESTORS - LEGAL

The Battery sector is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. This could result in unknown hazards manifest due to using "cheaper supplier or less developed technology". The construction impact of battery technology on investors is outlined in **Table 8-105.**

Table 8-105: Construction impact on investors - legal matters

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Investors - legal									
Without Mitigation	3	1	3	3	4	40	Moderate	(-)	Moderate
With Mitigation	2	1	3	3	2	18	Low	(-)	
Mitigation and Management Measures	— Use only internationally reputable technology suppliers who comply with all known regulations/guideline at the time of purchasing. — Ensure only latest state of the art technology systems are used and not old technologies prone to fires/explosions etc..								

8.20.2 OPERATIONAL PHASE (INCLUDING COMMISSIONING)

SOLID STATE LITHIUM-ION BATTERY ENERGY STORAGE SYSTEMS

From the details of accidents that have happened both with BESS installations and chemical plants in general, it is clear that many potential problems manifest during the commissioning phase when units are first powered up to test functionality. This phase is critical and all controls, procedures, mitigation measures etc that would be in place for full operation should be in place before commissioning commences.

HUMAN HEALTH - CHRONIC EXPOSURE TO TOXIC CHEMICAL OR BIOLOGICAL AGENTS

Operation and maintenance materials such as spare parts, paints, solvents, welding fumes, transformers oils, lubricating oils and greases etc., may cause occupational illness. The operational impact on human health **-** chronic exposure to toxic chemical or biological agents is outlined in **Table 8-106**.

Table 8-106: Operational Impact on human health - chronic exposure to toxic chemical or biological agents

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Chronic exposure to toxic chemical or biological agents									
Without Mitigation	2	1	3	4	5	**50**	**Moderate**	(-)	Easy
With Mitigation	1	1	3	4	2	**18**	**Low**	(-)	

Mitigation and Management Measures	— The operation and maintenance phase must be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993.
	— A SHEQ policy must be in place prior to commissioning.
	— A detailed risk assessment of all normal operating and maintenance activities on site to be compiled, and form the basis of operating instructions, prior to commencing commissioning.
	— A SHE procedure must be in place prior to commissioning, and must include, but not limited to, PPE requirements, management of change, integrity monitoring.
	— Ensure that relevant SHE appointees are in place.
	— Training of staff on general hazards on site must be conducted.
	— All necessary health controls/ practices to be in place, e.g. ventilation of confined areas, occupational health monitoring if required and reporting programs must be in place and implemented.
	— An emergency response plan for full operation and maintenance phase to be in place prior to beginning commissioning and to include aspects such as:
	  — appointment of emergency controller,
	  — emergency isolation systems for electricity,
	  — emergency isolation and containment systems for electrolyte,
	  — provision of PPE for hazardous materials response,
	  — provision of emergency facilities for staff at the main office building,
	  — provision of first aid facilities,
	  — first responder contact numbers etc.									

Compromised battery compartment vapours accumulate in the containers, as well as release solids/liquids on surfaces. Maintenance of battery components can cause corrosive and mildly toxic liquid on surfaces. This can result in dermatitis, and skin /eye/lung irritation. The operational impact on human health **-** chronic exposure to toxic chemical or biological agents is outlined in **Table 8-107**.

Table 8-107: Operational Impact on human health - chronic exposure to toxic chemical or biological agents for SSL BESS

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - Chronic exposure to toxic chemical or biological agents									
Without Mitigation	3	1	3	5	4	48	Moderate	(-)	Complex
With Mitigation	1	1	3	5	2	20	Low	(-)	
Mitigation and Management Measures	— Maintenance procedures must be in place should equipment need to be opened, e.g. pumps drained and decontaminated prior to repair in workshop etc. — Ensure PPE for handling battery parts and other equipment on site is specified and worn when required. — Training of staff on general hazards on site must be conducted. — Install a leak detection system with local alarms if regulated occupational exposure limits are exceeded etc prior to entry for inspection of battery containers. — Provide signage or labels on all equipment. — Confined space entry procedures must be developed and adhered to when entering tanks and possibly battery containers. — There needs to be careful thought given to procedures to be adopted before entering into the BESS or a container under normal circumstances (confined space) but particularly after a BMS shut down where there may be flammable or toxic gases present, a fire etc. Any situation could await those entering. — Safety Data Sheets (SDSs) must be available on site. — Operating manuals must be provided including start-up, shut-down, steady state, monitoring requirements. — Maintenance manuals with make safe, decontamination and repair procedures must also be in place. — A maintenance schedule must be developed and implemented to include the required daily, weekly, monthly, annual etc maintenance. — Provided portable equipment for calibration and for testing/verification of defective equipment, e.g. volt/current meters, infrared camera.									

HUMAN HEALTH - EXPOSURE TO NOISE

Moving parts inside containers, buildings, pumps, compressors, cooling systems etc., can cause adverse impact on hearing of workers, or may be a nuisance factor at near -by residences or other activities. The operational impact on human health - exposure to noise is outlined in **Table 8-108**.

Table 8-108: Operational Impact on human health - exposure to noise

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to noise									
Without Mitigation	2	1	5	5	4	52	Moderate	(-)	Easy
With Mitigation	2	1	5	5	2	26	Low	(-)	
Mitigation and Management Measures	— Design the system to ensure continuous noise does not exceed 85dB within the facilities or at any other location on site or 61 dB at the site boundary, e.g. emergency generator, air compressor etc. — Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.									

HUMAN HEALTH - EXPOSURE TO TEMPERATURE EXTREMES AND/OR HUMIDITY

Workers may be exposed to extreme temperatures and/or humidity such as heat during the day and cold weather in winter. Batteries can also generate heat within enclosed buildings / containers, and night work requires lighting which can generate heat. This could result in heat stroke or hypothermia. The operational impact on human health - exposure to temperature extremes and/or humidity is outlined in **Table 8-109**.

Table 8-109: Operational Impact on human health - exposure to temperature extremes and/or humidity

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health -exposure to temperature extremes and/or humidity									
Without Mitigation	4	2	3	1	2	**20**	**Low**	(-)	Easy
With Mitigation	3	2	3	1	1	**9**	**Very Low**	(-)	
Mitigation and Management Measures	— Building and container facilities to comply with Occupational Health and Safety Act 85 of 1993 specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. — Ensure containers are temperature controlled as required to remain within the optimal battery operating temperature range. — Lighting to be provided inside any buildings, inside the containers, possibly linked to the door opening and outdoors where necessary. — Adequate potable water to be provided during all phases of the project. — Suitable lighting to be provided including emergency lighting for safe building exit in the event of power failure. — PPE for operations and maintenance staff to be suitable for the weather conditions.								

HUMAN HEALTH - EXPOSURE TO PSYCHOLOGICAL STRESS

Isolated workstation and monotonous repetitive work can cause low performance, and system productivity suffers. The operational impact on human health - exposure to psychological stress is outlined in **Table 8-110**.

Table 8-110: Operational Impact on human health - exposure to psychological stress

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to psychological stress									
Without Mitigation	2	3	3	2	2	**20**	**Low**	(-)	Easy
With Mitigation	1	3	3	2	1	**9**	**Very Low**	(-)	
Mitigation and Management Measures	— Implement staff rotation to other activities within the site where necessary. — Performance monitoring of inspections / maintenance tasks in particular must be undertaken.								

HUMAN HEALTH - CHRONIC EXPOSURE TO ERGONOMIC STRESS

Lifting heavy equipment and movement at awkward angles during maintenance, stretching to reach high level and bending to low level, including working at heights if equipment is located on top of roofs or elevated electrical equipment (e.g. pylons), can result in back and other injuries. The operational impact on human health - exposure to ergonomic stress is outlined in **Table 8-111**.

Table 8-111: Operational Impact on human health - exposure to ergonomic stress

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to ergonomic stress									
Without Mitigation	5	1	3	2	3	33	Moderate	(-)	Easy
With Mitigation	4	1	3	2	2	20	Low	(-)	
Mitigation and Management Measures	— Training in lifting techniques must be provided. — Working at heights training must be provided. — If equipment is at height, ensure suitable safe (electrically and physically) ladders / harnesses etc. are available. — A working at height procedure needs to be in place.								

HUMAN AND EQUIPMENT SAFETY – EXPOSURE TO FIRE RADIATION

During the operation of the facility there are chances of involvements in an external fire e.g. veld fire, maintenance vehicle fire, electrical systems fire. Manufacturing defects or damage to batteries leading to shorting and heating can also be an issue along with high humidity condensation of water or ingress of water or flooding leading to shorting. Dust accumulation on electrical parts leading to overheating. Excessive electrical loads and/or surges. Operator abuse, Battery management System (BMS) failure or software failure. Incorrect extinguishing mediums can escalate the fire. Consequences include contaminated run off. Radiation burns unlikely to be severe as no highly flammable materials on site. Damaged equipment. Fire spreads to other units or offsite if grass/vegetation not controlled. The operational impact on human and equipment safety - exposure to fire radiation is outlined in **Table 8-112**.

Table 8-112: Operational Impact on human and equipment safety - exposure to fire radiation

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Human and Equipment Safety - exposure to fire radiation									
Without Mitigation	5	1	5	5	4	64	High	(-)	Complex
With Mitigation	5	1	5	5	1	16	Low	(-)	
Mitigation and Management Measures	— Grass cutting and fire breaks must be maintained around the BESS installations to prevent veld fires. No combustible materials to be stored in or near the batteries or electrical infrastructure. Ensure separation of site diesel tank, transformers from BESS and vice versa. — The Facility to comply with prescribed design standards such as the BESS design codes from the USA and standards of practice that (e.g. UL9540, NFPA 855 and DNV GL RP 43). — A detailed Failure Modes and Effects Analysis (FMEA) / (Hazard and Operability Analysis (HAZOP) / Bowtie methodology must be developed during design at the component level and system levels. — Conduct safety integrity level rating of equipment (failure probably) with suitable redundancy if required. — Conduct Site Acceptance Testing as part of commissioning of each unit and the overall system. — Abuse tests to be conducted by supplier. — Ensure an effective Battery Management System (BMS) is included in the design. BMS should be checking individual cell voltage as well as stack, module, container, system voltages/current etc. BMS tripping the cell and possibly the stack/ building unit or module/rack/container, if variations in voltage. — Diagnostics must be easily accessible. Diagnostics are able to distinguish cell from stack or cell from module faults. Protective								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Human and Equipment Safety - exposure to fire radiation									

systems are only as good as their reliability and functionality testing is important, e.g. testing that all battery trips actually work.

- Fire resistant barrier between the batteries and the PCS side if in the same container, or separate containers must form part of the design.
- Suitable ingress protection level to be provided for electrical equipment, e.g. IP55 - 66. If air cooling into container, suitable dust filters to be provided.
- Install smoke detectors linked to BMS & alerts in control room.
- Effects of battery aging to be considered. Solid state battery life starts to be impacted above 40 deg C and significant impacts above 50 deg C with thermal run away starting at 65-70 deg C. BMS trips system at 50 deg C. Temperature monitoring to be in place. Regular infrared scanning. Data needs to be stored for trend analysis.
- An Emergency plan, from transport and construction phase, must be extended to operational phase. The plan must include the hazards of the electrically live system. This Plan must include procedures to address solid state container fires - extinguishing, ventilating, entering as appropriate or not.
- PPE for container firefighting must include fire retardant, chemically resistant, nitrile gloves, antistatic acid resistant boots, fill face shields, BA sets.
- A planned fire response to prevent escalation to an explosion or an environmental event must be developed.
- Suitable supply of fire extinguishing medium and cooling medium must be provided. Consider fire water for cooling adjacent equipment for BESS units. Fogging nozzles can be used to direct smoke.
- Ensure procedures in place for clean up after event Lingering HF and other toxic residues in the soil and on adjacent structures.
- Procedures to be in place for Infrared (IR) scanning (or other suitable method) to determine if batteries are still smouldering / are sufficient cooled to handle as batteries may still be active some weeks after an event.
- Smoke or gas detector systems that are not part of the original battery container package, need to be linked to the main control panel for the entire system so that issues can be detected and responded to rapidly.

A Power Conversion System's (PCS – DC to AC) cooling failure can result in electrical fire. The consequence of this is that a fire can start in PCS or another section or room and spread to the battery area. The operational impact on human and equipment safety - exposure to fire radiation is outlined in **Table 8-113**.

Table 8-113: Operational Impact on human and equipment safety - exposure to fire radiation for SSL BESS

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to fire radiation									
Without Mitigation	5	2	5	5	4	68	High	(-)	Moderate
With Mitigation	5	2	5	5	1	17	Low	(-)	

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to fire radiation									
Mitigation and Management Measures	— Consider modern lithium container design - put the PCS in another part of the container with a fire rated wall separating it from the battery. Alternately the PCS is another container altogether.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO EXPLOSION OVER PRESSURES

Transformer shorting / overheating / explosion or flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces can cause static. Lithium Cobalt Oxide generates O2 during decomposition which can cause escalation. This can result in potential fatalities amongst first responders, or damage to container or other nearby items, e.g. other container. The operational impact on human and equipment safety - exposure to explosion over pressures is outlined in **Table 8-114**.

Table 8-114: Operational Impact on human and equipment safety - exposure to explosion over pressures

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to explosion over pressures[16]									
Without Mitigation	5	1	5	5	2	32	Moderate	(-)	Moderate
With Mitigation	5	1	5	5	1	16	Low	(-)	
Mitigation and Management Measures	— Electrical equipment will be specified to suit application. — An Emergency response plan must be in place as referred to above and employee training on the plan must be provided. — Undertake a hazardous area classification of the inside of the container to confirm the rating of electrical equipment. Might be zone 2 due to possible leaks of electrolyte or generation of flammable gases under thermal run away. — Suitable training of selected emergency responders who may be called out to the facility must be undertaken.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO ACUTE TOXIC CHEMICAL AND BIOLOGICAL AGENTS

Human pathogens and diseases, sewage, food waste as well as snakes, insects, wild and domesticated animals and harmful plants can cause illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc. The operational impact on human and equipment safety - exposure to acute toxic chemical and biological agents is outlined in **Table 8-115**.

Table 8-115: Operational Impact on human and equipment safety - exposure to acute toxic chemical and biological agents

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents									
Without Mitigation	4	1	3	2	3	30	Low	(-)	Moderate
With Mitigation	3	1	2	2	2	16	Low	(-)	
Mitigation and Management Measures	— All necessary good hygiene practices to be in place, e.g. provision of toilets, eating areas, infectious disease controls.								

[16] Refer to Appendix A of the SHE Risk Assessment (**Appendix H-12**) for an initial approximation of worst-case possible explosion impact zones

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents									
	— Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others must be developed and implemented. — Conduct awareness training for persons on site, safety induction to include animal hazards. — First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. — Due to isolated locations and distance from town, the ability to treat with anti-venom and extreme allergic reactions on site is critical to mitigate the impacts.								

Damaged battery components, leakage of electrolyte, or if the components are completely broken exposing hazardous chemicals, and thermal runaway and hazardous fumes are released, this can cause mild skin irritation from exposure to small leaks to serious corrosive burns for large exposure. The operational impact on human and equipment safety - exposure to acute toxic chemical and biological agents is outlined in **Table 8-116**.

Table 8-116: Operational Impact on human and equipment safety - exposure to acute toxic chemical and biological agents for SSL BESS

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents[17]									
Without Mitigation	4	3	3	5	3	**45**	**Moderate**	(-)	Moderate
With Mitigation	3	3	3	5	2	**28**	**Low**	(-)	
Mitigation and Management Measures	— Acid resistant PPE (e.g. overalls, gloves, eyeglasses) to be specified for all operations in electrolyte areas. — PPE to be increased (e.g. full-face shield, aprons, chemical suits) for operations that involve opening equipment and potential exposure, e.g. sampling, maintenance. — All operators/maintenance staff to be trained in the hazards of chemicals on site. — Refer to fire above as all the protective measures apply to prevent toxic smoke. — Refer to fire above as all the measures apply to mitigate toxic smoke. — Ensure a 24/7 helpline response. — Adhere to standard dangerous goods requirements for Hazmat labels. — All operators/maintenance staff to be trained in the hazards.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO VIOLENT RELEASE OF KINETIC OR POTENTIAL ENERGY

Moving equipment, pumps, heavy equipment at elevation, nip points, working at heights, traffic accidents and earthquake/tremors can cause injury or possibly fatality in unlikely worst case, damage to equipment, spills, and environment pollution. The operational impact on human and equipment safety - exposure to violent release of kinetic or potential energy is outlined in **Table 8-117**.

[17] Refer to Appendix A of the SHE Risk Assessment (Appendix H-12) for an initial approximation of worst-case possible noxious smoke impact zones

Table 8-117: Operational Impact on human and equipment safety - exposure to violent release of kinetic or potential energy

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to violent release of kinetic or potential energy									
Without Mitigation	5	1	5	5	3	48	Moderate	(-)	Moderate
With Mitigation	5	1	5	5	1	16	Low	(-)	
Mitigation and Management Measures	— Maintenance equipment to be serviced and personnel suitably trained in the use thereof. — Traffic signs, rules etc to be in place on site. — All normal working at heights, hot work permits, confined space entry, cordon off unsafe areas/works etc procedures to be in place. — An emergency response plan must be in place. — Civil design to take seismic activity into account.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO ELECTROMAGNETIC WAVES

The operational phase will include the use of electrical machines, generators etc. In hot dry areas, static generation is highly likely, as well as lightning strike. This may cause electrocution, ignition, burns, injury and death, as well as damage to electrical equipment. The operational impact on human and equipment safety - exposure to electromagnetic waves is outlined in **Table 8-118.**

Table 8-118: Operational Impact on human and equipment safety - exposure to electromagnetic waves

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety – exposure to electromagnetic waves									
Without Mitigation	5	2	5	5	3	51	Moderate	(-)	Complex
With Mitigation	5	2	5	5	1	17	Low	(-)	
Mitigation and Management Measures	— Adhere to codes and guidelines for electrical insulation. — Provide suitable PPE. — Low voltage equipment (e.g. batteries) to be separated from high voltage (e.g. transmission to grid). — Personnel to be trained in line with IEE 1657 – 2018 (Recommended Practice for Personnel Qualifications for Installation and Maintenance of Stationary Batteries). — Adhere to Eskom Operating Regulations for high voltage systems including access control, permit to work, safe work procedures, live work, abnormal and emergency situations, keeping records. — Software also need to be kept as update to date as reasonably practicable. — Consider suitably located Emergency stop buttons for the facility and the other equipment on site. — PPE to consider static accumulation for entering the facility, and particularly the battery containers especially after a high temperature shut down where there could possibly be flammable materials. — The procedures for responding to alarm and auto shut down on containers, needs to consider that there may be a dangerous environment inside and how to protect personnel who may enter to respond. — All outside work must be stopped during thunder storms.									

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety – exposure to electromagnetic waves									
	— Lighting conductors may be required for the installation, to be confirmed during design								

ENVIRONMENT - EMISSIONS TO AIR

Refrigerant may be an asphyxiant if accidentally released indoors it can accumulate and displace oxygen. It is however noted that this is not expected on a normal basis. The operational impact on environment - emissions to air is outlined in **Table 8-119**.

Table 8-119: Operational Impact on environment - emissions to air

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – emissions to air									
Without Mitigation	3	1	1	1	3	18	Low	(-)	Easy
With Mitigation	3	1	1	1	1	6	Very Low	(-)	
Mitigation and Management Measures	— Containers could be treated as entering a confined space and similar procedures entering confined spaces could be in place, e.g. do not enter alone, gas testing prior to entering, ensure adequate ventilation. Particularly after any warning alarms have gone off, but possibly even normally.								

ENVIRONMENT - EMISSIONS TO WATER

Waste will be generated during the operation of the facility. This may include cooling water blow-down, laboratory waste (if included in the design), maintenance waste, e.g. oils, spills from batteries, coolant system, diesel trucks, transformers, oil drips from parked vehicles, fire water runoff control, kitchen waste and sewage, refrigerant release. These can cause pollution if not contained and excessive disposal costs if emissions are not limited. The operational impact on environment - emissions to water is outlined in **Table 8-120**.

Table 8-120: Operational Impact on environment - emissions to water

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment - emissions to water									
Without Mitigation	2	2	3	2	3	27	Low	(-)	Moderate
With Mitigation	2	2	3	2	2	18	Low	(-)	
Mitigation and Management Measures	— Implement bunding under any outdoors tanks, curbing under truck offloading areas and sealed surfaces (e.g. concrete) under truck parking area. — Provide containment and suitable treatment/disposal for sewage and any kitchen liquids. — Procedures for dealing with damaged/leaking equipment as well as clean-up of spills to be in place and implemented. — Conduct normal site practices for preventing and containing diesel/paint etc spills. — Waste management plan to be in place and provide measures for, but not limited to, liquid waste treatment or suitable removal and disposal. — Spill clean-up procedures to be in place before bringing container on site, including spill kits – non-combustible materials, hazmat disposal. — Undertake reporting of reportable quantities in line with NEMA.								

ENVIRONMENT - EMISSIONS TO EARTH

The operation phase will generate solid waste. The disposal of solid-state batteries can cause environmental damage. The operational impact on environment - emissions to earth is outlined in **Table 8-121**.

Table 8-121: Operational Impact on environment - emissions to earth

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – waste generation									
Without Mitigation	2	2	3	3	3	**30**	**Low**	(-)	Easy
With Mitigation	2	2	3	3	1	**10**	**Very Low**	(-)	
Mitigation and Management Measures	— Implement system for waste segregation (e.g. electronic equipment, chemicals) and management on the site.								

ENVIRONMENT – WASTE OF RESOURCES

The operation phase will require the usage of water and power, however if the usage is not controlled it will result in wastages. Operations will include the disposal of batteries or components, or disposal of containers. This may result in delays, excessive costs and disposal of large volumes of hazardous waste. The operational impact on environment - waste of resources e.g. water, power etc is outlined in **Table 8-122**.

Table 8-122: Operational Impact on environment - waste of resources e.g. water, power

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment - waste of resources e.g. water, power etc									
Without Mitigation	1	1	1	2	4	**20**	**Low**	(-)	Easy
With Mitigation	1	1	1	2	2	**10**	**Very Low**	(-)	
Mitigation and Management Measures	— Water usage to be monitored on site during construction. — Handling protocols must be provided by the battery supplier. — Develop and implement a water management plan and spill containment plan. — Investigate end of Life plan for solid state batteries including options for reuse / recovery / reconditioning. — Similarly, for decommissioned containers consider reuse / recovery / repurpose.								

PUBLIC - AESTHETHICS

Bright surfaces reflecting light and tall structures in a flat area may cause irritation. The operational impact on public - aesthetics is outlined in **Table 8-123**.

Table 8-123: Operational Impact on public

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Public - Aesthetics									
Without Mitigation	1	2	4	4	2	**22**	**Low**	(-)	Easy
With Mitigation	1	2	4	4	2	**22**	**Low**	(-)	
Mitigation and Management Measures	— Refer to Visual Impact Assessment which is to include the BESS installation once design details are available.								

INVESTORS - FINANCIAL

The result of possible defective technology and extreme project delays can cause financial loss. The operational impact on investors - financial is outlined in **Table 8-124**.

Table 8-124: Operational Impact on investors – financial

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Investors - Financial									
Without Mitigation	5	1	3	4	3	**39**	**Moderate**	(-)	Easy
With Mitigation	3	1	3	4	2	**22**	**Low**	(-)	
Mitigation and Management Measures	— Undertake adequate research during the planning and design phase to select the supplier and/contractor with the best technology that is internationally recognized and proven. — Project management with deviation monitoring.								

EMPLOYEES AND INVESTORS – SECURITY

On route to the operational site there is a risk of potential hi-jacking of valuable but hazardous loads. On site there is a risk of theft of operational equipment and battery installation facilities. There may also be civil unrest or violent strike by employees. This may result in theft, injury to burglars, damage to equipment possibly setting off thermal runaway. The operational impact on employees and investors – security is outlined in **Table 8-125**.

Table 8-125: Operational Impact on employees and investors – security

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Employees and investors - Security									
Without Mitigation	3	1	3	2	4	**36**	**Moderate**	(-)	Moderate
With Mitigation	3	1	3	2	2	**18**	**Low**	(-)	
Mitigation and Management Measures	— Fencing around electrical infrastructure to adhere to SANS standard and Eskom Guidelines. — Consider motion detection lights and CCTV. — The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g. Skull and Cross Bones or other signs. — Night lighting to be provided both indoors and outdoors where necessary.								

Cyber security attacks aimed at the National Electricity Grid may result in the ransom of the National Electricity Grid. The operational impact on employees and investors – security is indicated in **Table 8-126**.

Table 8-126: Operational Impact on employees and investors – security

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Employees and investors - Security									
Without Mitigation	4	4	3	1	4	**48**	**Moderate**	(-)	Complex
With Mitigation	4	4	3	1	2	**24**	**Low**	(-)	
Mitigation and Management Measures	— Cyber security needs monitoring. — Remote access to system needs to be negotiated and controlled. — Install password controls, levels of authority etc. Protection of the National Electricity Grid from Cyber-attacks accessing through the BESS to be implemented. — Cyber emergency procedures should be in place prior to commissioning.								

EMERGENCIES

During the operational phase, there is the potential for fires, explosions, noxious smoke, large spills, traffic accidents and equipment/structural collapse. Inadequate emergency response to small event can lead to escalation. Consequences of these include injuries which can turn to fatalities, and small losses become extended down time. The operational impact on emergencies is outlined in **Table 8-127**.

Table 8-127: Operational Impact on emergencies

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Emergencies									
Without Mitigation	4	2	3	4	3	39	Moderate	(-)	Complex
With Mitigation	4	2	3	4	2	26	Low	(-)	
Mitigation and Management Measures	— All safety measures listed above must be implemented. — Emergency procedures need to be practiced prior to commencement of operations. — Ensure escape door open outwards, and doors hooked open when persons are inside, i.e. they should not be automatically self-closing. — There must be more than one exit from buildings. — Storage of spare batteries (e.g. in stores on site or elsewhere) also needs to consider possible thermal run away.								

INVESTORS LEGAL

The battery industry is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. This may result in unknown hazards that may manifest due to using "cheaper supplier or less developed technology". The operational impact on investors – legal is indicated in **Table 8-128**.

Table 8-128: Operational Impact on investors – legal

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Investors - legal									
Without Mitigation	3	1	3	3	4	40	Moderate	(-)	Moderate
With Mitigation	3	1	3	3	2	20	Low	(-)	
Mitigation and Management Measures	— Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing. — Ensure only latest state of the art battery system are used and not old technologies prone to fires/explosions etc..								

VRF BESS

From the details of accidents that have happened both with BESS installations and chemical plants in general, it is clear that many potential problems manifest during the commissioning phase when units are first powered up to test functionality. This phase is critical and all controls, procedures, mitigation measures etc that would be in place for full operation should be in place before commissioning commences.

HUMAN HEALTH - CHRONIC EXPOSURE TO TOXIC CHEMICAL OR BIOLOGICAL AGENTS

Operation and maintenance materials such as spare parts, paints, solvents, welding fumes, transformers oils, lubricating oils and greases etc., can result in occupational illness. The operational impact on human health - chronic exposure to toxic chemical or biological agents is indicated in **Table 8-129**.

Table 8-129: Operational Impact on human health - chronic exposure to toxic chemical or biological agents

Potential Impact Human health - Chronic exposure to toxic chemical or biological agents	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	2	1	3	4	5	50	Moderate	(-)	Easy
With Mitigation	1	1	3	4	2	18	Low	(-)	

Mitigation and Management Measures	— The operation and maintenance phase to be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993.
	— A SHEQ policy to be in place.
	— A detailed risk assessment of all normal operating and maintenance activities on site to be compiled, and form the basis of operating instructions, prior to commencing commissioning.
	— A SHE procedure to be in place, and include but not limited to, PPE specifications, management of change, integrity monitoring.
	— Ensure that relevant SHE appointees are in place.
	— Undertake training of staff on general hazards on site.
	— All necessary health controls/ practices to be in place, e.g. ventilation of confined areas, occupational health monitoring if required and reporting programs in place.
	— Emergency response plan for full operation and maintenance phase to be in place prior to beginning commissioning and to include aspects such as:
	  — appointment of emergency controller,
	  — emergency isolation systems for electricity,
	  — emergency isolation and containment systems for electrolyte,
	  — provision of PPE for hazardous materials response,
	  — provision of emergency facilities for staff at the main office building,
	  — provision of first aid facilities,
	  — first responder contact numbers etc.									

Compromised battery compartment vapours accumulate in the containers, as well as release solids/liquids on surfaces. Maintenance of battery components can cause corrosive and mildly toxic liquid on surfaces. This can result in dermatitis, and skin /eye/lung irritation. The operational impact on human health - chronic exposure to toxic chemical or biological agents is outlined in **Table 8-130**.

Table 8-130: Operational Impact on human health - chronic exposure to toxic chemical or biological agents

Potential Impact Human Health - Chronic exposure to toxic chemical or biological agents	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	2	1	3	5	4	44	Moderate	(-)	Complex
With Mitigation	1	1	3	5	2	20	Low	(-)	
Mitigation and Management Measures	— Maintenance procedures to be in place should equipment need to be opened, e.g. pumps drained and decontaminated prior to repair in workshop etc. — Ensure PPE for handling battery parts and other equipment on site is specified and worn when required.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - Chronic exposure to toxic chemical or biological agents									
	— Training of staff on general hazards on site must be conducted. — Provide signage or labels on all equipment. — Confined space entry procedures if entering tanks and possibly battery containers. — Safety Data Sheets (SDSs) to be available on site. — Operating manuals to be provided including start-up, shut-down, steady state, monitoring requirements. — Maintenance manuals with make safe, decontamination and repair procedures to be in place. — A maintenance schedule must be developed and implemented to include the required daily, weekly, monthly, annual etc maintenance. — Provided portable equipment for calibration and for testing/verification of defective equipment, e.g. volt/current meters, infrared camera								

HUMAN HEALTH - EXPOSURE TO NOISE

Moving parts inside containers, buildings, pumps, compressors, cooling systems etc. can cause adverse impact on hearing of workers, or may be a nuisance factor at near -by residences or other activities. The operational impact on human health - exposure to noise is outlined in **Table 8-131**.

Table 8-131: Operational Impact on human health - exposure to noise

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to noise									
Without Mitigation	2	1	5	5	4	**52**	**Moderate**	(-)	Easy
With Mitigation	2	1	5	5	2	**26**	**Low**	(-)	
Mitigation and Management Measures	— Design the system to ensure continuous noise does not exceed 85dB within the facilities or at any other location on site or 61 dB at the site boundary, e.g. emergency generator, air compressor etc. — Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.								

HUMAN HEALTH - EXPOSURE TO TEMPERATURE EXTREMES AND/OR HUMIDITY

Workers may be exposed to extreme temperatures and/or humidity such as heat during the day and cold weather in winter. Batteries can also generate heat within enclosed buildings / containers, and night work requires lighting which can generate heat. This could result in heat stroke or hypothermia. The operational impact on human health - exposure to temperature extremes and/or humidity is indicated in **Table 8-132**.

Table 8-132: Operational Impact on human health - exposure to temperature extremes and/or humidity

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health -exposure to temperature extremes and/or humidity									
Without Mitigation	4	2	3	1	2	**20**	**Low**	(-)	Easy
With Mitigation	3	2	3	1	1	**9**	**Very Low**	(-)	
Mitigation and Management Measures	— Building and container facilities to comply with Occupational Health and Safety Act 85 of 1993 specifically the thermal,								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health -exposure to temperature extremes and/or humidity									
	humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces. — Suitable lighting to be provided including emergency lighting for safe building exit in the event of power failure. — Adequate potable water to be provided during all phases of the project. — PPE for operations and maintenance staff to be suitable for the weather conditions.								

HUMAN HEALTH - EXPOSURE TO PSYCHOLOGICAL STRESS

Isolated workstation and monotonous repetitive work can cause low performance, and system productivity suffers. The operational impact on human health **-** exposure to psychological stress is outlined in **Table 8-133**.

Table 8-133: Operational Impact on human health - exposure to psychological stress

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to psychological stress									
Without Mitigation	2	3	3	2	2	20	Low	(-)	Easy
With Mitigation	1	3	3	2	1	9	Very Low	(-)	
Mitigation and Management Measures	— Implement staff rotation to other activities within the site where necessary. — Performance monitoring of inspections / maintenance tasks in particular must be undertaken.								

HUMAN HEALTH - CHRONIC EXPOSURE TO ERGONOMIC STRESS

Lifting heavy equipment and movement at awkward angles during maintenance, stretching to reach high level and bending to low level, including working at heights if equipment is located on top of roofs or elevated electrical equipment (e.g. pylons), can result in back and other injuries. The operational impact on human health **-** exposure to ergonomic stress is outlined in **Table 8-134**.

Table 8-134: Operational Impact on human health - exposure to ergonomic stress

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to ergonomic stress									
Without Mitigation	5	1	3	2	3	33	Moderate	(-)	Easy
With Mitigation	4	1	3	2	2	20	Low	(-)	
Mitigation and Management Measures	— Training in lifting techniques must be provided. — Working at heights training must be provided. — If equipment is at height, ensure suitable safe (electrically and physically) ladders / harnesses etc. are available. — A working at height procedure needs to be in place.								

HUMAN AND EQUIPMENT SAFETY – EXPOSURE TO FIRE RADIATION

During the operation of the facility there are chances of involvements in an external fire e.g. veld fire, maintenance vehicle fire, electrical systems fire. Manufacturing defects or damage to batteries leading to shorting and heating can also be an issue along with high humidity condensation of water or ingress of water or flooding leading to shorting. Dust accumulation on electrical parts leading to overheating. Excessive electrical loads and/or surges. Operator abuse, BMS failure or software failure. Incorrect extinguishing mediums can escalate the fire.

Consequences include contaminated run off. Radiation burns unlikely to be severe as no highly flammable materials on site. Damaged equipment. Fire spreads to other units or offsite if grass/vegetation not controlled. The operational impact on human and equipment safety - exposure to fire radiation is outlined in **Table 8-135**.

Table 8-135: Operational Impact on human and equipment safety - exposure to fire radiation

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to fire radiation									
Without Mitigation	5	1	5	5	4	**48**	**Moderate**	(-)	Complex
With Mitigation	5	1	5	5	1	**16**	**Low**	(-)	
Mitigation and Management Measures	— Grass cutting and fire breaks around the BESS installations. No combustible materials to be stored in or near the batteries or electrical infrastructure, e.g. separation of site diesel tank. Fire resistant barrier between the batteries and the PCS side if in the same container. — The Facility to comply with prescribed design standards such as the BESS design codes from the USA and standards of practice that (e.g. UL9540, NFPA 855 and DNV GL RP 43). — A detailed Failure Modes and Effects Analysis (FMEA) / (Hazard and Operability Analysis (HAZOP) / Bowtie methodology must be developed during design at the component level and system levels. — Conduct safety integrity level rating of equipment (failure probably) with suitable redundancy if required. — Conduct Site Acceptance Testing as part of commissioning of each unit and the overall system. — Abuse tests to be conducted by supplier. — Ensure an effective Battery Management System (BMS) is included in the design. BMS should be checking individual cell voltage as well as stack, module, container, system voltages/current etc. BMS tripping the cell and possibly the stack/ building unit or module/rack/container, if variations in voltage. — Diagnostics must be easily accessible. Diagnostics are able to distinguish cell from stack or cell from module faults. — Fire resistant barrier between the batteries and the PCS side if in the same container, or separate containers must form part of the design. — As per SANS Standards,suitable ingress protection level to be provided for electrical equipment, e.g. IP55 - 66. If air cooling into container, suitable dust filters to be provided if needed. — Install smoke detectors linked to BMS & alerts in control room. — Effects of battery aging to be considered. Temperature monitoring to be in place. Regular infrared scanning. Data needs to be stored for trend analysis. — An Emergency plan, from transport and construction phase, must be extended to operational phase. The plan must include the hazards of the electrically live system. This Plan must include procedures to address solid state container fires - extinguishing, ventilating, entering as appropriate or not. — PPE for container firefighting must include fire retardant, chemically resistant, nitrile gloves, antistatic acid resistant boots, fill face shields, BA sets. — A planned fire response to prevent escalation to an explosion or an environmental event must be developed.									

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to fire radiation									
	— Suitable supply of fire extinguishing medium and cooling medium must be provided. Fogging nozzles can be used to direct smoke. — Ensure procedures in place to clean up after event Lingering toxic residues in the soil and on adjacent structures.								

A Power Conversion System's (PCS – DC to AC) cooling failure can result in electrical fire. The consequence of this is that a fire can start in PCS or another section or room and spread to the battery area. The operational impact on human and equipment safety - exposure to fire radiation is outlined in **Table 8-136**.

Table 8-136: Operational Impact on human and equipment safety - exposure to fire radiation

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to fire radiation									
Without Mitigation	5	2	5	5	3	**51**	**Moderate**	(-)	Moderate
With Mitigation	5	2	5	5	1	**17**	**Low**	(-)	
Mitigation and Management Measures	— Consider separating the VRF building systems PCS from the batteries and other equipment and place it in another area.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO EXPLOSION OVER PRESSURES

Transformer shorting / overheating / explosion can result in potential fatalities amongst first responders; or damage to nearby equipment. The operational impact on human and equipment safety - exposure to explosion over pressures is indicated in **Table 8-137**.

Table 8-137: Operational Impact on human and equipment safety - exposure to explosion over pressures

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to explosion over pressures									
Without Mitigation	5	1	5	5	2	**32**	**Moderate**	(-)	Moderate
With Mitigation	5	1	5	5	1	**16**	**Low**	(-)	
Mitigation and Management Measures	— Electrical equipment to be specified to suit application. — An emergency response plan must be in place as referred to above and employee training on the plan must be provided.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO ACUTE TOXIC CHEMICAL AND BIOLOGICAL AGENTS

Human pathogens and diseases, sewage, food waste as well as snakes, insects, wild and domesticated animals and harmful plants can cause illness and at worst without mitigation, possibly extending to fatalities. Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc. The operational impact on human and equipment safety - exposure to acute toxic chemical and biological agents is outlined in **Table 8-138**.

Table 8-138: Operational Impact on human and equipment safety - exposure to acute toxic chemical and biological agents

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents									
Without Mitigation	4	1	3	2	3	**30**	**Low**	(-)	Moderate

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents									
With Mitigation	3	1	2	2	2	16	Low	(-)	
Mitigation and Management Measures	— All necessary good hygiene practices to be in place, e.g. provision of toilets, eating areas, infectious disease controls. — Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others must be developed and implemented. — Conduct awareness training for persons on site, safety induction to include animal hazards. — First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc. — Due to isolated locations and distance from town, the ability to treat with anti-venom and extreme allergic reactions on site is critical to mitigate the impacts.								

Damaged battery components, leakage of electrolyte, or if the components are completely broken exposing hazardous chemicals, and thermal runaway and hazardous fumes are released, this can cause mild skin irritation from exposure to small leaks to serious corrosive burns for large exposure. The operational impact on human and equipment safety - exposure to acute toxic chemical and biological agents is outlined in **Table 8-139**.

Table 8-139: Operational Impact on human and equipment safety - exposure to acute toxic chemical and biological agents for VRF BESS

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents									
Without Mitigation	4	3	3	5	3	45	Moderate	(-)	Moderate
With Mitigation	3	3	3	5	2	28	Low	(-)	
Mitigation and Management Measures	— Corrosion resistant PPE (e.g. overalls, gloves, eyeglasses) to be specified for all operations in electrolyte areas. — PPE to be increased (e.g. full-face shield, aprons, chemical suits) for operations that involve opening equipment and potential exposure, e.g. sampling, maintenance. — All operators/maintenance staff trained in the hazards of chemicals on site. — Ensure a 24/7 helpline response. — Adhere to standard dangerous goods requirements for Hazmat labels. — All operators/maintenance staff to be trained in the hazards.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO VIOLENT RELEASE OF KINETIC OR POTENTIAL ENERGY

Moving equipment, pumps, heavy equipment at elevation, nip points, working at heights, traffic accidents and earthquake/tremors can cause injury or possibly fatality in unlikely worst case, damage to equipment, spills, and environment pollution. The operational impact on human and equipment safety - exposure to violent release of kinetic or potential energy is outlined in **Table 8-140**.

Table 8-140: Operational Impact on human and equipment safety - exposure to violent release of kinetic or potential energy

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to violent release of kinetic or potential energy									
Without Mitigation	5	1	5	5	3	**48**	**Moderate**	(-)	Moderate
With Mitigation	5	1	5	5	1	**16**	**Low**	(-)	
Mitigation and Management Measures	— Maintenance equipment to be serviced and personnel suitably trained in the use thereof. — Traffic signs, rules etc to be in place on site. — All normal working at heights, hot work permits, confined space entry, cordon off unsafe areas/works etc procedures to be in place. — An emergency response plan must be in place. — Civil design to take seismic activity into account.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO ELECTROMAGNETIC WAVES

The operational phase will include the use of electrical machines, generators etc. In hot dry areas, static generation is highly likely, as well as lightning strike. This may cause electrocution, ignition, burns, injury and death, as well as damage to electrical equipment. The operational impact on human and equipment safety - exposure to electromagnetic waves is outlined in **Table 8-141.**

Table 8-141: Operational Impact on human and equipment safety - exposure to electromagnetic waves

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety – exposure to electromagnetic waves									
Without Mitigation	5	2	5	5	3	**51**	**Moderate**	(-)	Complex
With Mitigation	5	2	5	5	1	**17**	**Low**	(-)	
Mitigation and Management Measures	— Adhere to codes and guidelines for electrical insulation. — Provide suitable PPE. — Low voltage equipment (e.g. batteries) to be separated from high voltage (e.g. transmission to grid). — Personnel to be trained in line with IEE 1657 – 2018 (Recommended Practice for Personnel Qualifications for Installation and Maintenance of Stationary Batteries). — Adhere to Eskom Operating Regulations for high voltage systems including access control, permit to work, safe work procedures, live work, abnormal and emergency situations, keeping records. — Consider suitably located Emergency stop buttons for the facility and the other equipment on site. — Software also need to be kept as update to date as reasonably practicable. — Consider suitably located Emergency stop buttons for the facility and the other equipment on site. — PPE to consider static accumulation for entering the facility, and particularly the battery containers especially after a high temperature shut down where there could possibly be flammable materials. — The procedures for responding to alarm and auto shut down on containers, needs to consider that there may be a dangerous								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety – exposure to electromagnetic waves									
	environment inside and how to protect personnel who may enter to respond. — All outside work must be stopped during thunder storms. — Lighting conductors may be required for the installation, to be confirmed during design								

ENVIRONMENT - EMISSIONS TO AIR

Refrigerant may be an asphyxiant if accidentally released indoors it can accumulate and displace oxygen. It is however noted that this is not expected on a normal basis. The operational impact on environment - emissions to air is outlined in **Table 8-142**.

Table 8-142: Operational Impact on environment - emissions to air

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – emissions to air									
Without Mitigation	3	1	1	1	3	18	Low	(-)	Easy
With Mitigation	3	1	1	1	1	6	Very Low	(-)	
Mitigation and Management Measures	— Containers could be treated as entering a confined space and similar procedures entering confined spaces could be in place, e.g. do not enter alone, gas testing prior to entering, ensure adequate ventilation. Particularly after any warning alarms have gone off, but possibly even normally.								

ENVIRONMENT - EMISSIONS TO WATER

Waste will be generated during the operation of the facility. This may include cooling water blow-down, laboratory waste (if included in the design), maintenance waste, e.g. oils, spills from batteries, coolant system, diesel trucks, transformers, oil drips from parked vehicles, fire water runoff control, kitchen waste and sewage, refrigerant release or VRF electrolyte purging. These can cause pollution if not contained and excessive disposal costs if emissions not limited. These can cause pollution if not contained and excessive disposal costs if emissions are not limited. The operational impact on environment - emissions to water is outlined in **Table 8-143**.

Table 8-143: Operational Impact on environment - emissions to water

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment - emissions to water									
Without Mitigation	3	2	3	2	3	30	Low	(-)	Moderate
With Mitigation	3	2	3	2	2	20	Low	(-)	
Mitigation and Management Measures	— Electrolyte areas to be fully bunded to 110% of largest tank, or more. — Implement bunding under any outdoors tanks, curbing under truck offloading areas and sealed surfaces (e.g. concrete) under truck parking area. — Provide containment and suitable treatment/disposal for sewage and any kitchen liquids. — Procedures for dealing with damaged/leaking equipment as well as clean-up of spills to be in place and implemented. — Conduct normal site practices for preventing and containing diesel/paint etc spills.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment - emissions to water									
	— Waste management plan to be in place and provide measures for, but not limited to, liquid waste treatment or suitable removal and disposal. — Spill clean-up procedures to be in place before bringing container on site, including spill kits – non-combustible materials, hazmat disposal. — Undertake reporting of reportable quantities in line with NEMA. — Process controls to be in place to prevent contamination and deterioration of electrolyte leading to excessive purging. — Ensure proposed locations of the BESS facilities are a suitable distance from the closest water course. In the event of a major spill if this is too close it may not allow time for mitigation to be taken. Adequate secondary and possibly tertiary containment systems may then be needed on site.								

ENVIRONMENT - EMISSIONS TO EARTH

The operation phase will generate solid waste. The disposal of battery components can cause environmental damage. The operational impact on environment - emissions to earth is outlined in **Table 8-144**.

Table 8-144: Operational Impact on environment - emissions to earth

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – emissions to earth									
Without Mitigation	2	2	3	3	3	30	Low	(-)	Easy
With Mitigation	2	2	3	3	1	10	Very Low	(-)	
Mitigation and Management Measures	— Implement system for waste segregation (e.g. electronic equipment, chemicals) and management on the site.								

ENVIRONMENT – WASTE OF RESOURCES

The operation phase will require the usage of water and power. Operations will include the disposal of batteries or components. However, if the usage is not controlled it will result in wastages. Excessive purging of deteriorated or contaminated electrolyte may occur. These may result in delays, excessive costs and disposal of large volumes of hazardous waste. The operational impact on environment - waste of resources e.g. water, power etc is outlined in **Table 8-145**.

Table 8-145: Operational Impact on environment - waste of resources e.g. water, power etc

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment - waste of resources e.g. water, power etc									
Without Mitigation	2	1	1	2	4	24	Low	(-)	Easy
With Mitigation	2	1	1	2	2	12	Very Low	(-)	
Mitigation and Management Measures	— Water usage to be monitored on site. — Handling protocols to be provided by supplier of electrolyte. — Water management plan and spill containment plans to be in place. — Investigate end of Life plan for electrolyte batteries including options for reuse / recovery / reconditioning.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment - waste of resources e.g. water, power etc									
	— Similarly, for decommissioned containers / equipment, consider reuse / recovery / repurpose.								

PUBLIC - AESTHETHICS

Bright surfaces reflecting light and tall structures in a flat area may cause irritation. The operational impact on public - aesthetics is outlined in **Table 8-146**.

Table 8-146: Operational Impact on public - aesthetics

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Public - Aesthetics									
Without Mitigation	2	2	4	4	4	48	Moderate	(-)	Moderate
With Mitigation	1	2	4	4	2	22	Low	(-)	
Mitigation and Management Measures	— Visual impact assessment to include BESS installation when design details become available. Confirm any height limitations for VRFB BESS building (if utility scale).								

INVESTORS - FINANCIAL

The result of possible defective technology and extreme project delays can cause financial loss. The operational impact on investors - financial is outlined in **Table 8-147**.

Table 8-147: Operational Impact on investors - financial

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Investors - Financial									
Without Mitigation	5	1	3	4	3	39	Moderate	(-)	Easy
With Mitigation	3	1	3	4	2	22	Low	(-)	
Mitigation and Management Measures	— Undertake adequate research during the planning and design phase to select the supplier and/contractor with the best technology that is internationally recognized and proven. — Project management with deviation monitoring.								

EMPLOYEES AND INVESTORS – SECURITY

On route to the operational site there is a risk of potential hi-jacking of valuable but hazardous loads. On site there is a risk of theft of operational equipment and battery installation facilities. There may also be civil unrest or violent strike by employees. This may result in theft, injury to burglars, damage to equipment possibly setting off thermal runaway. The operational impact on employees and investors – security is outlined in **Table 8-148**.

Table 8-148: Operational Impact on employees and investors – security

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Employees and investors - Security									
Without Mitigation	3	1	3	2	4	36	Moderate	(-)	Moderate
With Mitigation	3	1	3	2	2	18	Low	(-)	
Mitigation and Management Measures	— Fencing around electrical infrastructure to adhere to SANS standard and Eskom Guidelines.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Employees and investors - Security									
	— Consider motion detection lights and CCTV. — The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g. Skull and Cross Bones or other signs. — Night lighting to be provided both indoors and outdoors where necessary.								

Cyber security attacks aimed at the National Electricity Grid may result in the ransom of the National Electricity Grid. The operational impact on employees and investors – security is indicated in **Table 8-149**.

Table 8-149: Operational Impact on employees and investors – security

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Employees and investors - Security									
Without Mitigation	4	4	3	1	4	48	Moderate	(-)	Complex
With Mitigation	4	4	3	1	2	24	Low	(-)	
Mitigation and Management Measures	— Cyber security needs monitoring. — Remote access to system needs to be negotiated and controlled. — Install password controls, levels of authority etc. Protection of the National Electricity Grid from Cyber-attacks accessing through the BESS to be implemented. — Cyber emergency procedures should be in place prior to commissioning.								

EMERGENCIES

During the operational phase, there is the potential for fires, explosions, noxious smoke, large spills, traffic accidents and equipment/structural collapse. Inadequate emergency response to small event can lead to escalation. Consequences of these include injuries which can turn to fatalities, and small losses become extended down time. The operational impact on emergencies is outlined in **Table 8-150**.

Table 8-150: Operational Impact on emergencies

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Emergencies									
Without Mitigation	4	2	3	4	3	39	Moderate	(-)	Complex
With Mitigation	4	2	3	4	2	26	Low	(-)	
Mitigation and Management Measures	— All safety measures listed above must be implemented. — Emergency procedures need to be practiced prior to commencement of operations. — Escape doors should swing open outwards and not into the building/container. — There must be more than one exit from buildings.								

INVESTORS LEGAL

The battery industry is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology. This may result in unknown hazards that may manifest due to using “cheaper supplier or less developed technology”. The operational impact on investors – legal is indicated in **Table 8-151**.

Table 8-151: Operational Impact on investors – legal

Potential Impact Investors - legal	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	3	1	3	3	4	40	Moderate	(-)	Moderate
With Mitigation	3	1	3	3	2	20	Low	(-)	
Mitigation and Management Measures	— Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing. — Ensure only latest state of the art battery system are used and not old technologies prone to fires/explosions etc..								

8.20.3 DECOMMISSIONING PHASE

SSL AND VRF BESS

Battery components may have a limited lifespan, there are damaged equipment, waste electrolyte etc. There could already be "waste" on the first day of commissioning and plans should be in place to deal with this. Ideally an End-of-Life plan needs to be in place before the first electrolyte / container / equipment is brought on site.

HUMAN HEALTH - CHRONIC EXPOSURE TO TOXIC CHEMICAL OR BIOLOGICAL AGENTS

The decommissioning impact on human health - chronic exposure to toxic chemical or biological agents is outlined in **Table 8-152**.

Table 8-152: Decommissioning Impact on human health - chronic exposure to toxic chemical or biological agents for both BESS types

Potential Impact Human health - Chronic exposure to toxic chemical or biological agents	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	1	1	1	1	1	4	Very Low	(-)	Easy
With Mitigation	1	1	1	1	1	4	Very Low	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

HUMAN HEALTH - EXPOSURE TO NOISE

The decommissioning impact on human health - exposure to noise is outlined in **Table 8-153**.

Table 8-153: Decommissioning Impact on human health - exposure to noise for both BESS types

Potential Impact Human Health - exposure to noise	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Without Mitigation	1	1	1	1	1	4	Very Low	(-)	Easy
With Mitigation	1	1	1	1	1	4	Very Low	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

HUMAN HEALTH - EXPOSURE TO TEMPERATURE EXTREMES AND/OR HUMIDITY

The decommissioning impact on human health - exposure to noise is outlined in **Table 8-154**.

Table 8-154: Decommissioning Impact on human health - exposure to temperature extremes and/or humidity for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health -exposure to temperature extremes and/or humidity									
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	Easy
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

HUMAN HEALTH - EXPOSURE TO PSYCHOLOGICAL STRESS

The decommissioning impact on human health - exposure to psychological stress is outlined in **Table 8-155**.

Table 8-155: Decommissioning Impact on human health - exposure to psychological stress for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to psychological stress									
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	Easy
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

HUMAN HEALTH - CHRONIC EXPOSURE TO ERGONOMIC STRESS

The decommissioning impact on human health - exposure to ergonomic stress is outlined in **Table 8-156**.

Table 8-156: Decommissioning Impact on human health - exposure to ergonomic stress for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human Health - exposure to ergonomic stress									
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	High
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	High
Mitigation and Management Measures	— As per construction and operational phases.								

HUMAN AND EQUIPMENT SAFETY – EXPOSURE TO FIRE RADIATION

The decommissioning impact on human and equipment safety - exposure to fire radiation is outlined in **Table 8-157**.

Table 8-157: Decommissioning Impact on human and equipment safety - exposure to fire radiation for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to fire radiation									
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	Easy
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO EXPLOSION OVER PRESSURES

The decommissioning impact on human and equipment safety - exposure to explosion over pressures is outlined in **Table 8-158**.

Table 8-158: Decommissioning Impact on human and equipment safety - exposure to explosion over pressures for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to explosion over pressures									
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	Easy
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO ACUTE TOXIC CHEMICAL AND BIOLOGICAL AGENTS

The decommissioning impact on human and equipment safety - exposure to acute toxic chemical and biological agents is outlined in **Table 8-159**.

Table 8-159: Decommissioning Impact on human and equipment safety - exposure to acute toxic chemical and biological agents for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to acute toxic chemical and biological agents									
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	Easy
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO VIOLENT RELEASE OF KINETIC OR POTENTIAL ENERGY

The decommissioning impact on human and equipment safety - exposure to violent release of kinetic or potential energy is outlined in **Table 8-160**.

Table 8-160: Decommissioning Impact on human and equipment safety - exposure to violent release of kinetic or potential energy for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety - exposure to violent release of kinetic or potential energy									
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	Easy
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

HUMAN AND EQUIPMENT SAFETY - EXPOSURE TO ELECTROMAGNETIC WAVES

The decommissioning impact on human and equipment safety - exposure to electromagnetic waves is outlined in **Table 8-161.**

Table 8-161: Decommissioning Impact on human and equipment safety - exposure to electromagnetic waves for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Human and Equipment Safety – exposure to electromagnetic waves									
Without Mitigation	1	1	1	1	1	4	Very Low	(-)	Easy
With Mitigation	1	1	1	1	1	4	Very Low	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

ENVIRONMENT - EMISSIONS TO AIR

The decommissioning impact on environment - emissions to air is outlined in **Table 8-162**.

Table 8-162: Decommissioning Impact on environment - emissions to air for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – emissions to air									
Without Mitigation	1	1	1	1	1	4	Very Low	(-)	Easy
With Mitigation	1	1	1	1	1	4	Very Low	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

ENVIRONMENT - EMISSIONS TO WATER

The decommissioning impact on environment - emissions to water is outlined in **Table 8-163**.

Table 8-163: Decommissioning Impact on environment - emissions to water for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment - emissions to water									
Without Mitigation	1	1	1	1	1	4	Very Low	(-)	Easy
With Mitigation	1	1	1	1	1	4	Very Low	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

ENVIRONMENT - EMISSIONS TO EARTH

Batteries / equipment will reach its end of life and may leak. This may result in environment damage from heavy metal ions. The decommissioning impact on environment - emissions to earth is outlined in **Table 8-164**.

Table 8-164: Decommissioning Impact on environment - emissions to earth for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – emissions to earth									
Without Mitigation	4	3	3	5	4	60	Moderate	(-)	Complex
With Mitigation	4	3	3	5	2	30	Low	(-)	
Mitigation and Management Measures	— Develop and implement End of Life shutdown procedure including a risk assessment of the specific activities involved. — Re-purpose the solid-state batteries / containers and equipment with associated Environmental impact considered. — Undertake disposal according to local regulations and other directives such as the European Batteries Directive.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment – emissions to earth									
	— End of life can be predefined and the monitoring can be in place to determine if it has been reached. — Consider impact of temperature and time, cycles								

ENVIRONMENT – WASTE OF RESOURCES

The decommissioning impact on environment - waste of resources e.g. water, power etc is outlined in **Table 8-165**.

Table 8-165: Decommissioning Impact on environment - waste of resources e.g. water, power etc for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Environment - waste of resources e.g. water, power etc									
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	Easy
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

PUBLIC - AESTHETHICS

The decommissioning impact on public - aesthetics is outlined in **Table 8-166**.

Table 8-166: Decommissioning Impact on public - aesthetics for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Public - Aesthetics									
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	Easy
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

INVESTORS - FINANCIAL

The decommissioning impact on investors - financial is indicated in **Table 8-167**.

Table 8-167: Decommissioning Impact on investors - financial for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
INVESTORS - FINANCIAL									
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	Easy
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

EMPLOYEES AND INVESTORS – SECURITY

The decommissioning impact on employees and investors – security is outlined in **Table 8-168**.

Table 8-168: Decommissioning Impact on employees and investors – security for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Employees and investors - Security									
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	Easy
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

EMERGENCIES

The decommissioning impact on emergencies is outlined in **Table 8-169**.

Table 8-169: Decommissioning Impact on emergencies for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
EMERGENCIES									
Without Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	Easy
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)	
Mitigation and Management Measures	— As per construction and operational phases.								

INVESTORS LEGAL

Disposal of hazardous "waste" is rife with difficulties and numerous regulations that need to be complied with. The decommissioning impact on investors – legal is outlined in **Table 8-170**.

Table 8-170: Decommissioning Impact on investors – legal for both BESS types

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Investors - legal									
Without Mitigation	3	1	3	3	4	**40**	**Moderate**	(-)	Complex
With Mitigation	3	1	3	3	3	**30**	**Low**	(-)	
Mitigation and Management Measures	— Applicants should seek the opinion from a waste consultant on how to correctly dispose of hazardous waste.								

9 CUMULATIVE IMPACT ASSESSMENT

Although the S&EIR process is essential to assessing and managing the environmental and social impacts of individual projects, it often may be insufficient for identifying and managing 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 WEF. 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.

According to the South African Renewable Energy EIA Application Database from DFFE, there are currently no registered applications involving planned renewable wind energy projects within a 30km radius around the proposed development. The closest known and approved renewable energy project is a solar PV plant located approximately 47km southwest of the proposed Camden II WEF. Therefore, with the exception of the other proposed Camden developments (Camden I WEF, Camden I SEF, Green Hydrogen Plant and associated grid connection infrastructure) forming part of the Camden Renewable Energy Complex, no other renewable energy projects within a 30km radius have been considered in this S&EIA process. It is noted that there is existing electrical infrastructure in the broader area which includes the Camden Power Station and associated power lines. Cumulative impacts assessed for the respective specialist studies are discussed in the sub-sections below.

NOISE

According to the Noise Impact Assessment (**Appendix H-11**) conducted, the proposed Camden I WEF is located adjacent to the proposed Camden II WEF, with no other WEFs identified in the area. With the nearest wind turbine from the Camden II WEF located ~4 km from the nearest Camden I receptor, cumulative impacts from Camden II are not anticipated. It is however noted that since the completion of the Noise Impact Assessments for the Camden I and II WEFs in August 2022, an additional WEF (Ummbila Emoyeni Renewable Energy Facility) is being proposed in the area. The proposed Ummbila Emoyeni Renewable Energy Wind Facility is **located approximately 30 km west of the proposed Camden I WEF** (and more than 30 km from the Camden II WEF). As per International Finance Corporation Guidelines, noise impacts from WEFs are only applicable within 2 km of the site. As such, being located at such a great distance from the proposed Camden I and II WEF, the Noise Specialist notes that , the proposed Ummbila Emoyeni WEF is envisaged to have no noise impact on the receptors neighbouring the Camden sites. An addendum to the Noise Impact Assessment is included in **Appendix H-11**.

AGRICULTURAL POTENTIAL

The potential cumulative agricultural impact of importance is a regional loss (including by degradation) of future agricultural production potential.

According to the DFFE database, there are no other renewable energy projects within a 30 km radius of the Camden I site. There is however, the associated Camden 1 SEF and Camden 2 Wind Energy Facilities and the Ummbila Emoyeni Wind and Solar Energy Facilities.. In quantifying the cumulative impact, the area of land taken out of agricultural use as a result of these projects (total generation capacity of up to 1,366 MW) will amount to a total of approximately 1,070 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 only 0.38% of the surface area. That is considered to be within an acceptable limit in terms of loss of agricultural land.

The risk of a loss of agricultural potential by soil degradation can effectively be mitigated for renewable energy developments. If the risk for each individual development is low, then the cumulative risk is also low.

Due to all of the considerations discussed above, the cumulative impact of loss of agricultural land use 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 is approved.

AQUATIC

In the assessment of the Camden I WEF, any similar projects were assessed (e.g Camden II WEF & Ummbila Emoyeni Wind Energy Facility) by the Aquatic Specialist. The cumulative impact on the aquatic environment is outlined in **Table 9-1**.

Table 9-1: Cumulative Aquatic Impacts

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Cumulative Aquatic impacts									
Without Mitigation	2	2	2	2	2	**16**	**Moderate**	(-)	Moderate
With Mitigation	2	2	2	2	2	**16**	**Low**	(-)	

BIODIVERSITY

Cumulative impacts on indigenous natural vegetation

The regional terrestrial vegetation type in the broad study area is listed as Vulnerable and is impacted across its range by historical activities. Loss of habitat will definitely occur for the project, which will be a small area in comparison to the total area of the vegetation type. However, the total loss of habitat due to a number of projects together will be greater than for any single project, so a cumulative effect will occur. The area lost in total will be very small compared to the total area of the vegetation type concerned. The cumulative effect will therefore be low for vegetation loss. The anticipated cumulative impact on indigenous natural vegetation is outlined in **Table 9-2**.

Table 9-2: Cumulative Impact on indigenous natura vegetation

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Cumulative impacts on indigenous natural vegetation									
Current project	1	1	3	5	5	50	Moderate	(-)	Moderate
Combination of projects	5	3	3	5	5	65	High	(-)	

Cumulative impacts on ecological processes

There are various ecological processes that may be affected at a landscape level by the presence of multiple projects. This includes population processes, such as migration (movement of species through the landscape), pollination (can be disrupted if insect pollinators are blocked from movement)and dispersal, but also more difficult to interpret factors, such as spatial heterogeneity (the diversity of habitats and their spatial relationship to one another), community composition (the species that occur in the landscape) and environmental gradients, that can become disrupted when landscapes are disturbed at a high level. Disturbance can alter the pattern of variation in the structure or function of ecosystems. Fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. An important consequence of repeated, random clearing is that contiguous cover can break down into isolated patches. This happens when the area cleared exceed a critical level and landscapes start to become disconnected. Spatially heterogenous patterns can be interpreted as individualistic responses to environmental gradients and lead to natural patterns in the landscape. Disrupting gradients and creating disturbance edges across wide areas is very disruptive of natural processes and will lead to fundamental changes in ecosystem function.

The current project has been designed to mostly occupy areas that are already disturbed. Where infrastructure is located in natural areas, it is near to edges or follows existing roads. There are few places where it intrudes significantly into natural areas. The anticipated cumulative impact on ecological processes is outlined in **Table 9-3.**

Table 9-3: Cumulative Impact on ecological processes

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Cumulative impacts on ecological processes									
Current project	2	1	3	4	3	30	Low	(-)	Moderate
Combination of projects	3	3	3	4	4	52	Moderate	(-)	

Cumulative impacts due to spread of declared weeds and alien invader plants

There is a moderate possibility that alien plants could be introduced to areas within the footprint of the proposed infrastructure from surrounding areas in the absence of control measures. The greater the number of projects, the more likely this effect will happen; therefore, the effect is cumulative. For the current site, the impact is predicted to be low due to the current absence of invasive species on site and the high ability to control any additional impact. The significance will therefore be low, especially if control measures are implemented. However, the increased overall disturbance of the landscape will create opportunities and, if new invasions are not controlled, can create nodes that spread to new locations due to the heightened disturbance levels. The anticipated cumulative impact due to alien plant invasion is outlined in **Table 9-4.**

Table 9-4: Cumulative Impact on increased alien plant invasion

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Cumulative impacts due to establishment and spread of declared weeds and alien invader plants									
Current project	1	1	3	2	2	**14**	**Very Low**	(-)	Moderate
Combination of projects	3	3	3	4	4	**52**	**Moderate**	(-)	

Cumulative impacts on CBAs and conservation planning

Large proportions of the site and surrounding sites are included in Critical Biodiversity Areas for Mpumalanga. Disruption of these areas means that conservation planners have to find alternative sites to include in future CBAs according to an algorithm that seeks a least-cost outcome for preserving biodiversity, i.e. the least amount of land space for preserving the greatest amount of area of biodiversity importance, as well as meeting specific conservation targets. At some point, the loss of suitable sites leads to a situation where it is no longer possible to plan effective conservation networks or the cost of doing so increases due to a lack of choice. The higher the density of similar projects in a uniform area, the less chance there is of finding sites suitable for conservation that contain all the attributes that are desired to be conserved, including both ecological processes and ecological patterns.

According to the calculation of that total area of each habitat being affected, the impact of the current project on CBAs on site was found to be relatively insignificant as less than 1% of the total area of CBAs on site will be affected (including a 3m buffer around all infrastructure that is assumed to be impacted). The impact assessment methodology assesses this as being of Moderate significance, (being definite and permanent), however the methodology disregards the size of the area affected. Therefore, a very small area or very large area will both have Moderate significance according to the impact assessment methodology. The assessed cumulative impact on CBAs and conservation planning is outlined in **Table 9-5.**

Table 9-5: Cumulative Impacts on CBAs and conservation planning

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Cumulative impacts on conservation planning									
Current project	1	1	3	5	5	**50**	**Moderate**	(-)	Moderate
Combination of projects	1	3	3	5	5	**60**	**Moderate**	(-)	

ANIMAL SPECIES

Cumulative construction activities will require clearing of natural habitat, to be replaced by the infrastructure. This will result in possible loss of habitat for populations of SCC. The cumulative impacts are outlined below in **Table 9-10.**

Table 9-6: Cumulative impacts on faunal habitat from construction clearing due to a number of projects

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Loss of faunal habitat									
Current project	2	1	3	5	4	**44**	**Moderate**	(-)	Moderate
Combination of projects	3	3	3	5	4	**56**	**Moderate**	(-)	

The cumulative impacts are outlined below in **Table 9-11**.

Table 9-7: Cumulative impacts of direct faunal mortality due to a number of projects: construction phase

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Loss of faunal habitat									
Current project	2	1	1	2	3	**18**	**Low**	(-)	High
Combination of projects	3	3	1	2	4	**36**	**Moderate**	(-)	

The cumulative impacts are outlined below in **Table 9-12**.

Table 9-8: Cumulative impacts of direct faunal mortality due to a number of projects: operational phase

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Loss of faunal habitat									
Current project	2	1	1	4	3	**24**	**Low**	(-)	High
Combination of projects	3	3	1	4	4	**44**	**Moderate**	(-)	

PLANT SPECIES

Construction activities will require clearing of natural habitat, to be replaced by the infrastructure. This will result in possible loss of populations of SCC. The cumulative impacts are outlined below in **Table 9-9.**

Table 9-9: Cumulative impacts on SCC from construction clearing due to a number of projects

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Loss of individuals of Species of Conservation Concern									
Current project	2	2	5	5	1	**14**	**Very low**	(-)	Moderate
Combination of projects	3	3	5	5	3	**48**	**Moderate**	(-)	

AVIFAUNA

The proposed Camden I WEF will consist of up to 37 turbines in total. According to information that that is available, the number of additional wind turbines that are planned within a 30km radius in broadly similar habitat around the proposed WEF is another (up to) 45 i.e. for the proposed Camden II WEF. If both the Camden I and Camden II projects are approved, a total of up to 82 turbines may be developed, of which the Camden I will contribute approximately 45%. As such, the WEFs' contribution to the total number of turbines, and by implication to the cumulative impact of all the planned turbines, is **High,** but could be reduced to **Moderate** with appropriate mitigation**.** The total area of similar habitat (excluding opencast mining and urban areas) available to birds in the 30km radius around the project area (including the project area) is approximately 4 258 km². This translates into approximately 1 turbine/52km² which is a low density. The turbine density, if all the turbines are constructed, and by implication the cumulative impact on avifauna of the currently planned wind energy projects within this area, is therefore considered to be **Low**, and the impact could be reduced if the recommended mitigation at the two Camden wind projects is diligently implemented.

The BESS will transform an area of approximately 5 ha. Given the available habitat of 4 258km² within a 30km radius around the project site, the cumulative impact of displacement and habitat transformation caused by the BESS is **Low** due to the small footprint.

The assessed cumulative impact due to disturbance associated with the construction of the wind turbines and associated infrastructure is outlined in **Table 9-10.**

Table 9-10: Cumulative Impact on disturbance of priority species due to construction

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Displacement of priority species due to disturbance associated with the construction of the wind turbines and associated infrastructure.									
Without Mitigation	4	3	3	3	4	52	Moderate	(-)	High
With Mitigation	3	3	3	2	3	33	Moderate	(-)	High

The assessed cumulative impact due to habitat transformation associated with the construction of the wind turbines and associated infrastructure is outlined in **Table 9-11**.

Table 9-11: Cumulative Impact on displacement of priority species due to habitat transformation

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Displacement of priority species due to habitat transformation associated with the construction of the wind turbines and associated infrastructure.									
Without Mitigation	3	3	4	4	4	56	Moderate	(-)	High
With Mitigation	3	3	3	4	3	39	Moderate	(-)	High

The assessed cumulative impact on mortality due to collisions with the wind turbines is outlined in **Table 9-12**.

Table 9-12: Cumulative Impact on mortality due to collisions with wind turbines

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Mortality of priority species due to collisions with the wind turbines.									
Without Mitigation	5	3	4	4	4	64	High	(-)	High
With Mitigation	4	3	3	4	3	42	Moderate	(-)	High

The assessed cumulative impact on mortality due to collisions with the medium voltage overhead powerlines is outlined in **Table 9-13**.

Table 9-13: Cumulative Impact on mortality due to collisions with medium voltage overhead powerlines

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Mortality of priority species due to collisions with the medium voltage overhead power lines.									
Without Mitigation	4	3	4	4	4	60	Moderate	(-)	High
With Mitigation	3	3	3	4	4	52	Moderate	(-)	High

The assessed cumulative impact on mortality due to electrocution on the medium voltage infrastructure is outlined in **Table 9-14**.

Table 9-14: Cumulative Impact on mortality due to electrocution

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Electrocution of priority species on the medium voltage infrastructure.									
Without Mitigation	5	3	4	4	4	**64**	**High**	(-)	High
With Mitigation	2	3	2	4	3	**33**	**Moderate**	(-)	High

The assessed cumulative impact due to disturbance associated with the construction of the BESS is outlined in **Table 9-15**.

Table 9-15: Cumulative Impact on disturbance of priority species due to BESS construction

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Displacement of priority species due to disturbance associated with the construction of the BESS.									
Without Mitigation	2	1	1	2	4	**24**	**Low**	(-)	High
With Mitigation	2	1	1	2	3	**18**	**Low**	(-)	High

The assessed cumulative impact due to habitat transformation during the construction of the BESS is outlined in **Table 9-16**.

Table 9-16: Cumulative Impact due to habitat transformation associated with the BESS construction

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Displacement of priority species due to habitat transformation associated with the construction of the BESS.									
Without Mitigation	3	1	5	4	2	**26**	**Low**	(-)	High
With Mitigation	3	1	5	4	2	**26**	**Low**	(-)	High

BATS

The Project Developer has proposed the development of an additional WEF adjacent to the Camden I WEF, namely the Camden II Wind Energy Facility, with a capacity of up to 200MW (up to 45 turbines). Additionally, Emoyeni Renewable Energy Farm (Pty) Ltd are proposing the development of the Ummbila Emoyeni Wind Energy Facility with a contacted output of 666MW, approximately 28 km to the west of the Camden I REC. The footprint of these three developments will likely be cumulative, with the ecological impact of all facilities operating in combination likely to exceed the sum of individual parts. The cumulative impacts of Camden II WEF on Camden I WEF are outlined below.

Several wind energy facilities will cumulatively amount to more foraging habitat loss; however, these impacts are fragmented and covers a relatively small footprint area. The cumulative impact and associated mitigation measures are outlined in **Table 9-17**.

Table 9-17: Cumulative Impact on bat foraging habitat

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Loss of foraging habitat by clearing of vegetation.									
Without Mitigation	2	3	2	4	4	**44**	**Moderate**	(-)	Moderate
With Mitigation	2	3	1	4	3	**30**	**Low**	(-)	

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Ease of mitigation
Loss of foraging habitat by clearing of vegetation.								
Mitigation and Management Measures	— Adhere to the bat sensitivity map criteria. — Rehabilitate cleared vegetation where possible at areas such as laydown yards.							

Several roosts being destroyed can impact bat populations of affected species over a larger area, however the impact is unlikely to occur. The cumulative impact and associated mitigation measures are outlined in **Table 9-18**.

Table 9-18: Cumulative Impact on bat roosts

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Roost destruction during earthworks.									
Without Mitigation	3	3	3	4	3	39	Moderate	(-)	Moderate
With Mitigation	3	3	3	4	1	13	Very Low	(-)	
Mitigation and Management Measures	— Adhere to the bat sensitivity map criteria.								

Bat mortalities over long periods of time can negatively impact species genetic diversity in a population. If this occurs over a larger area of several wind farms, it decreases the chances of bat populations recovering to a prior state. Bats play an important role in controlling insect numbers, certain species of insects may increase in numbers over a larger area if bats are negatively impacted. The cumulative impact and associated mitigation measures are outlined in **Table 9-19**.

Table 9-19: Cumulative Impact on bat mortalities during foraging

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Bat mortalities during foraging.									
Without Mitigation	4	3	4	4	5	75	High	(-)	Hard
With Mitigation	4	3	4	4	3	45	Moderate	(-)	
Mitigation and Management Measures	— Adhere to the sensitivity map criteria. — Turbine layout adjustments to adhere to the sensitivity maps, and where needed reducing blade movement at selected turbines and high-risk bat activity times/weather conditions as informed by operational monitoring results. — Bat mortality impact during operation should be measured and ensure that the WEF impacts remain within sustainable levels. — Acoustic deterrents are developed well enough to be trialled, if the operational study indicates above threshold mortalities.								

Migrating bats influence several ecosystems since they are cave dwelling species, also over a larger area due to the distances that may be travelled. If turbines are placed within a migration path, a larger area and higher diversity of ecosystems may be impacted. For migrating bats, the area of influence is dependent on the migration routes, and may therefore involve several WEF's not in the immediate area of the WEF. The cumulative impact and associated mitigation measures are outlined in **Table 9-20**.

Table 9-20: Cumulative Impact on bat mortalities during migration

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Bat mortalities during migration.									
Without Mitigation	4	3	4	4	4	**60**	**Moderate**	(-)	Hard
With Mitigation	4	3	4	4	2	**30**	**Low**	(-)	
Mitigation and Management Measures	— Reducing blade movement at selected turbines if a migration route is discovered as informed by operational monitoring results. — Bat mortality impact during operation should be measured and ensure that the WEF impacts remain within sustainable levels. — Acoustic deterrents are developed well enough to be trialled, if the operational study indicates above threshold mortalities.								

Floodlights and other lights at turbine bases or nearby buildings, will attract bats preying on insects and therefore significantly increase the likelihood of these bats being impacted on by moving turbine blades. Habitat creation in the roofs of nearby buildings can cause a similar increased risk factor. Considering several WEF's, the overall mortality rate will be significantly higher if this increased likelihood of impact persists on other surrounding wind farms. The cumulative impact and associated mitigation measures are outlined in **Table 9-21.**

Table 9-21: Cumulative Impact on bat mortalities due to light attraction

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Increased bat mortalities due to light attraction and habitat creation.									
Without Mitigation	4	3	4	4	5	**75**	**High**	(-)	Moderate
With Mitigation	4	3	4	4	2	**30**	**Low**	(-)	
Mitigation and Management Measures	— Only use lights with low sensitivity motion sensors that switch off automatically when no persons are nearby while still adhering to safety and security requirements, to prevent the creation of regular insect gathering pools. This will be at turbine bases (if applicable, and other infrastructure buildings). — For buildings, avoid tin roofs and roof structures that offer entrance holes into the roof cavity.								

VISUAL AND LANDSCAPE

Although it is important to assess the visual impacts of the proposed Camden I WEF and associated grid connection specifically, it is equally important to assess the cumulative visual impact that could materialise as a result of this development. Cumulative impacts occur where existing or planned developments, in conjunction with the proposed development, result in significant incremental changes in the broader study area. In this instance, such developments would include:

— existing and proposed mining / quarrying activities,

— electrical infrastructure including Camden Power Station and associated power lines; and

— proposed renewable energy facilities comprising the Camden Renewable Energy Complex (Wind, Solar, Hydrogen and associated grid connection infrastructure).

Existing mining / quarrying and electrical infrastructure have already resulted in large scale visual impacts, mostly along the N2 national route, extending south-eastwards from Ermelo to Camden Power Station. These developments have significantly altered the sense of place and visual character in the broader region.

Renewable energy facilities have the potential to cause large-scale visual impacts, and although the level of transformation already present in the landscape will reduce the contrast and overall visual impact of the new development, the incremental change in the landscape will be increased and the visual impacts on surrounding visual receptors would be exacerbated.

It is understood that new information regarding renewable energy projects in the broader area has come to light and as this information was not included in the cumulative impact assessments in the VIAs, SLR Consulting has been requested to provide a visual specialist comment letter regarding this new information. The visual specialist letter has been included as an Addendum to the Visual Impact Assessment (**Appendix H-10**). The additional renewable energy project identified is the proposed 666MW Ummbila Emoyeni Renewable Energy Wind Facility (DFFE Reference No 4/12/16/3/3/2/2160) near Bethal in Mpumalanga Province. This project comprises wind and solar energy facilities as well as grid connection infrastructure. Environmental Authorisation for this project has not yet been granted. The proposed Ummbila Emoyeni Renewable Energy Wind Facility is located 6km south-east of Bethal and 1km east of Mogenzon in Mpumalanga Province. Although the proposed project is approximately 28km from the Camden I WEF and associated grid connection infrastructure projects, the remaining six projects comprising the Camden Renewable Energy Complex are all more than 30kms away.

The respective VIA reports for the eight projects all concluded that the Camden Renewable Energy Complex as a whole will change the visual character of the area and alter the inherent sense of place, extending an increasingly industrial character into the broader area, and resulting in significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommended mitigation measures. In addition, it is possible that these developments in close proximity to each other could be seen as one large Renewable Energy Facility (REF) rather than several separate developments. Although this will not necessarily reduce impacts on the visual character of the area, it could potentially reduce the cumulative impacts on the landscape.

Accordingly, the significance of cumulative visual impacts were found to be potentially **High**, but could be reduced to **Moderate** with the implementation of mitigation measures.

Considering the distance of the proposed Ummbila Emoyeni Renewable Energy Wind Facility from the Camden Renewable Energy Complex, and the undulating nature of the intervening terrain, it is not anticipated that this new project will exacerbate the cumulative impacts already identified.

Additional renewable energy facilities in the area would generate additional traffic on gravel roads thus resulting in increased impacts from dust emissions and dust plumes. The night time visual environment could be altered as a result of operational and security lighting at multiple renewable energy facilities in the broader area.

The cumulative visual and landscape impact and associated mitigation measures are outlined in .

Table 9-22: Cumulative Impact on the visual landscape

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Bat mortalities during foraging.									
Without Mitigation	4	3	3	5	4	64	High	(-)	Moderate
With Mitigation	4	3	3	4	4	56	Moderate	(-)	
Mitigation and Management Measures	— Carefully plan to minimise the construction period and avoid construction delays. — Position laydown areas and related storage/stockpile areas in unobtrusive positions in the landscape, where possible. — Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. — Where possible, the operation and maintenance buildings should be consolidated to reduce visual clutter. — As far as possible, limit the number of maintenance vehicles which are allowed to access the facility. — Ensure that dust suppression techniques are implemented on all gravel access roads.								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Bat mortalities during foraging.									
	— As far as possible, limit the amount of security and operational lighting present on site whilst adhering to relevant safety standards. — Light fittings for security at night should reflect the light toward the ground and prevent light spill. — Lighting fixtures should make use of minimum lumen or wattage whilst adhering to relevant safety standards. — Mounting heights of lighting fixtures should be limited, or alternatively foot-light or bollard level lights should be used. — If possible, make use of motion detectors on security lighting.								

HERITAGE

Cumulative impacts considered as an effect caused by the proposed action that results from the incremental impact of an action when added to other past, present, or reasonably foreseeable future actions. (Cornell Law School Information Institute, 2020). Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. In the case of this project, impacts can be mitigated to an acceptable level. However, this and other projects in the area can have a negative impact on heritage sites in the area where these sites have been destroyed unknowingly.

TRANSPORT

The known potential development in the vicinity of Camden I are the following:

— Camden II WEF. This facility can also take access off the N2 and/or N11 via the district roads during its construction and operational phases.

— Emoyeni Renewable Energy Farm (Pty) Ltd – a proposed commercial Wind Energy Facility and associated infrastructure on a site located +/- 6 km south-east of Bethal and +/- 1km east of Morgenzon in Mpumalanga Province. The project site is located across the Govan Mbeki, Lekwa, and Msukaligwa Local Municipalities within the Gert Sibande District. The facility will have a contracted capacity of up to 666MW and will be known as the Ummbila Emoyeni Wind Energy Facility. The project is planned as part of a larger cluster of renewable energy projects (to be known as the Ummbila Emoyeni Renewable Energy Farm), which include one 666MW wind energy facility, to be developed in several phases, and one 150MW solar energy facility

Due to the location of this WEF and its site access off National Road N17 and the R35 (a Provincial Road), this facility is not expected to have any transport related impacts on the Camden I facility or vice versa.

Table 9-23 and **Table 9-24**outlines the expected cumulative transport impacts during construction on the local road network due to the latent Camden II facility.

Table 9-23: Cumulative Impact during construction due to vehicle trips on both the Camden I and II sites

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Noise, dust & exhaust pollution due to vehicle trips on-both the Camden I and II sites.									
Without Mitigation	2	1	1	1	5	**25**	**Low**	(-)	Easy
With Mitigation	1	1	1	1	2	**8**	**Very low**	(-)	

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Noise, dust & exhaust pollution due to vehicle trips on-both the Camden I and II sites.									
Mitigation and Management Measures	— All unsurfaced roads must be regularly sprayed with water to prevent dust generation — All vehicles that travel on-site must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby minimising noise/exhaust pollution — All vehicles that travel on-site must not be overloaded, and abnormal vehicles must comply to relevant legislation for overweight loads, to ensure lowest possible road surface damage.								

Table 9-24: Cumulative Impact during construction due to additional trips on the national and district roads

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Noise, dust & exhaust pollution due to additional trips on the national and district roads.									
Without Mitigation	2	2	1	1	5	30	Low	(-)	Easy
With Mitigation	1	2	1	1	2	10	Very low	(-)	
Mitigation and Management Measures	— All unsurfaced roads must be regularly sprayed with water to prevent dust generation — All vehicles that travel on-site must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby minimising noise/exhaust pollution — All vehicles that travel on-site must not be overloaded, and abnormal vehicles must comply to relevant legislation for overweight loads, to ensure lowest possible road surface damage.								

Table 9-25 and **Table 9-26** outlines the expected cumulative transport impacts during operations on the local road network due to the latent Camden II facility.

Table 9-25: Cumulative Impact during operation phase due to vehicle trips on both the Camden I and II sites

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Noise, dust & exhaust pollution due to vehicle trips on-both the Camden I and II sites.									
Without Mitigation	3	2	3	4	4	48	Moderate	(-)	Easy
With Mitigation	2	2	1	4	3	27	Low	(-)	
Mitigation and Management Measures	— All unsurfaced roads must be regularly sprayed with water to prevent dust generation — All vehicles that travel on-site must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby minimising noise/exhaust pollution — All vehicles that travel on-site must not be overloaded, and abnormal vehicles must comply to relevant legislation for								

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Noise, dust & exhaust pollution due to vehicle trips on-both the Camden I and II sites.									
	overweight loads, to ensure lowest possible road surface damage.								

Table 9-26: Cumulative Impact during operation phase due to additional trips on the national and district roads

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Noise, dust & exhaust pollution due to additional trips on the national and district roads.									
Without Mitigation	3	3	3	4	4	**52**	**Moderate**	(-)	Moderate
With Mitigation	2	3	1	4	3	**30**	**Low**	(-)	
Mitigation and Management Measures	— All unsurfaced roads must be regularly sprayed with water to prevent dust generation — All vehicles that travel on-site must be roadworthy to ensure noise and emissions levels comply to national vehicle standards, thereby minimising noise/exhaust pollution — All vehicles that travel on-site must not be overloaded, and abnormal vehicles must comply to relevant legislation for overweight loads, to ensure lowest possible road surface damage.								

— The maximum traffic generation of the Camden I and Camden II facilities will occur during the concurrent construction phases. The cumulative impact will be very low on the site and local road network during construction, with the implementation of the recommended mitigations.

— The maximum traffic generation of the Camden I and Camden II facilities are expected to occur at the same time for the operation phase, as the facilities will be operated concurrently. The cumulative impact will be low on the site and local road network during the operation phase, with the implementation of the recommended mitigations.

— It should be noted that the Significance of the transport impact of the Camden II facility is far lower than the expected significance of the Camden I facilities for the construction and operation phases.

— The cumulative impact of the decommissioning phases of the Camden I and Camden II facilities were not assessed, as it cannot be determined if these phases will occur concurrently, if ever.

SOCIAL

Sense of place

The potential cumulative impacts on the areas sense of place will be largely linked to potential visual impacts. In this regard the Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts associated with wind farms on landscapes. The relevant issues identified by Scottish Natural Heritage study include:

— Combined visibility (whether two or more wind farms will be visible from one location).

— Sequential visibility (e.g., the effect of seeing two or more wind farms along a single journey, e.g., road or walking trail).

— The visual compatibility of different wind farms in the same vicinity.

— Perceived or actual change in land use across a character type or region.

— Loss of a characteristic element (e.g., viewing type or feature) across a character type caused by developments across that character type.

The guidelines also note that cumulative impacts need to be considered in relation to dynamic as well as static viewpoints. The experience of driving along a tourist road, for example, needs to be considered as a dynamic sequence of views and visual impacts, not just as the cumulative impact of several developments on one location. The viewer may only see one renewable energy facility and the associated infrastructure at a time, but if each successive stretch of the road is dominated by views of renewable energy facilities, then that can be argued to be a cumulative visual impact (National Wind Farm Development Guidelines, DRAFT - July 2010).

The establishment of the Camden I WEF and other solar and wind energy facilities in the area will create the potential for combined and sequential visibility impacts. However, the impact on the areas sense of place should be viewed within the context of the impact of the Camden Power Station and associated transmission lines on areas sense of place. The areas sense of place has also been impacted by large-sale coal mining operations. The potential visual impact on the areas sense place is therefore likely to be limited. In addition, none of the affected landowners interviewed raised concerns about potential visual impacts associated with the proposed project. The potential cumulative impact on the areas sense of place is therefore likely to be limited. The cumulative impact on the sense of place and the landscape is outlined in **Table 9-27.**

Table 9-27: Cumulative Impact on sense of place and the landscape

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
Visual impacts associated with the establishment of more than one REF and the potential impact on the area's rural sense of place and character of the landscape.									
Overall impact of the proposed project considered in isolation	2	2	3	4	2	**26**	**Low**	(-)	Moderate
Cumulative impact of the project and other projects in the area	2	3	1	4	3	**36**	**Moderate**	(-)	
Mitigation and Management Measures	— The recommendations contained in the Visual Impact Assessment should be implemented.								

Local services and accommodation

The objective will be to source as many low and semi-skilled workers for the construction phase from the MM, specifically Ermelo. This will reduce the pressure on local services and accommodation in Ermelo. For a single WEF / SEF project ~ 100-150 workers require accommodation. In the event of the construction phase for 2-3 projects overlapping, the total number of workers requiring accommodation would be between 200 and 450. The potential pressure on local services will depend on the number of locally based contractors and workers that are employed during the construction phase.

The potential impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of the proposed facility and associated renewable energy projects in the MM. These benefits will create opportunities for investment in the MM, including the opportunity to up-grade and expand existing services and the construction of new houses. Socio-economic development (SED) contributions also represent an important focus of the REIPPPP and is aimed at ensuring that the build programme secures sustainable value for the country and enables local communities to benefit directly from the investments attracted into the area. The proposed WEF is also required to contribute a percentage of projected revenues accrued over the 20-year period to SED. This will provide revenue that can be used by the MM to invest in up-grading local services where required. In should also be noted that it is the function of national, provincial, and local government to address the needs created by development and provide the required services. The additional demand for services and accommodation created by the establishment of development renewable energy projects should therefore be addressed in the Integrated Development Planning process undertaken by the MM. The cumulative impact on local services is outlined in **Table 9-28.**

Table 9-28: Cumulative Impact on local services

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
The establishment of a number of renewable energy facilities has the potential to place pressure on local services, specifically medical, education and accommodation.									
Overall impact of the proposed project considered in isolation	2	2	N/A	2	2	12	Very Low	(-)	Easy
Cumulative impact of the project and other projects in the area	3	3	N/A	3	2	18	Low	(-)	
Mitigation and Management Measures	— The proponent should assess the availability of accommodation in Ermelo should the project be approved.								

Local economy

In addition to the potential negative impacts, the establishment of renewable energy facilities and associated infrastructure, including the proposed WEF, will also create several socio-economic opportunities for the ULM. The positive cumulative opportunities include creation of employment, skills development and training opportunities, and downstream business opportunities.

The review of the REIPPPP (June 2020) indicates that the SED contributions associated with 68 operational projects has amounted to R 1.2 billion to date. In terms of Enterprise Development (ED), R 7.2 billion has been committed for BW1 to BW4, 1S2 and 2S2. Assuming an equal distribution of revenue over the 20-year project operational life, enterprise development contributions would be R360 million per annum. Of the total commitment, R5.6 billion is specifically committed directly within the local communities where the IPPs operate, contributing significantly to local enterprise development. Up until the end of June 2020 a total of R 384.2 million had already been made to the local communities located in the vicinity of the 68 operating IPPs. This represents 93% of the total R384.2 million enterprise development contributions made to date).

The potential cumulative benefits for the local and regional economy are therefore associated with both the construction and operational phase of renewable energy projects and associated infrastructure and extend over a period of 20-25 years. However, steps must be taken to maximise employment opportunities for members from the local communities in the area and support skills development and training programmes. The cumulative impact on the local economy is outlined in **Table 9-29**.

Table 9-29: Cumulative Impact on local economy

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Ease of mitigation
The establishment of a number of renewable energy facilities will create employment, skills development and training opportunities, creation of downstream business opportunities. .									
Overall impact of the proposed project considered in isolation	2	2	N/A	4	4	32	Moderate	(+)	Easy
Cumulative impact of the project and other projects in the area	4	3	N/A	4	5	55	Moderate	(+)	
Mitigation and Management Measures	— The proponent should assess the availability of accommodation in Ermelo should the project be approved.								

10 ENVIRONMENTAL IMPACT STATEMENT

The essence of any impact assessment process is aimed at ensuring informed decision-making, environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA, the commitment to sustainable development is evident in the provision that "*development must be socially, environmentally and economically sustainable…. and requires the consideration of all relevant factors…*". NEMA also imposes a duty of care, which places an obligation on any person who has caused, is causing, or is likely to cause damage to the environment to take reasonable steps to prevent such damage. In terms of NEMA's preventative principle, potentially negative impacts on the environment and on people's environmental rights (in terms of the Constitution of the Republic of South Africa, Act No. 108 of 1996) should be anticipated and prevented, and where they cannot be prevented altogether, they must be minimised and remedied in terms of "reasonable measures".

In assessing the environmental feasibility of the proposed construction of the WEF, the requirements of all relevant legislation have been considered. The identification and development of appropriate mitigation measures that should be implemented to minimise potentially significant impacts associated with the project, has been informed by best practice principles, past experience, and the relevant legislation (where applicable).

The conclusions of this EIR are the result of comprehensive assessments. These assessments were based on issues identified through the S&EIR process and public participation undertaken to date. The EIR will be subject to public review, which will be undertaken according to the requirements of NEMA with every effort made to include representatives of all stakeholders within the process. The EIR will be updated and finalised taking into consideration all comments received during the public review period before being submitted to the CA for consideration.

10.1 ENVIRONMENTAL SENSITIVITIES

The following environmental sensitivities were identified for the Camden I WEF and associated infrastructure, as a result of the Project location and proposed activities and will require specific applications or measures for mitigation to minimise impact.

- **Aquatic**
  - Wetlands and associated buffers (See **Section 7.1.5**)
- **Terrestrial**
  - CBAs (See **Section 7.2.2**)
  - Grasslands (See **Section 7.2.4**)
  - Listed Ecosystems (See **Section 7.2.4**)
  - Wetlands (See **Section 7.2.4**)
- **Avifauna**
  - Avifauna Sensitivities (consisting of drainage lines and associated wetlands, pans and grasslands) (See **Section 7.2.7**)
- **Bats**
  - Bat Sensitivities (consisting of wetlands/dams/pans etc and associated buffers, drainage lines and associated buffers (See **Section 7.2.8**)
- **Heritage**
  - Heritage finds (consisting of heritage ruins and graves)

The above sensitivities are discussed in the sub-sections below. The combined environmental sensitivities of the proposed Project footprint are shown in **Figure 10-11.**

10.1.1 AQUATIC SENSITIVITIES

SITE SENSITIVITY BASED ON THE AQUATIC BIODIVERSITY THEME INCLUDED IN THE SCREENING TOOL AND SPECIALIST ASSESSMENT

Based on the DFFE Screening Tool, the site contains areas of Very High sensitivity due to the presence of CBAs and rivers. The remaining area within the development footprint is deemed to be of low sensitivity **Figure 10-1**.

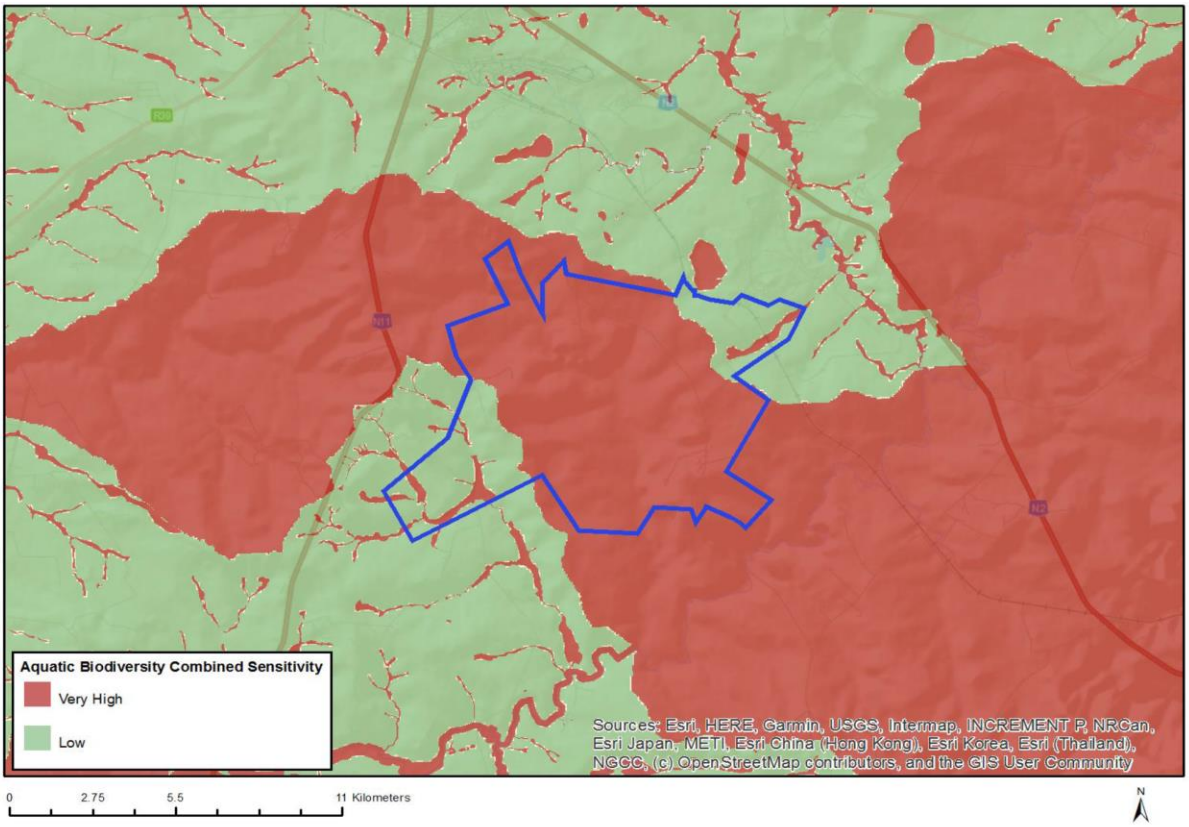

Figure 10-1: DFFE Screening Tool outcome for the aquatic biodiversity theme

Based on the above outcomes, the Aquatic specialist **agrees with** the environmental sensitivities identified on site. The findings have been informed by a site visit undertaken by the Aquatic Specialist in August 2020.

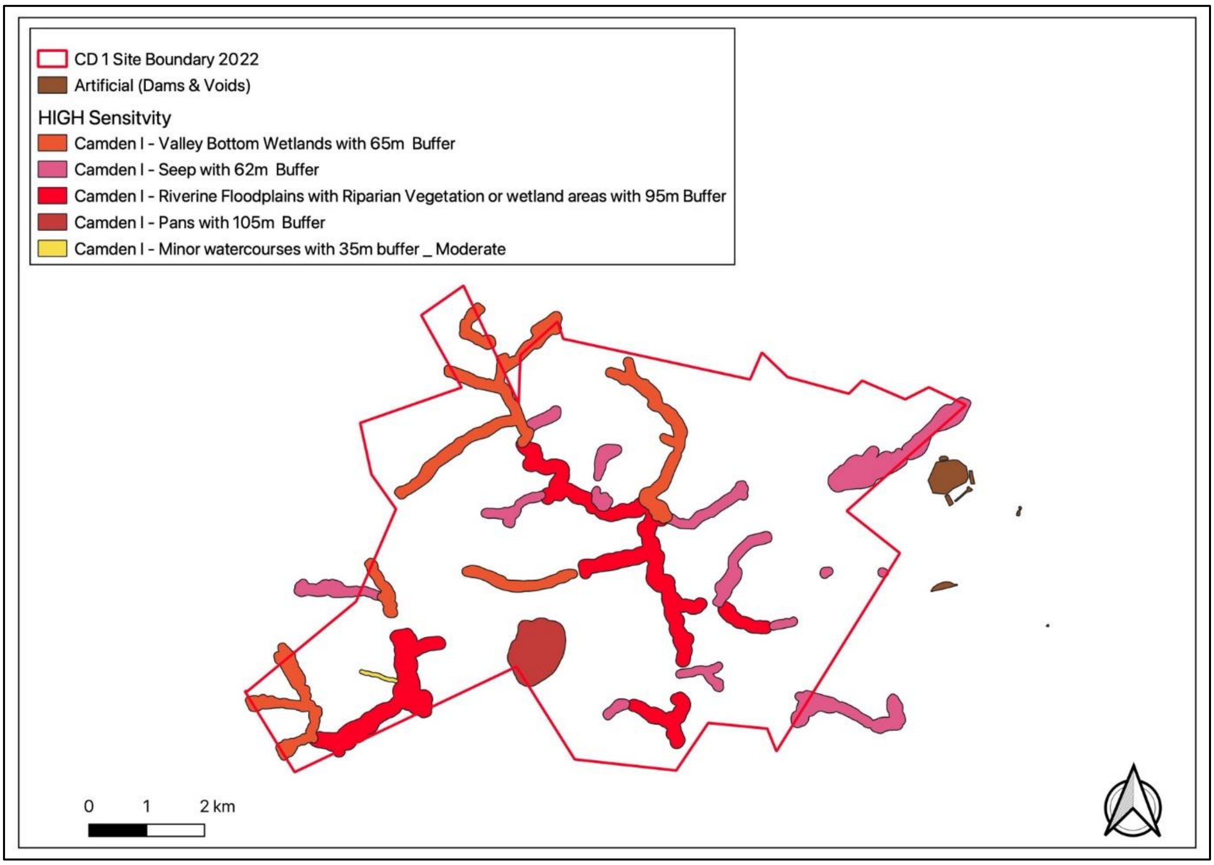

Figure 7-16 shows the sensitivity map produced following the desktop assessment as well as a groundtruthing exercises, with mapping of the observed features at a finer scale. **Figure 10-2** below provides an overview of the sensitivity of various aquatic features (with buffers distances included) as it relates to the main project component types for the project.

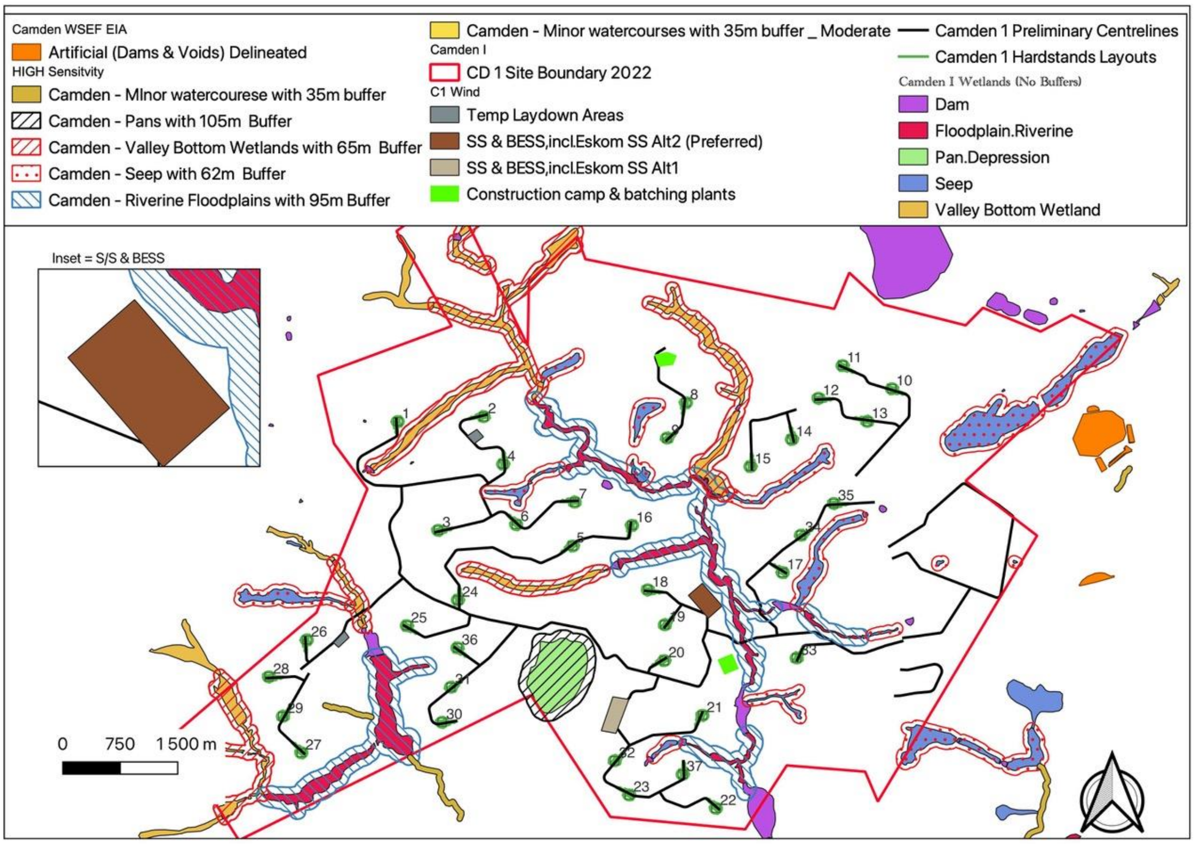

Figure 10-2: Camden I WEF, BESS and associated substations (including alternatives) in relation to buffered aquatic systems delineated in this assessment (EnviroSci, 2022)

In conclusion, the DEA Screening Tool identified two sensitivity ratings within the development footprint, namely, very high and low. Although there is some overlap with the findings on site and the Screening Tool's outcome, the development footprint contains various sensitivities (very high, and Moderate) that were identified following the undertaking of the site visit and spatial input considerations.

The environmental sensitivity input received from the aquatic ecology specialist has been considered and appropriate layout and development restrictions were implemented within the development footprint to ensure that the impact to aquatic ecology is deemed acceptable by the aquatic ecologist.

10.1.2 TERRESTRIAL SENSITIVITIES

The biodiversity theme sensitivity as indicated in the DFFE Screening Tool was derived to be Very High (**Figure 10-3**). This is due to presence on site of areas included within Critical biodiversity area 1 and 2, Ecological Support Areas, Endangered Ecosystem, Vulnerable Ecosystem, Langcarel Nature reserve, FEPA subcatchment, Strategic Water Source Area, and/or Protected Areas Expansion Strategy. The theme indicates almost the entire study area as being in the Very High sensitivity category, but there are significant areas that have been cultivated and impacted by heavy grazing that do not support this classification.

The site is within an area of natural grassland but degraded (from heavily to light). A broad classification of the habitat units on site, which also reflects relatively uniform plant species compositional units, is provided in the Biodiversity Assessment report (**Appendix H-4**). There are some habitats in the study area that have been described as sensitive in their own right in terms of the Biodiversity Assessment, as well as in terms of regional assessments. These include:

<u>CBA "Irreplaceable" areas</u>

The Mpumalanga Biodiversity Sector Plan (MBSP) (Mpumalanga Parks and Tourism Agency 2014) shows areas on site within various conservation planning categories, including areas designated as "CBA: Irreplaceable". These are areas that are required to meet biodiversity targets (for biodiversity pattern and ecological process features), the implication being that there are no other areas that meet the biodiversity criteria for meeting these conservation planning objectives. The Provincial policy is that they should remain in a natural state. **Where possible, impacts on these areas should be minimised.**

Wetlands

These are described in the Terrestrial Biodiversity Assessment only in terms of being a unique botanical habitat and not in the sense of a formal wetland delineation, which is normally assessed in a separate specialist study. The wetlands must be delineated according to "DWAF, 2003: A Practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones". **Restrictions in terms of infrastructure within these areas should be according to the National Water Act (Act 36 of 1998).**

Grasslands:

Grassland vegetation, in a general sense has been identified as threatened nationally as a habitat type. Indications are that loss of any grassland habitat is permanent in an ecological and biodiversity sense, and it is not possible to restore grassland to a natural state after they have been disturbed. They should therefore be treated as sensitive and all efforts made to minimize impacts on any area of grassland. **If possible, the footprint of any proposed infrastructure should be kept to a minimum within any undisturbed, natural grasslands, especially those in a moderate to good condition.**

Plant species of concern

There are a number of listed plant species that could potentially occur on site. The key habitats are grasslands and wetlands. There are also various protected species that could potentially occur on site.

Protected Areas: (National Parks and Nature Reserves)

Approximately a third of the site on the south-eastern side is shown as a protected area. This is the Langcarel Private Nature Reserve, proclaimed in 1967, which occupies the north-western border of the site, on the Farm Welgelegen 322 IT (green area in **Figure 7-20)**. This area is not being managed as a protected area and has undergone similar levels of degradation as surrounding areas, due primarily to overgrazing, but also partially due to alien invasive plants. In addition, no conservation management or activities were evident on site during the field assessment. This pattern of over-utilization affects all grasslands on site, resulting in them being in moderate to poor condition. A separate process is underway to have it (or part thereof) de-proclaimed as part of ongoing province-wide reserve verification efforts by the provincial authorities. No evidence was observed on site of any conservation activities during the field assessment. Assuming that this area would no longer be treated as a conservation area, the landscapes inside this boundary have been allocated here to conservation plan categories that most closely match the surrounding areas and the buffer area would not be applicable. It is therefore assumed that any areas of natural habitat within the "Protected Area" (i.e. excluding any modified areas) would have been designated as CBA1, the next-highest category. This is on the basis that these areas are within two different listed ecosystems (Chrissiesmeer Panveld, listed as Endangered, and Eastern Highveld Grassland, listed as Vulnerable) and it is likely that the conservation planning process would have counted these areas as secured before searching for additional "Irreplaceable" sites. Assessed impacts with moderate significance after mitigation were "Loss of indigenous natural vegetation" and "Impact on integrity of CBAs". However, these are only moderate because they are permanent and will definitely happen – the extent of the impact is limited due to the layout avoiding most areas of sensitivity. On this basis, the project is therefore deemed acceptable from a terrestrial biodiversity perspective and it is recommended the Environmental Authorisation be granted. The Biodiversity Specialist is of the opinion that the impacts associated with the project can be mitigated to acceptable levels provided the recommended mitigation measures identified are implemented.

Protected Areas Expansion Strategy

According to the National Protected Areas Expansion Strategy 2008 (NPAES2008), 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**. A draft National Protected Areas Expansion Strategy was published for public comment in 2018, but is deliberately not available as a spatial dataset. It does, however, reference the Mpumalanga Protected Area Expansion Strategy, in which priority areas are identified in terms of High, Medium and Low priorities. A map within this PDF document shows areas around Hendrina within the Low priority class that may include the site, but a spatial dataset to confirm this could not be sourced at the time of producing this report. On the basis of the Screening Tool output, which identifies "Protected Areas Expansion Strategy" as a factor within the study area, it is assumed that natural areas within the study area fall within this category (Low Priority **-** Mpumalanga Protected Area Expansion Strategy).

Listed ecosystems

Chrissiesmeer Panveld is listed as Endangered, and Eastern Highveld Grassland and Eastern Temperate Freshwater Wetlands are both listed as Vulnerable in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). **However, the first two are included almost entirely within a CBA: Irreplaceable area on site, so is already discussed in point 1 above. The second is a wetland vegetation type and is covered in point 2 above.**

The above information was used in conjunction with methodology to calculate Site Ecological Importance, described in the Terrestrial Biodiversity Assessment report (**Appendix H-4**). A map of habitat sensitivity on site was provided by the terrestrial specialist (**Figure 10-4**). The proposed infrastructure in relation to sensitivities is as follows:

- Wind Turbines (37): The proposed turbines are located within grasslands and in cultivated areas. They therefore affect areas either with LOW sensitivity, or MEDIUM-HIGH sensitivity (cultivated wetlands), or HIGH sensitivity (grassland).
- Construction camp and batching plants: The two construction camps and batching plant location alternatives are both in grassland, one in CBA2 and one in grassland. The alternatives therefore affect an area with HIGH and MEDIUM-HIGH sensitivity.
- SS & BESS (2 alternative sites): Alternative 1 is half in grassland (HIGH sensitivity) and half in cultivated land (LOW sensitivity). Alternative 2 (preferred) is in grassland (HIGH sensitivity) next to a wetland (VERY HIGH sensitivity).
- Temporary laydown areas x 2: The northern temporary laydown area is within a secondary grassland area (MEDIUM-LOW sensitivity). The southern temporary laydown area is within a cultivated area and therefore affects an area with LOW sensitivity.
- Internal road infrastructure: This is potentially the infrastructure component with the largest footprint, in terms of effects on natural habitat. These roads occasionally traverse habitat in HIGH and VERY HIGH sensitivity classes, but the majority of the roads are placed where there are existing roads, or are within areas of lower sensitivity.

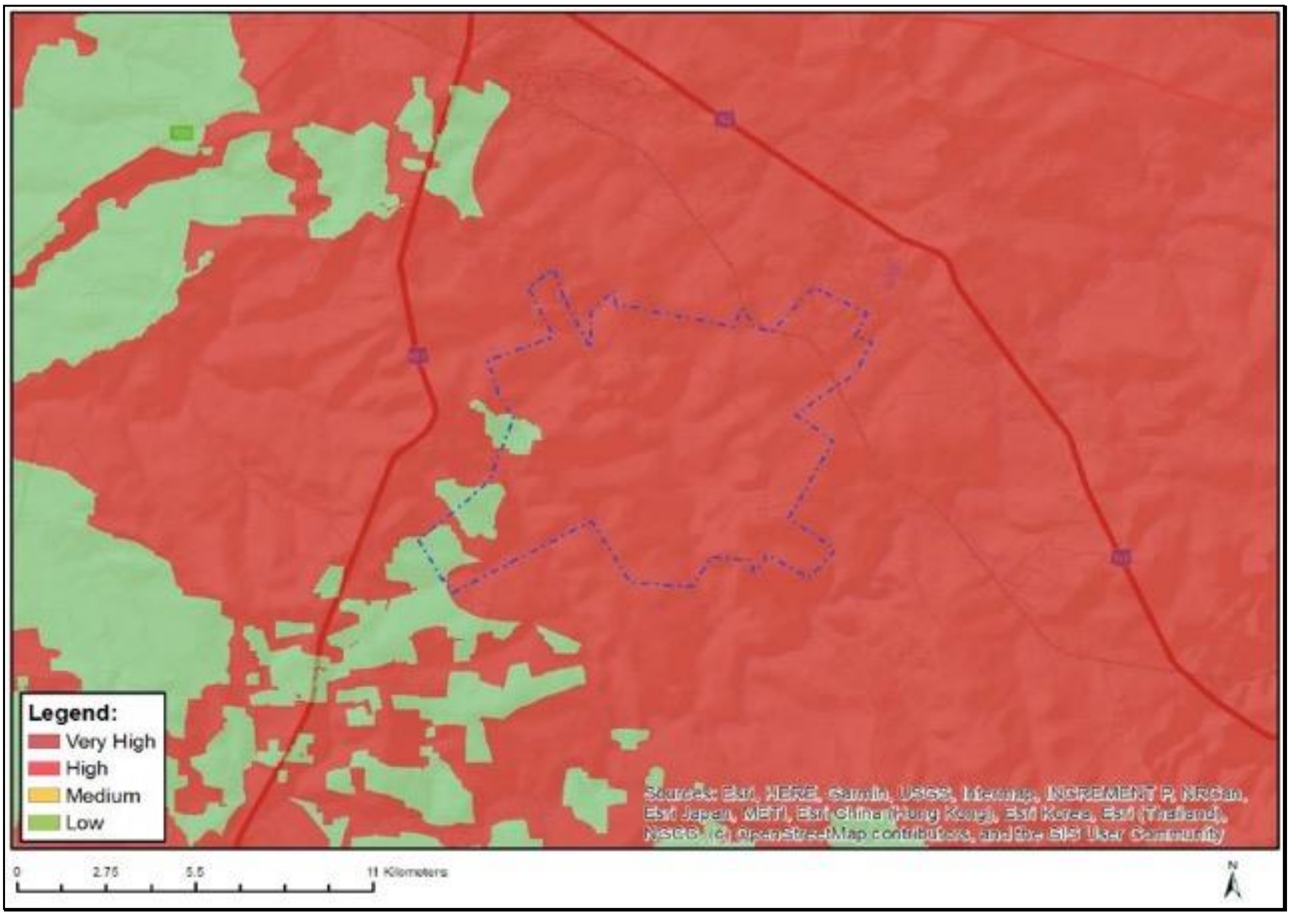

Figure 10-3: DFFE Screening Tool outcome for the terrestrial biodiversity theme

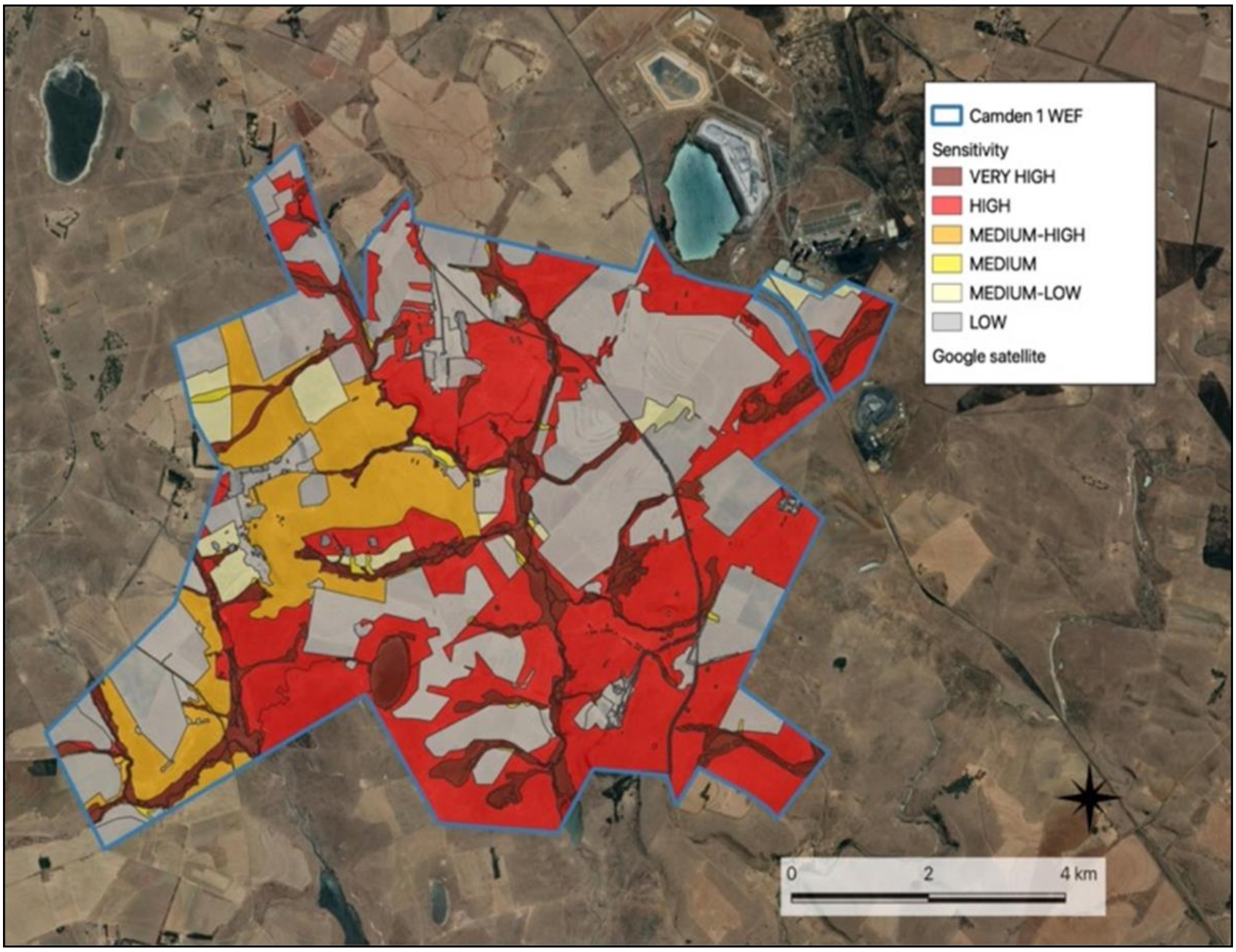

Figure 10-4: Habitat sensitivity of the study area, including consideration of CBAs (David Hoare Consulting, 2022)

10.1.3 AVIFAUNAL SENSITIVITY

Based on the DFFE Screening Tool[18], the Animal Species theme, relevant to the Camden I WEF, the project area is classified as **Medium to High** sensitivity (**Figure 10-5**), based on the potential presence of several species of conservation concern (SCC) namely Grey Crowned Crane (Globally and Regionally Endangered), Martial Eagle (Globally and Regionally Endangered), Southern Bald Ibis (Globally and Regionally Vulnerable), White-bellied Korhaan (Regionally Vulnerable) and Secretarybird (Globally Endangered and Regionally Vulnerable).

This classification was confirmed during the site surveys, based on the presence of recorded SCC, namely Secretarybird (Globally Endangered, Regionally Vulnerable) White-bellied Bustard (Regionally Vulnerable), Blue Crane (Globally Vulnerable, Regionally Near-threatened), Grey Crowned Crane (Globally and Regionally Endangered), Martial Eagle (Globally and Regionally Endangered), Lanner Falcon (Regionally Vulnerable), Greater Flamingo (Regionally Near-threatened), Lesser Flamingo (Globally and Regionally Near-threatened), Black Harrier (Regionally and Globally Endangered), Southern Bald Ibis (Regionally and Globally Vulnerable), Blue Korhaan (Globally Near-threatened), African Grass Owl (Regionally Vulnerable) and Cape Vulture (Globally Vulnerable and Regionally Endangered).

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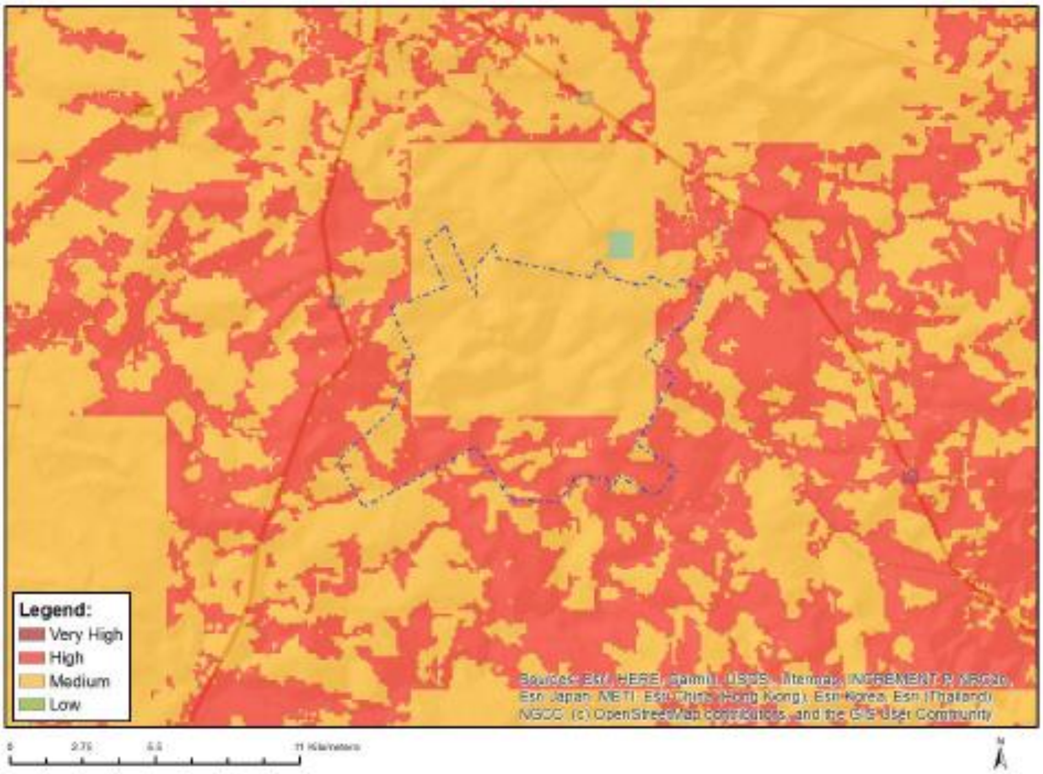
[18] The avifaunal wind theme in the screening tool is only applicable to projects in a Renewable Energy Development Zone (REDZ)

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	x		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Balearica regulorum
High	Aves-Polemaetus bellicosus
High	Aves-Geronticus calvus
High	Aves-Eupodotis senegalensis
Medium	Aves-Balearica regulorum
Medium	Aves-Sagittarius serpentarius

Figure 10-5: DFFE Screening Tool outcome for the animal species theme

Figure 10-6 indicates the avifauna sensitivity zones identified in the course of the study, relevant to the wind energy facility.

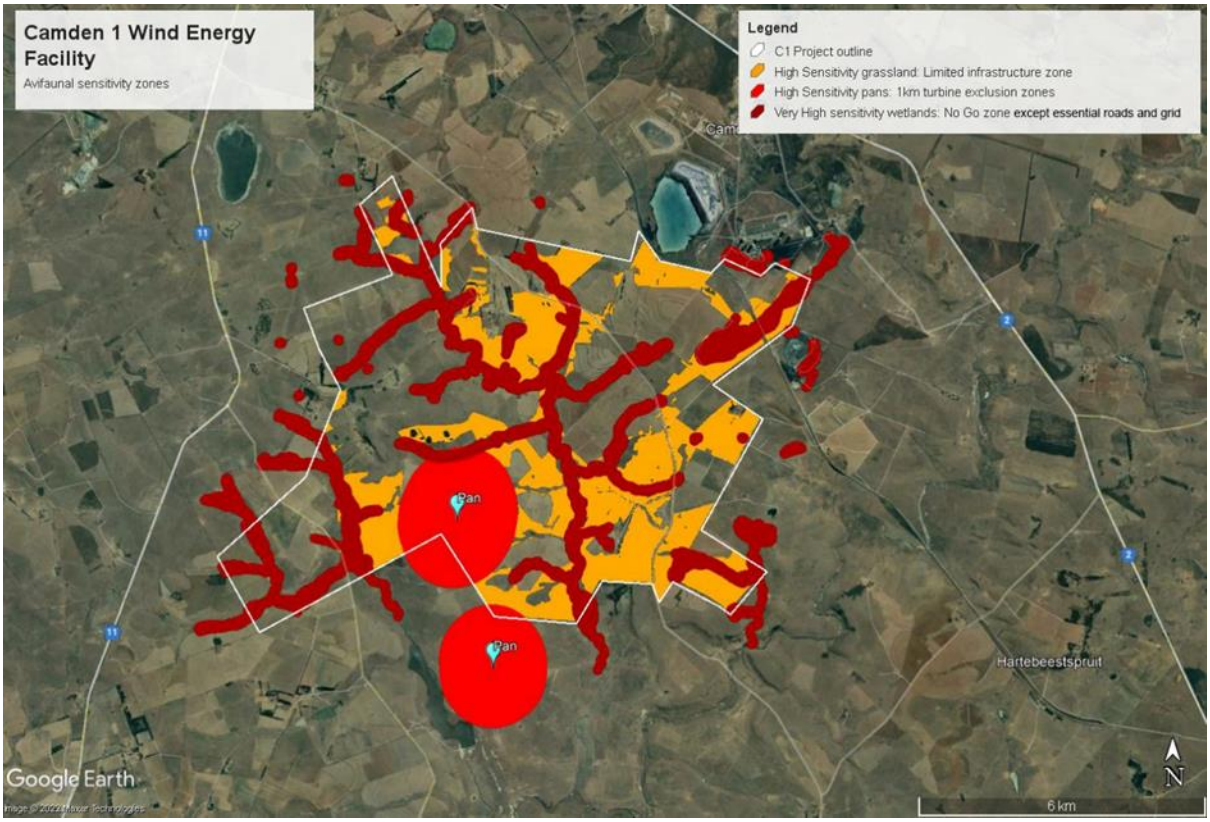


Figure 10-6: Avifaunal sensitivity zones

It is important to note that following completion of the pre-construction bird monitoring programme (August 2020 – September 2021 for Camden I WEF and July 2020 – May 2021 for Camden II WEF), and after the closure and conclusion of the Draft EIR Public Participation period for the Camden Renewable Energy complex (07 September 2022 to 10 October 2022), The avifauna Specialist was informed of a potential Martial Eagle (*Polemaetus bellicosus*) nest located near the Camden II WEF. Detailed information on the Martial Eagle nest finding is included as **Annexure 1** of the Avifauna Impact Assessment (**Appendix H-2**). In accordance with best practice and in alignment with the buffer distance recommended by BirdLife South Africa, a 5km no-turbine exclusion zone around this nest must therefore be implemented. This has been consequently considered and included as an additional consolidated environmental sensitivity map (**Figure 10-12**) of the Final EIR.

10.1.4 BAT SENSITIVITY

The DFFE Screening Tool denotes areas of the Camden I WEF site as High sensitivity with regards to with regards to being within 500m of a river and within 500m of a wetland; a “Medium sensitivity” is also denoted with regards to the presence of croplands (**Figure 10-7)**

MAP OF RELATIVE BATS (WIND) THEME SENSITIVITY

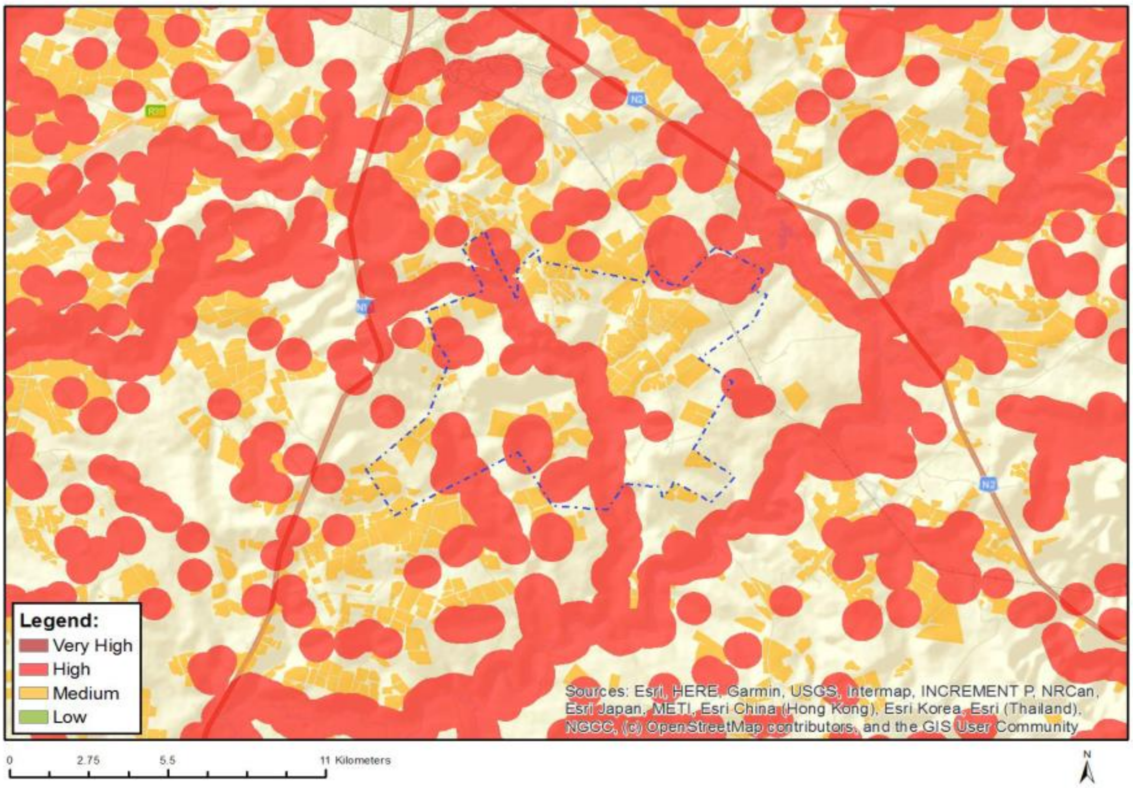


Figure 10-7: DFFE Screening Tool outcome for the bats (wind) theme

The Bat Specialist used Google Earth satellite imagery and verifications during site visits to spatially demarcate areas of the site with high and medium sensitivities relating to bat species ecology and habitat preferences, where high sensitivities and their buffers are no-go zones for turbines and turbine blade overhang. The description of parameters used in the development of the sensitivity map is provided in **Table 7-7** and **Table 7-8**.

Figure 10-8 depicts the sensitive areas of the site, based on features identified to be important for foraging and roosting of the species that are most likely to occur on site. The layout depicted adheres to the sensitivities, as identified in **Table 7-8.**

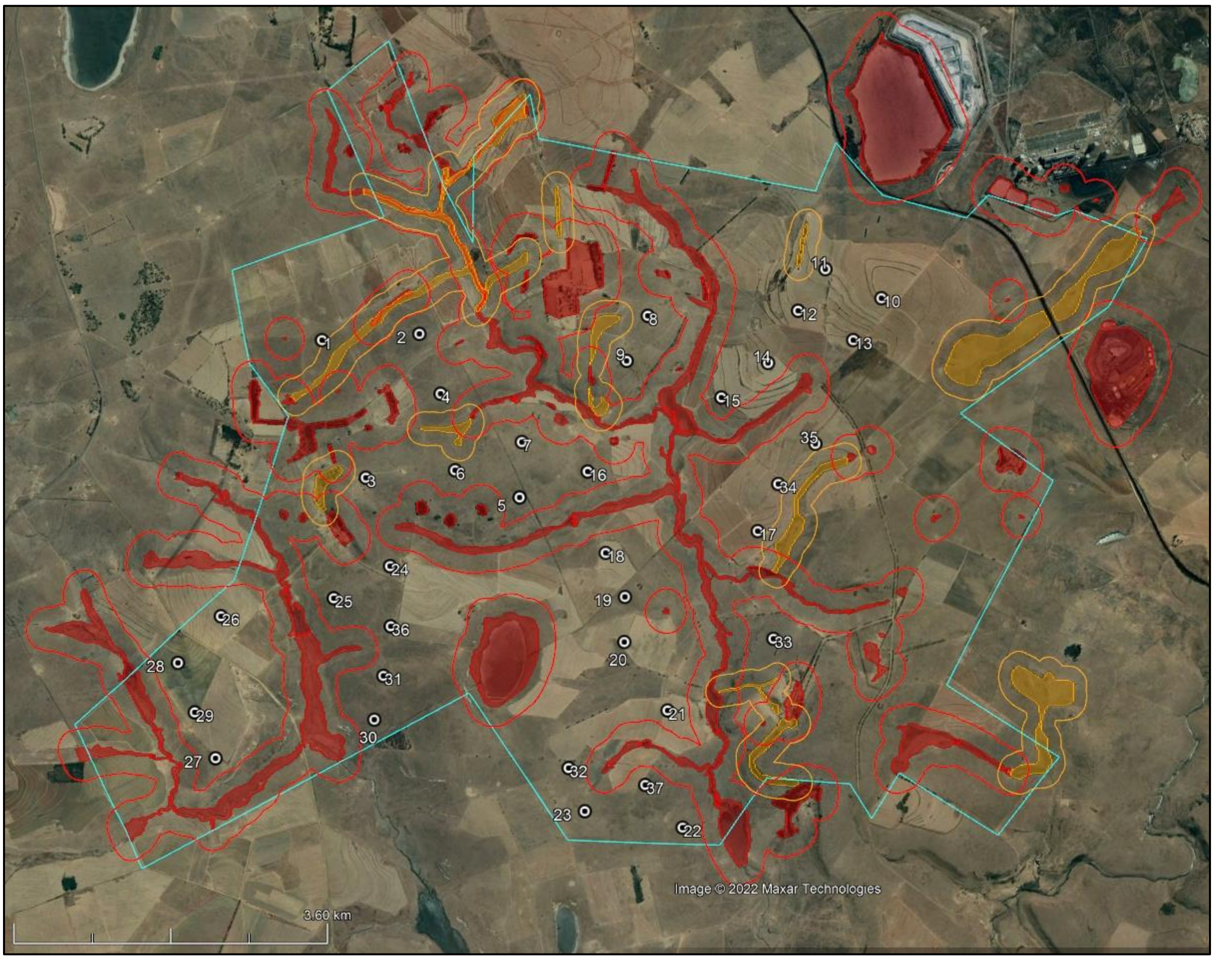
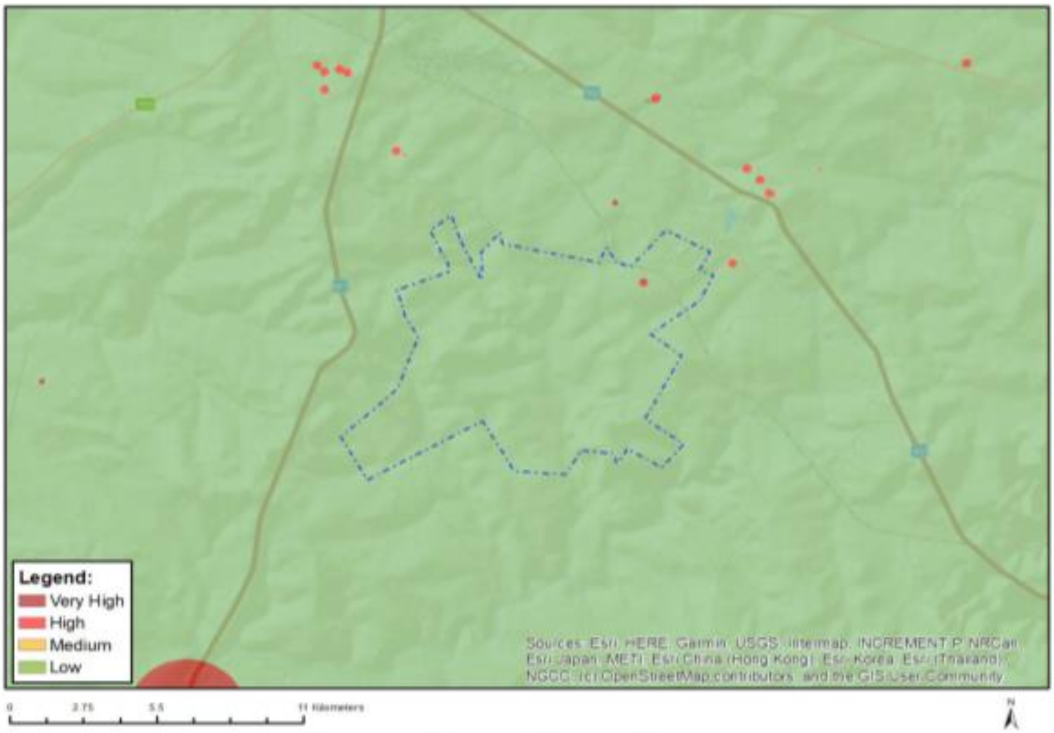


Figure 10-8: Bat sensitivity map of the wind energy facility site (Animalia, 2022)

10.1.5 HERITAGE SENSITIVITY

Based on the DFFE Screening Tool the Camden I WEF site is classified as Very High sensitivity with regards to the archaeological and cultural heritage theme (**Figure 10-9**). This is attributed to the site being within 100m of an Ungraded Heritage site.

MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Within 150m of a Grade IIIa Heritage site
Low	Low sensitivity
Very High	Within 100m of an Ungraded Heritage site

Figure 10-9: DFFE Screening Tool outcome for the archaeological and cultural heritage theme

According to the Heritage Specialist the project area is characterised by agricultural activities without any major focal points that would have attracted human occupation in antiquity and is thus considered to be of **Low** archaeological potential. This was confirmed during the field survey and no archaeological sites of significance were noted and finds were limited to ruins (CA001), ephemeral stone packed features of farm labourer dwellings and kraals (CA002, CA004, CA005, CA006, CA007, CA008, CA009, CA010, CA012, CA015. CA016, CA017) as well as a cemetery (CA003). Based on the current layout and recorded observations (**Figure 10-10**Error! Reference source not found.**)** CA001 (located ~ 18 meters west of a proposed road) and CA004 (located ~ 7 meters west of a proposed road) could be impacted on by the proposed Camden 1 WEF. No direct impact is expected on the recorded burial sites in the Project area. The heritage significance of the recorded ruins at CA001 is medium and CA004 is of low significance. The ruins at CA001 are assumed to be older than 60 years based on historical maps dating to 1968 and will need to be recorded prior to application for a destruction permit if impacted on.

In terms of Cultural Landscape the study area is in a rural setting and characterised by cultivation and agricultural activities with a historical layering consisting of burial sites and the remnants of stone packed structures/ settlements.

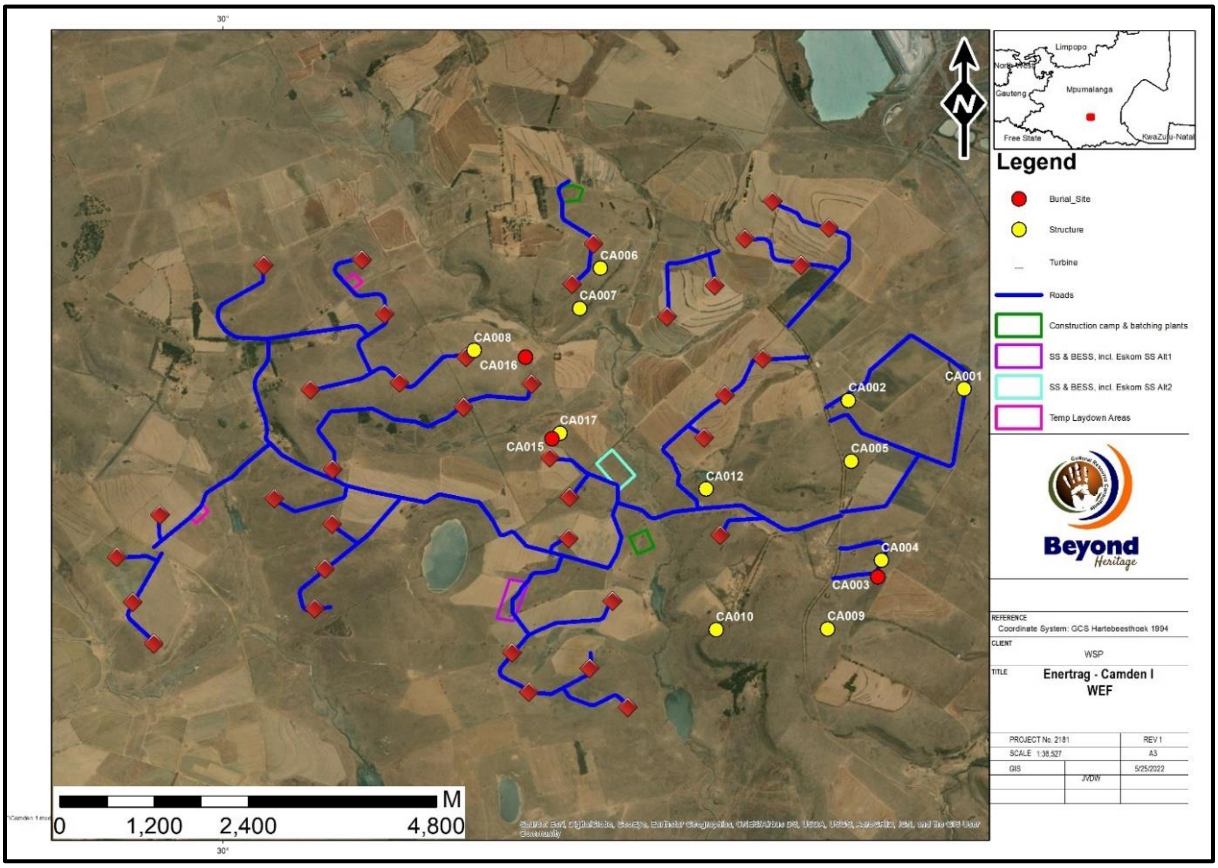


Figure 10-10: Project layout in relation to recorded features (Beyond Heritage, 2022)

10.2 SENSITIVITY MAPPING

A consolidated environmental sensitivity map[19] (**Figure 10-11**) has been compiled based on the sensitivities and buffers outlined in the specialist studies. As highlighted in Section above, a Martial Eagle nest was confirmed following completion of the pre-construction bird monitoring programme (August 2020 – September 2021 for Camden I WEF and July 2020 – May 2021 for Camden II WEF), and after the closure and conclusion of the Draft EIR Public Participation period for the Camden Renewable Energy complex (07 September 2022 to 10 October 2022). The location of the nest and associated 5km buffer is indicated in the consolidated environmental sensitivity map (**Figure 10-13**). Detailed information on the Martial Eagle nest finding is included as **Annexure 1** of the Avifauna Impact Assessment (**Appendix H-2**).

[19] With regards to the areas shown as ***Other Natural Areas*** in terms of the Mpumalanga Biodiversity Sector Plan (MBSP)**:** *These are natural areas that have not been selected to meet biodiversity pattern or ecosystem process targets, or to support the functioning of Critical Biodiversity Areas. Despite this, they are not without 'value'. ONAs often retain much of their natural character and may contribute significantly to maintenance of viable species populations and natural ecosystem functioning, and may provide important ecological infrastructure and ecosystem services. They are not, however, prioritized for immediate conservation action in the MBSP, unless CBAs or ESAs are lost, or impacting activities within the ONAs impact negatively on other areas.*

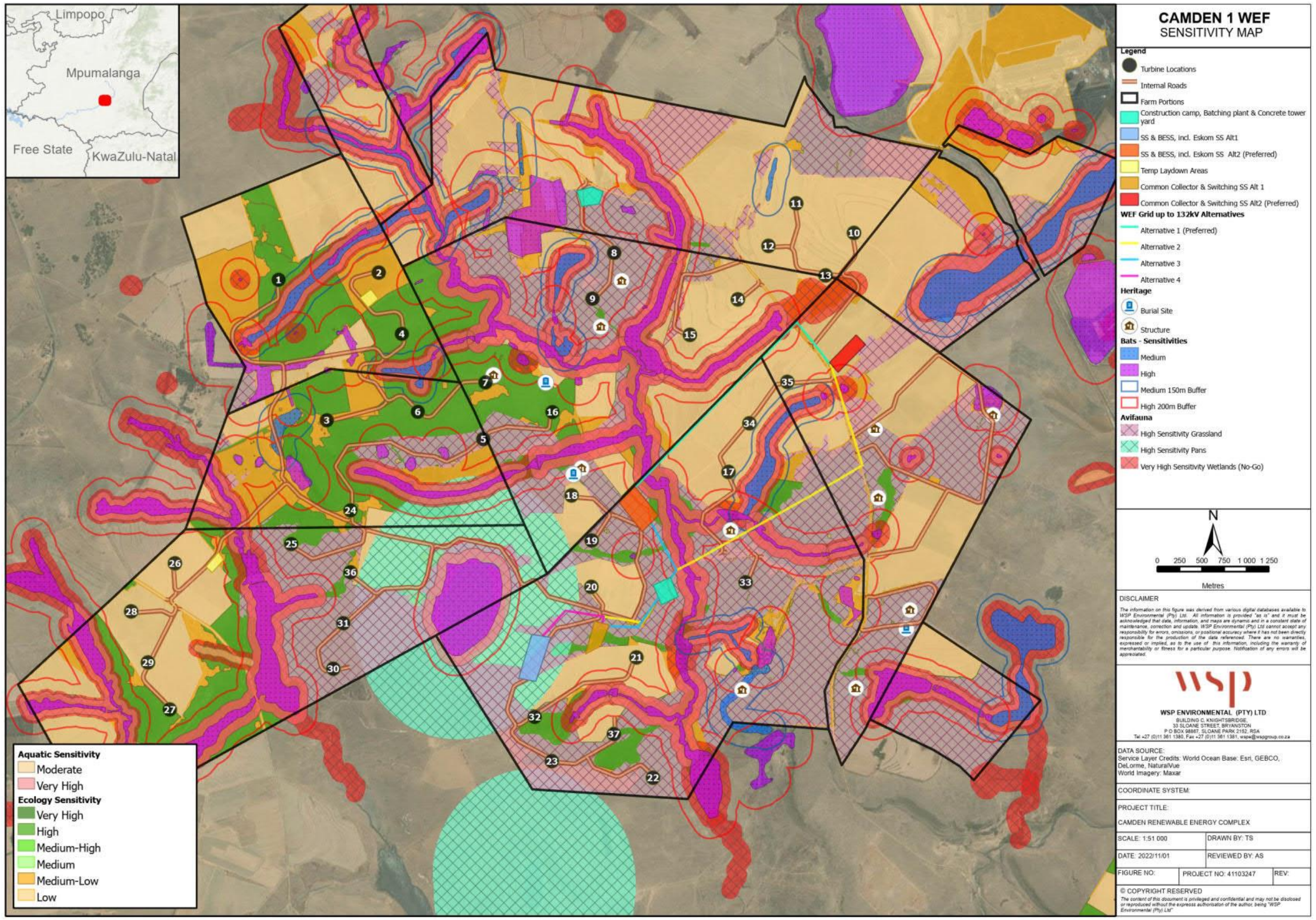


Figure 10-11: Site Layout overlain onto Environmental Sensitivity Map[20]

[20] Due to the CBA layers overlapping with the Ecology sensitivity layers a separate map indicating CBAs has been included below. However, it is important to note that the Ecology sensitivity layers take into account the CBA layers together with the terrestrial ecology on-site sensitivity verification.

Figure 10-12: Site Layout overlain onto Environmental Sensitivity map (indicating CBAs)

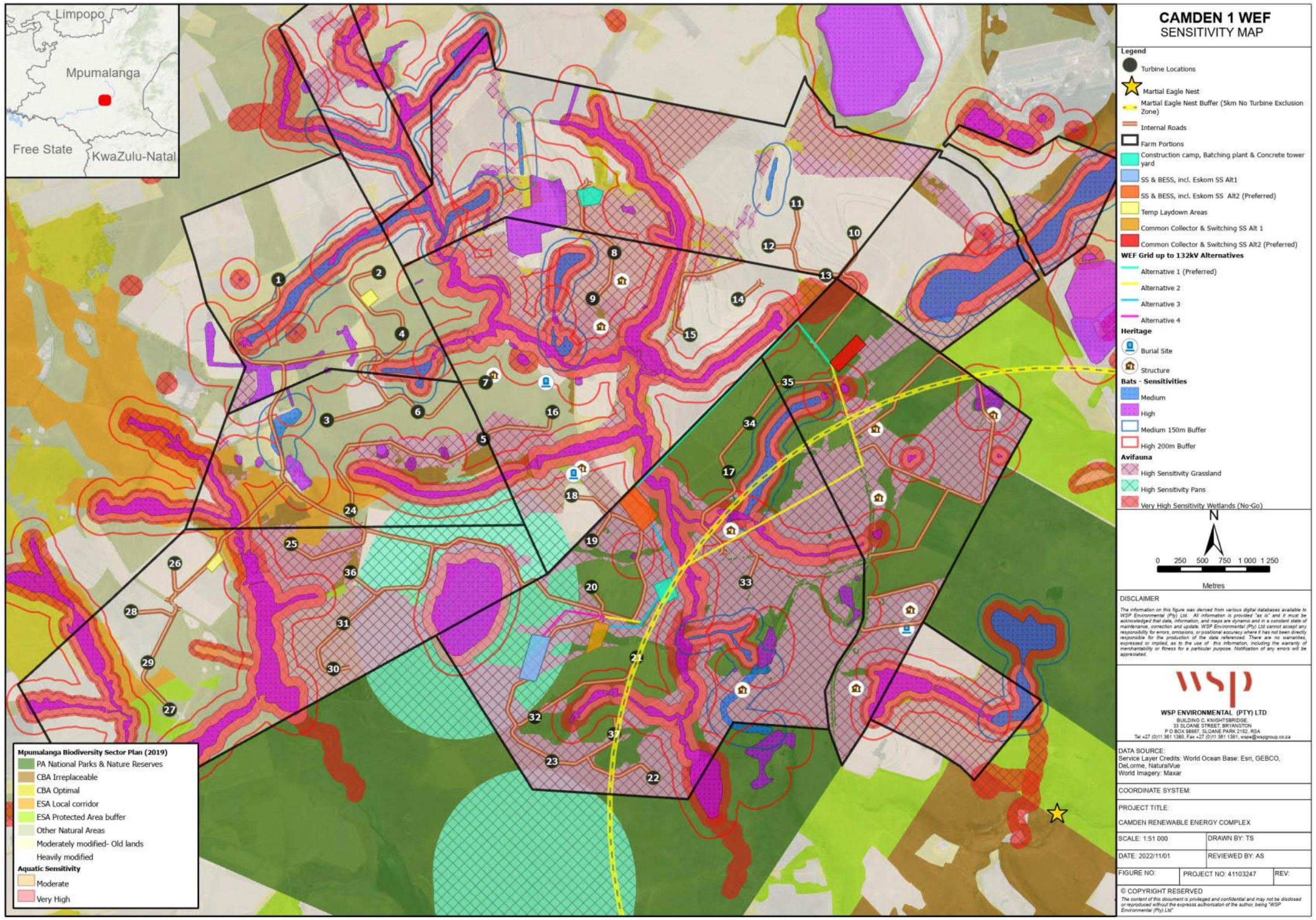


Figure 10-13: Site Layout overlain onto Environmental Sensitivity Map (including 5km radius of Martial Eagle nest (i.e., 5 km no-turbine exclusion zone)). Note: only turbine position 22 and 33 are located within the 5km radius of Martial Eagle nest (i.e. 5 km no-turbine exclusion zone) and would therefore require relocation outside this avifaunal no-turbine zone during the final layout approval process.

10.3 SPECIALIST CONCLUSIONS

10.3.1 NOISE/ACOUSTIC ASSESSMENT

According to the Noise Assessment, the existing noise climate surrounding the Camden I WEF is predominantly rural with very low baseline noise levels. Noise sources include birds, insects, livestock and activities of resident farmers. Anthropogenic influences include traffic on local roads and on the nearby N2 and N11 National roads as well as train activity along the railway line located just northeast of the study area. A distinctive hum from the nearby Camden Power Station is also evident at receptors in close proximity to the power station.

Based on the IFC EHS Guidelines for Wind Energy a preliminary modelling exercise was executed using a simple model which assumes hemispherical propagation of noise from each turbine to determine potential impact on receptors within a 2 km radius of the turbines. If L_{A90} noise levels at all sensitive receptors are below 35 dB(A) at a wind speed of 10 m/s (at a height of 10 m) during day and night times, this would be sufficient to assess the noise impact of the proposed facility, offering adequate protection of amenity at these receptors. If L_{A90} levels at any receptor location are above 35 dB(A), then impacts at these receptors may be perceived and potential turbine relocations may need to be considered. In low noise environments, the ETSU-R-97 report itself, however, stipulates that noise from wind farms should be limited to a range between 35 and 40 dB(A) (daytime). Additionally, a fixed limit of 43 dB(A) should be implemented during night-time. This should increase to 45 dB(A) (day and night) if the potential receptors have financial investments in the facility. With the Camden I WEF being located within a low noise environment a combination of the IFC and ETSU methodology was followed in this assessment.

Twelve sensitive receptors (farmhouses) were identified within 2 km of the site. Based on WSP's preliminary model (following the IFC methodology), the following was determined:

- Results indicate that predicted L_{A90} noise levels during both day and night are below the 35 dB(A) threshold, as stipulated in the IFC EHS guidance, at four of the twelve receptors.
- Noise levels at C1_Rec 01, C1_Rec 02, C1_Rec 05, C1_Rec 07, C1_Rec 08, C1_Rec 09, C1_Rec 10 and C1_Rec 12 are predicted to be above the threshold indicating that noise from the turbines could create a nuisance or impact at these locations.
- However, being a low noise environment, with reference to the ETSU daytime limit range of 35 – 40 dB(A), LA90 noise levels at seven of the twelve receptor locations are below this threshold. Additionally, at night, LA90 levels at all receptor locations are below the ETSU 43 dB(A) threshold.
- It is, however, understood that all of the surrounding receptors (except for C1_Rec 06 and C1_Rec 11, which are both below the 35 dB(A) threshold anyway) have direct interest and are vested in the Project, thus a blanket threshold value of 45 dB(A) (day and night) applies. Predicted noise levels at all receptor locations are below this 45 dB(A) threshold, and complaints are not anticipated.

The resultant environmental acoustic risks associated with the construction phase of the Project are anticipated to be "low" to "very low" with general mitigation options employed. For the operational phase, impacts are anticipated to be "low" as it is understood that the direct surrounding receptors are all vested in the Project. Ultimately, should no complaints from receptors arise, it is recommended that the Project can be considered for authorisation.

10.3.2 AGRICULTURE ASSESSMENT

The conclusion of the Agricultural Assessment is that the agricultural impact of the proposed development is acceptable because it offers a valuable opportunity for renewable energy development with very little loss of future agricultural production potential.

This is substantiated by the following points:

- The proposed development will only exclude an insignificantly small proportion of the land (0.8%) from agricultural production. The amount of agricultural land loss is well within the allowable development limits prescribed by the agricultural protocol. These limits reflect the national need to conserve valuable arable land and therefore to steer, particularly renewable energy developments, onto land of lower production potential.

- The proposed development will generate a reliable additional income that will improve the financial security for farming operations on the site, without significantly compromising the existing farming production or income.
- The proposed development offers security benefits against stock theft and other crime.
- The proposed development offers an improved road network, with associated storm water handling system, that can be used for farming operations.
- It is the net sum of positive and negative effects that determines the overall agricultural impact. Tiny losses of agricultural land are likely to be more than compensated for by the positive impacts, so that the net overall impact is likely to be positive.
- The proposed development poses a low risk in terms of causing soil degradation, which can be adequately and fairly easily managed by standard, best-practice management actions.
- The proposed development will also have the wider societal benefits of generating additional income and employment in the local economy.
- In addition, the proposed development will contribute to the country's urgent need for energy generation, particularly renewable energy that has much lower environmental and agricultural impact than existing, coal powered energy generation.
- All renewable energy development in South Africa decreases the need for coal power and thereby contributes to reducing the large agricultural impact that open cast coal mining has on highly productive agricultural land throughout the coal mining areas of the country.

The impact of the proposed development on the agricultural production capability of the site is assessed as being acceptable because of the above factors. Therefore, from an agricultural impact point of view, it is recommended that the development be approved.

The conclusion of this assessment on the acceptability of the proposed development and the recommendation for its approval is not subject to any conditions, other than recommended mitigation.

10.3.3 AQUATIC IMPACT ASSESSMENT

During this assessment, several sensitive aquatic habitats were observed and are shown in the maps provided in this report. Noteworthy areas, that should be avoided, include the main riverine systems with wetlands, valley bottom wetlands, seeps and the endorheic pans. The only exception being where existing crossings may be used and/or upgraded that intersect valley bottom wetlands, riverine systems and three pans.

This applies to the Wind Energy Facility in particular where the proposed roads will either avoid aquatic systems or utilise impacted areas. All grid connections / powerlines must span aquatic systems and while no new access tracks along these grid corridors must be created within aquatic systems

The current layouts have, to a large degree, avoided these sensitive features and buffer areas, greatly reducing the potential overall impact and risk to Aquatic resources. Only the most southern road entrance is located within a buffer area, but not aligned with a previous disturbance and this should be micro-sited prior to construction to an adjacent existing farm track or outside the buffer area if possible. The overall and cumulative impacts, as assessed, are linked to instances where complete avoidance was not possible, or the nature of the activities involve a potential risk to aquatic resources even at great distance. Overall, it is expected that the impact on the aquatic environment would be **Low (-) post mitigation and with the assumptions listed above**.

Based on the findings of this study, the specialist finds no reason to withhold to an authorisation of any of the proposed activities for the various projects, assuming that key mitigations measures are implemented. Lastly no preference is provided with regard any of the grid connections, as it assumed based on the characteristics of the site, that all the aquatic systems could be spanned or avoided, while making use of existing tracks, only.

This also applies to the various substation / construction and laydown positioning as none of these have a direct impact on the aquatic environment are anticipated for each of the projects. This must be coupled to a detailed monitoring plan must be developed prior to the construction phase.

10.3.4 BIODIVERSITY

The vegetation types that occur on site are Eastern Highveld Grassland, listed as Vulnerable, and Amersfoort Highveld Clay Grassland, not listed. Almost all areas within Eastern Highveld Grassland also fall within another listed ecosystem, Chrissiesmeer Panveld, listed as Vulnerable, and defined independently to the vegetation types. Parts of the site are therefore within two listed ecosystems that overlap.

There is a proclaimed conservation area on site, the Langcarel Private Nature Reserve. This area has not been managed as a protected area and has undergone similar levels of degradation as surrounding areas due primarily to overgrazing, but also partially due to alien invasive plants. In addition, no conservation management activities were evident on site during the field assessment. This pattern of over-utilization affects all grasslands on site, resulting in them being in moderate to poor condition. A separate process is underway to have it (or part thereof) de-proclaimed as part of ongoing province-wide reserve verification efforts by the provincial authorities. The habitat has been used for livestock production and is impacted by this landuse. It is therefore the authors' opinion on the basis of the current land use and levels of modification, that the private nature reserve does not align with the objective and purpose of the protected area status.

There are some Critical Biodiversity Areas (CBA1 and CBA2) on site, but only an insignificantly small part of these areas are directly affected by the proposed project (0.7% of area of CBAs on site).

Natural grassland on site is in moderate to poor condition, primarily due to heavy overgrazing. There are significant areas of low grass cover and bare areas, and plant species composition has been degraded by grazing effects.

The proposed layout avoids sensitivities to a large degree. Wetland crossings are at existing roads, and all other wetlands are avoided. There is some infrastructure within natural grasslands, but most road infrastructure, the component of wind energy projects that usually has the highest impact, is mostly along existing roads or within disturbed or transformed areas. The proposed project (all infrastructure components together) affects less than 2% of the remaining natural habitat on site.

Assessed impacts with moderate significance after mitigation are "Loss of indigenous natural vegetation" and "Impact on integrity of CBAs". However, these are only moderate because they are permanent and will definitely happen – the extent of the impact is limited due to the layout avoiding most areas of sensitivity. On this basis, the project is therefore deemed acceptable from a terrestrial biodiversity perspective and it is recommended the Environmental Authorisation be granted. The author is of the opinion that the impacts associated with the project can be mitigated to acceptable levels provided the recommended mitigation measures identified are implemented.

10.3.5 AVIFAUNA ASSESSMENT

The proposed wind energy facility will have a moderate impact on priority avifauna which, in most instances, could be reduced to a low impact through appropriate mitigation, although some instances moderate residual impacts will still be present after mitigation. No fatal flaws were discovered during the onsite investigations. .

The proposed BESS will have a low impact on priority avifauna which, could be reduced to a very low level in most instances through appropriate mitigation, although some instances low residual impacts will still be present after mitigation. No fatal flaws were discovered during the onsite investigations. The proposed BESS development is therefore supported, provided the mitigation measures listed in this report are strictly implemented.

Following completion of the pre-construction bird monitoring programme (August 2020 – September 2021 for Camden I WEF and July 2020 – May 2021 for Camden II WEF), and after the closure and conclusion of the Draft EIR Public Participation period for the Camden Renewable Energy complex (07 September 2022 to 10 October 2022), The avifauna Specialist was informed of a potential Martial Eagle (*Polemaetus bellicosus*) nest located near the Camden II WEF. The presence of the nest was confirmed by the Avifauna Specialist on 12 October 2022. Detailed information on the Martial Eagle nest finding is included as **Annexure 1** of the Avifauna Impact Assessment (**Appendix H-2**). According to the Avifauna Addendum (**Annexure 1** of the Avifauna Impact Assessment (**Appendix H-2**), the presence of this nest affects the following turbine locations proposed within a 5km radius of the nest and are therefore not supported from an avifaunal perspective:

— Camden I Wind Energy Facility: WTG locations 22 and 33 only.

It is important to note that all other turbine locations presently adhere fully to the avifaunal assessment, findings and recommendations and that all the requested mitigation measures have been incorporated into the respective project EMPrs, including but not limited to pre-construction walkthroughs, avoidance of wetland and dams and adherence to all sensitivity criteria as provided, as well as operational monitoring and pro-active mitigation in the form of shutdown on demand.

The conclusions, impacts and ratings (pre and post mitigation), as well as findings of this Avifauna Impact Assessment Report (**Appendix H-2**) remain unchanged. The proposed WEF development is therefore supported, provided the mitigation measures listed in this report are strictly implemented, including ensuring no turbines within the 5km no-turbine buffer around the Martial Eagle nest is approved with the final layout approval. The buffer of 5km is presented on the sensitivity map in the EIA and whilst the affected turbines as a result of the buffer are still depicted therein, the Department of Environment, Forestry and Fisheries (DFFE) must exclude these locations from the Environmental Authorisation.

10.3.6 BAT ASSESSMENT

The Bat Environmental Impact Assessment Report considered information gathered from site visits between November 2020 and October 2021, literature, and satellite imagery. The bat species most likely to be impacted on by the proposed WEF are *Miniopterus natalensis*, *Laephotis* (formally *Neoromicia*) *capensis* and *Tadarida aegyptiaca*. These species are of special importance based on their likelihood of being impacted by the proposed WEF, due to high abundances and certain behavioural traits. They have also been dominating records of fatalities at wind energy facilities in South Africa. These more abundant species are of a large value to the local ecosystems as they provide a greater contribution to most ecological services than the rarer species, due to their higher numbers. With ever-increasing numbers of wind energy facilities set to become operational in the country over the next few years, the negative impacts on bat populations will accumulate. As such, pressure on all bat species, those rare as well as common, will escalate, increasing the extinction risk for the former and potentially sending the latter into unsustainable population declines over the longer term.

Curtailment may be implemented during operation if the results of the operational bat mortality monitoring indicate that bats are being killed above sustainable thresholds. These thresholds are advised on during the operational study.

It is recommended that all turbines be curtailed below generator cut-in speed for every night, commencing on the commercial operational date. Additional curtailment at wind speeds higher than the generator cut-in speed, may be implemented during operation if the results of the operational bat mortality monitoring indicate that bats are being killed above sustainable thresholds.

Development of acoustic deterrents is progressed far enough for deterrents to be trialled, if the operational study indicates above sustainable threshold mortalities. These thresholds are advised on during the operational study.

The presence of security lights on and around infrastructure creates significant light pollution that can impact bat feeding habits and species composition negatively, by artificially discouraging photophobic (light averse) species and favouring species that readily forage around insect-attracting lights. Additionally, if the buildings and associated infrastructure are placed close to wind turbines, the light pollution at these buildings can attract photophilic bat species, thereby significantly increasing their chances of being killed by moving blades of turbines within close proximity.

The Strategic Environmental Assessment (SEA) assigns 50km buffers to large bat roosts for wind energy, therefore any existing or possible cave/roost locations may be assigned a buffer up to 50km if they are found to be supporting large enough bat colonies. Figure 4.3 of the Bat Environmental Impact Assessment Report (Appendix H-3) shows the dolomitic geology of the greater area, with an approximate 100km site boundary radius shown in red. At its nearest, the dolomite extends to approximately 65km north-east of the REC. Dolomite is known to be prone to good cave formation, and many bat colonies are supported in such caves in the country, particularly in the province of Gauteng. Museum records of bats collected from two caves and two mines within approximately 100km of the site exist. Specimens of *Miniopterus. natalensis* and *Rhinolophus clivosus* were collected from River Cave (96km north of site); *R. simulator*, *Myotus tricolor* and *Cloeotis percivali* from a mine tunnel on Waterval Farm (91km north), *R. simulator*, *R. blasii*, *R. clivosus* and *Miniopterus fraterculus* from Kalkoenkrans Cave (64km north-east) and *Miniopterus natalensis* from Barites mine (108km northeast). All of the above locations are further than 50km from the proposed site.

A sensitivity map (**Figure 7-25**) was drawn up indicating potential roosting and foraging areas. The High Bat Sensitivity areas are expected to have elevated levels of bat activity and support greater bat diversity. High Bat Sensitivity areas and their buffers are 'no–go' areas due to expected elevated rates of bat fatalities due to wind turbines. Avoidance is the most affective mitigation measure for reducing the impact on bats, and should be implemented as the first layer of mitigation. No turbine blades may intrude into high sensitivity buffers. Medium sensitivities indicate areas of probable increased risk due to seasonal fluctuations in bat activity, but turbines are allowed to be constructed in medium sensitivity areas. **Table 7-8** provides details on the significance of the sensitivity criteria on each infrastructure type. The proposed layout respects the sensitivity map, and no turbines or turbine blades are intruding into high sensitivities and their buffers.

The yearly median of average hourly bat passes at 110m is 0.32 bp/h. the preconstruction guidelines of MacEwan *et al.* (2020), specifies levels of bat mortality risk based on this median activity level and the ecoregion that the site is located in. The site is located in the Highveld Grasslands ecoregion according to Olson *et al.* (2012), and this ecoregion is not covered in the preconstruction guidelines. Therefore, the bat mortality risk cannot be assigned according to the guidelines in MacEwan *et al.* (2020), and the probability of active mitigations being required during operation need to be determined by the results of the operational mortality monitoring.

The pre-construction bat monitoring has now been completed in accordance with the latest monitoring protocols and guidelines, passive bat activity data has been gathered and provides comparative bat activity and species assemblages across all seasons as well as various habitats, terrain and/or areas of the site.

If the proposed WEF is approved, a minimum of 2 years of operational bat mortality monitoring should be conducted from the start of the operation of the facility.

Thus far, from a bat impact perspective, no reasons have been identified for the Camden I WEF development not to receive Environmental Authorisation, under the mitigative conditions stated in this EIA Report.

10.3.7 VISUAL AND LANDSCAPE ASSESSMENT

A combined visual study was conducted to assess the magnitude and significance of the potential visual impacts associated with the development of the proposed Camden 1 WEF and associated grid connection infrastructure near Ermelo in Mpumalanga Province. The VIA has demonstrated that the study area has a somewhat mixed visual character, transitioning from the heavily transformed urban / peri-urban landscape associated with the town of Ermelo in the north and north-east to a more rural / pastoral character across the remainder of the study area. Hence, although WEF and power line development would alter the visual character and contrast with this rural / pastoral character, the location of the proposed WEF and grid connection infrastructure in close proximity to Camden Power Station and the associated power lines, mining activity and rail infrastructure will significantly reduce the level of contrast.

A broad-scale assessment of visual sensitivity, based on the physical characteristics of the study area, economic activities and land use that predominates, determined that the area would have a low to moderate visual sensitivity. However, an important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs.

One formal protected area (Langcarel Private Nature Reserve) was identified within the study area, although the area is entirely managed for commercial agriculture with no conservation activities present and no evidence of public access to the site. Any landscape value or visual appeal has therefore been reduced. The area is not typically valued for its tourism significance and relatively few leisure-based tourism facilities (lodges/accommodation facilities) were identified inside the study area. This factor in conjunction with the high levels of transformation in the north-east have reduced the overall visual sensitivity of the broader area.

A total of six (6) sensitive receptors were identified in the study area, four (4) of which are considered to be sensitive receptors as they are linked to leisure/nature-based tourism activities in the area. None of these receptors are however expected to experience high levels of visual impact from the proposed WEF facility. An additional fourteen (14) receptors were identified within 2km of the proposed WEF development, all of which appear to be farmsteads that could be regarded as potentially sensitive visual receptors as the proposed development will likely alter vistas experienced from these locations. Twelve (12) of these farmsteads are however located within the Camden I WEF project area and it has been confirmed by the Proponent that the relevant land owners are in support of the overall Camden Renewable Energy Complex project. As such, they are not expected to perceive the proposed development in a negative light and this would reduce the level of visual impact experienced at these locations. The remaining two potentially sensitive receptors are expected to experience moderate levels of visual impact as a result of the proposed development.

Although the N2 and N11 receptor roads traverse the study area, motorists travelling along these routes are only expected to experience moderate impacts from the proposed Camden 1 WEF. As there are no national routes or main roads within 5 kms of the grid assessment corridors, it is not anticipated that these roads will be subjected to any visual impacts as a result of the grid connection infrastructure.

A preliminary assessment of overall impacts revealed that impacts associated with all the proposed Camden I WEF and associated grid connection infrastructure (post mitigation) are of low significance during both construction and decommissioning phases. During operation however, visual impacts (post mitigation) from the Camden I WEF would be of moderate significance with relatively few mitigation measures available to reduce the visual impact. Visual impacts associated with the Camden I WEF 132kV Grid Connection project during operation would be of low significance.

Considering the presence of existing and proposed mining activity and electrical generation and distribution infrastructure, the introduction of new renewable energy facilities in the area will result in further change in the visual character of the area and alteration of the inherent sense of place, extending an increasingly industrial character into the broader area, and resulting in significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommended mitigation measures. Considering the distance of the proposed Ummbila Emoyeni Renewable Energy Wind Facility from the Camden Renewable Energy Complex, and the undulating nature of the intervening terrain, it is not anticipated that this new project will exacerbate the cumulative impacts already identified. In conclusion, the Specialist acknowledges this additional project and confirms that there are no changes to the findings of the original VIA reports..

A comparative assessment of site alternatives for the on-site WEF infrastructure and also for the grid connection alternatives was undertaken in order to determine which of the alternatives would be preferred from a visual perspective. No fatal flaws were identified in respect of any of the alternatives for the proposed on-site substation / BESS facilities, temporary construction laydown area and temporary construction camp / cement batching plant and all alternatives were found to be favourable.

No fatal flaws were identified for either of the substation alternatives or any of the grid connection infrastructure alternatives. No preference was determined for either of the substation site alternatives and both alternatives were found to be favourable.

10.3.8 HERITAGE ASSESSMENT

The Project area is a characterised by agricultural activities (mainly grazing and cultivated fields) without any major focal points like pans or hills that would have attracted human occupation in antiquity and is considered to be of low archaeological potential. This was confirmed during the field survey and no archaeological sites of significance were noted and finds were limited to ruins (CA001), ephemeral stone packed features of farm labourer dwellings and kraals (CA002, CA004, CA005, CA006, CA007, CA008, CA009, CA010, CA012, CA015. CA016, CA017) as well as a cemetery (CA003). The impact of the project on the recorded heritage resources can be mitigated to an acceptable level with no adverse impacts to heritage resources.

According to the SAHRA Paleontological sensitivity map the study area is of zero to very high paleontological significance and an independent study was conducted for this aspect. Bamford (2022) concluded that the impact on palaeontological resources is low and the project should be authorised from a paleontological point of view. A Fossil Chance Find Protocol should be added to the EMPr.

Potential risks to the proposed project are the occurrence of intangible features and unrecorded cultural resources (of which graves and subsurface cultural material are the highest risk). This can cause delays during construction, as well as additional costs involved in mitigation, and possible layout changes.

The overall impact of the project on heritage resources is considered to be low. Residual impacts can be managed to an acceptable level through implementation of the recommendations made in this report. The socio-economic benefits also outweigh the possible impacts of the development if the correct mitigation measures are implemented for the project.

The project can commence with the implementation of the recommendations in this report are implemented as part of the EMPr, based on the South African Heritage Resource Authority (SAHRA) 's approval.

10.3.9 PALAEONTOLOGICAL ASSESSMENT

Based on the fossil record but confirmed by the site visit and walk through, there are NO FOSSILS of the *Glossopteris* flora even though fossils have been recorded from rocks of a similar age and type in South Africa. It is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary. There is a very small chance that fossils may occur below the ground surface in the shales of the Vryheid Formation (Ecca Group, Karoo Supergroup) so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once excavations and drilling for foundations and amenities have commenced, then they should be rescued and a palaeontologist called to assess and collect a representative sample.

10.3.10 TRANSPORT ASSESSMENT

The following conclusions and recommendations were made based on the Transport Impact Assessment undertaken for the Camden I facilities:

- The Scope of the TIA was informed by the Committee of Transport Officials' South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Vol. 1, Version 1, August 2012.
- A concurrent construction phase was assumed to ensure a conservative traffic generation and impact analysis.
- There are no known planned road upgrades in the study area.
- There are no known large scale latent developments in the vicinity of the site that may have an impact on the local road network, except for the latent energy developments that were assessed as part of the Cumulative Impact Assessment, the Camden II WEF.
- Access to the site will be via the existing access of the D260 and D1107 to the N11 and the D1264 to the N2.
- Construction and operational phase parking will be accommodated on-site.
- There is no need for dedicated public transport or non-motorised transport infrastructure to serve the site during the construction and operational phases.
- The estimated peak construction trip generation of all the facilities will be 118 veh/hr during the weekday AM and PM peaks. This trip generation estimate represents a conservative (high) calculation. Due to the site accesses to the facility off low to medium trafficked National roads, and low trafficked district roads, the traffic impact during the workday AM and PM peak hours are expected to be negligible.
- The expected traffic increase on the district roads during the construction phase could result in damage to the unsurfaced roads, as they are not designed for abnormal vehicles. The repairs, if required, should be the responsibility of the Contractor and the Provincial road authority.
- The transport route/s of the wind turbine components, solar PV modules, batteries, transformers and ammonia plant components between their origin of manufacture to the site may be National, Provincial or Local roads; and each authority will be required to provide the necessary permits for the transportation of any oversized or abnormally heavy components.
- It is recommended that an abnormal vehicle route management plan be undertaken when the port/s of entry of the tower components (masts, blades, rotor nacelles, generators, etc.) are known. These plans should include all aspects such as horizontal and vertical requirements along the routes, bridges along the route, speed limits, etc. These plans and the application for the abnormal permits is normally the responsibility of the logistics company that will transport the components to site.
- The Operational phase trip generation of the Wind WEF, Solar PV and Green ammonia plant is expected to be negligible due to the low number of permanent staff trips. The associated transport impact on the surrounding road network will be negligible.

- The safety of the intersections off the National roads may be compromised due to the increase in especially heavy vehicle volumes. It is recommended that additional temporary and permanent road signage is installed at the intersections of the D260/N11, the D1107/N11 and the D1264/N2 to improve the safety of the intersections. The developer has undertaken to implement the required signage to the relevant Provincial and SANRAL standards, if allowed to do so (i.e. appropriate consents are obtained).
- It is not possible to determine the volume of traffic that will be generated during the decommissioning phases of the three facilities. It can however be expected that the volumes will be lower than during the construction phase, these trips may not occur concurrently, and the resultant transport impact on the local access roads will therefore be lower than during the Construction phase.
- The overall significance of each impact during the Construction Phase of the facility detailed in Section 8.15.1 is Low without mitigation, and Very Low with mitigation. The impacts are limited to the peak construction period only, site only/local or regional, and fully reversible.
- The proposed mitigating measures are easy to implement and will assist to either prevent or reduce the impacts of increased vehicle engine and tyre noise, exhaust fumes and generation of dust on unsurfaced roads and unnecessary road damage.
- The maximum traffic generation of the Camden I and Camden II facilities are expected to occur at the same time for the construction phase, as the facilities will be developed concurrently. The cumulative impact will be very low on the site and local road network during construction, with the implementation of the recommended mitigations.
- The maximum traffic generation of the Camden I and Camden II facilities are expected to occur at the same time for the operation phase, as the facilities will be operated concurrently. The cumulative impact will be low on the site and local road network during the operation phase, with the implementation of the recommended mitigations.
- It should be noted that the Significance of the transport impact of the Camden II facility is far lower than the expected significance of the Camden I facilities for the construction and operation phases.
- The cumulative impact of the decommissioning phases of the Camden I and Camden II facilities were not assessed, as it cannot be determined if these phases will occur concurrently, if ever.

It is concluded that the proposed Camden I Facility will have a low transport impact on the adjacent road network, if the recommended upgrades and mitigation measures are implemented, and it is recommended that the TIA should be accepted as part of the EIA application.

10.3.11 SOCIAL IMPACT ASSESSMENT

The findings of the SIA indicate that the proposed up to 200 MW Camden I WEF project will create a number of social and socio-economic benefits, including creation of employment and business opportunities during both the construction and operational phase. The project will also contribute to local economic development though socio-economic development (SED) contributions. In addition, the development will improve energy security and reduce the carbon footprint associated with energy generation.

The findings of the SIA also indicate that the potential negative impacts associated with both the construction and operational phase are likely to be **Low Negative** with mitigation. The potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. The up to 200 MW Camden I WEF is therefore supported by the findings of the SIA.

10.3.12 RISK ASSESSMENT

GENERAL

The risk assessment has found that with suitable preventative and mitigative measures in place, none of the identified potential risks are excessively high, i.e., from a SHE perspective no fatal flaws were found with the proposed VRFB or Lithium Solid-state BESS installations at the Camden I Wind Energy Facilities.

At a large facility, without installation of the state-of-the art battery technology that includes protective features, there can be significant risks to employees and first responders. The latest battery designs include many preventative and mitigative measures to reduce these risks to tolerable levels. (Refer to tables in **Section 8.20** under preventative and mitigative measures). Where possible, state-of-the-art technology should be used, i.e. not old technology as it presents higher risks.

The design should be subject to a full Hazard and Operability Study (HAZOP) prior to commencement of procurement. A HAZOP is a detailed technical systematic study that looks at the intricacies of the design, the control system, the emergency system etc. and how these may fail under abnormal operating conditions. Additional safeguards may be suggested by the team doing the study.

VANADIUM REDOX FLOW BATTERY INSTALLATIONS

The most significant hazard with VRF battery units is the possibility of spills of corrosive and environmentally toxic electrolyte. Many preventative and mitigative features will be included in the design and operation, e.g., full secondary containment, level control on tanks, leak detection on equipment etc. (Refer to tables in **Section 8.20**).

VRF batteries do not present significant fire and electrical arcing hazards provided they are correctly designed, operated, maintained and managed. Suitable Battery Management System (BMS), safety procedures, operating instructions, maintenance procedures, trips, alarms and interlocks should be in place. (Refer to tables in **Section 8.20**).

LITHIUM SOLID STATE CONTAINERIZED BATTERIES

With lithium solid-state batteries, the most significant hazard with battery units is the possibility of thermal runaway and the generation of toxic and flammable gases. There have been numerous such incidents around the world with batteries at all scales and modern technology providers include many preventative and mitigative features in their designs. This type of event also generates heat which may possibly propagate the thermal runaway event to neighbouring batteries if suitable state of the art technology is not employed.

The flammable gases generated may ignite leading to a fire which accelerates the runaway process and may spread the fire to other parts of the BESS or other equipment installed near the BESS.

If the flammable gases accumulate within the container before they ignite, they may eventually ignite with explosive force. This type of event is unusual but has happened with an older technology container installed at McMicken in the USA in 2019.

Due to a variety of causes, thermal runaway could happen at any point during transport to the facility, during construction or operation / maintenance at the facility or during decommissioning and safe making for disposal.

Due to the containerized approach as well as the usual good practice of separation between containers, which should be applied on this project, and therefore the likely restriction of events to one container at a time, the main risks are close to the containers i.e. to transport drivers, employees at the facilities and first responders to incidents.

In terms of a worst conceivable case container fires, the significant impact zone is likely to be limited to within 10m of the container and mild impacts to 20m. Based on the current proposed layouts, impacts at the closest isolated farmhouses are not expected.

In terms of a worst conceivable case explosion, the significant impact zone is likely to be limited to with 10m of the container and minor impacts such as debris within 50m. Based on the current proposed layouts, impacts at the closest isolated farmhouses are not expected. In terms of a worst reasonably conceivable toxic smoke scenario, provided the units are placed suitably far apart to prevent propagation from one unit to another and large external fires are prevented, the amount of material burning should be limited to one container at any one time. In this case, beyond the immediate vicinity of the fire, the concentrations of harmful gases within the smoke should be low. Both the alternative BESS installation's locations are over 500m from any occupied farmhouse, although Option 1 has more houses in the general down wind direction (southeast) which may be a slight disadvantage. Nevertheless, the risks posed by BESS to the closest isolated farmhouses are negligible.

TECHNOLOGY AND LOCATION OF BESS FACILITIES

From a safety and health point of view, the above risk assessment shows that risks posed by VRFB systems may be slightly lower than those of SSL facilities, particularly with respect to fire and explosion risks. From an environmental spill and pollution point of view the VRFB systems present higher short- term risks than the SSL systems. However, the above conclusions may be due to the fact that the VRFB technology is not as mature as SSL technology and therefore there is not as much operating experience and accident information available for the VRFB.

From a SHE risks assessment point of view, where there is a choice of location that is further from public roads, water courses or isolated farmhouses, this would be preferred. VRFB hazards are mostly related to possible loss of containment of electrolyte and SSL batteries to fires producing toxic smoke and fire fighting which may result in contaminated of firewater runoff. One would not want these liquids to enter water courses nor the smoke to pass close to houses / public traffic. The Option 1 alternative location for the BESS is approximately 200m from a stream that tributes to the Vaal River system. This proximity to an important water course is a disadvantage of this location, but with suitable mitigation measures in place, the risks are acceptably low and this option remain a viable.

<u>The following recommendations have been made:</u>

There are numerous different battery technologies but using one consistent battery technology system for the BESS installations associated with all the developments in the Camden area would allow for ease of training, maintenance, emergency response and could significantly reduce risks.

Where reasonably practicable, state-of-the-art battery technology should be used with all the necessary protective features e.g. draining of cells during shutdown and standby-mode, full BMS with deviation monitoring and trips, leak detection systems.

Neither battery technology type presents any safety or health fatal flaws.

The tables in **Section 8.20** of this report contains technical and systems suggestions for managing and reducing risks. Ensure the items listed in these tables under preventative and mitigative measures are included in the design.

The overall design should be subject to a full Hazop prior to finalization of the design.

For the VRFB systems an end of life (and for possible periodic purging requirements) solution for the large quantities of hazardous electrolyte should be investigated, e.g. can it be returned to the supplier for re-conditioning.

Prior to bringing any solid-state battery containers into the country:

- An Emergency Response Plan should be in place that would be applicable for the full route from the ship to the site. This plan would include details of the most appropriate emergency response to fires both while the units are in transit and once they are installed and operating.
- An End-of-Life plan should be in place for the handling, repurposing or disposal of dysfunctional, severely damaged batteries, module and containers.

The site layout and spacing between lithium solid-state containers should be such that it mitigates the risk of a fire or explosion event spreading from one container to another.

Under certain weather conditions, the noxious smoke from a fire in a lithium battery container could travel some distance from the unit. The smoke will most likely be acrid and could cause irritation, coughing, distress etc. Close to the source of the smoke, the concentration of toxic gases may be high enough to cause irreversible harmful effects. Location of the facilities needs to ensure a suitable separation distance from public facilities/residences etc. All the current proposed BESS locations are over 500m from isolated farmhouses although Option 1 has more houses in the general down wind direction which may be a slight disadvantage.

Where there is a choice of alternative locations for the BESS, those that are further from water courses would be preferred. VRFB hazards are mostly related to possible loss of containment of electrolyte and solid-state systems may experience fires that may result in loss of containment of liquids or the use of large amounts of fire water which could be contaminated. One would not want these run-offs to enter water courses directly. The buffer distance between water bodies and the facilities containing chemicals should be set in consultation with a water specialist and is therefore not specified in this SHE RA. However, it is noted that the Option 2 alternative location for the BESS is approximately 200m from a stream that tributes to the Vaal River system. This proximity to an important water course is a disadvantage of this location, but with suitable mitigation measures in place, the risks are acceptably low and this option remain a viable option.

From the above it is clear that from a SHE point of view there is a slight preference for BESS location Option 1, although both options remain viable

Finally, it is suggested once the technology has been chosen and more details of the actual design are available, that necessary updated risk assessments should be in place.

10.4 IMPACT SUMMARY

A summary of the identified impacts and corresponding significance ratings for the Camden II WEF is provided in **Table 10-1.**

Table 10-1: Impact Significance Summary

ASPECT	IMPACT DESCRIPTION	PHASE	SIGNIFICANCE (WITHOUT MITIGATION)	NATURE	SIGNIFICANCE (WITH MITIGATION)	NATURE
Air Quality	Generation of dust and PM.	Construction	**Moderate**	Negative	**Low**	Negative
Noise and Vibrations	Construction noise.	Construction	**Low**	Negative	**Very Low**	Negative
	Operational phase impacts of noise on sensitive receptors.	Operation	**Low**	Negative	**Low**	Negative
Topography & Geology	Displacement and exposure of subsoils, resulting in visual impact. Increased risk of soil erosion.	Construction	**Low**	Negative	**Low**	Negative
	Undermined areas impact on foundations.	Operation	**Low**	Negative	**Low**	Negative
Soils, Land Capability and Agricultural Potential	Loss of agricultural potential by soil degradation.	All Phase	**Very Low**	Negative	**Very Low**	Negative
Aquatic	Loss of Very High Sensitivity Systems.	Construction	**Moderate**	Negative	**Low**	Negative
	Damage or loss of riparian and/or riverine systems.		**Moderate**	Negative	**Low**	Negative
	Potential impact on localised surface water quality		**Moderate**	Negative	**Low**	Negative
	Impact on habitat change and fragmentation related to hydrological regimes.		**Moderate**	Negative	**Low**	Negative
	Impact of increased run off leading to erosion and sedimentation.	Operation	**Low**	Negative	**Very Low**	Negative

ASPECT	IMPACT DESCRIPTION	PHASE	SIGNIFICANCE (WITHOUT MITIGATION)	NATURE	SIGNIFICANCE (WITH MITIGATION)	NATURE
Biodiversity	Loss of indigenous natural vegetation.	Construction	**Moderate**	Negative	**Moderate**	Negative
	Impact on integrity of Critical Biodiversity Areas.		**Moderate**	Negative	**Moderate**	Negative
	Establishment and spread of declared weeds and alien invader plants.		**Low**	Negative	**Very Low**	Negative
	Continued disturbance to natural habitats due to general operational activities and maintenance.	Operation	**Moderate**	Negative	**Low**	Negative
	Establishment and spread of declared weeds and alien invader plants.		**Moderate**	Negative	**Very Low**	Negative
	Continued runoff and erosion.		**Moderate**	Negative	**Low**	Negative
	Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites.	Decommissioning	**Low**	Negative	**Low**	Negative
	Establishment and spread of declared weeds and alien invader plants.		**Moderate**	Negative	**Low**	Negative
Avifauna	Displacement of priority species due to disturbance associated with the construction of the wind turbines and associated infrastructure.	Construction	**Moderate**	Negative	**Moderate**	Negative
	Displacement of priority species due to habitat transformation associated with the construction of the wind turbines and associated infrastructure.		**Moderate**	Negative	**Moderate**	Negative
	Displacement of priority species due to disturbance associated with the construction of the BESS.		**Low**	Negative	**Very Low**	Negative

ASPECT	IMPACT DESCRIPTION	PHASE	SIGNIFICANCE (WITHOUT MITIGATION)	NATURE	SIGNIFICANCE (WITH MITIGATION)	NATURE
	Displacement of priority species due to habitat transformation associated with the construction of the BESS.		**Low**	Negative	**Low**	Negative
	Mortality of priority species due to collisions with the wind turbines	Operation	**Moderate**	Negative	**Low**	Negative
	Electrocution of priority species on the medium voltage infrastructure.		**Moderate**	Negative	**Low**	Negative
	Mortality of priority species due to collisions with the medium voltage infrastructure.		**Moderate**	Negative	**Low**	Negative
	Displacement of priority species due to disturbance associated with the dismantling of the wind turbines and associated infrastructure.	Decommissioning	**Moderate**	Negative	**Low**	Negative
Bats	Loss of foraging habitat by clearing of vegetation.	Construction	**Moderate**	Negative	**Low**	Negative
	Roost destruction during earthworks.		**Moderate**	Negative	**Very Low**	Negative
	Bat mortalities during foraging.	Operation	**High**	Negative	**Moderate**	Negative
	Bat mortalities during migration.		**Moderate**	Negative	**Low**	Negative
	Increased bat mortalities due to light attraction and habitat creation.		**High**	Negative	**Low**	Negative
Visual and Landscape	Visual impact due to construction.	Construction	**Moderate**	Negative	**Low**	Negative
	Visual impact of wind turbines and associated infrastructure.	Operation	**Moderate**	Negative	**Moderate**	Negative
	Visual impact due to decommissioning	Decommissioning	**Moderate**	Negative	**Low**	Negative

ASPECT	IMPACT DESCRIPTION	PHASE	SIGNIFICANCE (WITHOUT MITIGATION)	NATURE	SIGNIFICANCE (WITH MITIGATION)	NATURE
Heritage and Cultural Resources	Destruction or damage to recorded ruins.	Construction	**Low**	Negative	**Very Low**	Negative
	Destruction or damage to recorded graves.		**High**	Negative	**Low**	Negative
Palaeontology	Loss of fossils.	Construction	**Low**	Negative	**Very Low**	Positive (Recovery of fossils)
Transport	Noise, dust & exhaust pollution due to vehicle trips on-site.	Construction	**Low**	Negative	**Very Low**	Negative
	Noise, dust & exhaust pollution due to additional trips on the national and district roads.		**Low**	Negative	**Very Low**	Negative
Social	Creation of employment and business opportunities.	Construction	**Low**	Positive	**Moderate**	Positive
	Impacts on family structures and social networks associated with the presence of construction workers.		**Moderate**	Negative	**Low**	Negative
	Influx of job seekers into local community.		**Low**	Negative	**Low**	Negative
	Risk to safety, livestock and damage to farm infrastructure.		**Moderate**	Negative	**Low**	Negative
	Noise, dust and safety impacts associated with movement of construction related activities and movement of traffic to and from the site.		**Low**	Negative	**Very Low**	Negative
	Loss of livestock and grazing and damage to farm infrastructure associated with increased incidence of grass fires.		**Moderate**	Negative	**Low**	Negative
	Impact on productive farmland.		**Moderate**	Negative	**Low**	Negative

ASPECT	IMPACT DESCRIPTION	PHASE	SIGNIFICANCE (WITHOUT MITIGATION)	NATURE	SIGNIFICANCE (WITH MITIGATION)	NATURE
	Improve energy security and support renewable sector.	Operation	**Moderate**	Negative	**Moderate**	Positive
	Creation of employment, skills development and business opportunities.		**Low**	Positive	**Moderate**	Positive
	Generation of additional income for affected farmers.		**Low**	Positive	**Moderate**	Positive
	Benefits associated with support for local community's from SED contributions.		**Moderate**	Positive	**Moderate**	Positive
	Visual impact and impact on the areas rural sense of place.		**Low**	Negative	**Low**	Negative
	Visual impact and impact on property values.		**Low**	Negative	**Very Low**	Negative
	Impact of the WEF on local tourism operations and activities.		**Very Low**	Negative	**Very Low**	Negative
Climate Change	Emissions of air pollutants	Construction	**Moderate**	Negative	**Low**	Negative
	Reduced GHGs and contribution of cleaner energy to the National grid.	Operation	**High**	Positive	**High**	Positive
Hazardous Substances and Pollutants	Soil, groundwater and surface water contamination	Construction	**Low**	Negative	**Low**	Negative
	Soil, groundwater and surface water contamination	Operation	**Low**	Negative	**Low**	Negative
Waste Management	Generation of general and hazardous waste	Construction	**Moderate**	Negative	**Low**	Negative
	Generation of sanitation waste		**Moderate**	Negative	**Low**	Negative

10.5 ALTERNATIVES ASSESSMENT

Project alternatives in terms of activity, technology, location and layout were considered as part of this EIAR process. It is important to note that while there are advantages and disadvantages for the alternatives considered, including the Site Substation & BESS Alternative 1 and Alternative 2 (preferred) as discussed in **Table 6-4**, all site alternatives are considered feasible and reasonable from an environmental perspective. The revised layout avoids sensitivities as much as possible.

The Site Substation & BESS Alternative 2 is the preferred option as it provides the shorter connection to the preferred collector substation. However, both Alternatives are considered feasible and reasonable for the proposed Camden I WEF. **Table 10-2** outlines the preferred alternatives, in terms of the turbines, on-site substation and BESS locations, considered feasible and preferred from an environmental perspective (that is, as per the input from the Specialists).

Table 10-2: Preferred Site Alternatives

ALTERNATIVE	PREFERRED	COMMENT
Site	Camden I WEF development area — Portion 0 of Klipfontein Farm No. 442 — Portion 1 of Klipfontein Farm No. 442 — Portion 3 of Klipfontein Farm No. 442 — Portion 1 of Welgelegen Farm No. 322 — Portion 2 of Welgelegen Farm No. 322 — Portion 2 of Uitkomst Farm No. 292 — Portion 10 of Uitkomst Farm No. 292 — Portion 3 of Langverwacht Farm No. 293 — Portion 14 of Mooiplaats Farm No. 290 — Portion 3 of Klipbank Farm 295	There is no site alternative for the Camden I WEF. The location of the project infrastructure was subjected to a site selection process as described in **Section 6.5.**
Activity	Wind technology	Wind technology has been identified as the preferred activity in terms of generating electricity from a renewable resource.

Layout and Design	— Revised Layout (37 turbine positions)
	— Site Substation & BESS Alternative 2 (Preferred)
	— Site Substation & BESS Alternative 1
		The Camden I WEF layout, including the associated infrastructure was revised during the Scoping Phase, from the initial 45 turbines to 37 turbine positions. The turbine layout was revised in order to avoid sensitive features and buffer areas.
		Based on the current revised layout:
		— From a Heritage perspective, the following could be impacted on:
		  — degraded farmhouse with multiple related structures scattered around the area. (located ~ 18 meters west of a proposed road); and
		  — small degraded square packed stone feature (located ~ 7 meters west of a proposed road).
		— No direct impact is expected on the recorded burial sites in the Project area
		— Additionally, two alternatives for substations were considered and both are acceptable from a heritage point of view.
		— From a terrestrial biodiversity perspective, the turbine layout has a small footprint area,

ALTERNATIVE	PREFERRED	COMMENT
		and those natural areas that are affected are generally in relatively poor condition due to overgrazing. — Turbine positions 22 and 33 are located within the 5km radius of Martial Eagle nest (i.e. 5 km no-turbine exclusion zone) and would therefore require relocation outside this avifaunal no-turbine zone during the final layout approval process. All other 35 Turbine locations are located outside of avifaunal no-go zones (i.e., adheres to the no-go zones requested in the avifauna assessment). — Wetland road crossings are at existing roads and all other wetlands are avoided. — There is some infrastructure within natural grasslands, but most road infrastructure, the component of wind energy projects that usually has the highest impact, is mostly along existing roads or within disturbed or transformed areas. The proposed project (all infrastructure components together) affects less than 2% of the remaining natural habitat on site. — The Site Substation and BESS alternatives are not located in significant proximity to any social receptors (all further than 1km). — From a visual perspective, no fatal flaws were identified in respect of any of the alternatives for the proposed on-site substation / BESS facilities, temporary construction laydown area and temporary construction camp / cement batching plant and all alternatives were found to be favourable. — From a SHE risks assessment point of view; BESS Alternative 1 location is approximately 200m from a stream that tributes to the Vaal River system. This proximity to an important water course is a disadvantage of this location, but with suitable mitigation measures in place, the risks are acceptably low and this option remain a viable.

10.5.1 NO-GO ALTERNATIVE

The No-Go Alternative assumes that the proposed Camden I WEF and associated infrastructure will not be developed and the current *status quo* will continue. This includes continued use of the land for cultivation and livestock production, as well as the possibility of future mining. The No-Go Alternative provides the baseline against which other alternatives are compared and has been considered throughout this EIR and relevant specialist studies. Should the 'No-Go' alternative be considered, there would be no impact on the existing environmental baseline and no benefits will be derived from the implementation of an additional land-use to the local economy and affected communities. The alternative also bears the opportunity cost of missed socio-economic benefits to the local community that would otherwise realise from establishing the farms which form part of the project areas. The option of not developing also entails that the bid to provide renewable/clean energy to the national grid and contribute to meeting the country's energy demands will not be realised.

Conversely, in this scenario, environmental impacts of the project (as outlined in **Section 8**) associated with the development of the Camden I WEF would be avoided. The No-Go Alternative has the following implications:

- In terms of agriculture, there are no agricultural impacts of the no-go alternative. However, it should be noted that any future coal mining on the site will have a significant and much greater agricultural impact than the proposed wind energy facility.
- The development offers an additional income source to agriculture, without excluding agriculture from the land. Therefore, the negative agricultural impact of the no-go alternative is more significant than that of the development, and so, purely from an agricultural impact perspective, the proposed development is the preferred alternative between the development and the no-go. In addition, 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.
- No aquatic environment / resources would be impacted upon.
- From an avifaunal perspective, the ‘no-go’ alternative will result in the current status quo being maintained. The ‘no-go’ option would eliminate any additional impact on the ecological integrity of the proposed WEF development site, as far as avifauna is concerned, bearing in mind that there have already been extensive impacts in the project area in the form of agriculture.
- From a Terrestrial Biodiversity Specialist perspective, the No-Go option will increase the rate of land degradation due to over-grazing, especially under adverse future climate scenarios, whereas there is a possibility of this effect being lessened in the case of the project promoting local economic diversity. There is also a moderate to high risk of loss of natural areas due to expansion of coal mining.
- The No-Go Alternative would also mean that no vegetation will be removed or disturbed during the development of the WEF. No impact on the CBA 1 and 2 on site, and no impact on the natural grassland.
- No birds will be impacted upon, either through the loss of their habitat by clearing of vegetation which can result in displacement, or bird mortality due to collisions with wind turbines and medium overhead powerlines, or electrocution on the medium voltage overhead powerlines.
- No bats will be impacted upon either through the loss of foraging habitat due to vegetation clearing, roost destruction, or bat mortalities by colliding with turbine blades or by suffering barotrauma during foraging activities, or during migration.
- If the ‘No-Go’ option is implemented, the area would thus retain its visual character and sense of place and no visual impacts would be experienced by any locally occurring receptors.
- No potential heritage artefacts or potential palaeontological resources will be impacted on.
- No noise impacts during the construction phase or during the operational phase when wind turbines are rotating.
- No additional traffic to the project area as a result of the construction phase.

Based on the Social Impact Assessment, the primary goal of the Project is to assist in providing additional capacity to Eskom to assist in addressing the current energy supply constraints. The project also aims to reduce the carbon footprint associated with energy generation. As indicated above, energy supply constraints and the associated load shedding have had a significant impact on the economic development of the South African economy. South Africa also relies on coal-powered energy to meet more than 90% of its energy needs. South Africa is therefore one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world’s second largest producer carbon emissions.

The No-Go Alternative would represent a lost opportunity for South Africa to improve energy security and supplement its current energy needs with clean, renewable energy. Given South Africa’s current energy security challenges and its position as one of the highest per capita producers of carbon emissions in the world, this would represent a significant negative social cost.

10.6 IMPACT STATEMENT

The overall objective of the EIA is to provide sufficient information to enable informed decision-making by the authorities. This was undertaken through consideration of the proposed project components, identification of the aspects and sources of potential impacts and subsequent provision of mitigation measures.

In assessing the environmental feasibility of the Camden I WEF, the requirements of all relevant legislation have been considered. The identification and development of appropriate management and mitigation measures that should be implemented in order to minimise potentially significant impacts associated with the project, has been informed by best practice principles, past experience and the relevant legislation (where applicable).

The EIA process has found that the proposed project will involve activities which will lead to a number of direct and indirect negative impacts on the biophysical and socio-economic environment. These impacts were found to vary in terms of their consequence and probability. Positive impacts are limited to the creation of employment opportunities and other socio-economic benefits as a result of the multiplier effect. This includes the potential to improve energy security in South Africa, increase the generation of renewable energy and reduce the reliance on coal powered energy to meet the country's electricity demand. Positive impacts also include the potential recovery, removal and placement of fossils in a recognised institution (if uncovered).

Mitigation measures have been developed where applicable for the above aspects and are presented within the EMPr (**Appendix I**). The mitigation measures are necessary to ensure that the project is planned, constructed and operated in an environmentally responsible manner. It is imperative that all impact mitigation recommendations contained in the EMPr, of which the environmental impact assessment took cognisance, are legally enforced.

It is the opinion of WSP that the information contained in this document (read in conjunction with the final scoping report) is sufficient for the DFFE to make an informed decision for the environmental authorisation being applied for in respect of this project. The findings of this S&EIA process and associated Specialist studies conclude that there are no fatal flaws associated with the proposed development. Negative environmental impacts associated with the proposed Camden I WEF can be mitigated to acceptable levels. It is therefore the opinion of the EAP that the project can proceed, and that all the listed mitigation measures and recommendations are considered by the DFFE.

EA AUTHORISATION PERIOD

Appendix 1(3)(1)(q) of the NEMA EIA Regulations 2014, as amended requires "where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised" must be included in the EIA Report.

The EA is required to be valid for a period of 10 years from the date of issuance of the EA. This is considered a reasonable period to allow the Applicant time to conduct relevant internal processes which can only begin after issuance of the EA.

FINALISATION OF THE EMPR AND LAYOUT

It is important to note that the EMPr (**Appendix I**) and project layout included in this EIR are not final and although included in this EIR, these are not submitted for approval at this stage. Subsequent to the decision-making phase, if environmental authorisation is granted for the Camden I WEF, the EMPr will have to be amended to include measures as dictated by the final layout map and micro-siting, including the requirements of the EA. <u>This final layout will therefore be required to adhere to the 5km no-turbine buffer around the Martial Eagle nest during the final layout approval process, which will be subject to public participation at the time.</u>

The amended EMPr and final layout subjected to micro-siting will be submitted to the DFFE for review and approval following detailed design.

ASPECTS TO BE INCLUDED AS CONDITIONS IN THE EA

The following key aspects are recommended to be included as conditions of authorisation:

- The layouts submitted in the EIR are not final. The final layouts are to be submitted to the DFFE for approval prior to construction.
- The EMPr submitted in the EIR is not final. The final EMPr is to be submitted to the DFFE for approval prior to construction.
- Construction must only commence once the Protected Area status has been changed for the directly affected properties (i.e. Portion 1 & 2 of Farm No. 322 (Welgelegen));
- All mitigation measures detailed in this EIR and the relevant specialist reports must be implemented.
- Recommendations for the layout as provided by the relevant specialists must be implemented as far as possible.

- The final EMPr must form part of all contractual documents with contractors during construction and operational phases of the project. Furthermore, a dedicated Environmental Control Officer (ECO) must be appointed to ensure compliance to all EA conditions and EMPr commitments throughout the construction phase.
- Applications for all relevant and required permits must be submitted prior to construction.
- Where required, water use authorisation under NWA is to be obtained from the Department of Water and Sanitation prior to construction.
- Undertake monitoring and recording of bird mortalities during the implementation and operational phase for the first 2 years and then at every five years thereafter. This information must be disclosed to the MTPA Scientific Services data base.

11 CONCLUSION

ENERTRAG is proposing the development of a Camden Renewable Energy Complex within the vicinity of the Camden Power Station in Mpumalanga. **This report is specific to the Camden I WEF (up to 200MW)**. The proposed Camden II WEF is located south-west of Ermelo, in Mpumalanga and falls within the Msukaligwa Local Municipality and the Dr Pixley Ka Seme Local Municipality of the Gert Sibande District Municipality.

This S&EIA process considered the biophysical location of the proposed development, as well as a feasibility assessment by the proponent, which *inter alia* served to identify site options that would be optimal for energy production and grid interconnection. As discussed previously, the purpose of the proposed Camden I WEF is to contribute to the national energy targets of diversification of energy supply and the promotion of clean energy. The project will also aid in overcoming the national power shortages that are currently faced in the country. The Project will be the first large-scale wind energy facilities being developed in Mpumalanga. Other socio-economic benefits would result from the proposed project, including the increase of energy supply, employment opportunities and local economic development.

The anticipated environmental and social impacts associated with the proposed Camden I WEF have been identified and assessed by the various specialists. The initial layout consisted of 45 turbine positions for the Camden I WEF, which was considered and assessed by the Specialists during the Scoping Phase to ensure any development constraints and environmental sensitivities can be avoided. Based on the Specialist findings, a revised layout was developed to avoid sensitive features and buffer areas, and mitigate against overall impact. The revised layout consisting of 37 turbines positions (current layout) was taken forward for further Specialist assessment during the EIA Phase (this report). Based on the findings of the Specialists, the current layout avoids sensitivities as much as possible. According to the Terrestrial Biodiversity Assessment, the proposed turbine layout, consisting of 37 turbines, has a small footprint area, and those natural areas that are affected are generally in relatively poor condition due to overgrazing. The Specialist has calculated that the entire project, including a 3m buffer area around all proposed infrastructure for possible edge effects, only affects approximately 2% of the remaining natural habitat on site. Furthermore, the current layout adheres to the no-go zones requested in the Avifauna assessment.

It is also important to note that although there is a proclaimed conservation area (Langcarel Private Nature Reserve) adjacent to the site, the area is not being managed as a nature reserve and a separate process is underway to have it deproclaimed as part of ongoing province-wide reserve verification efforts by the provincial authorities. Furthermore, no evidence was observed on site of any conservation management activities during the Terrestrial Biodiversity field assessment. Following assessment, the Biodiversity Specialist is of the opinion that the impacts associated with the project can be mitigated to acceptable levels provided the recommended mitigation measures identified are implemented, and that on the basis of the current land use and levels of modification, that the private nature reserve status does not align with the objective and purpose of the protected area status.

Based on the findings of the impact assessment and specialist studies, the proposed project is considered to have an overall **Low** to **Moderate** negative environmental impact and an overall **Low** to **Moderate** positive socio-economic impact, with the implementation of the relative mitigation measures. All of the specialists have recommended that the proposed project receive EA if the recommended mitigation measures are implemented.

In consideration of the findings of the S&EIA Process, as well as the national, provincial and local strategic requirements to support sustainable development whilst promoting socio-economic development, it is the opinion of the EAP that the proposed project will make a positive contribution towards socio-economic development in the Gert Sibande District Municipality in addition to national benefits in terms of renewable energy generation. It is recommended that the project receive EA in terms of the EIA Regulations (as amended), provided that the outlined mitigation measures of this S&EIA process are implemented effectively.

The draft EIR was made available for public review from 07 September 2022 to 10 October 2022. All I&APs on the database (included in the SER (Appendix D of the EIR) were notified of the release of the draft EIR, EMPr and specialist reports for a period of 30 days. These I&APs were also notified of the public meeting which was held during the public review period of the draft EIR.

All issues and comments submitted to WSP to date, have been incorporated in the CRR (Appendix D of the EIR (i.e. SER)). This Final EIR is being submitted to the DFFE, as the competent authority, for decision-making.

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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 ACCEPTANCE OF APPLICATION

APPENDIX

G

SCOPING PHASE APPROVAL

APPENDIX

H

SPECIALIST STUDIES

APPENDIX

H-1 AGRICULTURE

APPENDIX

H-2 AVIFAUNA

H-3 *BATS*

APPENDIX

H-4 TERRESTRIAL BIODIVERSITY (INCLUDING PLANT SPECIES ASSESSMENT & ANIMAL SPECIES ASSESSMENT)

APPENDIX

H-5 AQUATIC

APPENDIX

H-6 HERITAGE

APPENDIX

H-7 PALAENTOLOGY

H-8 *SOCIO-ECONOMIC*

APPENDIX

H-9 TRAFFIC

H-10 *VISUAL*

H-11 NOISE

APPENDIX

H-12 *SHE RISK ASSESSMENT*

APPENDIX

H-13 *GEOTECHNICAL*

APPENDIX

I

ENVIRONMENTAL MANAGEMENT PROGRAMME

APPENDIX

J

DFFE SCREENING TOOL

APPENDIX

K

PRE-APPLICATION MEETING MINUTES