AECOM

Proposed Development of a Battery Energy Storage System (BESS) and Associated Infrastructure at the Cuprum Substation located within Copperton, near the town of Prieska, Northern Cape Province

Revised Draft Basic Assessment Report

DFFE Reference Number: 14/12/16/3/3/1/2601

Eskom SOC (Pty) Ltd - Northern Cape Operating Unit

Project number: 60657237

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Quality information

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List of Acronyms

Acronym	Description
AC/DC	Alternating Current/Direct Current
Asl	Above Sea Level
BA	Basic Assessment
BAR	Basic Assessment Report
BESS	Battery Energy Storage System
BGIS	Biodiversity - Geographic Information Systems
BID	Background Information Document
CA	Competent Authority
CARA	Conservation of Agricultural Resources Act (No. 43 of 1983) and Regulations
CBA	Critical Biodiversity Area
CLO	Community Liaison Officer
CRR	Comments and Response Report
Csb	Category for cool-dry summer climate (Mediterranean)
CSP	Concentrating Solar Power
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DMR	Department of Mineral Resources
DoE	Department of Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EN	Endangered
EO	Environmental Officer
EQA	Environment Conservation Act (No. 73 of 1989)
ESA	Ecological Support Area
ESS	Energy Storage Control System
GIS	Geographic Information Systems
GNR	Government Notice Regulations
GPS	Geographic Positioning System
GWh	Gigawatt hours
HGM	Hydrogeomorphic
HIA	Heritage Impact Assessment
HV	High voltage

Acronym	Description
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
km^2	Square Kilometres
LC	Least Concerned
m^2	Square Metre
mm	Millimetre
MW	Mega Watt
MWh	Megawatt-hour
NEM:AQA	National Environmental Management: Air Quality Act (No. 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act (No. 10 of 2004)
NEM:PAA	National Environmental Management: Protected Areas Act (No. 57 of 2003)
NEM:WA	National Environmental Management: Waste Act (No. 59 of 2008)
NEMA	National Environmental Management Act (No. 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act (No. 25 of 1999)
NT	Near Threatened
NWA	National Water Act (No. 36 of 1998)
OHSA	Occupational Health and Safety Act (No. 85 of 1993)
PCS	Power Conversion System
PES	Present Ecological State
PPP	Public Participation Process
PV	Photovoltaic
S&EIR	Scoping and Environmental Impact Reporting
SABAP2	South African Bird Atlas Project, Version 2
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SCC	Species of Conservation Concern
SG	Surveyor General
SOC	State Owned Company
SPLUMA	Spatial Planning and Land Use Management Act (No. 16 of 2013)
VU	Vulnerable
WCBSP	Western Cape Biodiversity Spatial Plan

1. Introduction

AECOM SA (Pty) Ltd (AECOM) was appointed by Eskom Holdings SOC Limited (Eskom), the Applicant, to undertake a re-application for Environmental Authorisation (EA), subject to a Basic Assessment (BA) process for the proposed development of a Battery Energy Storage System (BESS) and associated infrastructure at the Cuprum Substation located within Copperton, near the town of Prieska, Northern Cape Province. The original application for EA (Ref: 14/12/16/3/3/1/2372), submitted during 2021, was issued with a refusal decision, dated 03/04/2022. The refusal was issued based on procedural grounds. For this reason, following the lapsing of the appeal period, the Applicant is issuing this re-application for the same development in the same location.

The development triggers activities listed in the Environmental Impact Assessment (EIA) Regulations (2014) (as amended) and promulgated in terms of the National Environmental Management Act (No. 107 of 1998), as amended (NEMA). The triggered activities necessitate the requirement of an Environmental Authorisation (EA) to be obtained by way of a BA process prior to the commencement of the development as specified in terms of Government Notice Regulations (GNR) 983 (Listing Notice 1) of the EIA Regulations (2014), as amended.

The following sections provide an overview of the project background, purpose, and structure of the report to be considered in the BA process.

1.1 Brief Project Background

The development involves the installation and establishment of a BESS and associated infrastructure to accommodate the storage of energy (the Project). The BESS will typically store energy during the low demand load periods at night (23h00 to 4h59) and provide ancillary energy services into the grid during high demand periods in the day (5h00 to 22h59). The development will provide energy support to business services within the area, integrate energy from the surrounding renewable facilities and act as a distributor collector substation for the surrounding substations. A full project overview can be found under Section 0 for additional information.

1.2 Purpose of the Study

The Listed Activities triggered by the development informs a BA process to be followed. These activities are triggered in terms of GNR 983 (Listing Notice 1) and requiring a BA and associated Public Participation Process (PPP) to be followed.

The BA process is a planning and decision–making tool. It identifies potential positive and negative impacts that the Project may have on the receiving environment (including the biophysical, social, and economic environments). The process further facilitates the development of project specific recommendations and mitigation measures which will serve to avoid or minimise the negative impacts, as well as enhance project benefits.

The purpose of the BA process is to assist both the relevant environmental authority (Department of Forestry, Fisheries and the Environment, DFFE) and the Applicant (Eskom) in making decisions regarding the implementation of the Project.

As such, AECOM is in the process of conducting the BA process in line with the requirements of GNR 982 and GNR 983 (Listing Notice 1) of the EIA Regulations (2014) as amended. No activities contained in GNR 984 (Listing Notice 2) are applicable to the Project. The EIA Regulations (2014) as amended were promulgated in terms of NEMA.

Due consideration is also given to the National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA), National Water Act (No.36 of 1998) (NWA), National Environmental Management Waste Act (No. 59 of 2008) (NEM:WA), National Heritage Resources Act (No.25 of 1999) (NHRA), the Northern Cape Nature Conservation, 2009 (No. 9 of 2009), related guideline documents, and other applicable legislation.

The findings identified and assessed by the independent Environmental Assessment Practitioner (EAP) and team of specialists will be to objectively assess the development in the context of the receiving environment and associated sensitivities. Based on the findings identified during the assessment, a set of project specific mitigation measures will be identified for implementation with the aim to reduce/limit impact severity and further achieve sustainable development. Should any fatal flaws be identified, this will be outlined and discussed along with recommendations (if possible) to avoid.

1.3 Structure of the Report

For ease of reference, a brief outline of the report has been provided in Table 1-1 below. The report structure and content are in line with the requirements of Section 19 and Appendix 1 of the EIA Regulations (2014), as amended.

Table 1-1: Structure of the Report

Chapter No	Chapter Heading
Chapter 1	This chapter provides a background to the Project and the purpose for this report.
Chapter 2	Provides details of the applicant and the EAP's project team.
Chapter 3	Provides a description of the Project, motivation for the Project as well the limitations associated with this assessment.
Chapter 4	This chapter presents considerations for different possible means of meeting the general purpose and need of the proposed activity.
Chapter 5	This chapter provides the applicable legislative requirements related to the Project.
Chapter 6	This chapter presents the study methodology and the assumptions made while undertaking this EA Application and BA process.
Chapter 7	Gives an account of the Public Participation Process undertaken for this EA Application and BA process.
Chapter 8	This chapter describes the receiving environment that could possibly be affected by aspects of the Project.
Chapter 9	Baseline: Provides a description of the social profile associated with the Project.
Chapter 10	Provides a detailed description of the potential impacts associated with the Project.
Chapter 11	This chapter provides an overview on the Environmental Management Programme associated with this Project.
Chapter 12	This chapter summarises the impact of the proposed Project on the environment.
Chapter 13	Deductions based on the findings of the study

2. Project Team

The following chapter provides details of the applicant, EAP and key members of the team including specialists. This section also details the expertise of the EAP and affirmations under the EIA Regulations, 2014 (as amended).

2.1 Applicant Details

Details of the Applicant are as follows:

Table 2-1 Applicant Details

Applicant	Eskom Holdings SOC (Pty) Ltd (Northern Cape Operating Unit)
Contact Person	Ms Andrea van Gensen
Postal address	PO Box 606, Kimberly, South Africa
Telephone	053 830 5730
E-mail address	vGenseAL@eskom.co.za

2.2 Environmental Assessment Practitioner

Details of the EAP are as follows, and the associated CV is enclosed in Appendix G, as required in terms of Appendix 1 (3) (a) (ii) of the EIA Regulations (2014) as amended:

Table 2-2 EAP Details

Environmental Consultant	AECOM SA (Pty) Ltd
EAP	Mrs Sarah Caulfield
Postal Address	PO Box 3173, Pretoria, 0001
Telephone	+27 82 385 9881
E-mail Address	sarah.caulfield@aecom.com

Sarah Caulfield is a Senior Environmental Scientist, Registered EAP (EAPASA – Reg No. 2019/1376) and Professional Natural Scientist (Pr.Sci.Nat.) in the field of Environmental Science (SACNASP – Reg. No. 400716/15). She has been appointed by Eskom as the EAP responsible for providing legal and technical guidance on the BA process to ensure the professional quality of the project reports.

Sarah Caulfield has obtained a Bachelor of Science (BSc) and a BSc Hons degree in Environmental Science from the University of KwaZulu-Natal (UKZN), as well as a Master's Degree (LLM) in Environmental Law from the University of Cape Town (UCT).

Sarah has 13 years' experience in the field of environmental management, having during this period fulfilled the role of researcher, project member, project leader, expert reviewer, unit manager and discipline leader. This has provided her with an opportunity to cultivate a perspective on not only working within projects and project teams but also managing multiple projects and multiple teams as a collective. She has been involved in the management and compilation of Strategic Environmental Assessments for master planning purposes, Environmental licencing processes (BA, Scoping and EIA, WML), Environmental Management Programmes (EMPr's), Water Use License Applications (WULAs) and environmental input into engineering design.

In terms of Appendix 1 of the EIA Regulations, 2014 as amended, the EAP affirms the following:

- the correctness of the information provided in the reports;
- the inclusion of comments and inputs from stakeholders and Interested and Affected Parties (I&APs);
- the inclusion of inputs and recommendation from the specialist reports where relevant;
- the inclusion of information provided by the EAP to I&APs; and
- the inclusion of responses by the EAP to comments or inputs made by I&APs.

2.3 Details of the Team

Collaboration with Eskom and the project Engineers was important to ensure the accuracy of project-related information and enhanced the comprehensiveness of the BA process undertaken to date. The project team that contributed towards this assessment is presented in Table 2-3.

Table 2-3: Project Team

Name	Role	Company
EAP Team		
Sarah Caulfield	EAP	AECOM SA (Pty) Ltd
Namso Nyamela	Junior Environmental Scientist	AECOM SA (Pty) Ltd
Specialists		
Johannes Oren Maree	Terrestrial Ecological Assessment	Sativa Travel and Environmental Consultants (Pty) Ltd
Johannes Oren Maree	Aquatic Site Sensitivity Verification and Compliance Statement	Sativa Travel and Environmental Consultants (Pty) Ltd
Trust Mlilo	Phase 1 Archaeological and Heritage Assessment	Sativa Travel and Environmental Consultants (Pty) Ltd
Jacobus Francois Durand	Palaeontological Desktop Study	Sativa Travel and Environmental Consultants (Pty) Ltd
Robyn Phillips	Avifauna Assessment	Cossypha Ecological
Johann Lanz	Agricultural Site Sensitivity Verification and Compliance Statement	Johann Lanz Soil Scientist
Daniel Meintjies	Alien and Invasive Species Management Plan and Rehabilitation Plan	AECOM SA

3. Project Overview

This chapter covers the need and desirability of the Project as well as a detailed project description. The project description is further subdivided into the construction phase and operational phase components as well as the battery options for the Project.

3.1 Need and Desirability of the Project

On 31 May 2016, the Eskom Board proposed the cancellation of the Kiwano Concentrating Solar Power (CSP) project as a result of financial implications of the project. Eskom thereafter engaged with the National Treasury (NT), the Department of Public Enterprises (DPE), the Department of Energy (DOE) and a variety of project funders between June and December 2016. It was evident that there would be no government support for the cancellation of the loan agreements with the project funders, due to the negative impact it would have on the Government and Eskom's reputation. Furthermore, it would negatively impact on Eskom and the Country's ability to attract funds for future capital projects. The 'brown' (coal) component of the loan agreement could also not be split from the 'green' (renewable) component, as this was the basis for the World Bank (WB) approval of the Eskom Investment Support Project for its Major Build program at Kusile and Medupi.

As a result, Eskom submitted a proposal to the WB, in a letter dated 27 January 2017, to investigate suitable alternative projects to replace the CSP project. The WB accepted Eskom's proposal and affirmed that Eskom provide a well-founded commitment to the WB in April 2017 with regards to the alternative project technology, size and cost of the project.

After a high-level need identification investigation, Eskom has proposed the development of various BESS projects to meet the requirements set out by the WB. These projects also form part of the WB funding set of criteria for the Major Build Program that requires a carbon friendly alternative to be implemented by Eskom as an alternative to the Kiwano CSP project.

The BESS projects, totalling approximately 1440 MWh, are to be installed at various locations across the South Africa. The projects are expected to be executed in two (2) phases, namely:

- Phase 1 – Installation of approximately 800 MWh of distributed BESS which is to be implemented during 2021 at Eskom Distribution sites; and
- Phase 2 - Installation of approximately 640 MWh BESS which is to be implemented during 2022 at locations closer to the renewable power plant sites.

In order maximise the benefit of this requirement, it is preferred to install some of the energy storage capacity at the existing distribution networks near renewable energy sources.

Preliminary investigations have identified the Cuprum Substation situated in the Northern Cape as a high potential site for integrating the BESS due to its proximity to an existing 20MW photovoltaic (PV) facility (Mulilo Sonnedix Prieska PV 75MW) and approved 238MW Renewable Energy Independent Power Producer (REIPP) wind generation facility (Garob Wind Farm). These two (2) facilities are soon to be integrated to the substation's downstream network.

Eskom have therefore proposed to develop a BESS and associated infrastructure at the Cuprum Substation situated in Copperton, near the town of Prieska, Northern Cape Province. The proposed development will provide energy support to business ancillary services within the area, with the aim to achieve the following:

- Strengthen the electricity distribution network and address current voltage and capacity constraints;
- Integrate a greater amount of renewable energy into the electricity grid; and
- Reduce the requirement for investment in new conventional generation capacity (i.e., gas, nuclear, coal) and new distribution substations and powerlines to strengthen networks.

The BESS will be expected to charge during the low demand load period at night (23h00 to 4h59) and be available to provide ancillary and energy services during high demand period in the day (5h00 to 22h59). The BESS will, moreover, have capability to provide capacity to meet the current and future planned energy demand on the grid. This will ultimately lead to the strengthening and increased reliability of the electricity grid.

3.2 Locality

The Project will be situated adjacent to the existing Cuprum Substation (29° 57' 33.14" S, 22° 18' 1.26" E) located within Copperton which is situated near the town of Prieska in the Northern Cape Province (refer to Figure 3-1). The site falls under the Siyathemba Local Municipality and Pixley ka Seme District Municipality.

The development will traverse three (3) properties, as listed below:

- Vogelstruis Bult Farm 104 Portion 1;
- Vogelstruis Bult Farm 104 Portion 5; and
- Vogelstruis Bult Farm 104 Portion 25.

The Surveyor General (SG) 21-digit codes for the affected properties are provided in Table 3-1 below.

Table 3-1: SG 21 Digit Codes of the Affected Properties

Property	SG Office	Major Region					Minor Region				Erf / Farm Number					Portion Number				
1	Kimberley	C	0	6	0	0	0	0	0	0	0	0	1	0	4	0	0	0	0	1
2	Kimberley	C	0	6	0	0	0	0	0	0	0	0	1	0	4	0	0	0	0	5
3	Kimberley	C	0	6	0	0	0	0	0	0	0	0	1	0	4	0	0	0	2	5

3.2.1 Coordinates

Table 3-2The tables below indicate the co-ordinates and extent of the proposed infrastructure.

Table 3-2 Co-ordinates and extent of the proposed BESS area

Point	Latitude	Longitude
A	29° 57′ 38.80″ S	22° 17′ 58.69″ E
B	29° 57′ 38.34″ S	22° 17′ 59.28″ E
C	29° 57′ 36.55″ S	22° 18′ 01.51″ E
D	29° 57′ 35.86″ S	22° 18′ 00.78″ E
E	29° 57′ 35.18″ S	22° 18′ 01.60″ E
F	29° 57′ 38.41″ S	22° 18′ 04.83″ E
G	29° 57′ 42.62″ S	22° 17′ 59.57″ E
H	29° 57′ 40.16″ S	22° 17′ 56.96″ E
I	29° 57′ 38.80″ S	22° 17′ 58.69″ E
Total area to be cleared	195 m x 130 m (at its widest point)	20 705 m^2

Table 3-3 Co-ordinates and extent of the proposed Substation Extension / Engineering Area

Point	Latitude	Longitude
A	29° 57′ 35.86″ S	22° 18′ 0.78″ E
B	29° 57′ 36.55″ S	22° 18′ 01.51″ E
C	29° 57′ 38.33″ S	22° 17′ 59.27″ E
D	29° 57′ 36.17″ S	22° 17′ 56.98″ E
E	29° 57′ 34.38″ S	22° 17′ 59.20″ E
F	29° 57′ 35.91″ S	22° 18′ 00.70″ E
G	29° 57′ 35.86″ S	22° 18′ 00.78″E
Total area to be cleared	95 m x 78 m	7 298 m^2

Table 3-4 Bend co-ordinates and extent of the proposed 11kV Overhead Powerline

Point	Latitude	Longitude
Start	29° 57' 33.44" S	22° 17' 59.01" E
A	29° 57' 38.47" S	22° 17' 52.80" E
B	29° 57' 41.03" S	22° 17' 55.41" E
C	29° 57' 44.39" S	22° 17' 58.90" E
D	29° 57' 45.90" S	22° 18' 08.51" E
End	29° 57' 47.39" S	22° 18' 10.83" E
Total area to be cleared	820 m long x 8 m wide construction corridor	6 560 m^2

Table 3-5 Bend co-ordinates and extent of the proposed 66kV Overhead Powerline

Point	Latitude	Longitude
Start	29° 57' 33.73" S	22° 17' 59.28" E
A	29° 57' 38.34" S	22° 17' 53.58" E
B	29° 57' 43.67" S	22° 17' 59.11" E
C	29° 57' 43.75" S	22° 18' 06.45" E
End	29° 57' 46.82" S	22° 18' 11.25" E
Total area to be cleared	800 m long x 8 m wide construction corridor	6 400 m^2

Table 3-6: Pylon Coordinates of the proposed 11kV Overhead Powerline

Point	Latitude	Longitude
CUK1	29° 57' 33.93" S	22° 17' 58.38" E
CUK2	29° 57' 35.47" S	22° 17' 56.48" E
CUK3	29° 57' 38.47" S	22° 17' 52.78" E
CUK4	29° 57' 41.12" S	22° 18' 44.04" E
CUK4-1	29° 57' 41.12" S	22° 17' 55.04" E
CUK4-2	29° 57' 41.22" S	22° 17' 54.64" E
CUK4-3	29° 57' 41.32" S	22° 17' 54.24" E
PR1	29° 57' 41.42" S	22° 17' 53.80" E
CUK5	29° 57' 44.36" S	22° 17' 58.91" E
CUK6	29° 57' 45.13" S	22° 18' 03.71" E
CUK7	29° 57' 45.89" S	22° 17' 08.51" E

Table 3-7: Pylon Coordinates of the proposed 66kV overhead powerline

Point	Latitude	Longitude
ICUKA-001	29° 57' 34.50" S	22° 17' 57.27" E
HVB2	29 °57' 38.21" S	22° 17' 57.04" E
HVB1	29° 57' 43.63" S	22° 17' 59.06" E
HVTOFF	29° 57' 43.74" S	22° 18' 06.43" E
1CUKA-004	29° 57' 43.07" S	22° 18' 05.40" E
1CUKA-005	29° 57' 45.66" S	22° 17' 09.56" E

Table 3-8 Bend co-ordinates and extent of the proposed Water Pipeline Re-alignment

Point	Latitude	Longitude
Start	29° 57’ 35.96” S	22° 18’ 00.84” E
A	29° 57’ 32.68” S	22° 18’ 05.12” E
End	29° 57’ 27.97” S	22° 18’ 00.29” E
Length	350 m long	

Table 3-9 Co-ordinates and extent of the proposed Water Pipeline Construction Corridor

Point	Latitude	Longitude
A	29° 57′ 32.48″ S	22° 18′ 05.20″ E
B	29° 57′ 32.49″ S	22° 18′ 05.22″ E
C	29° 57′ 32.51″ S	22° 18′ 05.22″ E
D	29° 57′ 32.53″ S	22° 18′ 05.22″ E
E	29° 57′ 32.55″ S	22° 18′ 05.21″ E
F	29° 57′ 32.57″ S	22° 18′ 05.20″ E
G	29° 57′ 36.05″ S	22° 18′ 00.86″ E
H	29° 57′ 35.95″ S	22° 18′ 00.76″ E
I	29° 57′ 32.52″ S	22° 18′ 05.04″ E
J	29° 57′ 27.94″ S	22° 18′ 00.17″ E
K	29° 57′ 27.85″ S	22° 18′ 00.28″ E
L	29° 57′ 32.48″ S	22° 18′ 05.20″ E
Total area to be cleared	352 m long x 4 m wide	1 408 m^2

Table 3-10 Bend co-ordinates and extent of the proposed Access Road

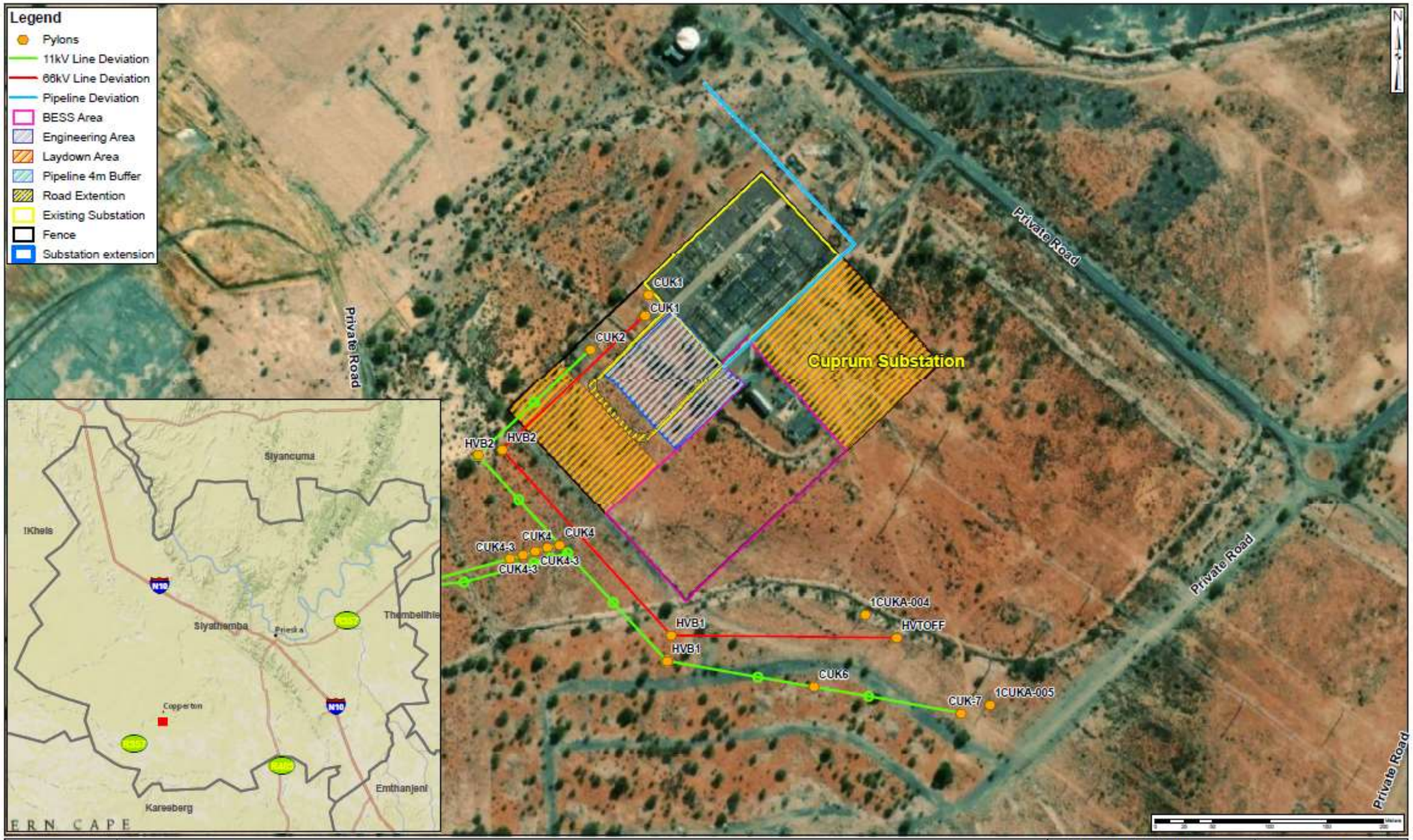
Point	Latitude	Longitude
A	29° 57′ 36.26″ S	22° 17′ 56.56″ E
B	29° 57′ 34.26″ S	22° 17′ 59.05″ E
C	29° 57′ 34.38″ S	22° 17′ 59.18″ E
D	29° 57′ 36.27″ S	22° 17′ 56.82″ E
E	29° 57′ 36.28″ S	22° 17′ 56.82″ E
F	29° 57′ 36.30″ S	22° 17′ 56.80″ E
G	29° 57′ 36.33″ S	22° 17′ 56.76″ E
H	29° 57′ 36.36″ S	22° 17′ 56.74″ E
I	29° 57′ 36.39″ S	22° 17′ 56.73″ E
J	29° 57′ 36.42″ S	22° 17′ 56.71″ E
K	29° 57′ 36.46″ S	22° 17′ 56.70″ E
L	29° 57′ 36.49″ S	22° 17′ 56.69″ E
M	29° 57′ 36.53″ S	22° 17′ 56.69″ E
N	29° 57′ 36.60″ S	22° 17′ 56.69″ E
O	29° 57′ 36.67″ S	22° 17′ 56.71″ E
P	29° 57′ 36.69″ S	22° 17′ 56.72″ E

Point	Latitude	Longitude
Q	29° 57′ 36.73″ S	22° 17′ 56.74″ E
R	29° 57′ 36.76″ S	22° 17′ 56.76″ E
S	29° 57′ 36.80″ S	22° 17′ 56.80″ E
T	29° 57′ 37.77″ S	22° 17′ 57.83″ E
U	29° 57′ 37.79″ S	22° 17′ 57.85″ E
V	29° 57′ 37.80″ S	22° 17′ 57.87″ E
W	29° 57′ 37.83″ S	22° 17′ 57.90″ E
X	29° 57′ 37.85″ S	22° 17′ 57.95″ E
Y	29° 57′ 37.87″ S	22° 17′ 58.00″ E
Z	29° 57′ 37.89″ S	22° 17′ 58.08″ E
A1	29° 57′ 37.89″ S	22° 17′ 58.13″ E
B1	29° 57′ 37.89″ S	22° 17′ 58.18″ E
C1	29° 57′ 37.89″ S	22° 17′ 58.24″ E
D1	29° 57′ 37.87″ S	22° 17′ 58.30″ E
E1	29° 57′ 37.85″ S	22° 17′ 58.34″ E
F1	29° 57′ 37.83″ S	22° 17′ 58.39″ E
G1	29° 57′ 37.81″ S	22° 17′ 58.41″ E
H1	29° 57′ 37.79″ S	22° 17′ 58.44″ E
I1	29° 57′ 35.89″ S	22° 18′ 00.80″ E
J1	29° 57′ 36.00″ S	22° 18′ 00.92″ E
K1	29° 57′ 38.02″ S	22° 17′ 58.42″ E
L1	29° 57′ 38.03″ S	22° 17′ 58.40″ E
M1	29° 57′ 38.05″ S	22° 17′ 58.38″ E
N1	29° 57′ 38.07″ S	22° 17′ 58.34″ E
O1	29° 57′ 38.09″ S	22° 17′ 58.30″ E
P1	29° 57′ 38.11″ S	22° 17′ 58.21″ E
Q1	29° 57′ 38.12″ S	22° 17′ 58.13″ E
R1	29° 57′ 38.11″ S	22° 17′ 58.05″ E
S1	29° 57′ 38.09″ S	22° 17′ 57.98″ E
T1	29° 57′ 38.06″ S	22° 17′ 57.89″ E
U1	29° 57′ 38.02″ S	22° 17′ 57.85″ E
V1	29° 57′ 37.99″ S	22° 17′ 57.81″ E
W1	29° 57′ 36.79″ S	22° 17′ 56.53″ E
X1	29° 57′ 36.76″ S	22° 17′ 56.51″ E
Y1	29° 57′ 36.73″ S	22° 17′ 56.48″ E
Z1	29° 57′ 36.69″ S	22° 17′ 56.46″ E
A2	29° 57′ 36.65″ S	22° 17′ 56.44″ E
B2	29° 57′ 36.60″ S	22° 17′ 56.43″ E
C2	29° 57′ 36.54″ S	22° 17′ 56.42″ E

Point	Latitude	Longitude
D2	29° 57′ 36.52″ S	22° 17′ 56.42″ E
E2	29° 57′ 36.47″ S	22° 17′ 56.43″ E
F2	29° 57′ 36.43″ S	22° 17′ 56.44″ E
G2	29° 57′ 36.38″ S	22° 17′ 56.46″ E
H2	29° 57′ 36.32″ S	22° 17′ 56.50″ E
I2	29° 57′ 36.27″ S	22° 17′ 56.55″ E
J2	29° 57′ 36.26″ S	22° 17′ 56.56″ E
Total area to be cleared	260 m long x 5 m wide	1 324 m^2

Table 3-11 Co-ordinates and extent of proposed Laydown Areas

Point	Latitude	Longitude
Laydown Area 1		
A	29° 57′ 35.91″ S	22° 18′ 07.92″ E
B	29° 57′ 38.41″ S	22° 18′ 04.83″ E
C	29° 57′ 35.18″ S	22° 18′ 01.60″ E
D	29° 57′ 32.84″ S	22° 18′ 04.66″ E
E	29° 57′ 35.91″ S	22° 18′ 07.92″ E
Total area to be cleared	130 m x 111.5 m	14 500 m^2
Laydown Area 2		
A	29° 57′ 35.83″ S	22° 17′ 55.46″ E
B	29° 57′ 38.80″ S	22° 17′ 58.69″ E
C	29° 57′ 40.16″ S	22° 17′ 56.96″ E
D	29° 57′ 37.17″ S	22° 17′ 53.79″ E
E	29° 57′ 35.83″ S	22° 17′ 55.46″ E
Total area to be cleared	125 m x 62 m	7 750 m^2



Project Title:	Eskom Battery Energy Storage System (BESS): Basic Assessment
	Siyathemaba Local Municipality, Northern Cape Province
Map Title:	Locality Map

Scale 1:3 000 (When page size is: A3 landscape)

Figure 1

Projection: Transverse Mercator
Datum: Hartebeesthoek 1994
Central Meridian: 23.0
Compiled By: GA Maree
GIS QC By:
Approved By: D Govender
Date Saved: 2022/11/15
Project Number: 60657237
Map Ref: LocalityPlan4.mxd
Revision: 00

Sources: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors
National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, Increment P Corp.

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AECOM

Figure 3-1 Locality Map

3.3 Project Description

The following sections provide an overview of the project background and details of the infrastructure associated with the BESS. A high-level overview of the construction and operational activities are outlined in the sub-sections below, along with information on the potential technology options associated with the BESS development.

3.3.1 Background

The Cuprum Substation is located within the Prieska Network Development Plan (NDP) study area in the Northern Cape Operating Unit (NCOU). The NDP area encompasses the presented network up to and including Mooidraai and Kleinbegin Substations. The NDP falls within the Siyathemba local municipality and is partially within the Upington Renewable Energy Development Zone (REDZ).

It is anticipated that an end state of 1 965MW of Independent Power Producer's (IPPs) would be connected in the Prieska REDZ. To date 170MW is commissioned and 238MW was expected to come online in 2020. It is anticipated that the remainder of the 1 965MW in capacity will be initiated by 2030 in alignment with the 2019 Integrated Resource Plan's (IRP) with the intent to add 26GW of renewable generation capacity to the grid by 2030.

Cuprum Substation is considered a distribution collector station and, therefore, a high potential platform for the assessment and application of BESS and renewable energy integration. Cuprum Substation consists of two 132/11kV step down transformers and a single 11/66kV step up transformer. The substation's 132/11kV transformers are not coupled on the secondary voltage side and consist of a 20MVA and 10MVA unit, respectively. The 20MVA is currently exclusively used to import 20MW of solar photovoltaic generation from the Mulilo Prieska 20MW IPP facility. The 10MVA transformer supplies an 11kV feeder and a step-up 12.5MVA 11/66kV transformer that feeds Karoo Substation via a 109km 66kV line. Cuprum Substation connects to Kronos 400/132kV Main Transmission Substation (MTS) via an 8km double circuit 132kV Kingbird overhead line. There is an extensive 132kV network adjoining Cuprum that extends to Garona, Upington and Boundary MT predominantly via the Wolf overhead lines that are due for refurbishment.

Cuprum Substation is considered a possible BESS substitute for the Karoo, Ganspan and Douglas proposed BESS sites. This is due to the advantage it offers as a single large site as opposed to 3 individual sites, i.e., lower project costs and risks.

According to the IPP Strategic Plan for the Kronos/Cuprum network, which indicates the REIPP potential in the area from current connection applications to the Department of Energy (DoE), 636.5MW would be connected via Cuprum Substation. At the current stage three (3) projects have been committed and allocated to Cuprum Substation which include the Copperton Wind (102MW), Garob Wind (136 MW) and Mulilo Prieska Renewable Energy PV (20 MW).

In terms of electricity demand within the NDP area, the Prieska Copper Mine and the Square Kilometre Array (SKA) projects are the main drivers. Prieska Copper Mine was shut down in the 1990s as low copper prices hindered further exploration. An Australian company, Orion Gold, has acquired Agama Exploration and Mining, which owns a majority stake in the copper mine. To bring the plant back to production capacity, an application for a new 40MVA supply point at Cuprum Substation was lodged with Eskom.

The SKA project is an international effort to build the world's largest radio telescope, with eventually over a square kilometre (one million square metres) of collecting area. The SKA currently has a 33kV bulk supply point with a Notified Maximum Demand (NMD) of 1.5MVA at Karoo Substation. Demand peaked at 1MVA in 2018 and an application for NMD increase to 5.3MVA at the SKA was assessed in July 2019. Due to overloading of equipment, the Karoo Substation load will have to be supplied from Cuprum 132/11kV 20MVA transformer or a dedicated 132/66kV transformer.

The Project activities will include the following:

- Re-alignment of the Cuprum/Karoo 66kV and Cuprum/Kronos 11kV overhead lines along the peripheries of the Eskom property boundary to make provision for the BESS and substation expansion;
- Extension of the Cuprum Substation's fence around the substation to include the BESS area;
- Extension of the Cuprum Substation's 132kV busbar to make provision for the new transformer which will extend the substation on the south-western side;
- Placement of the BESS control panels in an existing building located within the Cuprum Substation;

- Establishment of the BESS containers on a cleared area and connection to Eskom grid infrastructure;
- Extension of the existing road by 260 m which will connect to the runway inside the Cuprum Substation; and
- Rerouting of a 350 m water pipeline with a diameter of 32 mm.

Table 3-12 provides additional technical information on the proposed project.

Table 3-12 Summary of Technical Details for the Proposed Project

Component	Description / Dimension
BESS Footprint	195 m x 130 m (at its widest point) = 20 705 m^2
BESS Capacity	70 MW/280MWH/ useable capacity
BESS Technologies	Solid State Battery (e.g., Lithium Ion and Sodium Sulphur) and Flow Battery (e.g., Vanadium Redox Flow)
Substation	1 X 80MVA transformer, 92m X 81m extension of substation and lightning mast height 21m
Medium Voltage Cabling	33kV 3 phase cable/s, 360m length
High Voltage Cabling	Not applicable
Underground Cabling Depth	2m deep
Powerlines (HV)	66kV, 23MVA, 800m, 18m Height and 22 m servitude (11 m on either side of the line) All construction activities associated with the establishment of the line will be confined to an 8 m corridor (4 m on either side of the line) Construction activities associated with the erection of poles will be limited to an 18 m radius around the location of the pole.
Powerlines (MV)	11kV, 3.4MVA, 820m, 11m Height MV line and 18m servitude (9 m on either side of the line) right of way (only wayleave) All construction activities associated with the establishment of the line will be confined to an 8 m corridor (4 m on either side of the line) Construction activities associated with the erection of poles will be limited to an 11 m radius around the location of the pole.
Fencing	3 tier fence, middle fence electrified (non lethal), 10m wide, 2.4m in height
Laydown Area	**1:** 130 m x 111.5 m (= 14 500 m^2) **2:** 125 m x 62 m (7 750 m^2)
Access Road	5 m width and 260 m length, Turning points 7m wide
Water Pipeline Re-alignment	32mm and 350 m length (construction corridor of 8 m in width)

3.3.2 Infrastructure

A BESS is a storage technology developed for storing electric charge by using specially developed batteries.

BESSs are a sub-set of Energy Storage Systems (ESSs) which is a general term for the ability of a system to store energy using thermal, electro-mechanical or electro-chemical solutions. Examples of these systems include pumped hydro, compressed air storage, mechanical flywheels as well as BESSs (Diwan, 2019). These systems complement intermittent sources of energy such as wind, tidal and solar power to balance energy production and consumption (Diwan, 2019).

The underlying concept is based on the fact that the stored energy can be used at a later stage and can integrate variable renewable energy sources, such as wind and solar, into a power system or grid (Diwan, 2019). Due to the

intermittent nature of renewable energy sources and the associated supply concerns, BESS technologies can address excess energy concerns by storing excess energy and dispatching into the power system/grid (SRK, 2019).

As indicated in Figure 3-2 below, there are several uses associated with BESS infrastructure. BESS technologies typically connect to renewable energy facilities and store additional electrical energy. The BESS will also support ancillary business services by connecting to the grid as well indirectly supplying energy to common appliances.

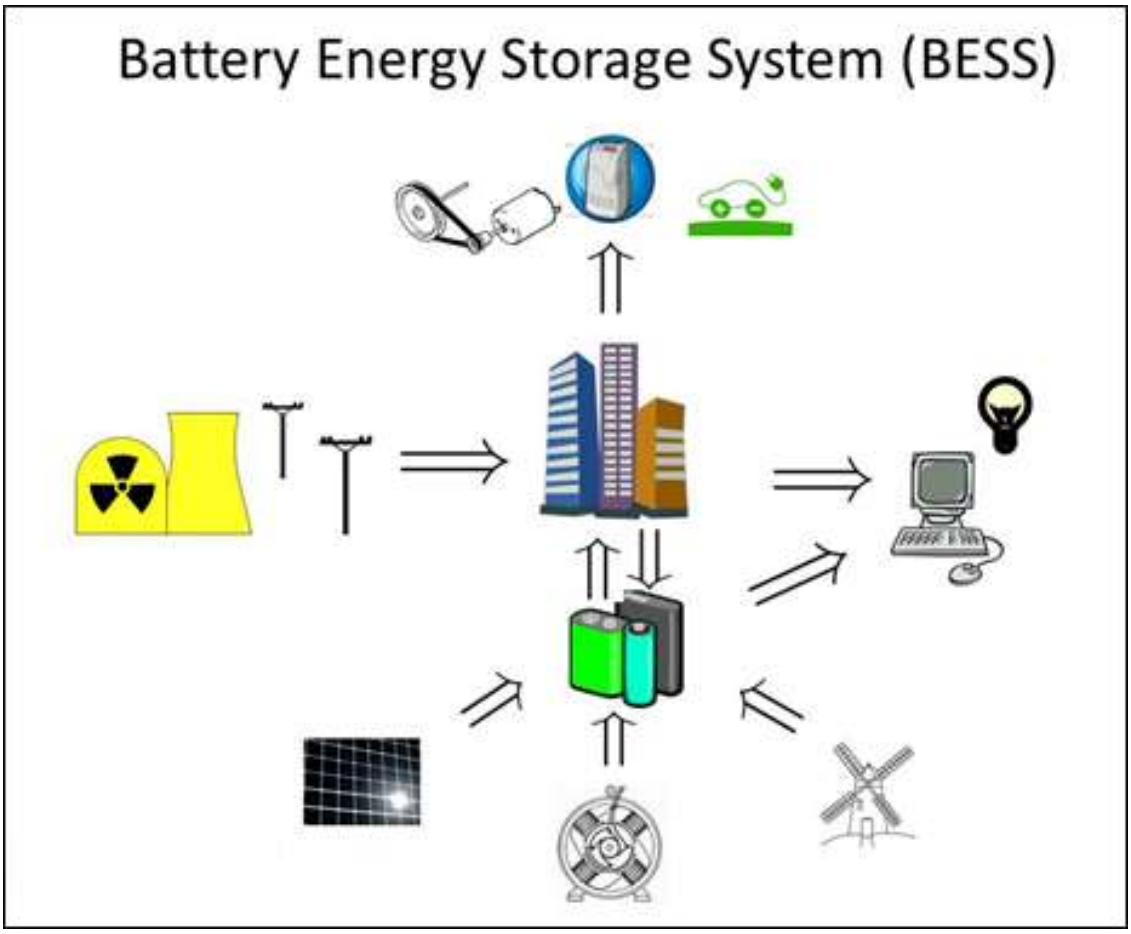


Figure 3-2 Flow Diagram of Common Uses and Linkages of BESS

Source: (Diwan, 2019)

In addition, the BESS uses peak arbitrage to store electricity during low consumption periods and dissipate during peak consumption periods. This results in peak clipping/shaving which reduces the overall network demand placed on the electrical grid during peak consumption. As a result, the BESS reduces the increased reliability on electrical infrastructure without exhausting substations through utilisation but rather incorporating technology into temporarily storing energy for future demand.

In the event where the BESS is not required to charge or discharge, it may be used for frequency regulation purposes (SRK, 2019). Frequency regulation involves monitoring of alternating current (AC) frequencies and responding to anomalies to keep the frequency close to the target frequency.

An electrical grid transmits power from generators to end users at a fixed alternating current (AC) frequency. If power generation is equal to power usage, the frequency remains stable (SRK, 2019). If power usage exceeds power generation, the frequency drops and could contribute to issues such as load shedding. Reversibly, if the power generation exceeds power usage the frequency rises and could ultimately lead to damage of the grid and connected devices. Additional renewables added to the grid increase variability in supply and fluctuations in frequencies which result in further difficulties to achieve an optimum frequency. Fossil fuel-based plants are traditionally used to provide frequency regulating services (SRK, 2019). Therefore, the BESS can be used for this

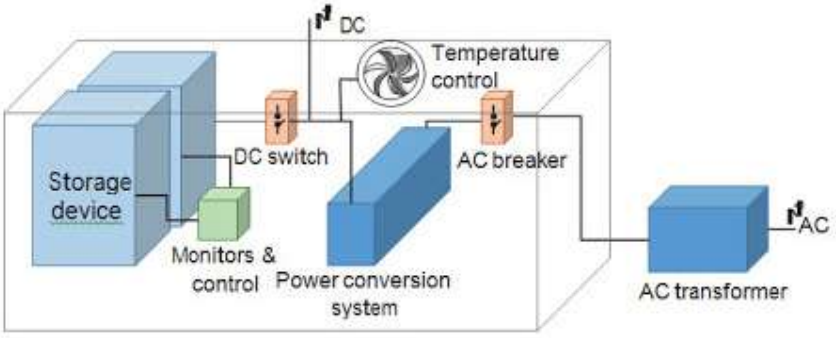
application as it provides flexibility, faster response time and a lower overall carbon footprint in comparison to fossil fuel-based plants (SRK, 2019).

3.3.3 Components

The BESS consists of several rechargeable batteries, each comprising one or more electrochemical cells. The battery cells are connected into modules. These modules are then connected to form full battery stacks/packs.

The basic components of a BESS include the following (SRK, 2019):

- A battery stack (made up of multiple battery modules) contained within the storage device;
- The Battery Management System (BMS). This is responsible for monitoring, controlling, and protecting the battery cells, including preventing over-charge/under-charge;
- The Power Conversion System (PCS). The PCS contains the inverter to change the Direct Current (DC) from the battery to AC for use in the grid;
- A temperature control system; and
- External electrolyte tanks in the case of flow batteries.



Network integration equipment (e.g., power cables, control cables, isolators, circuit breakers, transformers, etc.) will also be required to connect the new BESS to existing infrastructure at the Cuprum Substation. The site will also require additional fencing, security equipment, lighting, and/or control room upgrades. A platform (compacted fill, earth protection layer and stone chip) for the BESS will be constructed to accommodate the containers and cable trenches to connect the BESS to the grid. The associated infrastructure including the 11kV and 66kV overhead powerlines, water pipeline and extension of the substation busbar (to accommodate 2 x 132kV feeder bays) has been strategically placed and located around the Cuprum Substation to accommodate the BESS within the development footprint.

3.3.4 Size of the Project Area

The area for the BESS covers approximately 20 705 m^2 (195 m x 130 m (at its widest point)).

The realignment of the Cuprum/Karoo 66kV and Cuprum/Kronos 11kV overhead lines will be routed for approximately 800 m and 820 m, respectively, while the extension of the substation's 132kV busbar and associated structures covers approximately 7 298 m^2 (92 x 79m) (refer to Figure 3-1). Additionally, a 260 m road (with a width of 5m at turning points and 7m at the corners) will be located around the west, south and east portions of the substation while 350 m water pipeline (with a diameter of 32mm) will enter the substation through the northern entrance and proceed to link into an existing building located in the centre of the substation. The existing substation fence will also be extended on the south-west end of the substation to accommodate the 3 x 132kV feeder bays (refer to Figure 3-1).

The development of the BESS and associated infrastructure will result in the clearance of approximately 53 000 m^2 (5.3 hectares) of indigenous vegetation

The site camp and laydown areas have been delineated on the map included below.

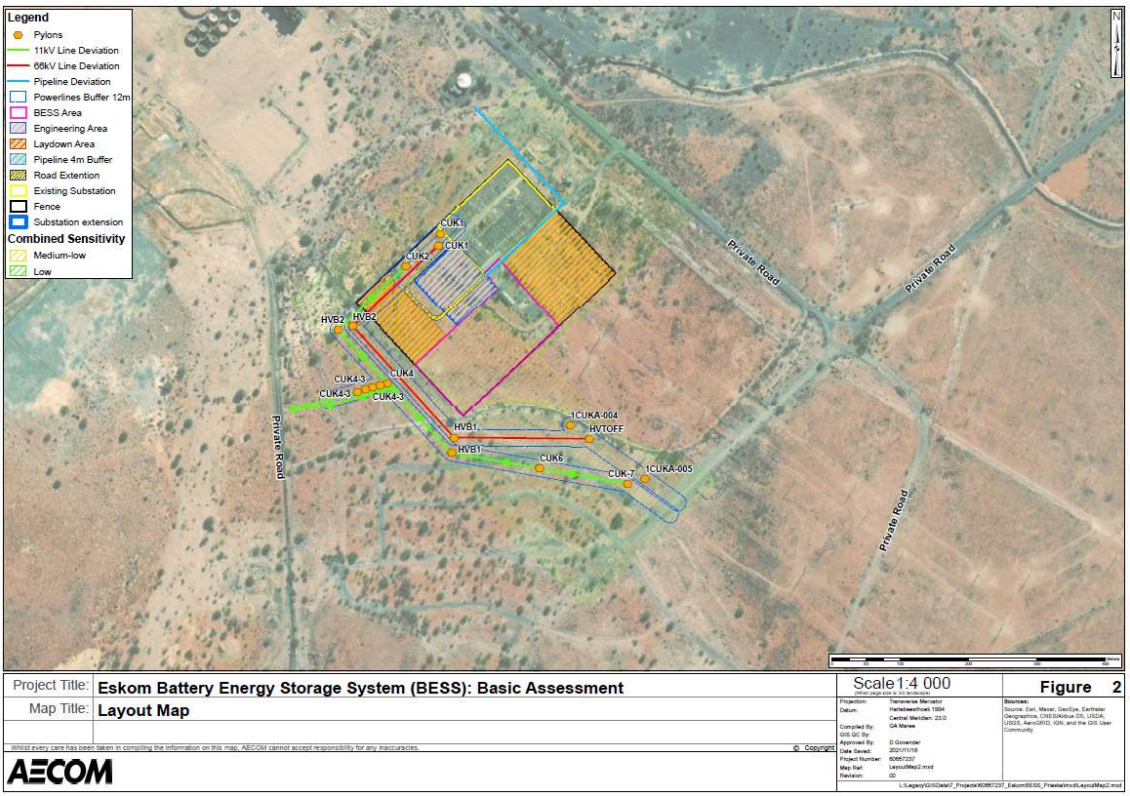


Figure 3-3 Sensitivity Map

3.3.5 Servitudes

The servitude for the BESS, road, water pipeline, 132kV busbar and fence extension is currently being applied for by Eskom. However, servitude negotiations and approval will be required for realignment of the overhead lines as the powerlines infringe on the adjacent property not owned or currently leased by Eskom.

3.3.6 Site Access

The site is accessible through the R375 via an unnamed road labelled as Copperton/Alkantpan. The Cuprum Substation is access controlled and is only accessible by authorised personnel. Therefore, existing roads will be used to gain access the site.

3.3.7 Powerline Corridor

The proposed Cuprum/Karoo 66kV overhead line will be constructed within a 22 m servitude (22 m on either side of the line. The Cuprum/Kronos 11kV overhead line will be constructed within a 18m servitude (9 m on either side of the line).

For construction purposes, a construction corridor of 8 m width (4 m on either side of the line) will apply to all proposed powerlines. The construction corridor will enable the contractor to have enough space to work around the stays and accommodate angle strainers. All construction-related disturbance associated with the erection of the powerlines will be limited to within this construction corridor.

The minimum ground clearance for each of the proposed powerlines is as indicated in Table 4-7.

Table 3-13 Minimum Ground Clearance - 24m corridor

Description	11kV Cuprum/Kronos	66kV Cuprum/Karoo
Minimum ground clearance	Conductor: 5.2m Equipment: 4m	5.7m

3.4 Construction Phase

This section includes a breakdown of the construction phase related activities including site establishment as well as the general approach to waste, water and energy efficiency.

3.4.1 Laydown Areas

The Contractor will require laydown areas for the duration of the contract period. The location and extent of the proposed laydown areas are shown in Figure 3-1. The laydown areas will be located on Vogelstruis Bult Farm 104 Portion 1, which is owned by the Applicant. The designated location will be contained within an access-controlled area and guarded by security.

3.4.2 Construction Camp

A construction camp will not be required for skilled migrant workers. The contractor(s) will source accommodation in nearby areas such as Copperton, Prieska and Douglas for their labourers during the construction phase.

3.4.3 Construction Activities

Construction planning and coordinating delivery of construction materials and equipment will be undertaken to reduce travel cost and fuel usage. The duration of the construction phase will be approximately 7-9 months from start to finish.

3.4.4 Waste Effluent

The Project will generate solid construction waste during construction however, it is understood that the waste volumes generated would not trigger the thresholds as prescribed in terms of the NEM:WA.

Waste resulting from construction activities will be collected and disposed of at a registered landfill site as per regulatory requirements. It is anticipated that no effluent will be generated during construction and operation of the Project. Refer to the Draft EMPr (Appendix F- Section 11.13) for detailed waste and effluent management measures proposed during construction.

3.4.5 Water Requirements and Use

The appointed construction Contractor will be responsible for his own arrangements regarding the supply of water from the local municipality for construction purposes.

Furthermore, no water will be abstracted (from a watercourse) for construction purposes and the development does not fall within 500 m of a watercourse – a Water Use Licence (WUL) is not required.

3.4.6 Energy Efficiency

The activity is expected to have minimal energy requirements and will not require additional generation infrastructure for construction equipment i.e., large generators. As such, no alternative energy sources have been identified at this time to support the Project.

The contractor will be advised to avoid multiple trips when transporting equipment during construction to improve overall efficiencies and energy expenditure. The transportation of materials can be done simultaneously with other activities or where possible transport all construction materials at the same time.

3.4.7 Installation Process

The installation process for the BESS infrastructure differs for each technology options mentioned in Section 3.6.

In reference to Solid State Batteries (refer to Section 3.6.1 and 3.6.2), two (2) options are available for installation depending on the battery supplier. The first option involves the installation all battery components directly into a container which is then transported to site and mounted onto a plinth. This option is typically undertaken for small unit/modules (refer to Figure 3-4).

The second option is for the batteries to be transported as battery modules in a temporary container to site. Once the plinth is constructed on site, a battery container is mounted onto the plinth and the battery modules (from the temporary container) are placed into battery racks/cabinet within the container (refer to Figure 3-8).

In reference to Flow Batteries (refer to Section 3.6.3), the battery container is transferred to site together with empty tanks which will store the electrolyte material. Once the container and tanks are installed on site, the liquid electrolyte is then transferred to the tank.

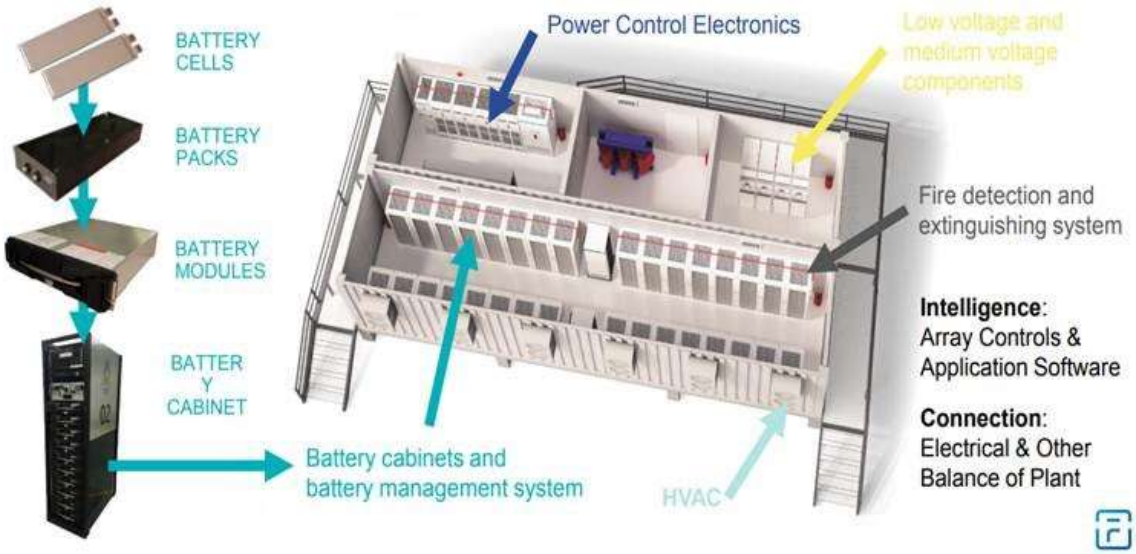


Figure 3-4 Containerised Solid State Battery

3.5 Operational Phase

This section includes a breakdown of the operational phase activities including details regarding the approach to regular maintenance (including monitoring) and disposal.

3.5.1 Storage of dangerous or hazardous goods

Due to the tender and procurement processes associated with the BESS infrastructure, it is unclear at this stage which battery technology will be selected. Therefore, the storage of hazardous and dangerous goods will only be applicable if flow batteries are selected as the technology option as this technology stores liquid electrolytic material in tanks. Eskom has, however, confirmed that the total amount of hazardous materials stored on site, because of the Project, will not exceed 500 m³.

In the event flow batteries are selected as the technology option, the liquid electrolytic material will be stored within tanks and placed into a container on site (refer to Figure 3-6). The containers will be mounted onto plinths and secured within a secondary or tertiary platform/bund.

3.5.2 Maintenance

The Project will require regular maintenance and replacement of malfunctioning/weathered components in accordance with an operating and maintenance programme. In the event waste is generated from maintenance and replacement activities, all damaged/ replaced components will be removed from the site. These components will be disposed to a licensed waste facility. In the event hazardous waste is generated during the operational phase, the waste will be transported to registered hazardous waste management facility to be disposed of accordingly.

No additional solid waste will be generated during the operational phase.

3.5.3 Disposal

The lifecycle of the battery technologies varies from ten (10) to twenty-five (25) years. Eskom will include a return to supplier clause, whereby the supplier will be responsible to recycle any hazardous waste emanating from the technology operation, maintenance and finally replacement as well as meet any legislative requirement that this

may require (SRK, 2019). Once the battery storage system has reached its end of life, the battery will be returned to the supplier for recycling in accordance with the NEM:WA.

The following section provides details on the battery options for the Project. Three (3) different battery technologies have been proposed which present both unique (and in some cases common) physical and chemical properties. The batteries are also categorised into solid state or flow batteries which are explained further in the chapter.

3.6 Technology

A variety of technology options are available for the development of the BESS at the Cuprum Substation.

At this stage Eskom cannot commit to a particular technology due to commercial/procurement requirements. This section will serve to outline the battery technology options available at this stage as well as a detailed description of each option.

The battery technology options available fall into two (2) broad categories – flow batteries (e.g., Vanadium Redox Flow) and solid-state batteries (e.g., Lithium Ion and Sodium Sulphur).

Flow batteries use solid electrodes and liquid electrolytes which are stored in tanks and pumped into cells to produce electrochemical reactions (SRK, 2019) (refer to Figure 3-5). The liquid electrolyte is considered a hazardous or dangerous good (DFFE, 2020). The electrolyte is furthermore stored separately from the solid electrodes and is pumped through the cell (i.e., electrode) for charging and discharging.

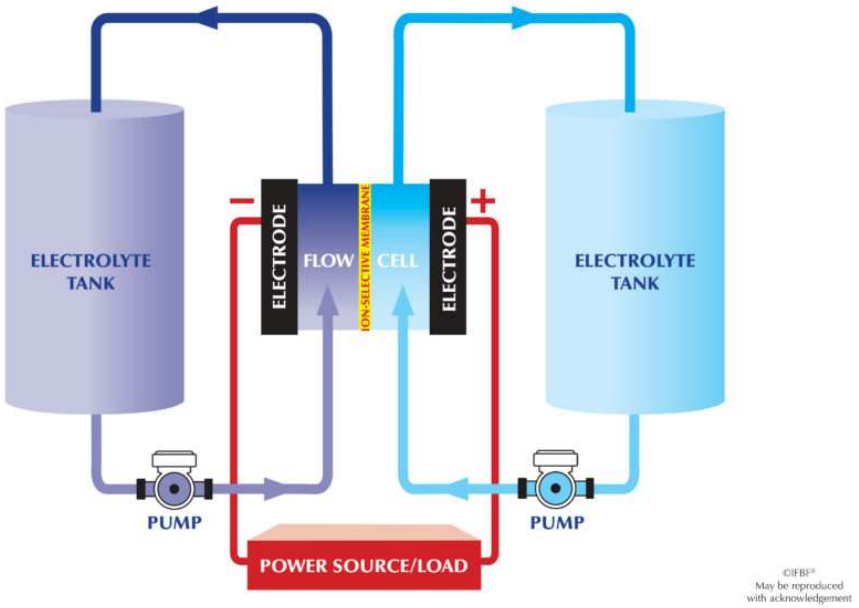


Figure 3-5 Flow Battery

Source: International Flow Battery Forum (IFBF)

Flow batteries are also typically stored in containers which are similar in dimension to that of a shipping container (refer to Figure 3-6) and further contained by a secondary or tertiary platform/bund.

Figure 3-6 Typical Storage of Flow Batteries

Source: (Energy Storage Association , 2020)

Solid state batteries use solid electrodes and electrolytes which permits the flow of electrical charge between the cathode and anode. They consist of both solid electrodes and electrolytes instead of the liquid electrolytes typically found in flow batteries (refer to Figure 3-7) (SRK, 2019). These batteries typically consist of a graphite anode, metal-oxide cathode, and electrolyte gel. Battery cells are integrated into battery modules and racked (refer to Figure 3-8) to form an integrated battery system. The storage method for solid state batteries do not constitute as the storage of hazardous or dangerous goods (DFFE, 2020).

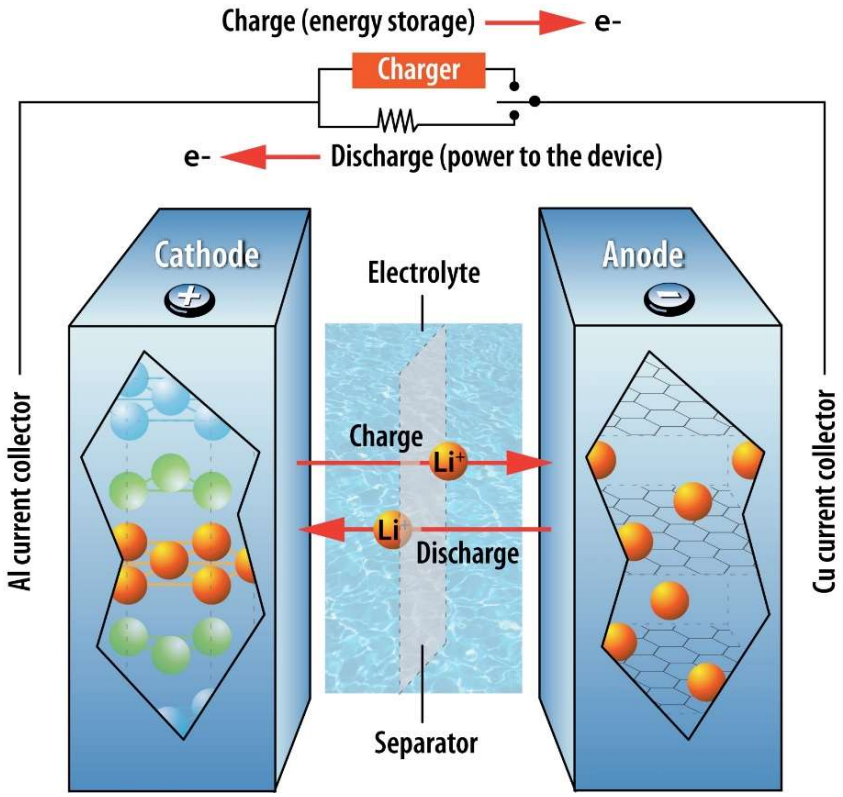


Figure 3-7 Solid State Battery

Source: (West, 2015)

Figure 3-8 Typical Storge of Solid-State Battery Modules (within battery stacks)

Source: (SRK, 2019)

The types of battery technologies are further subdivided into three (3) specific technologies that have been selected as possibilities for the Project (see section 3.6.1 to 3.6.3). A single battery technology, or a combination of two or more of the technologies below may be implemented to make up the 240 MWh capacity requirement. These three (3) specific technologies include:

- Solid State Battery: Lithium Ion (Li-ion);
- Solid State Battery: Sodium Sulphur (NaS); and
- Flow Battery: Vanadium Redox Flow (VRF).

The lifecycle of the battery technologies varies from ten to twenty-five years. Eskom will include a return to supplier clause, whereby the supplier will be responsible to recycle any hazardous waste emanating from the technology operation, maintenance and replacement. The supplier will also need to ensure that the technology solution implemented on site meets all legislative requirements.

3.6.1 Solid State Battery: Lithium Ion

The term “lithium-ion” refers not to a single electrochemical couple but to a wide array of different chemistries, all of which are characterized by the transfer of lithium ions between the electrodes during the charge and discharge reactions (Energy Storage Association , 2020). Li-ion cells do not contain metallic lithium; rather, the ions are inserted into the structure of other materials, such as lithiated metal oxides or phosphates in the positive electrode (cathode) and carbon (typically graphite) or lithium titanate in the negative (anode) (Energy Storage Association , 2020).

Li-ion cells may be produced in cylindrical or prismatic (rectangular) format which are typically built into multi-cell modules in series and/or parallel arrays (refer to Figure 3-8). The modules are connected to form a battery string at the required voltage, with each string being controlled by a battery management system. Battery packs can also be combined with other equipment such as inverters and controls systems and further packaged into BESS at manufacturing facilities (Energy Storage Association , 2020).

Furthermore, Li-ion BESS can be containerized and placed on pads or simple foundations (refer to Figure 3-9) and electrically connected to switchgear. Electronic subsystems are an important feature for Li-ion batteries, which lack the capability of aqueous technologies (e.g., lead-acid batteries) to dissipate overcharge energy.

The expected Li-ion BESS lifetime is related to the cycling Depth of Discharge (DoD) and is generally limited to less than 80% DoD to ensure an adequate life (SRK, 2019). Most utility scale applications have an approximate 10-year lifetime (SRK, 2019).

Modularized and packed systems offer ease of system removal from site for disposal at end of life (SRK, 2019). The materials used in Li-ion batteries are typically considered non-hazardous waste.

Figure 3-9 Standard BESS Design- Lithium-Ion Solid State Battery

Source: (Energy Storage Association , 2020)

3.6.2 Solid State Battery: Sodium Sulphur

Sodium Sulphur (NaS) batteries were first developed in the 1960's and further modified more recently to suit BESS applications. There are two (2) active materials in a NaS battery which are molten sulphur as the positive electrode and molten sodium as the negative electrode (Energy Storage Association , 2020). The electrodes are separated by a solid ceramic, sodium alumina, which also serves as the electrolyte. This ceramic allows only positively charged sodium-ions to pass through. During discharge, electrons are stripped off the sodium metal leading to formation of the sodium-ions that then move through the electrolyte to the positive electrode compartment. The electrons that are stripped off the sodium metal move through the circuit and then back into the battery at the positive electrode, where they are taken up by the molten sulphur to form polysulfide (Energy Storage Association , 2020). The positively charged sodium-ions moving into the positive electrode compartment balance the electron charge flow. During charge this process is reversed (Energy Storage Association , 2020).

The battery must be kept hot (typically > 300 ºC) to facilitate the process (i.e., independent heaters are part of the battery system). In general Na/S cells are highly efficient (typically 89%).

NaS batteries are contained within airtight, double-walled stainless-steel enclosures that are structured as cells. These enclosures are also placed on pads or simple foundations (refer to Figure 3-10). The batteries are also able to charge and discharge each day from 100% state of charge to 0% providing a full DoD. The expected NaS lifetime is approximately 15 years with an average of 4 500 cycles and 90% DoD (SRK, 2019).

These batteries, furthermore, use hazardous materials, including metallic sodium, which is combustible if exposed to water (SRK, 2019). However, the sodium, sulphur, beta-alumina ceramic electrolyte, and sulphur polysulfide components of the battery are typically disposed of by routine industrial processes or recycled at the end of the NaS battery life (SRK, 2019).

Figure 3-10 Standard BESS Design – NaS Solid State Battery

Source: (West, 2015)

3.6.3 Flow Battery: Vanadium Redox Flow

A flow battery is charged and discharged by a reversible reduction-oxidation reaction between the two liquid vanadium electrolytes of the battery. Unlike conventional batteries, electrolytes are stored in separated storage tanks, not in the power cell of the battery. During operation these electrolytes are pumped through a stack of power cells, in which an electrochemical reaction takes place and electricity is produced. Flow batteries are typically containerized and stored in anolyte and catholyte tanks (refer to Figure 3-11). The first operational Vanadium Redox Flow (VRF) battery was successfully demonstrated in the late 1980s. The VRF battery offers a relatively high cell voltage which is favourable for higher power and energy density (SRK, 2019).

The electrolytes in the VRF battery are composed of vanadium ions in an aqueous sulphuric acid solution. The acid solution has a low pH between 0.1 and 0.5 (SRK, 2019). The vanadium electrolytes are stored in separate large electrolyte tanks outside the cell stack. The electrolyte tanks and associated pipes, valves etc. must be composed of materials that are resistant to corrosion in the very low pH environment (SRK, 2019).

The electrodes used in VRF are composed of high-surface area carbon materials. The membrane physically separates the two vanadium-based electrolyte solutions, preventing self-discharge while allowing for the flow of ions to complete the circuit. The ion exchange material could be potentially toxic which is composed of highly acidic (or alkaline) material (Energy Storage Association , 2020).

Figure 3-11 Standard BESS Design – VRF Flow Battery

Source: (Energy Storage Association , 2020)

3.7 Risk Assessment

A Risk Assessment (RA) has been undertaken and included under Appendix D of this BAR.

The RA was consolidated across all battery technologies and accounted for risks at the different lifecycle stages including storage, transportation, installation, operation, maintenance as well as decommissioning. Furthermore, the assessment also included potential environmental consequences as a result of the risks which has informed the potential impacts identified in Section 10 as well the impact assessment undertaken in Section 10.5.

The RA also fulfils the requirement set out in the Occupational Health and Safety Act: Regulations: Major Hazard Installations (MHI) (2001).

4. Description of Alternatives

In terms of the EIA Regulations of 2014 (as amended), consideration needs to be given to all possible alternatives. The assessment of alternatives allows different approaches and ways of meeting the need, purpose and objectives of a proposed activity to be explored, allowing for the identification and selection of the best practicable environmental option for the implementation. Alternatives for consideration may include location or route alternatives, site alternatives, design/layout alternatives, activity alternatives and process or technology alternatives.

On 14 October 2021, Eskom consulted with the DFFE in relation to the nature of the Project and the way forward in terms alternatives. Eskom indicated at this meeting that it is technology agnostic (unbiased towards the use of any one technology over another). Due to the tender and procurement processes associated with the BESS infrastructure, a preferred technology cannot be recommended at this time, and will only be confirmed upon selection and appointment of a contractor, following the completion of tender and procurement processes. Kindly refer to Appendix E for a copy of the meeting minutes. N**o alternative(s), therefore, have been proposed for the Project.** The sub-sections below detail the steps taken by Eskom to identify feasible and viable alternatives for the Project, with discussions on the location, activity and technology options for the Project. It further provides information on the no-go alternative which assumes that the development does not go ahead, and the status quo of the current site conditions remain.

4.1 Location Alternatives

Eskom undertook a preliminary study into the network planning for the Project. The study investigated the potential BESS location, capacity, strategic integration, network loading and future network and load forecast.

The Cuprum Substation functions as both a distribution collection station and a potential platform for renewable energy integration due to the existing connections to Kronos, Karoo, Garona and Upington Substations as well as the Mulilo Prieska 20MW IPP facility, respectively. Therefore, the substation is considered a possible BESS substitute for individual BESS sites located within Karoo, Ganspan and Douglas due to the existing connections to Kronos, Karoo, Garona and Upington Substations. The Cuprum Substation offers an advantage as a single establishment for the proposed BESS infrastructure as opposed to three (3) individual sites.

Furthermore, three (3) renewable projects have been committed and allocated to Cuprum Substation which include the Copperton Wind (102MW), Garob Wind (136 MW) and Mulilo Prieska Renewable Energy PV project (20 MW). It is also understood that a further 378.5 MW has been allocated to the Cuprum Substation (IPP Strategic Plan for the Kronos/Cuprum network) from future planned REIPP projects. Therefore, the Cuprum Substation will require energy storage facilities to accommodate the influx of renewable energy required for network integration and store additional electrical energy required for peak arbitrage.

An increase in demand for electricity from the Cuprum Substation will also occur because of the revival of the Prieska Copper Mine and the SKA project. An application for a new 40MVA supply point at Cuprum Substation was lodged with Eskom by Orion Gold (Prieska Copper Mine) as well as the requirement for a dedicated 132/66kV transformer for the SKA project.

In conclusion, the location of the BESS at the Cuprum Substation will strategically serve as a storage point for several integrated substations and networks including current and future renewable projects. The BESS will also service and form part of the electrical demand for the revived Prieska Copper Mine and SKA project within the NDP area. Therefore, the Cuprum Substation has been identified as the only preferred location for the Project, with no other feasible location alternatives. A worst-case scenario has therefore been determined as an envelope of criteria (see section 4.5) and assessed as part of this BA process.

Furthermore, no alternative powerline realignment route(s) have been proposed. The proposed powerline route is restricted to existing infrastructure on site which entails the realignment of the Cuprum/Karoo 66kV and Cuprum/Kronos 11kV overhead lines along the Eskom property boundary to connect to the existing grid network. The proposed realigned route follows the shortest distance to the existing network and is restricted to Eskom's property boundary. Additionally, any alternative routes are viewed as non-viable since alternative routes would require removal of substation infrastructure and realignment of the larger grid network to establish a new connection point.

4.2 Activity Alternatives

Eskom submitted a proposal to the WB to investigate suitable alternative projects to replace the Kiwano CSP project and comply with the WB funding set of criteria for the Major Build program. After undertaking a high-level need identification investigation, Eskom has proposed the development of BESS to meet the requirements set out by the WB. The use of BESS and associated infrastructure has been identified as an appropriate solution to the Kiwano CSP project. The project is therefore required to connect an equivalent of a 100 Mega Watt (MW) of renewable plant as per the Kiwano CSP project, with a capacity of at least 525-Gigawatt hour (GWh) per year. To meet these requirements, the BESS infrastructure will be placed around selected distribution networks to provide support in terms of enhanced frequency control of the network, reactive power support and improved quality of supply performance. Therefore, the BESS will improve overall network efficiency to reach the capacity that the CSP would have potentially generated if it had been completed.

The WB accepted Eskom's proposal and affirmed that Eskom provide a well-founded commitment to the WB in April 2017 with regards to the alternative project technology, size and cost of the project. After a high-level need identification investigation, Eskom has proposed the development of various BESS projects to meet the requirements set out by the WB throughout substations within South Africa.

Therefore, given that it is a contractual requirement between the WB and Eskom to develop BESS throughout South Africa, which has given rise to the identification of this Project, no other feasible activity alternatives will be investigated. A worst-case scenario has been determined as an envelope of criteria (see section 4.5) and assessed as part of this BA process.

4.3 Technology Options

Three (3) battery options have been identified as suitable for the Project. However, due to the nature of the final procurement process (i.e., which batteries would be available to the successful bidder) and potential litigation concerns (e.g., whereby the proposed technology is selected by the DFFE before a successful bidder is announced) still to be determined, a single technology cannot be recommended for implementation.

As such, even though different technologies for BESS have been outlined in section 3.6 under the Project Overview chapter, it will not be possible to compare and recommend a preferred technology alternative as part of this BA process. **Therefore, no technology alternatives are presented for the Project and has been deemed as technology agnostic**. A worst-case scenario has been determined as an envelope of criteria (see section 4.5) and assessed as part of this BA process. **A selected technology option will be chosen upon finalisation of the procurement and bid process.**

4.4 No-Go Alternative

The "no-go" alternative refers to maintaining the status quo and not embarking on the Project. The no-go alternative in the context of this Project, therefore, implies that the BESS and associated infrastructure will not take place. If the Project does not proceed, the potential changes to the receiving environment, whether their consequences are negative or positive, would not be realised and the inherent risks would be avoided.

The inability of Eskom to undertake the proposed development will however, impact on the local and regional economic conditions due the fact that Eskom will not be able to strengthen the electricity distribution network, integrate renewable energy and reduce investment in conventional generation methods (i.e., coal-based power stations). Furthermore, if Eskom is not able to implement the BESS development as an alternative to the Kiwano CSP project, it will run commercial risks for not complying with the funding criteria of their loan agreement with the WB. This may result in their loan agreement being terminated.

The Project will furthermore contribute to a reduced reliance of fossil fuels and lowered carbon footprint in line with the objectives of the 2019 Integrated Resource Plan (IRP) for electricity, which will not be realised if the no-go alternative is implemented. Moreover, Eskom will not be able to meet the IPP Strategic Plan for the Kronos/Cuprum network.

4.5 Assessment of the Worst-Case Scenario

Eskom has undertaken an investigation of location, activity, and technology alternatives, all of which have resulted in no alternatives being available for this Project. To this end, a worst-case scenario has been determined and assessed by means of an envelope of criteria that the development will entail.

The envelope of criteria for the Project (see Appendix J) involves the delivery of a BESS solution at the Cuprum Substation (at the location identified for the most feasible connection and off take requirements), along with the associated infrastructure development and adjustments (see Chapter 3 Project Overview) to connect this facility to the existing Eskom energy grid. The envelope of criteria then feeds into the worst-case scenario which has been assessed as part of this BAR, and further used to develop appropriate and project specific mitigation measures for implementation

This approach investigates the worst-case scenario environmental impacts for the development of the BESS at the specific location, across the three (3) potential technology options, whilst remaining impartial and technology neutral This will ensure that, regardless of which technology option is implemented in the end (should positive EA be granted for the Project), the environmental impacts assessed as part of this BAR will be for the worst-case scenario. Therefore, the implementation of either technology option will either hold the same or less significant environmental impacts to the receiving environment.

Kindly refer to section 10.4 (Impact Assessment Methodology) and 10.5 (Impact Assessment) for further details on the methodology implemented to assessment worst-case scenario and potential impacts identified associated with the Project.

5. Legislation and Guideline Documents

This chapter provides information on environmental legislation, policy and guideline documents relevant to the project.

5.1 National Environmental Management Act, 107 of 1998

The NEMA provides a framework for cooperative environmental governance between the various spheres of government by establishing principles for decision-making on matters relating to the environment. The NEMA also promotes integrated environmental management to ensure sustainable resource utilisation and development. It further requires that the DFFE be the lead agent in ensuring effective custodianship of the environment. It acknowledges that sensitive, vulnerable, highly dynamic, or stressed ecosystems, such as wetlands and similar systems, require specific attention in management and planning procedures, especially where subjected to significant human resource usage and development pressure. The DFFE is the approving/competent authority in this Project.

The NEMA principles (contained in Section 2) guide the interpretation, administration and implementation of the Act and any other law concerned with the protection of the environment. Its overarching emphasis is that development must be environmentally, socially and economically sustainable. The Act also states that sustainable development requires the consideration of, inter alia, the following:

- That pollution and degradation of the environment are avoided, or where it cannot be altogether avoided, minimised and remedied;
- That waste is avoided, or where it cannot be altogether avoided, is minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
- That the use and exploitation of non-renewable natural resources is responsible and equitable, and considers the consequences of the depletion of the resource;
- That the development, use and exploitation of renewable resources and the eco-systems of which they are part do not exceed the level beyond which their integrity is jeopardised; and
- That negative impacts on the environment and on peoples' environmental rights be anticipated and prevented, and where it cannot be altogether prevented are minimised and remedied.

The NEMA principles apply to all activities that may significantly affect the environment and serve as guidelines by reference to which organs of state will exercise their functions when taking a decision in terms of the NEMA.

Sections 24 and 44 of the NEMA make provision for the promulgation of Regulations that identify activities which may not commence without EA. The result being that the NEMA began governing the EIA process with the promulgation of the EIA Regulations in April 2006 (Government Gazette No. 28753 of 21 April 2006). These Regulations was then replaced by the EIA Regulations of 2010 and then subsequently replaced by the EIA Regulations of 2014 (amended in 2017) listed in Government Gazette No. 38282 of 04 December 2014 (GNR No. 982, 983, 984 and 985) (as amended).

On submission of an application, the competent authority (CA) must consider all the relevant information contained in the Basic Assessment Report (BAR) (including any pollution, environmental impacts or environmental degradation likely to be caused if the application is approved or refused) and thereafter decide of whether to grant/refuse an EA to the Project or not.

Certain minimum conditions are attached to the EA, as required by Section 24E of the NEMA. However, it is at the CA's discretion to include additional project specific conditions. In terms of Section 24F of the NEMA, it is an offence not to comply with any condition applicable to an EA issued for a listed activity.

Typical conditions that may be applied by the CA include:

- Measures to prevent, manage and mitigate environmental impacts to acceptable levels;
- Prevention of pollution of water bodies and groundwater;
- Rehabilitation programme for disturbed natural and/or heritage areas;

- Appointment of an independent Environmental Control Officer (ECO) to oversee the construction phase and to ensure that the development phase is conducted in an environmentally responsible manner;
- Conservation and visitor management plans; and
- Requirements of other authorities, such as the Department of Water and Sanitation (DWS), the Department of Energy (DoE), the Department of Mineral Resources (DMR), South African Heritage Resources Agency (SAHRA) and/or relevant provincial authorities.

5.2 Activities Applicable to the NEMA

The development activities associated with the project trigger listed activities in terms of Listing Notice 1 of the EIA Regulations of 2014 (as amended), governed in line with Section 24(2) and (d) of the NEMA. Refer to Table 5-1below for the listed activities triggered by the project.

Table 5-1: Listed Activities in Terms of the NEMA

Activity	Description	Description of Activities Applicable
GNR 983, 04 December 2014 (as amended) Listing Notice 1		
11	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 (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more; excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is a. temporarily required to allow for maintenance of existing infrastructure; b. 2 kilometres or shorter in length; c. within an existing transmission line servitude; and d. will be removed within 18 months of the commencement of development.	The development will include realignment of the existing Cuprum/Karoo 66kV and Cuprum/Kronos 11kV overhead lines to make provision for the BESS and substation expansion.
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.	The establishment of the 70MW/ 240MWh BESS may result in the storage of dangerous goods. At this stage, it is uncertain whether the batteries will be fully assembled and/or whether the electrolyte will be stored in a container. As such, a worst-case scenario is assumed where the battery assembly will only take place on site, with the electrolyte to be stored in a container on site until such time. This listed activity will, therefore, be triggered.
27	The **clearance of an area of 1 hectares or more,** but less than 20 hectares of **indigenous vegetation**, except where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The development of the BESS and associated infrastructure will result in the clearance of approximately 53 000 m^2 (5.3 hectares) of indigenous vegetation. This will exceed the threshold of 1 hectare to be cleared, therefore the listed activity will be triggered.

	Where, "indigenous vegetation" refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years;
GNR 984, 04 December 2014 (as amended) Listing Notice 2	
Not applicable	
GNR 985, 04 December 2014 (as amended) Listing Notice 3	
Not applicable	

The listed activities triggered for the project, forms part of Listing Notice 1 and therefore requires a BA process to be undertaken in applying for the EA.

5.3 Protocols for Specialist Assessments

On 20 March 2020, in Government Gazette 43110, Government Notice (GN) 320, the DFFE published 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 NEMA when applying for an EA. GN 320 prescribes general requirements for undertaking Site Sensitivity Verification, as well as protocols for assessment and minimum report content requirements for specified environmental themes. GN 320 was enforced within 50 days of publication of the notice i.e. on 9 May 2020.

Each protocol applies exclusively to the environmental theme identified within its scope. Multiple themes may apply to a single application for EA, and assessments for these themes must be undertaken in accordance with the relevant protocol, or where no specific protocol has been prescribed, in accordance with the requirements of the EIA Regulations, specifically Appendix 6.

Table 5-2 below provides a summary of the themes and their relative sensitives, as identified by the National web-based Screening Tool. The table further provides information on which specialist assessments have been compiled, as per the requirements of the protocols.

Table 5-2 Specialist Study Requirements for the Project

Theme	Sensitivity Rating	Studies Required in terms of the Protocol	Specialist Studies Conducted	Motivation for No Specialist Studies
Agriculture	Low	Agricultural Compliance Statement	Agricultural Site Sensitivity Verification and Compliance Statement	Site Sensitivity Verification confirmed the Low sensitivity rating. In accordance with the Protocols, a Compliance Statement was required and compiled.
Animal Species	Medium	• No specific Protocol • Comply with Appendix 6 of the EIA Regulations, 2014 (as amended)	Terrestrial Ecological Impact Assessment and Avifaunal Compliance Statement	
Aquatic Biodiversity	Very High	Aquatic Biodiversity Specialist Assessment	Aquatic Site Sensitivity Verification and Compliance Statement	Site Sensitivity Verification noted that there are no watercourses within or in proximity to the proposed development footprint. The revised sensitivity of the site is therefore Low. In accordance with the Protocols, a Compliance Statement was required and compiled.
Archaeological and Cultural Heritage	Low	• No specific Protocol	Phase 1 Archaeological and Heritage Impact Assessment	

Theme	Sensitivity Rating	Studies Required in terms of the Protocol	Specialist Studies Conducted	Motivation for No Specialist Studies
		• Comply with Appendix 6 of the EIA Regulations, 2014 (as amended)		
Civil Aviation	High	Civil Aviation Compliance Statement	Civil Aviation Site Sensitivity Verification	Site Sensitivity Verification revised the sensitivity of the site to Low. As per the Protocols, there are no further requirements for sites of Low sensitivity.
Defence	Low	No requirement identified	None	None required for Low Sensitivity in terms of the Protocol.
Palaeontology	Medium	• No specific Protocol • Comply with Appendix 6 of the EIA Regulations, 2014 (as amended)	Palaeontological Desktop Study	
Plant Species	Low	• No specific Protocol • Comply with Appendix 6 of the EIA Regulations, 2014 (as amended)	Terrestrial Ecological Impact Assessment	
Terrestrial Biodiversity	Very High	Terrestrial Biodiversity Specialist Assessment	Terrestrial Ecological Impact Assessment Avifaunal Compliance Statement	
None	None	None	Risk Assessment	

5.4 National Heritage Resource Act, 25 of 1999

The NHRA (No. 25 of 1999) is the primary statute regulating the protection and management of South Africa's heritage resources. The NHRA aims to promote good management of the national estate and ensures community participation in the protection of national heritage resources and involves all three levels of government (national, provincial and local) in the management of the country's national heritage. SAHRA is the enforcing authority for the NHRA. The national estate includes, but is not limited to places, buildings, structures and equipment of cultural significance, places to which oral traditions are attached or which are associated with living heritage; historical settlements and townscapes, landscapes and natural features of cultural significance, geological sites of scientific or cultural importance, archaeological and paleontological sites, graves and burial grounds, and sites of significance relating to South African history and movable objects.

A variety of formal protection measures are provided for in the NHRA, ranging from national and provincial heritage sites, protected areas, provisional protection, inclusion on the heritage register of a province, heritage areas and heritage objects legal protection of paleontological and archaeological sites (including rock art) and meteorites, burial grounds and graves, and the protection of structures older than 60 years and public monuments and memorials.

Applicants must contact the SAHRA or the relevant authorised provincial agency to ascertain which properties and objects are formally protected by the Act and how any future development would impact on these heritage resources. Formal permit applications or authorisations would be required from the relevant heritage resource management authority to make changes to heritage resources. In the case of any built environment features, the approving authority is the Northern Cape Heritage Authority (previously called Ngwao Boswa jwa Kapa Bokone).

In terms of Section 34(1) of the NHRA, 1999, no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

The provisions of Section 38 of the NHRA provide that the applicant is responsible for contacting SAHRA at the earliest stages of initiating a development and for furnishing the SAHRA with details relating to the Project. The information is provided for the reason that SAHRA can determine if a Heritage Impact Assessment (HIA) is required. The following activities listed the NHRA apply to the proposed site project:

- National heritage sites, areas and objects;
- Provincial heritage sites, areas and objects;
- Protected areas;
- Structures;
- Archaeology, palaeontology, meteorites;
- Burial grounds and graves; and
- Public monuments and memorials.

The various categories of heritage resources recognised as part of the National Estate in Section 3 of the NHRA include, among others:

- Geological sites of scientific or cultural importance;
- Palaeontological sites; and
- Palaeontological objects and material, meteorites and rare geological specimens.

According to Section 35 of the NHRA, dealing with archaeology, palaeontology and meteorites:

- The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority;
- All archaeological objects, palaeontological material and meteorites are the property of the State; and
- Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.

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;
- Trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
- Bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
- When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—
- Serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
- Carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
- If mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
- Recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

- Minimum standards for the palaeontological impact assessment have been published by SAHRA (2013). These standards have been incorporated, along with the requirements of the heritage impact assessment, into the specialist studies undertaken for the project.

5.5 National Water Act, 36 of 1998

The NWA provides a framework to protect, develop, conserve and manage the nation's water resources. Water use is defined broadly in terms of the NWA, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation. In general, a water use must be licensed (in terms of Section 21) unless it is listed in Schedule 1 as an existing lawful water use; is permissible under a general authorisation; or if a responsible authority waives the need for a licence.

Water uses as identified in Section 21 of the NWA requiring a licence, include the following:

- Section 21 (a) - Taking of water from a water resource;
- Section 21 (b) - Storing of water;
- Section 21 (c) - Impeding or diverting the flow of water in a water course;
- Section 21 (d) - Engaging in a stream flow reduction activity contemplated in Section 36 of the Act
- Section 21 (e) - Engaging in a controlled activity: S37 (1) (a) irrigation off any land with waste, or water containing waste generated through any industrial activity or by a water work;
- Section 21 (f) - Discharging waste or water containing waste into a water resource;
- Section 21 (g) - Disposing of waste in a manner which may impact on a water resource;
- Section 21 (h) - Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- Section 21 (i) - Altering the bed, banks, course, or characteristics of a watercourse. This includes altering the course of a watercourse (previously referred to as a river diversion);
- Section 21 (j) - Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity, or for the safety of people; and
- Section 21 (k) - Using water for recreational purposes.

The NWA also provides for pollution prevention measures, with particular emphasis on water resource pollution. In accordance, the licensee shall ensure that activities impacting upon water resources and effluent releases are monitored for compliance with the applicable Regulations. Emergency incidents involving water resources are included in the Act, requiring the polluter to remediate and mitigate the impacts of such an emergency incident.

In terms of Section 19 of the NWA, "an owner of land, a person in control of land or a person who occupies or uses the land on which any activity or process is or was performed or undertaken; or any other situation exists, which causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring". These measures may include, but are not limited to:

- Measures to cease, modify, or control any act or process causing the pollution.
- Compliance with any prescribed waste standard or management practice.
- Containment or prevention of the movement of pollutants.
- Remediation of the effects of the pollution.
- Remediation of the effects of any disturbance to the bed and banks of a watercourse.
- With specific reference to the project, it is important to note that no water use is triggered in line with Section 21 of the NWA. As such, no Water Use Licence is required.

5.6 National Planning and Policy Context on Energy

5.6.1 White Paper on The Energy Policy of South Africa, 1998

The white paper on South African energy policy governs the development of South Africa energy sector (DME, 1998). This document identifies key objectives for energy supply such as managing energy related environmental impacts, access to affordable energy services and securing energy supply though diversity.

5.6.2 Renewable Energy Policy in South Africa, 2003

The white paper on renewable energy supplements the energy policy and sets out government's strategic goals, vision, policy principles and objectives implementing and promoting renewable energy in South Africa. South Africa has various sources of renewable resources such as solar and wind that are supported by this policy. From a fuel resource perspective, renewable energy applications are proven to be the least costly, especially from an environmental and social perspective. Meeting technical and economic as well other constraints is one of the major concerns of the governmental policy on renewable energy. South Africa has set a 10 year 10 000 GWH target for renewable energies by 2013 to be produced mainly from solar, wind and biomass as well small-scale hydro. This amounts to approximately 4% of the country's estimated demands by 2013.

5.6.3 Integrated Resource Plan (IRP), 2019

The IRP is an electricity infrastructure development plan based on least-cost electricity supply and demand balance, taking into account security of supply and the environment (minimize negative emissions and water usage). At the time of promulgation, it was envisaged that the IRP would be a "living plan" to be revised regularly. The promulgated IRP 2010–2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development.

Following the promulgation of the IRP 2010–2030, implementation followed in line with Ministerial Determinations issued under Section 34 of the Electricity Regulation (Act No.4) of 2006. The Ministerial Determinations give effect to planned infrastructure by facilitating the procurement of the required electricity capacity. Since the promulgated IRP 2010–2030, the following capacity developments have taken place:

- A total 6 422 MW under the Renewable Energy Independent Power Producers Programme (REIPPP) has been procured, with 3 876 MW operational and made available to the grid;
- In addition, IPPs have commissioned 1 005 MW from two Open Cycle Gas Turbine (OCGT) peaking plants;
- Under the Eskom build programme, the following capacity has been commissioned:1 332 MW of Ingula pumped storage, 1 588 MW of Medupi, 800 MW of Kusile and 100 MW of Sere Wind Farm; and
- In total, 18 000MW of new generation capacity has been committed to.

Besides capacity additions, several assumptions have changed since the promulgation of IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs.

These changes necessitated the review and update of the IRP which resulted in the IRP 2019.

5.7 Other Applicable Environmental Legislation

A screening of relevant legislation and municipal requirements was undertaken to identify the key legal issues related to the Project. Additional legislation to be considered during the implementation of the Project is summarised in Table 5-3 below:

Table 5-3: Summary of Other Applicable Legislation

Legislation	Sections	Applicability
The Constitution (No. 108 of 1996)	Chapter 2	Bill of Rights
	Section 24	Environmental rights
	Section 25	Rights in property

Legislation	Sections	Applicability
	Section 32	This section provides that every person has the constitutional right of access to information held by the state, including for example a state department such as the DEA, and any information held by another person in so far as that information is required for the exercise or protection of any of their rights, including their environmental right.
	Section 33	The Constitution entitles everyone to administrative action that is lawful, reasonable, and procedurally fair and if one's rights have been adversely affected by administrative action one has the right to be given written reasons for the decision.
Environment Conservation Act (No. 73 of 1989) (ECA) and Regulations	Although the Environment Conservation Act has been substantially repealed by the NEMA and the NEM:WA, certain Regulations promulgated under the Act remain in effect. Of importance are the National Noise Control Regulations.	
Northern Cape Nature Conservation Act, Act No. 9 of 2009	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: • Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off a property; • Aquatic habitats may not be destroyed or damaged; • The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species; and • Permits must be obtained for indigenous vegetation disturbed within 100m from a public road The Act provides lists of protected species for the Province.	
National Environmental Management: Protected Areas Act (No. 57 of 2003) (NEM:PAA)	The NEM:PAA was signed into law on 18 February 2004 and came into operation on 01 November 2004. The aim of the Act is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity, natural landscapes and seascapes. The Act operates in conjunction with the NEM:BA.	
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Sections 65-69	These sections deal with restricted activities involving alien species; restricted activities involving certain alien species totally prohibited; and duty of care relating to alien species.
	Sections 71 and 73	These sections deal with restricted activities involving listed invasive species and duty of care relating to listed invasive species.
	Alien and Invasive Species Regulations in terms of section 97 (1).	
	Chapter 2	Categories of listed invasive species.
Northern Cape Critical Biodiversity Areas (2016)	The Northern Cape Critical Biodiversity Area identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of e landscape as a whole. The Northern Cape Critical Biodiversity Area (CBA) Map updates, revises and replaces all older systematic biodiversity plans and associated products for the province. These include the: • Namakwa District Biodiversity Sector Plan • Cape Fine-Scale Plan (only the extent of the areas in the Northern Cape i.e., Bokkeveld and Nieuwoudtville) • Richtersveld Municipality Biodiversity Assessment	
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA) and Regulations	Sections 2, 5, 6	Implementation of control measures for soil conservation works as well as alien and invasive plant species in and outside of urban areas.
National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA)	The provisions of this Act would only be applicable during the construction phase of the project	
	Section 32	Measures for the control of dust
	Section 34	Measures for the control of noise
	Section 35	Measures for the control of offensive odours

Legislation	Sections	Applicability
	Chapter 5	Licensing of listed activities
	Schedule 2	Ambient air quality standards
NEM:WA	Section 16	General duty in terms of waste management
	Section 17	Reduction, re-use, recycling, and recovery of waste
	Section 20	No person may commence, undertake, or conduct a waste management activity, except in accordance with: 1. the requirements or standards prescribed by said Act and Regulations; and 2. a waste management licence issued in respect of that activity if a licence is required.
	Section 26	Prohibition of unauthorised disposal of waste
	Section 27	Prohibition of littering
Occupational Health and Safety Act (No. 85 of 1993) (OHSA) and Regulations	General Administration Regulations GN R929 of June 2003	Material Safety Data Sheets must be made available at the request of any interested or affected party.
	Section 8	General duties of employers to their employees.
	Section 9	General duties of employers and self-employed persons to persons other than their employees.
Fencing Act (No. 31 of 1963)	Section 17	Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to the protection of flora.
Hazardous Substances Act (No. 15 of 1973)	Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances.	
National Road Traffic Act (No. 93 of 1996) and Regulations	Section 54	Transportation of dangerous goods.
Spatial Planning and Land Use Management Act (No. 16 of 2013) (SPLUMA)	• Framework act for all spatial planning and land use management legislation. • Provide for a uniform, effective and comprehensive system of spatial planning and land use management for the Republic. • Ensure that the system of spatial planning and land use management promotes social and economic inclusion. • Provide for development principles and norms and standards. • Provide for the sustainable and efficient use of land. • Provide for cooperative government and intergovernmental relations amongst the national, provincial, and local spheres of government. • Redress the imbalances of the past and to ensure that there is equity in the application of spatial development planning and land use management systems.	
Land Survey Act (No. 8 of 1997)	To regulate the survey of land in South Africa.	

5.8 Policies and Guidelines

The BA process must consider the planning policies that govern the study area to ensure that the scale, density and nature of activities/developments are harmonious and in keeping with the sense of place and character of the area. Furthermore, relevant guidelines as applicable to the management of the BA process and to this application have also been considered. The proposed environmental and infrastructure modifications must be viewed in the context of the following planning policies and guidelines:

Policies

- Siyathemba Local Municipality Integrated Development Plan 2017-2022;
- Siyathemba Local Municipality Spatial Planning and Land Use Management Act (16/2013) (By-law);
- Pixley Ka Seme District Municipality Integrated Development Plan 2017 – 2022;

- Pixley Ka Seme District Municipality Spatial Development and Land Development Plan 2013 – 2018 (By-law);
- Public Participation in the EIA process, NEMA EIA Regulations (2014) as amended, Chapter 6;
- NEMA Waste Act: Waste Classification and Management Regulations (GNR 634), 2013, DEA, Pretoria;
- NEMA Waste Act: National Norms and Standards for the Storage of Waste (GNR 926 of 29 November 2013, DEA, Pretoria;
- SANS 1929: Ambient air quality – limits for common pollutants; and
- SANS 10103: The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication.

Guidelines

- Integrated Environmental Management (IEM) Guideline Series (Series 2): Scoping in the EIA process (2002);
- IEM Guideline Series (Series 3): Stakeholder engagement (2002);
- IEM Guideline Series (Series 4): Specialist studies (2002);
- IEM Guideline Series (Series 5): Impact Significance (2002);
- IEM Guideline Series (Guideline 5): Companion to the EIA Regulations 2010 (October 2012);
- IEM Guideline Series (Series 7): Cumulative Effects Assessment (2002);
- IEM Guideline Series (Guideline 7): Public Participation in the EIA process (October2012);
- IEM Guideline Series (Series 7): Alternatives in the EIA process (2002);
- IEM Guideline Series (Guideline 9): Draft guideline on need and desirability in terms of the EIA Regulations 2010 (October 2012);
- DEA (2017) Guideline on Need and Desirability, Department of Environmental Affairs (DEA) Pretoria, South Africa (2017);
- IEM Guideline Series (Series 12): Environmental Management Plans (EMP) (2002);
- IEM Guideline Series (Series 15): Environmental impact reporting (2002);
- Government Notice (GN) 320 (2020): 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; and
- GN 1150 (2020): 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.

6. Study Approach and Methodology

The BAR for the Project is being conducted in accordance with the process described in Regulation 19 and Appendix 1 of the EIA Regulations (2014) as amended, promulgated in terms of section 24(E) of the NEMA. This chapter serves to provide the study approach and methodology applied in the undertaking of the BA process.

The Draft BAR was made available for public review and comment for a 30-day period, between 10 August 2022 and 9 September 2022.

On the basis of comments received during this comment period, the need arose to make amendments to the information contained in the Draft BAR. Notification, dated 29 September 2022 was therefore sent to the DFFE, informing them that the Final BAR will be submitted within 140 days of the date of submission of the Application Form, as provided for by Section 19(1)(b) of the EIA Regulations, 2014, as amended.

The Revised Draft BAR (this document) must be made available for a 30-day comment period, following which all comments received, and responses provided must be captured into the Comments and Responses Report (CRR) and factored into the Final BAR, prior to submission to the CA for their decision-making.

6.1 Assumptions and Limitations

The assumptions, limitations and constraints associated with the BA process for the Project are listed below.

Basic Assessment Process

- The BA process is multi-disciplinary, informed by the project team (Table 2-3). It is necessary to assume that the information provided by the project team is accurate and true at the time of writing the report;
- No significant changes to the project are anticipated with regards to the narrative on the receiving environment for the period between completion of the report and implementation of the Project;
- Information regarding the project infrastructure was provided by the Applicant; and
- No activities listed in terms of GNR 984 (Listing Notice 2) of the EIA Regulations (2014), as amended, requiring a Scoping and Environmental Impact Report (S&EIR) process will be triggered by the project.

Palaeontological Desktop Study

- No significant changes regarding the development footprint and study area initially provided are expected for the Project.

Avifauna Impact Assessment

- To obtain a comprehensive understanding of the dynamics of the biota on site, including species of conservation concern, studies should include sampling through the different seasons of the year, over several years, and extensive sampling of the area. Due to project time constraints, such long-term research was not feasible, and the survey was conducted in a single field visit during winter;

- Due to project time constraints, the survey was not conducted during the peak breeding season (summer) for the Species of Conservation Concern (SCC) identified in the screening tool report;
- The assessment was written following the guidelines provided by the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species, published in GN 1150 of 30 October 2020; and
- Findings, recommendations and conclusions provided in this report are based on the authors' best scientific and professional knowledge as well as information available at the time of compilation.

Ecological Impact Assessment

- All information regarding the project as provided by the Applicant are taken to be accurate;
- Field investigations were undertaken on the 23rd of April 2021, which forms part of the summer (wet) season investigations;
- Due to the nature of the project, the small footprint and state of the site, no additional site investigations are required, including a winter (wet) season assessment;
- Precise buffer zones or exact GPS positions cannot be made using generalised corridors or KML files on Google Earth. However, the buffer zones drawn are accurate to within 2-3m;
- Standard and acceptable methodologies as required in South Africa were used;
- The latest data sets were used in terms of obtaining and establishing background information and desktop reviews for the project. The data sets were taken to be accurate but were verified and refined during field investigations (ground-truthing);
- No specific or highly specialised scientific equipment was used except standard soil augers, hand-held Garmin GPS instruments, relevant computer programmes, etc; and
- There were no significant limitations encountered that hindered the project or potentially impacted on the outcomes of the study.

Heritage Impact Assessment

The Heritage Impact Assessment (HIA) has been influenced by the unpredictability of buried archaeological remains (absence of evidence does not mean evidence of absence) and the difficulty in establishing intangible heritage values. It should be remembered that archaeological deposits (including graves and traces of mining heritage) usually occur below the ground level. Should artefacts or skeletal material be revealed at the site during construction, such activities should be halted immediately, and a competent heritage practitioner, SAHRA or PHRA must be notified for an investigation and evaluation of the find(s) to take place (see NHRA (Act No. 25 of 1999), Section 36 (6).

Aquatic Site Sensitivity Screening and Verification

- All information regarding the project as provided by the Applicant are taken to be accurate;
- Field investigations were undertaken on the 23rd of April 2021, which forms part of the summer (wet) season investigations;
- The study and site investigations were limited to surface water systems and do not include any underground investigations. Such investigations are however seen as unnecessary for the project;
- Due to the nature of the project, the small footprint and state of the site, no additional site investigations are required, including a winter (dry) season assessment;
- Precise buffer zones or exact GPS positions cannot be made using generalised corridors or KML files on Google Earth. However, the buffer zones drawn are accurate to within 2-3m;
- Standard and acceptable methodologies as required in South Africa were used;
- The latest data sets were used in terms of obtaining and establishing background information and desktop reviews for the project. The data sets were taken to be accurate but were verified and refined during field investigations (ground-truthing);

- No specific or highly specialised scientific equipment was used except standard soil augers, hand-held Garmin GPS instruments, relevant computer programmes, etc; and
- There were no significant limitations encountered that hindered the project or potentially impacted on the outcomes of the study.

7. Public Participation Process

The PPP is an integral requirement of the NEMA and BA process. AECOM has undertaken the PPP for the Project in accordance with the requirements of Chapter 6 of the EIA Regulations (2014), as amended.

The purpose of the PPP is to inform I&APs about the BA process required for the Project. It furthermore captures and responds to concerns and comments as well as allows the EAP to adjust the overall approach and information where necessary/applicable. This ultimately serves to ensure informed decision-making for the CA.

The Project specific PPP approach and application are outlined in the subsections below.

7.1 Objectives and Approach

The purpose of a PPP implemented as part of the application for an EA, is to meaningfully engage with potential I&APs during the planning, assessment, implementation and management of the Project. The main objectives of the PPP include the following:

- Notify potential I&APs of the proposed development and provide background and technical information relating to the BA process;
- Create networks and feedback mechanisms whereby I&APs can participate and raise their viewpoints (comments and concerns) with regards to the proposed development and associated activities; and
- Ensure that the views and inputs from the I&APs are accurately reflected and considered as part of the application process, to inform the decision-making process of the CA.

The PPP is designed to ensure that the Project's plans for engagement with potential I&APS are communicated and understood by everyone concerned. I&APs are considered to include all organisations and communities who may be affected by the Project or who have an interest in it.

A PP plan was since developed for the Project to meet these objectives and aims to:

- Provide a plan of engagement with the I&APs during the BA process.
- Describe the range of information to be communicated and the ways of informing to stakeholders by group/type where applicable; and
- Identify the I&APs whose participation will require additional effort, along with the means to achieve this.

A summary of the PP Plan is provided in Figure 7-1 below.

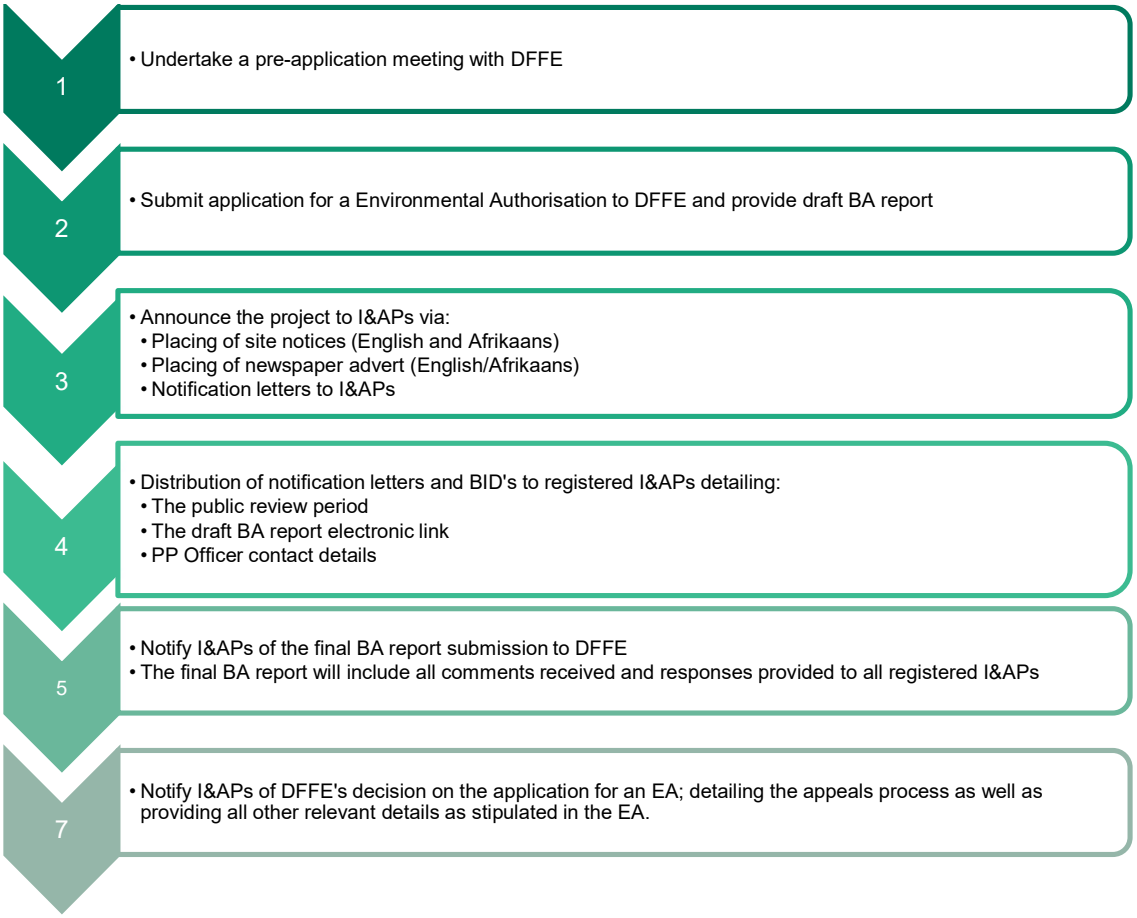


Figure 7-1 Summary of the Approved PP Plan

7.1.1 Identification and Registration of I&APs

I&APs are defined as any person, group of persons, or organization on which the Project (or activity) has an actual or potential, direct or indirect, positive or negative impact. Reversibly, an IAP may also be one that has an actual or potential, direct or indirect, positive or negative impact on the Project (or activity).

The objective of stakeholder identification and analysis is to establish which organizations and individuals may be directly or indirectly affected (positively and negatively) or have an interest in the Project to assess their needs and expectations for engagement based on their interest and influence in relation to the Project.

The IAP database has been developed for the Project which is included under Appendix E6. The database includes the following:

- Directly affected and adjacent landowners;
- Local, District and Provincial Government;
- Organs of state (which have jurisdiction in respect of the proposed activity);
- Ward councillors;
- Nearby communities, public associations and businesses; and
- Non-Government Organisations (NGOs).

It is important to note that the IAP Database is a living document, that has been updated on an on-going basis as new information and/or I&APs wish to be registered on the Project throughout the BA process. All registered IAPs have been informed of the latest Project updates and means by which to engage on the Project.

7.1.2 Announcement of the Project

The Project has been announced and I&APs were invited to register on the Project database through the following methods:

- Newspaper advertisement and tear sheet (in English and Afrikaans) – refer to Appendix E1;
- Site notice placements (in English and Afrikaans) – refer to Appendix E3 ;
- Background Information Documents (BID) distribution – refer to Appendix E4;
- Notification letters to I&APs of the public review period for the Draft BAR and EMPr (registered I&APs) – refer to Appendix E2.

All comments received and responses provided were captured and responded to as part of the CRR. Table 7-1 below provides a summary of how project information has been made available for public review and engagement throughout the BA process.

Table 7-1 Information Disclosed and Disclosure Methods

Information to be Disclosed	Method
Project announcement	• Public announcement was placed in the Noordkaap Bulletin (in English and Afrikaans); • Site notices were placed on site and at public locations (in English and Afrikaans);
Information on the Project and BA process	• Notification letters were emailed to I&APS with email addresses (including, but not limited to, local municipalities, local/district/provincial governments, businesses and adjacent landowners) announcing the public review period for the Project and providing a website link to the Draft BAR and EMPr (including Appendices).
Report Publication	• A copy of the Draft BAR was made available to stakeholders via an electronic link for a period of thirty (30) days allowing I&APs to review and comment in line with legislated requirements (from the 10 August 2022 to the 9 September 2022).

7.1.2.1 Newspaper advertisement

A newspaper advertisement to announce the Project and invite stakeholders to register as an I&AP was published in both English and Afrikaans as indicated in Table 7-2 below.

Table 7-2: Newspaper Advertisements Published

Newspaper	Date	Geography
Noordkaap Bulletin	4 August 2022	Prieska

7.1.2.2 Site Notices

Site notices announcing the Project in English and Afrikaans were placed on 10 August 2022 along the site boundary and areas of public interest, as per the locations stated in Table 7-3. The purpose of the site notices was to aid in Project announcement and to further invite stakeholders to register on the Project database. Photographs of the site notice placements have been included under Appendix E3 of this BAR.

Table 7-3 Site Notice Locations

Site notice	Location (proposed)	Latitude	Longitude
1.	Entrance gate to the Cuprum Substation, Copperton, Prieska	29°57'30.96"S	22°18'6.70"E
2.	Entrance gate to the Copperton Town	29°55'22.22"S	22°18'15.55"E
3.	Siyathemba Local Municipality Prieska Office	29°40'1.58"S	22°44'55.41"E
4.	Alpha Library (located within Prieska)	29°39'42.07"S	22°44'25.70"E

7.1.2.3 Background Information Document

A Background Information Document (BID) was distributed via email to registered I&APs contained in the IAP database ahead of the 30-day public review period on 3 August 2022. Please refer to Appendix E4 of this BAR for a copy of the BID distributed to I&APs.

The BID provided background information to the public on the BA process for the Project as well as contact details of the Public Participation Officer. The provision of contact details in the BID ensured an on-going interaction with I&APs. The BID has been distributed as an attachment to the notification letter to all registered I&APs. The BID was available upon request and was also provided to newly registered I&APs during the BA process.

7.1.2.4 Notification Letter

A notification letter was distributed to the identified and registered I&APs on the Project database, announcing the Project, opportunities for participation throughout the process and public review period, on 3 August 2022. Please refer to Appendix E2 of this BAR for a copy of the notification letter distributed to I&APs including notification of the public review period and extension thereof.

The aim of announcing the Project was to inform and engage with I&APs on the Project, as well as raise critical concerns and queries that need to be considered in the planning and implementation phases of the Project. This provides IAPs the opportunity to review the project information and provide inputs to the EAP for incorporation.

The aim of the notification emails and letters was also to afford I&APs an opportunity to provide comments on the Draft BAR and EMPr (including appendices) as well as communicate on how to access documents for public review.

I&APs have inherent knowledge of the surrounding areas and can provide valuable insights into the Project which are not always noticeable by the EAP and/or project team. This engagement facilitates the transfer of information and access to local knowledge which ultimately leads to avoidance and minimisation of potential impacts.

7.1.3 Public Review of the Draft BAR and EMPr

The Draft BAR for the Project was made available for public review for a minimum period of 30 calendar days, as required in terms of Chapter 2, Section 3 (8) of the EIA Regulations (2014), as amended. The public review period commenced on 10 August 2022 and ended on 9 September 2022. I&APs were notified of the availability of the Draft BAR via notification letters (refer to Section 7.1.2).

A webpage link was included in all IAP notification documents. Please refer to Table 7-4 for the webpage link provided to IAPs.

Table 7-4: Link to be Provided to IAP's

Link
https://aecom.com/eskom_prieska_bess

7.1.4 On-going Communication

AECOM's contact details were provided on all written communication to ensure that I&APs were able to interact with the Public Participation Team and comments raised could be communicated to the EAP. I&APs were registered on the database upon request throughout the BA process. Furthermore. I&APs were kept up to date with the latest project information, process and means to further engage and comment throughout the process.

7.1.5 Comments Raised

All comments raised by I&APs throughout the BA process to date have been recorded and responded to in the CRR which forms part of this Revised Draft BAR. The CRR includes the following (where applicable):

- Type of communication, e.g., by mail, telephone, and other means of communication;
- Confirmation on where the comments originated from and the organisation/group which they represent;
- Number of comments by topic and type of stakeholder, date and details of feedback provided (individual responses are sent to I&APs); and
- Numbers and types of grievances and the nature and timing of their resolution (if any).

7.1.6 Notification of Environmental Authorisation

Once the CA has reached a decision regarding EA, I&APs registered on the database will be notified of the decision within 14 (fourteen) calendar days. The full EA document will be made available along with relevant information by means of which to appeal the decision should they so wish. Should anyone wish to appeal, an appeal must be lodged with the Minister within 20 days of the date of the EA.

8. Description of the Affected Environment

This chapter provides an overview of the affected environment in the context of the study area and proposed development. The study area incorporates the Eskom Cuprum Substation and its associated infrastructure, and as well as the immediate surroundings. The areas adjacent to and surrounding the study area include powerline servitudes, mining infrastructure, open pits, stockpiles, railway lines and gravel roads. This section should be read in conjunction with the specialist studies undertaken for the Project (refer to Appendix D). A composite sensitivity map of the study area and surrounding area is illustrated in Figure 8-6.

8.1 Climate

The study area is situated within the Arid Interior Climatic Zone of South Africa (refer to Figure 8-1). The region is arid with rainfall occurring in late summer/early autumn (major peak) and typically varies from year to year in terms of annual rainfall. Mean Annual Precipitation (MAP) ranges from about 201mm to 400mm for the region (refer to Figure 8-2). Mean maximum and minimum monthly temperatures for Copperton are 33°C and 7°C from January to July. The area is known to be windy, where whirl winds and dust devils are common on hot summer days. Frost occurs in winter ((Mucina, 2006); (World Weather Online, 2020)).

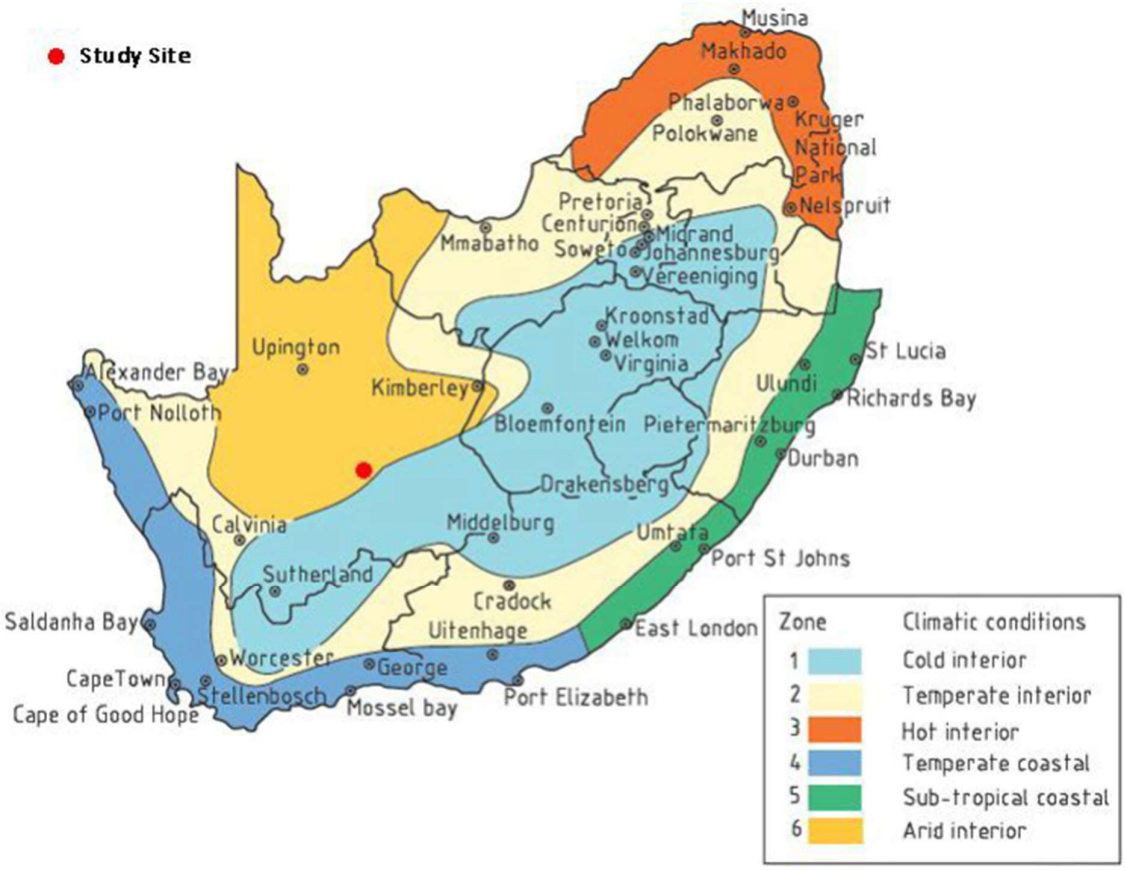


Figure 8-1 Climatic Zones of South Africa

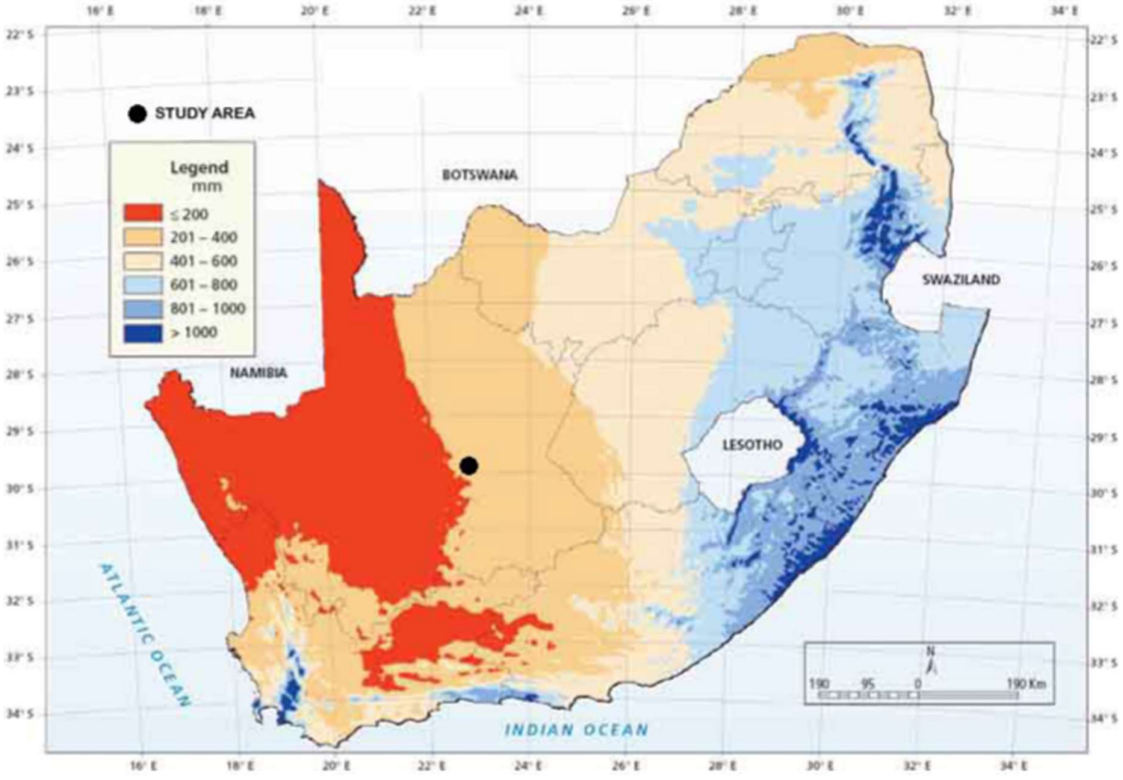


Figure 8-2 Rainfall Zones of South Africa

8.2 Topography

The topography of the area is very flat to slightly undulating open Karoo plains. There are no significant rocky outcrops (koppies), rocky ridges, hills or valleys within the study area or immediate surrounding areas. The average height above sea level of the study area is approximately 1 081m, with a maximum and minimum of 1 082m and 1 079m, respectively. The average downward gradient (slope) is from south east to north west and only varies between 1,2% to 0,8%.

8.3 Geology and Soils

The region is situated within the Bushmanland Basin which comprises of mudstones and shales of the Ecca Group (Prince Albert and Volksrust Formations) and Dwyka tillites. Approximately 20% of rock outcrop is formed by Jurassic intrusive dolerite sheets and dykes. Soils are shallow Glenrosa and Mispah forms, with lime generally present in the entire landscape and, to a lesser extent, red - yellow apedal, freely drained soils with a high base status and usually <15% clay. The salt content in these soils is very high (Mucina & Rutherford, 2006). The general soil description is that of strongly saline soils, which generally occur in relatively deep deposits in low lying arid areas. The soils are mostly freely drained, structureless soils.

8.4 Land Cover

The landcover or land use of the region is predominantly that of large open grazing farmlands for livestock, mines and low levels of urbanisation, except for the small towns (such as Copperton). The land use of the study area and immediate surroundings is that of extensive mining operations to the immediate north, a solar farm to the south-east, wind farm to the east and the Cuprum Substation at which the Project is situated.

8.5 Vegetation

An Ecological Assessment undertaken by an ecological specialist was used to inform this section. The site visit was undertaken on the 23rd April 2021 which included further field investigations and assessment of the baseline conditions and environmental status quo.

8.5.1 Biome

South Africa is sub-divided up into nine (9) biomes. The study area and surrounding areas are within the Nama-Karoo Biome of South Africa (Figure 8-3). The site is within the Bushmanland Bioregion and within the original extent of the veldtype known as Bushmanland Basin Shrubland (refer to Table 8-1). The veld type, Bushmanland Basin Shrubland, is also known as Bushmanland Nama Karoo (Low, 1998)) and Desert False Grassveld (Acocks, 1988).

Table 8-1 Description of Vegetation Classification(s)

Category Description	Classification
Biome	Nama-Karoo
Bioregion	Bushmanland
Vegetation Types	Bushamanland Basin Shrubland

The vegetation of the Nama-Karoo Biome is characterised by a dominance of small microphyllous shrubs, particularly from the Asteraceae (Daisy family). The Biome is a complex of extensive plains, dominated by low (dwarf) shrubs (generally <1 m tall) intermixed with grasses, succulents, geophytes and annual forbs. Small trees occur only along drainage lines or on rocky outcrops—habitats with special hydropedological microclimatic characteristics (Mucina & Rutherford, 2006). Grasses form an important component of the ecosystems. As with the Succulent Karoo, the Nama Karoo is too arid for extensive or commercial cultivation but has been negatively impacted through overgrazing of livestock. Although to date the Nama-Karoo has not been subject to significant levels of transformation, there are significant threats to the Biome presented by potential mining in the minerals and petroleum industries. The Nama-Karoo Biome is divided into three broad bioregions, namely: Bushmanland & West Griqualand; Upper Karoo and Lower Karoo.

Figure 8-3 below shows the hierarchy and classifications of the vegetation of the study area.

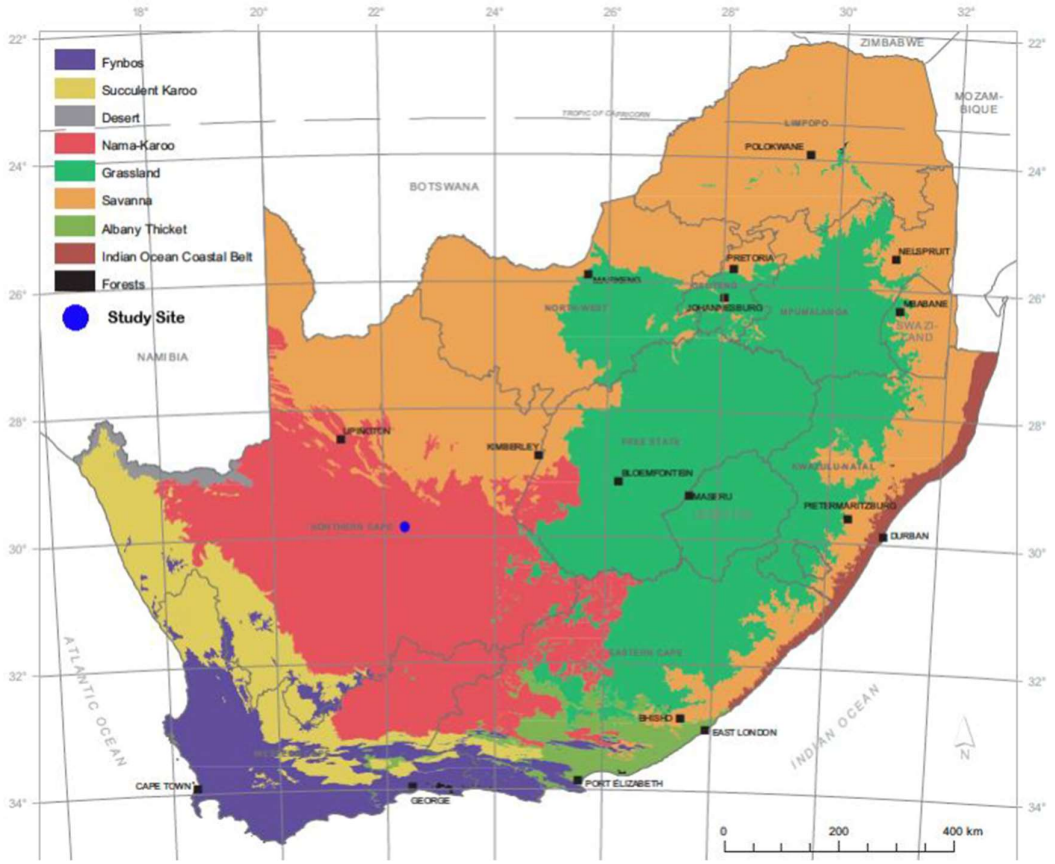


Figure 8-3 Biomes within South Africa (including the study area)

Bushmanland Basin Shrubland is characterised by slightly irregular plains with dwarf shrubland dominated by a mixture of low sturdy and spiny (and occasionally succulent) shrubs (*Rhigozum, Salsola, Pentzia, Eriocephalus*), 'white' grasses (*Stipagrostis*) and in years of high rainfall also by abundant annuals such as species of *Gazania* and *Leysera* (Mucina, 2006).

The Bushmanland Basin, in which the study area and veld type (Bushmanland Basin Shrubland) are situated, forms an environment for a number of endorheic pans (Vloere) and extensive systems of intermittent river channels (including that of the Sak River). The vegetation of the large Bushmanland Basin shows increased presence of shrubs (especially succulents) and plant indicators of high salt status of soil.

At a finer scale, the area immediately adjacent to the Cuprum Substation on the south-western side, where the substation is proposed to be extended, is devoid of vegetation and highly disturbed. A small amount of natural vegetation exists on the site of the proposed BESS and immediate surrounds, to the extent of the powerline re-alignment. This portion of the site comprises bare patches of gravelly sandy soil, sparsely covered with grasses and scrubby vegetation. The vegetation on site is mostly scattered low shrubs and grasses, with open sandy and dolomitic stone areas. A few large shrubs and trees are also scattered throughout the area. Several alien plants species are also present including the invasive *Prosopis glandulosa var. torreyana* (Honey Mesquite).

No red data listed (RDL) (Critically endangered, endangered or vulnerable) or orange data listed (ODL) floral species were observed within the study area.

8.5.2 Conservation Status

Bushmanland Basin Shrubland is not a threatened veld type / ecosystem. The conservation status (or threat status) is that of Least Threatened (LT) (refer to Table 8-2 below) .

Table 8-2 Veld Type and Conservation Status

Veld Type	Status	Details
Bushmanland Basin Shrubland	Least Threatened (LT)	None of the veld type is conserved in statutory conservation areas. No signs of serious transformation, but scattered individuals of Prosopis sp. (Mesquite bush) occur in some areas (e.g., in the vicinity of the Sak River drainage system), and some localised dense infestations form closed 'woodlands' along the eastern border of the vegetation unit with Northern Upper Karoo (east of Van Wyksvlei). (Mucina & Rutherford, 2006, 2010)

Table 8-3 below provides a basic description of the status categories. The Biodiversity Act, 2004 (Act No.10 of 2004) provides for listing of threatened or protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or protected. The main purpose for the listing of threatened ecosystems is an attempt to reduce the rate of ecosystem and species destruction and habitat loss, leading to extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems (SANBI).

Table 8-3 Ecosystem Status

Status	% Transformed	Effect on Ecosystem
Least Threatened (LT)	0-20% (<20% loss)	No significant disruption of ecosystem functions
Vulnerable (VU)	20-40% (>20% loss)	Can result in some ecosystem functions being altered
Endangered (EN)	40-60% (>40% loss)	Partial loss of ecosystem functions
Critically Endangered (CR)	>60% or BT Index for that specific veld type	Species loss. Remaining habitat is less than is required to represent 75% of species diversity

8.5.3 Alien Invasive Plant Species

The study area does not consist of an abundance of alien invasive weeds. There are only a few scattered common weeds found on site and within the study area, including mesquite bush (*Prosopis glandulosa var. torreyana*). Mesquite is a highly invasive alien weed in arid regions. It is commonly found in scattered bushes which can grow to a notably large size. The main alien plant species encountered on site and the greater study area were recorded in Table 8-4 including the respective category rating. These categories are as set out in the Conservation Act of Agricultural Resources Act, 1983 (CARA) (Act 43 of 1983).

Table 8-4 Alien Invasive Plants

Botanical Name	Common Name	Category
Argemone ochroleuca	White-flowered Mexican poppy	1
Malva verticillata	Mallow	-
Prosopis glandulosa	Honey Mesquite	2
Ricinus communis	Castor oil plant	2

8.5.4 Northern Cape Biodiversity Spatial Plan

CBAs are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI, 2020). These form the key outputs of a systematic conservation assessment and are the biodiversity sectors inputs into multi-sectoral planning and decision-making tools. The Northern Cape CBA map serves as a key development tool to assist planning and decision making in the province. The map identifies biodiversity priority areas (CBAs and ESAs) together with protected areas that are

important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole.

The site does not occur within any CBA or ESA, and borders an area classified as Other Natural Areas (ONAs), with a few isolated patches of ONA falling within the site. The re-alignment of the two powerlines will take place within areas marked as ONA (refer to Figure 8-4).

8.5.5 National Priority Areas

National priority consists of formal and informal (private) Protected Areas (i.e. nature reserves), Important Bird Areas (IBAs), RAMSAR sites, National Fresh Water Ecosystem Priority Areas (NFEPA) and National Protected Areas Expansion Strategy Focus Areas (NPAES).

The study area is not situated within or close to any national priority areas, including IBAs and Protected Areas (PAs). There are no priority areas, including protected areas, within a 10km radius of the study area. The nearest PA is the Prieska koppie Nature Reserve, 54km to the northeast, and the Platberg Karoo Conservancy Important Bird Area (IBA) lies 148.5km to the southeast.

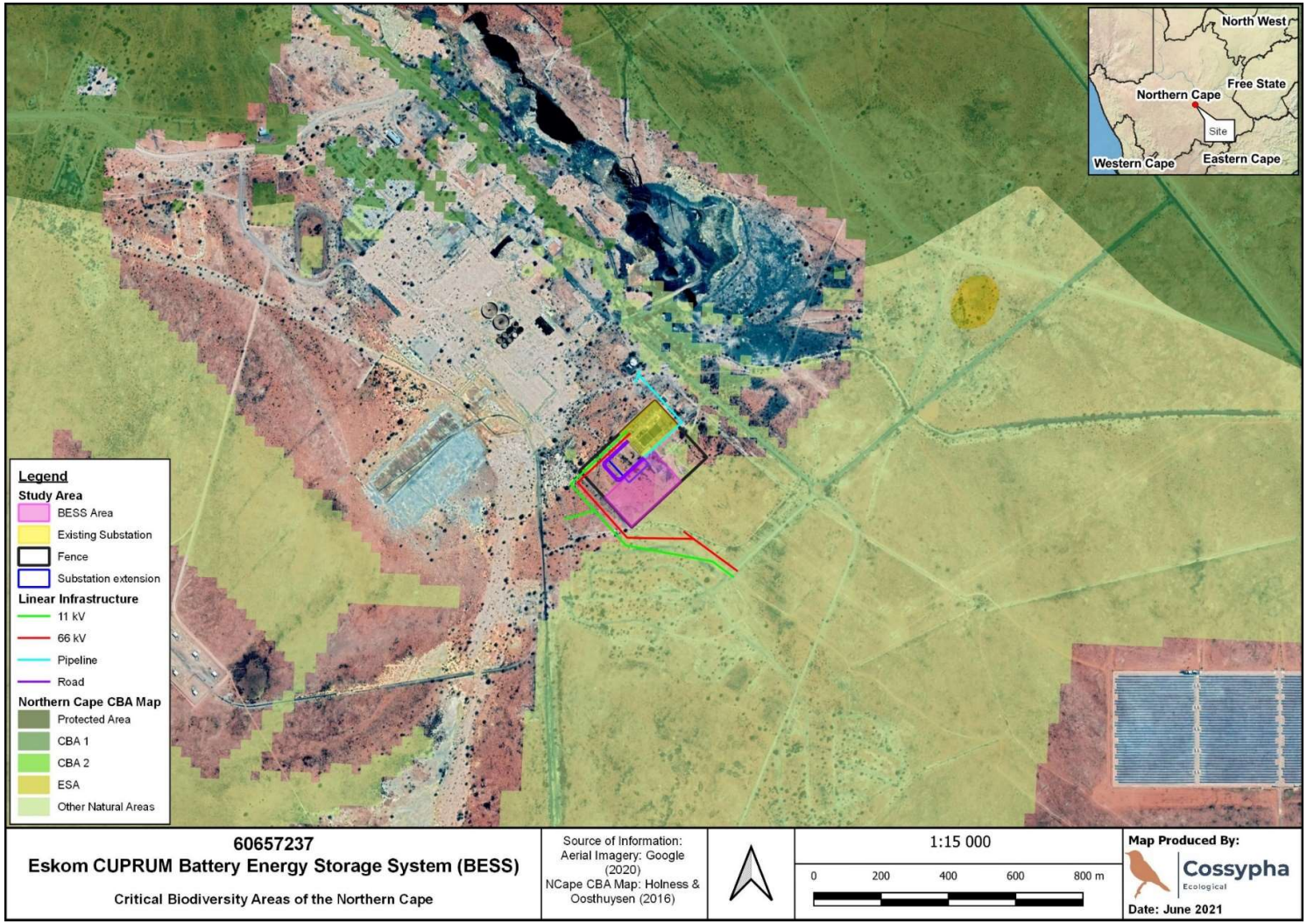


Figure 8-4 Biodiversity Spatial Plan in Relation to the Project and Study Area

8.6 Fauna

Fauna, of a wild and free roaming nature, are likely to be found in the area and occasionally on the study area. This generally includes steenbok, mongoose, foxes (bat-eared), jackals (black-backed), caracal, aardvark and various common snakes and bird species. Other ecological studies have recorded springbok, black korhaan, meerkat, pied crown and various pipits and larks. Black- footed cat and brown hyena have been identified on rare occasions in the greater area.

The International Union for Conservation of Nature (IUCN) Red List provides the name and category of species in relation to their conservation status. The Red List identifies the black-footed cat as Vulnerable and the brown hyena as Near Threatened. The black-footed cat is a specialist of open, short grass areas with an abundance of small rodents and ground-roosting birds, and hence is likely to breed and feed in the area. The brown hyena is more likely to be an occasional visitor to the area as its presence would have been noticed by local farmers due to its relatively large size. It is likely that local farmers would have tried to kill any hyena based on common negative perceptions of the animal.

The following subsections below detail Species of Conservation Concern (SCC) as well as avifauna, mammals, reptiles and invertebrates likely to fall within the study area.

8.6.1 Species of Conservation Concern

The general habitat of the study area and immediate surroundings are not ideal for most SCC. SCC and their likelihood of occurrence in the study area and immediate surroundings are tabulated below (refer to Table 8-5).

Table 8-5 Species of Conservation Concern Likely to Occur in the Study Area

Scientific Species Name	Common Name	Red Data Status	Preferred Habitat	Habitat Restrictions	Presence in study area
Frogs					
Pyxicephalus adspersus	Giant bullfrog	Threatened	Grassland; savanna	Temporary floodplains, pans	No
Mammals					
Atelerix frontalis	SA hedgehog	Near threatened	Most, broad	Broad	No
Manis temmincki	Pangolin (Scaly anteater)	Vulnerable	Grassland, savanna	Woody savanna, ants, termites	Unlikely
Mellivora capensis	Honey badger (Ratel)	Near threatened	Most, broad	Broad	Likely
Cloeotis percivali	Short-eared trident bat	Critically endangered	Savanna	Caves and subterranean habitat	No
Pipistrellus rusticus	Rusty bat	Near threatened	Most, broad	Woody savanna, large trees	No
Snakes					
Python natalensis	Southern African python	Vulnerable	Ridges, Wetlands	Rocky areas; open Water	No

No species of conservation concern were identified during the field investigation undertaken by the ecological specialist (refer to Appendix D).

8.6.2 Mammals

There are approximately three hundred (300) mammal species in South Africa with approximately one hundred (100) located within the Northern Cape Province. Common species include lion, cheetah, leopard and hyena, most of which are found in protected areas.

No large or medium-sized mammals were observed within the study area during the field investigation undertaken by the ecological specialist. A few burrows were found scattered in the area, which appear to be used by small field mouse, scrub hare and mongoose. Larger burrows, typically dug by Aardvark, were not observed in the study area.

Aardvark are listed as a protected species under NEMBA: Threated or Protected Species and assigned a Least Concern category under the IUCN Red List.

Due to the mining and renewable development activities within the area, common species of wild animals and mammals will be too reserved to enter into the study area.

An Ecological Impact Assessment was also undertaken for the Project (refer to Appendix D) which further investigated the probability of Red Data Listed mammals occurring in the study area. The Red Data Sensitivity Index Score (RDSIS) for the study area's potential Red Data Listed (RDL) mammals yielded an average score of 36,5%, indicating a '**Low / Medium'** index score of importance or occurrence with regards to RDL mammal species within the general vicinity of the study area.

8.6.3 Avifauna

An Avifaunal Assessment was undertaken for the Project (refer to Appendix D) which included a field survey. The site visit was undertaken on the 23rd April 2021 which included further field investigations and assessment of the baseline conditions and environmental status quo. Therefore, the information contained within this section is further informed by the avifaunal assessment undertaken for the Project.

There are approximately two hundred and fifteen (215) bird species that are expected to occur in Quarter Degree Grid Cell (QDGC) 2922CD in which the study area is located. This is comparatively low compared to other parts of the country which assumes a high level of endemism exists in the region. Approximately sixty-two (62) species are endemic to southern Africa of which forty-two (42) are associated with arid Karoo habitat. Only twenty-one (21) species occurring in QDGC are of conservation concern either nationally (Taylor, 2015) or globally (IUCN, 2021). According to the Southern African Bird Atlas Project (SABAP2) data, ninety-eight (98) species have been recorded in the pentad in which the site falls (pentad 2955_2215), five (5) of which are SCC.

Table 8-6 lists the avifaunal SCC that have been recorded within the QDGC, and includes threat status, likelihood of occurring in the study area, and SABAP2 reporting rate for pentad 2955_2215.

Table 8-6 Avifaunal SCC Likely to Occur within QDGC 2922CD

Family	Common Name	Scientific Name	Threat Status (RSA/IUCN)	SABAP2 RR%	Likelihood of Occurring on site
Otididae	Ludwig's Bustard*	*Neotis ludwigii*	EN/EN		Medium
Accipitridae	Black Harrier*	*Circus maurus*	EN/VU		Medium
Accipitridae	Martial Eagle*	*Polemaetus bellicosus*	EN/VU		Medium
Sagittariidae	Secretarybird*	*Sagittarius serpentarius*	VU/VU		Medium
Glareolidae	Burchell's Courser*	*Cursorius rufus*	VU/LC		Medium
Accipitridae	Verreaux's Eagle*	*Aquila verreauxii*	VU/LC	10	Medium
Falconidae	Lanner Falcon*	*Falco biarmicus*	VU/LC		Medium
Otididae	Kori Bustard*	*Ardeotis kori*	NT/NT	10	Medium
Alaudidae	Sclater's Lark*	*Spizocorys sclateri*	NT/NT	10	Medium
Coraciidae	European Roller	*Coracias garrulus*	NT/NT		Medium
Otididae	Karoo Korhaan*	*Eupodotis vigorsii*	NT/LC	70	Medium
Glareolidae	Double-banded Courser*	*Rhinoptilus africanus*	NT/LC	20	Medium
Alaudidae	Red Lark*	*Calendulauda burra*	VU/VU		Low
Rostratulidae	Greater Painted-snipe	*Rostratula benghalensis*	VU/LC		Low
Ciconiidae	Black Stork	*Ciconia nigra*	VU/LC		Low
Gruidae	Blue Crane	*Anthropoides paradiseus*	NT/VU		Low
Anatidae	Maccoa Duck	*Oxyura maccoa*	NT/NT		Low
Charadriidae	Chestnut-banded Plover	*Charadrius pallidus*	NT/NT		Low

Phoenicopteridae	Lesser Flamingo	*Phoeniconaias minor*	NT/NT	Low
Phoenicopteridae	Greater Flamingo	*Phoenicopterus roseus*	NT/LC	Low
Ciconiidae	Abdim's Stork	*Ciconia abdimii*	NT/LC	Low

Note: EN = Endangered; VU = Vulnerable; NT – Near Threatened

Species that have been recorded in the neighbouring pentads are indicated by an asterisk. Birds listed in green are endemic to southern Africa, while those in blue are non-breeding migrants to the region.

This species and certain others occurring in the region were given a medium likelihood of occurring in the study area and surrounds (refer to Table 8-6). The justification for the assigned likelihood is based on the disturbed nature of the study area as well as the existence of suitable habitat in the broader landscape. The occurrence in the vicinity of the study area (i.e. in the adjacent pentads as well as the site's pentad) of 12 of these species, including *Neotis ludwigii* (Ludwig's Bustard), has been confirmed by SABAP2 (marked with an asterisk in Table 8-6). While these species may utilise habitat in the surrounding landscape, they may pass through the study area on occasion, but are unlikely to persist in the study area for any significant length of time. Some of these species are also wide-ranging, such as *Polemaetus bellicosus* (Martial Eagle) and may come within the study area at times. Their presence on the site is therefore unlikely but cannot be ruled out.

During the field survey, only twenty (20) bird species were observed in and around the study area, including thirteen (13) species which are endemic to southern Africa. The majority were recorded outside the study area in the surrounding locale. Most species observed were habitat generalists or associated with arid Karoo habitats, and included predominantly smaller passerines and a few medium sized non-passerine species. Two raptor species were recorded, and few ground dwelling birds were encountered. Bird species recorded during the field survey are listed in Table 8-7 along with their national (Taylor, 2015) and global (IUCN, 2021) conservation status.

Table 8-7 Birds Recorded in the Study Area and Surrounds During the Field Survey

Scientific Name	Common Name	Conservation Status	
		National	Global (IUCN)
Tricholaema leucomelas	Acacia Pied Barbet	LC; En	LC
Streptopelia capicola	Cape Turtle-Dove	LC	LC
Afrotis afraoides	Northern Black Korhaan	LC; En	LC
Burhinus capensis	Spotted Thick-knee	LC	LC
Melierax canorus	Southern Pale chanting Goshawk	LC; En	LC
Falco rupicolus	Rock Kestrel	LC	LC
Lanius collaris	Common Fiscal	LC	LC
Corvus albus	Pied Crow	LC	LC
Telophorus zeylonus	Bokmakierie	LC; En	LC
Batis pririt	Pririt Batis	LC; En	LC
Cercomela familiaris	Familiar Chat	LC	LC
Prinia flavicans	Black-chested Prinia	LC; En	LC
Malcorus pectoralis	Rufous-eared Warbler	LC; En	LC
Sylvia subcaerulea	Chestnut-vented Tit-Babbler	LC; En	LC
Calendulauda africanoides	Fawn-coloured Lark	LC; En	LC
Calendulauda sabota	Sabota Lark	LC; En	LC
Eremopterix verticalis	Grey-backed Sparrowlark	LC; En	LC
Plocepasser mahali	White-browed Sparrow-Weaver	LC	LC
Philetairus socius	Sociable Weaver	LC; En	LC
Emberiza impetuani	Lark-like Bunting	LC; En	LC

Note: LC = Least Concern; En = Endemic

Birds listed in green are endemic to southern Africa.

The on-site inspection confirmed that the site is mostly degraded and has been modified and disturbed by past and present human activities. The site supports very limited natural vegetation that serves as suitable avifaunal habitat and it is highly unlikely that the study area will be utilised by breeding birds, especially those of conservation concern. While natural vegetation does occur within the study area, it is sparse and would likely only be used by birds as transient habitat.

The site does not contribute to any significant ecological processes nor does it retain important ecological functioning. Overall, the site is considered to be of low sensitivity in terms of avifaunal habitat, with a portion in the southern corner of the site showing slightly less disturbance and fewer alien plant species, considered medium-low (refer to Figure 8-5). Reptiles

No reptiles were observed during the field investigation undertaken by the ecological specialist (refer to Appendix D). Lizards tend to prefer rocky habitats and there are no rocky outcrops (koppies), rocky ridges or areas of large rock sheets directly within the study area. The likelihood is rare that any priority lizard species will be present in the study area, but some common plated lizards and agamas may be present.

No frog species are expected to reside or occur regularly on the study area.

Snakes tend to be more mobile and adaptable to various and altered environments. It is more than likely that a few common species will be present in the area and occasional on the study area as well. Priority species, such as the African Rock Python (*Python natalensis*) are not found on the study area or immediate surrounding area.

8.6.4 Invertebrates

Invertebrates such as spiders, scorpions and butterflies are important faunal groups, but are very difficult to properly assess in a short time period. During field investigations, undertaken by the ecological specialist, specific attention was given to priority species such as *Mygalomorphae* arachnids (Trapdoor and Baboon spiders) and red data butterflies. No priority species were observed.

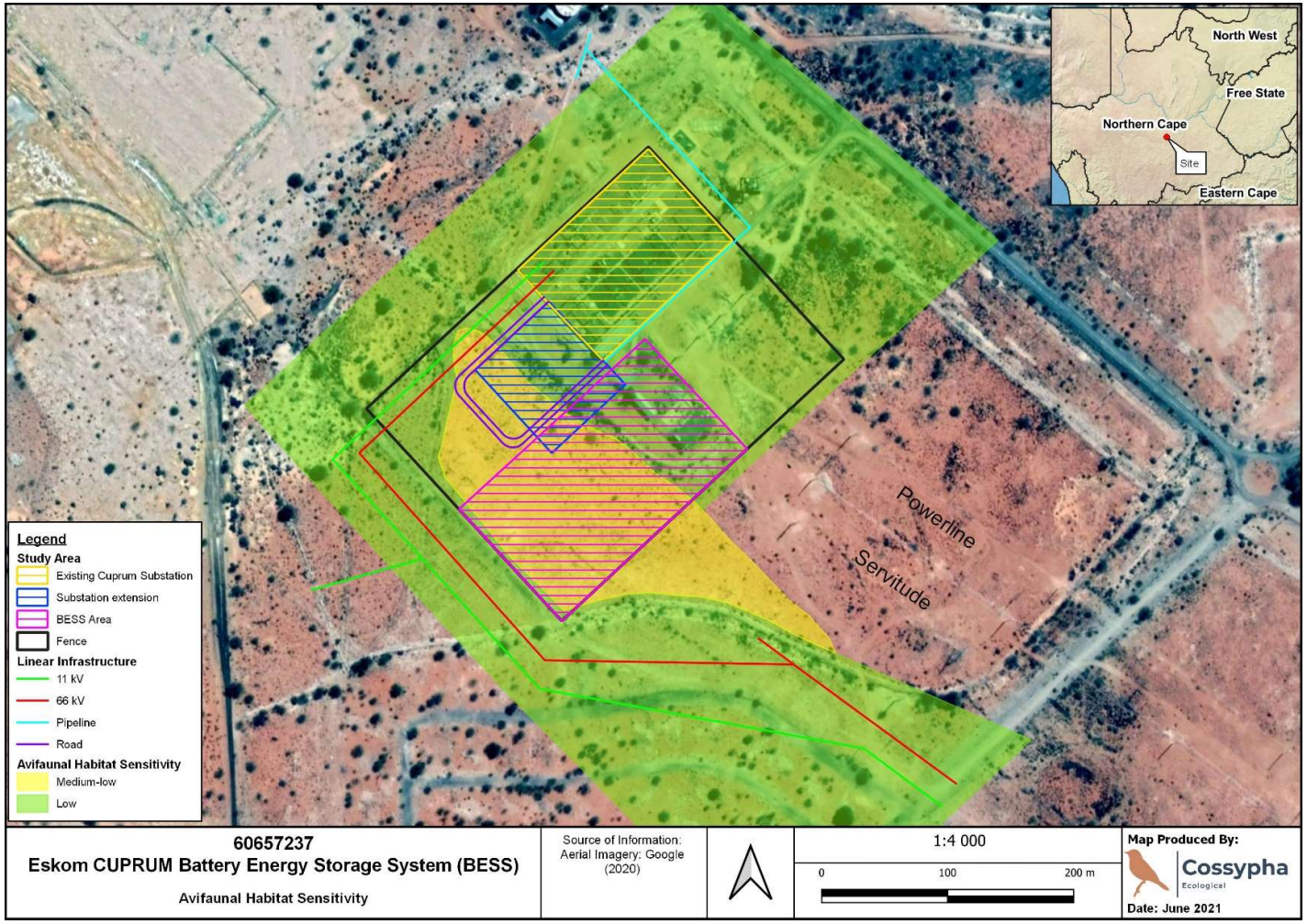


Figure 8-5 Avifaunal Habitat Sensitivity within the Study Area

8.7 Aquatic Environment

An Aquatic Site Verification Assessment was undertaken for the Project (refer to Appendix D) which included a field survey. The on-site verification was undertaken on the 23rd April 2021 which included further field investigations and assessment of the baseline conditions and environmental status quo including the presence of any water bodies and resource within the study area.

The nearest stream/river to the site is the Basterspu-se-Leegte located approximately 1.2km north of the study area. The river is non-perennial, highly ephemeral in nature, dry for most of the year and almost never flows from end-to-end. Baster-se-Leegte 'flows' from east to west and is highly disturbed and modified as it flows through the mining area in Copperton. Approximately 200m to 250m west and north of the study area are markings of stormwater surface waterflow (sheet flow). These have created notable white markings, along with dolomitic soils and geology, but are not distinctive watercourses and alter depending on various factors such as construction of roads, houses or mining in the area.

According to NFEPA Map and National Wetland Map 5 (2018), there are no NFEPA watercourses in the study area, with the closest being the non-perennial and highly ephemeral river, Basterspu-se-Leegte. Therefore, in accordance with the Aquatic Verification Assessment, it is understood that no watercourses occur within the study area. There are also no saltpans or other types of wetlands within a 500m radius of the outer boundaries of the study area.

8.8 Heritage

The appropriate management of cultural heritage resources is usually determined on their assessed significance as well as the likely impacts of any proposed developments. Cultural significance is defined in the Burra Charter as meaning aesthetic, historic, scientific, or social value for past, present, or future generations (Article 1.2). Social, religious, cultural, and public significance are currently identified as baseline elements of a heritage assessment, and it is through the combination of these elements that the overall cultural heritage values of the site of interest, associated place or area are resolved.

Archaeological sites, as defined by the National Heritage Resources Act (Act 25 of 1999) are places in the landscape where people once lived in the past – generally more than 60 years ago – and have left traces of their presence behind. In South Africa, archaeological sites include hominid fossil sites, places where people of the Earlier, Middle and Later Stone Age lived in open sites, river gravels, rock shelters and caves, Iron Age sites, graves, and a variety of historical sites and structures in rural areas, towns and cities.

A Heritage Impact Assessment (HIA) was undertaken for the Project (refer to Appendix D) to investigate the potential impacts to cultural heritage resources and archaeological sites. The assessment also focused on the sensitivity of the area in terms of archaeology and to avoid or reduce the potential impacts of the proposed development by means of mitigation measures. The study concluded that the impacts will be negligible due to the disturbed nature of the site and lack of significant archaeological resources from both the desktop assessment and field investigation. The study also did not identify any buildings or structures which are more than 60 years old. Table 8-8 presents results of the archaeological and heritage survey conducted by the heritage specialist within the proposed development Project site.

Table 8-8 Results of the Archaeological and Heritage Survey

Heritage Resource	Status/Findings
Buildings, structures, places and equipment of cultural significance	None recorded during the survey
Areas to which oral traditions are attached or which are associated with intangible heritage	None exists on the study area
Historical settlements and townscapes	None recorded on the study area
Landscapes and natural features of cultural significance	None
Archaeological sites	None recorded within the development site
Graves and burial grounds	None recorded within the development site must be protected/
Movable objects	None

Heritage Resource	Status/Findings
Overall comment	No burial site was recorded within the development site, there is potential to encounter unmarked graves.

8.9 Palaeontology

A desktop Palaeontological Impact Assessment was undertaken for the Project (refer to Appendix D) which involved an overview of the literature on the palaeontology and associated geology of the area.

The results from this assessment indicate that the study area is underlain by the sedimentary deposits of the Gordonia Formation of the Kalahari Group. These sediments were deposited between the Late Cretaceous until recent and is characterised by fluvial gravels, sands, lacustrine and pan mudrocks, diatomites and diatomaceous limestones, evaporites, consolidated to unconsolidated aeolian sands and pedocretes (especially calcrete). (Almond, 2009)

The region is considered by SAHRA as having a Moderate Palaeontological Sensitivity. The Gordonia Formation may contain fossil spores and pollen, root casts and burrows (such as termitaria), rare vertebrate remains (mammals, fish, ostrich eggshell etc.), diatoms, freshwater stromatolites, freshwater and terrestrial mollusc shells, ostracods and charophytes (Almond, 2009).

None of these fossils have been reported from the study area.

8.10 Composite Sensitivity Map

Figure 8-6 combines the sensitivity distribution of baseline environment identified in section **8**. This provides a summary of the sensitive areas located within the study area and surrounding areas.

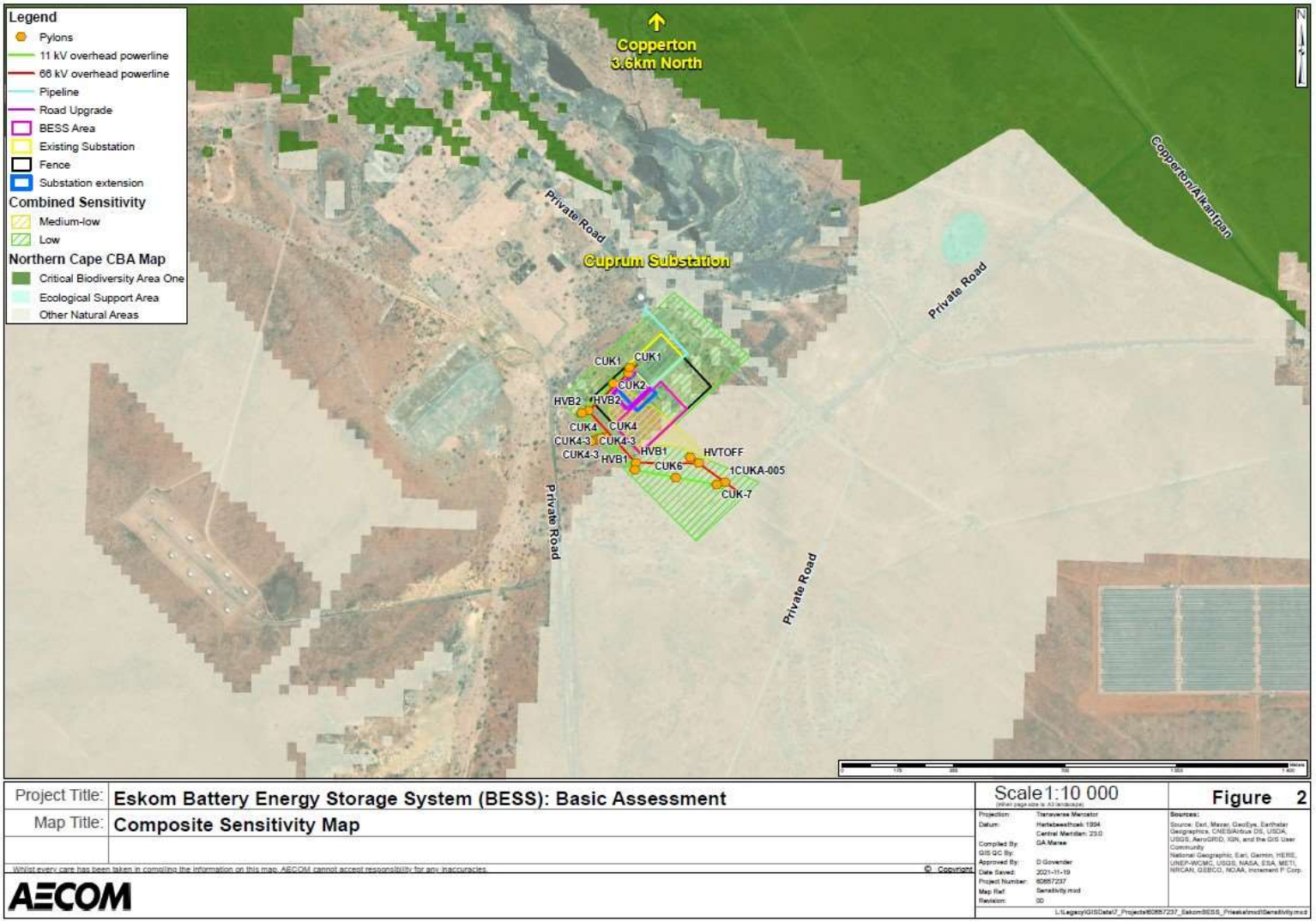


Figure 8-6 Composite Sensitivity Map

9. Social Baseline

This chapter focuses on the social baseline conditions of the study area with reference to the South African National Census of 2011 undertaken by Statistics South Africa. The 2011 census has been used as the most recent edition of the census.

The Project is located within the Siyathemba Local Municipality which forms part of Pixley ka Seme District Municipality situated in the Northern Cape Province of South Africa. The Siyathemba Municipality is a Category B Municipality (NC077), established in 2001, in accordance with the demarcation process (Stats SA, 2011). The municipality is located within the central eastern parts of the Northern Cape on the banks of the Orange River and falls within the boundaries of the Pixley ka Seme District (Stats SA, 2011).

The Siyathemba Municipality was initially made up of three entities, namely, Prieska, Marydale and Niekerkshoop. After demarcation of the municipality, the area was extended to include not only the towns and surrounding suburbs of Marydale, Niekerkshoop and Prieska but also Copperton. The municipal area encompasses a geographic area of approximately 8,200km², which implies that Siyathemba Municipality accounts for 8% of the total district surface area and approximately 3% of the provincial area (Stats SA, 2011).

9.1 Demographics

The Siyathemba Local Municipal area has a total population of about 21,591 according to Census 2011. The municipality experienced a population growth rate of approximately 14.6% between 2001 and 2011. This indicates a positive growth rate of 1.57 % per annum between 2001 and 2011. The municipal area has a population density of 1 person per km^2. The average household size is 3.6 persons per household. There are approximately 5,831 households; 36.1% of which are headed by females. The Siyathemba Local Municipality is ranked at number 209 among 226 municipalities in terms of population size.

The Coloured population is the dominant population group in the municipality at 80%, followed by the Black African population at 18.8%, followed by the White population group and Other population (8.5% and 0.4% respectively). The Indian/Asian population group covers 0.5% of the total population.

The most common first language of residents throughout this municipality is Afrikaans, which is spoken by approximately 78% of the population, followed by isiXhosa at 3.1% and English at 0.9%.

The gender distribution of the municipality is almost equal with 49.8% of males and 50.2% of females. Figure 9-1 below indicates that a large proportion of the population are of young working age (between 20 and 29 years) as well between 40 and 44 years.

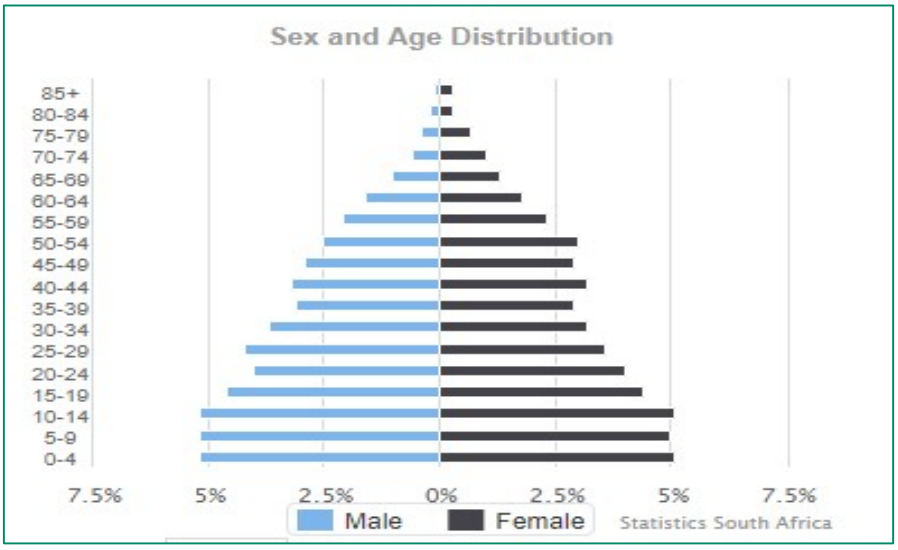


Figure 9-1 Age and Gender Distribution in Siyathemba Local Municipality (Source: StatsSA, 2011)

9.2 Education Levels

There has been a slight increase in the percentage of the population over the age of 20 within the municipality reporting access to formal education between 2001 and 2011, with the figure increasing from 4.7% to 5.3% (refer to Figure 9-2).

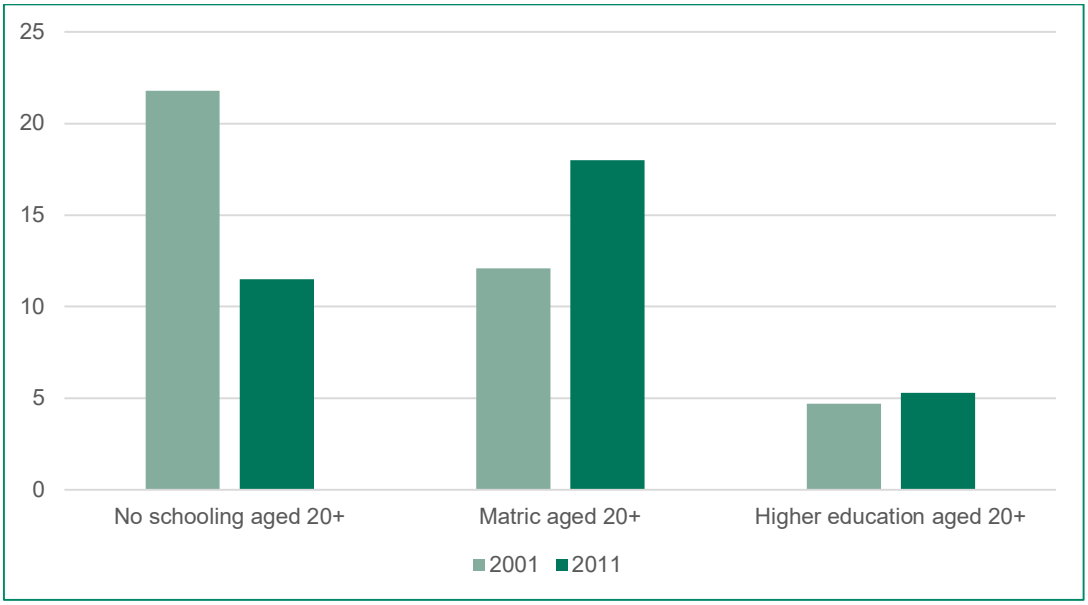


Figure 9-2 Highest Education Level for Individuals Aged 20 Years and Older (Source: StatsSA, 2011)

9.3 Employment

A total of 63.2% of the population are of working age (between 15 and 64 years) as depicted in Figure 9-1. However, 12.6% are unemployed, 5.6% of the population are discouraged work seekers and 42.3% are economically inactive. People in the latter category are typically students or homemakers. The unemployment rate is 24.3%, while the youth unemployment rate is estimated to be 30.2%.

9.4 Income

The main economic contributor towards the Copperton town across all sectors includes mining, manufacturing, agriculture and wholesale and retail trade. Figure 9-3 below indicates the average household income for the Copperton town.

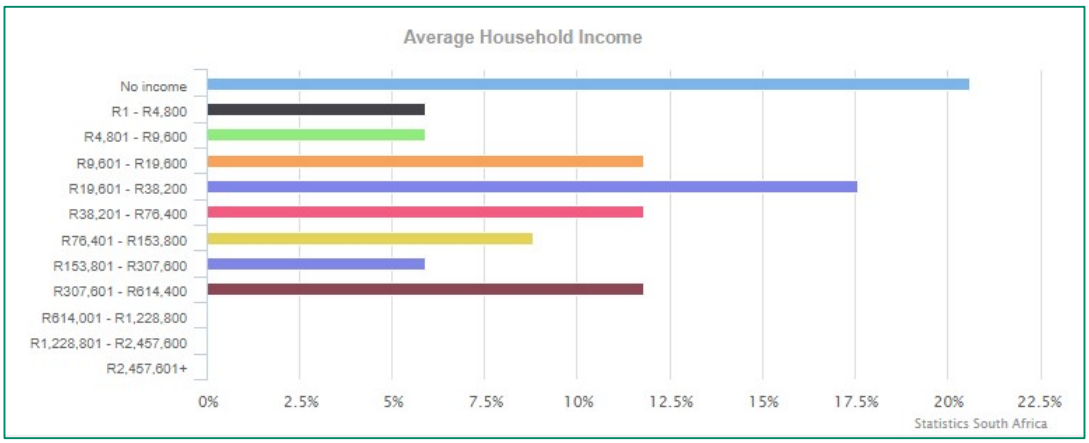


Figure 9-3 Average Household Income with the Copperton area

9.5 Basic and Public Services

9.5.1 Piped Water

Access to piped water has improved within the Copperton town as 93.8% all households reported to have access to piped water within their household. Local water schemes provide a substantial portion of the sources of water for households within the municipality.

9.5.2 Sanitation

In 2011, 90.9% of households had a flush toilet connected to sewerage and 9.1% connected to a septic tank. Additionally, 66.7% of refuse disposal was undertaken by local authority/private company at least once a week while 15.2% of residents dispose their own refuse.

9.5.3 Access to Electricity

Access to electricity for lighting (the most basic level of access) within the Copperton town is currently estimated in 2011 as 97%. Approximately 87.9% of the households have access to electricity for lighting. Majority of the electricity used in households is provided by the municipality (Figure 9-4).

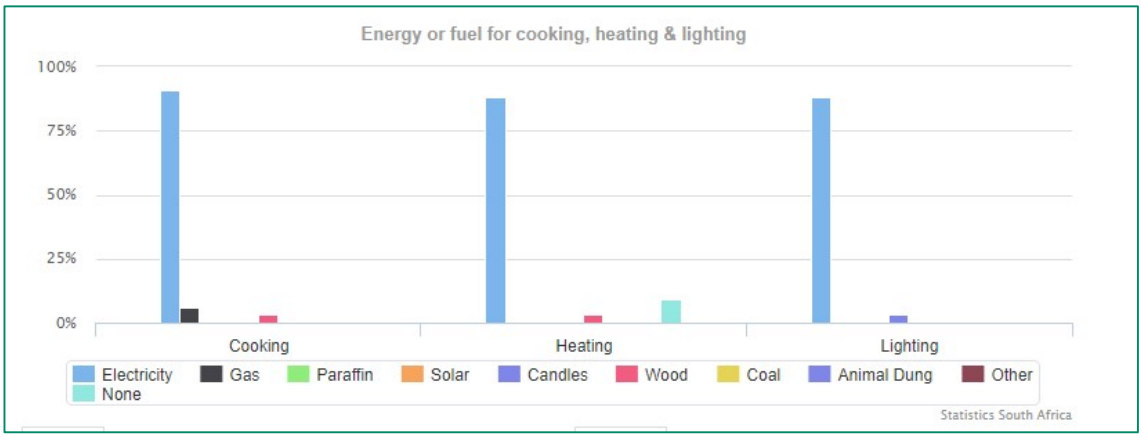


Figure 9-4 Distribution of Energy for Cooking, Heating and Lighting (Source: StatsSA, 2011)

10. Environmental Impact Assessment

The over-arching objective of the detailed impact assessment forming part of the BA process is to identify, record and assess the scale of the changes that may occur within a specific receiving environment, in response to the introduction of new components or the expansion of current components within that receiving environment. In terms of Environmental Impact Assessment as provided for as an Integrated Environmental Management (IEM) tool for assessment in terms of the National Environmental Management Act and its associated Regulations, this refers to a specific site.

This approach enables the EAP to provide the team of specialist with a clearly defined Scope of Work and allows the specialist to focus and highlight pertinent changes as an independent assessor of the changes to the receiving environment in the context of their field of speciality.

The approach therefore provides a framework for the assessment of the impacts that the proposed project will have on the receiving environment, and of the impacts the environment will have on the proposed Project. Based on inputs from the project team, stakeholders, I&APs and specialists, the potential environmental (biophysical, social and cultural) impacts have been identified and have accordingly been assessed and their significance summarised as an 'Environmental Impact Statement' (see section 12).

The construction and operational phase related impacts have been assessed in terms of the worst-case scenario informed by the envelope of criteria. The envelope of criteria for the Project involves the delivery of a BESS solution at the Cuprum Substation (at the location identified for the most feasible connection and off take requirements), along with the associated infrastructure development and adjustments (see Chapter 3 Project Overview) in order to connect this facility to the existing Eskom energy grid. The envelope of criteria informed the development of the worst-case scenario as assessed in this BAR, and further used to develop appropriate and Project specific mitigation measures for implementation. This will ensure that, regardless of which technology option is implemented in the end (should positive EA be granted for the Project), the environmental impacts assessed as part of this BAR will be for the worst-case scenario. Therefore, the implementation of either technology option will either hold the same or less significant environmental impacts to the receiving environment.

As mentioned previously, Eskom consulted with the DFFE in relation to the nature of the Project and the way forward in terms alternatives. Eskom indicated that due to the tender and procurement processes associated with the BESS infrastructure, a preferred technology cannot be recommended. Kindly refer to Appendix E for a copy of the meeting minutes. **No alternative(s), therefore, have been proposed for the Project. A selected technology option will be chosen upon finalisation of the procurement and bid process.**

10.1 Design and Construction Phase

Impacts during the construction phase of the Project are considered for the worst-case scenario as mentioned in section 4.5. Impacts of significance that may occur during the construction phase of the Project, include:

- Increased degradation and fragmentation of vegetation communities;
- Introduction and spread of alien invasive species;
- Displacement, loss and fragmentation of the faunal community due to habitat degradation/ destruction;
- Displacement, loss and fragmentation of the avifaunal communities due to habitat degradation and powerline collisions
- Degradation of receiving air quality conditions;
- Increased generation of noise;
- Soil contamination and erosion;
- Increased construction vehicle traffic on local roads;
- Local skills transfer and increased awareness of renewable energy;
- Increase in employment and skills development opportunities;
- Reduction in visual aesthetics;
- Damage or destruction of archaeological and/or palaeontological resources; and

- Pollution of the receiving environment due to inappropriate management and handling of waste.

10.2 Operational Phase

Impacts during the operational phase of the Project are considered for the worst-case scenario as mentioned in section 4.5. Impacts of significance that may occur during the operational phase of the Project, include:

- Loss and displacement of indigenous vegetation;
- Loss and fragmentation of the faunal and avifaunal communities;
- Increased disturbance to avifaunal communities due to powerline collisions and electrocutions;
- Contamination of soil and groundwater resources;
- Improved development opportunities due to increased reliability of energy services; and
- Reduction in visual aesthetics.

10.3 Decommissioning and Closure

Impacts associated with the Project during decommissioning and closure relate to the dismantling of the BESS and associated infrastructure. The lifespan of the BESS varies across the technologies (refer to Section 3.6) after which Eskom plan to return the battery to the supplier for disposal. The impacts listed below relate to the dismantling and removal of the BESS, and return to the manufacturing facility:

- Contamination of soil and groundwater due to spills and leakages from the battery units during dismantling; and
- Contamination of soil and groundwater due to machinery hydrocarbon spills.

10.4 Impact Assessment Methodology

Each concern identified during the BA process consists of components that on their own or in combination with each other give rise to potential significant impacts, either positive or negative from the Project onto the environment or from the environment onto the Project. The significance of the potential impacts for the study area will be considered before and after the identified mitigation measures are implemented.

10.4.1 Impact Assessment Criteria

The criteria used for the assessment of the potential impacts of the Project are described in Table 10-1. A detailed impact assessment matrix used to assess the impacts identified is provided in Appendix F.

Table 10-1 Impact Assessment Criteria

Criteria	Description
Nature	Includes a description of what causes the effect, what will be affected and how it will be affected.
Duration	Lifetime of the impact is measured in relation to the lifetime of the Project.
Extent	Physical and spatial scale of the impact.
Intensity	Examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment.
Type	Description of the impact as positive, negative or neutral, and direct or indirect.
Consequence	Combination of duration, extent and intensity of impact in relation to the type.
Probability	This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the lifecycle of the activity, and not at any given time.
Significance	Synthesis of the characteristics described above and assessed as low, medium or high. Distinction will be made for the significance rating without the implementation of mitigation measures and with the implementation of mitigation measures.

10.4.2 Duration

The lifetime of the impact is measured in relation to the lifetime of the Project activity that the impact is linked to (refer to Table 10-2).

Table 10-2 Description of Duration Criteria

Description	Explanation	Scoring
Short term	Impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than any of the development phases.	1
Short to medium term	Impact will be relevant through to the end of the construction phase.	2
Medium term	Impact will last up to the end of the development phases, where after it will be entirely negated.	3
Long term	Impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter.	4
Permanent	The only impact class that is non-transitory. Mitigation by man or natural process will not occur in such a way or time span that the impact can be considered transient.	5

10.4.3 Extent

The physical and spatial scale of the impact is classified and described in Table 10-3 below:

Table 10-3 Description of Extent Criteria

Description	Explanation	Scoring
Footprint	Impacted area extends only as far as the activity, such as footprint occurring within the total site area.	1
Site	Impact could affect the whole, or a significant portion of the site.	2
Regional	Impact could affect the area around the site including neighbouring farms, transport routes and adjoining towns.	3
National	Impact could have an effect that expands throughout the country (South Africa).	4
International	Impact has international ramifications that go beyond the boundaries of South Africa	5

10.4.4 Intensity

The assessment of the intensity of the impact will be a relative evaluation within the context of all the activities and the other impacts within the framework of the Project. The intensity will be measured using the criteria listed in Table 10-4.

Table 10-4 Description of Intensity Criteria

Description	Explanation	Scoring
Low	Impact alters the affected environment in such a way that the natural processes or functions are not affected.	2
Low-Medium	Impact alters the affected environment in such a way that the natural processes or functions are slightly affected.	4
Medium	Affected environment is altered, but functions and processes continue, albeit in a modified way.	6
Medium-High	Affected environment is altered, and the functions and processes are modified immensely.	8
High	Function or process of the affected environment is disturbed to the extent where the function or process temporarily or permanently ceases.	10

10.4.5 Consequence

Based on the above criteria, the consequence of issues will be determined using the following formula:

Consequence = Type × (Duration + Extent + Intensity)

The consequence of the impact is rated and described in Table 10-5 below:

Table 10-5 Description of Consequence Criteria

Description	Explanation	Scoring
Extreme Detrimental	A very serious negative impact which may be sufficient by itself to prevent implementation of the Project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts will be irreplaceable and irreversible should adequate mitigation and management measures not be successfully implemented.	-18 to-20
High Detrimental	A serious negative impact which may prevent the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects. The impacts may result in the irreversible damage to irreplaceable environmental or social aspects should mitigation measures not be implemented.	-14 to > -17
Moderate Detrimental	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and/or natural environment.	-10 to -13
Slight Detrimental	A small negative impact. The impact will result in medium to short term effects on the social and/or natural environment.	-6 to -9
Negligible	An acceptable negative/positive impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative/positive medium to short term effects on the social and/or natural environment. The impacts are reversible and will not result in the loss of irreplaceable aspects.	-5 to 5
Slight Beneficial	A small positive impact. The impact will result in medium to short term effects on the social and/or natural environment.	6 to 9
Moderate Beneficial	An important positive impact. The impact is insufficient by itself to justify the implementation of the Project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment.	10 to 13
High Beneficial	A beneficial impact which may help to justify the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment.	14 to 17
Extreme Beneficial	A very beneficial impact which may be sufficient by itself to justify implementation of the Project. The impact may result in permanent positive change.	18 to 20

10.4.6 Probability

Probability describes the likelihood of the impact(s) occurring for any length of time during the lifecycle of the activity, and not at any given time. Table 10-6 shows the classes in relation to probability criteria.

Table 10-6 Description of Probability Criteria

Description	Explanation	Scoring
Improbable	Possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is thus zero (0%).	1
Possible	Possibility of the impact occurring is very low, either due to the circumstances, design or experience. The chances of this impact occurring is defined as 25%.	2
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50%.	3
Highly likely	It is most likely that the impacts will occur at some stage of the Development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75%.	4
Definite	Impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied upon. The chance of this impact occurring is defined as 100%.	5

10.4.7 Confidence

The level of knowledge or information that the EAP or a specialist had in their judgement is rated as shown in Table 10-7. Note that this criterion is not given a numerical value.

Table 10-7 Description of Confidence Criteria

Criteria	Description
Low	Judgement is based on intuition and not on knowledge or information.
Medium	Judgement is based on common sense and general knowledge.
High	Judgement is based on scientific and/or proven information.

10.4.8 Reversibility

Reversibility is the ability of the affected environment to recover from the impact, with or without mitigation (Table 10-8). Note that this criterion is not given a numerical value.

Table 10-8 Description of Reversibility Criteria

Criteria	Description
Yes	The affected environment will be able to recover from the impact.
No	The affected environment will be unable to recover from the impact that is permanently modified.

10.4.9 Level of Significance

Based on the above criteria, the significance of issues will be determined using the following formula:

Significance = Consequence × Probability

The significance of the impact is rated and described in Table 10-9 below:

Table 10-9 Impact Assessment Significant Rating

Description	Explanation	Scoring
No Impact	There is no impact	0
Very Low	Impacts are near negligible. A few mitigation measures are required to reduce the negative impact	0 – 10
Low	Impacts are less important. Some mitigation is required to reduce the negative impacts.	11 – 30
Medium	Impacts are important and require attention. Mitigation is required to reduce the negative impacts.	31 – 60
High	Impacts are of high importance. Mitigation is essential to reduce the negative impacts.	61 – 89
Fatal Flaw	Impacts present a fatal flaw, and alternatives must be considered	90 – 100

10.5 Impact Assessment

This section assesses the potential significant impacts associated with the Project during the construction, operational and decommissioning phases.

The assessment also considers the cumulative impacts as a result of the Project. A summary of the impacts is tabulated in section 10.5.6.

Note: The sub-sections set out below should be read in conjunction with the detailed impact assessment enclosed herewith as Appendix F.

10.5.1 Pre-construction Impacts

The impacts anticipated for the Pre-construction Phase will be minimal and negligible. The site set up and demarcations for the site will be done in conjunction with an appointed independent Environmental Control Officer (ECO).

Prior to the construction phase, preference should be given to sourcing local skilled and unskilled labour where applicable. Recruitment of labour should be guided by Eskom's recruitment policies which should promote the employment of local labour by any appointed contractors.

10.5.2 Construction Impacts

The impacts associated with the construction phase will be linked to the establishment of the BESS, substation extension, powerline realignment, water pipeline and road extension. The following sub-sections detail the construction phase related impacts for the worst-case scenario informed by the envelope of criteria for the Project.

10.5.2.1 Increased degradation and fragmentation of vegetation communities

The findings of the Ecological Impact Assessment undertaken for this Project confirms that the study area is devoid of vegetation and highly disturbed. The area adjacent to the Cuprum Substation on the south-western side, where the substation is proposed to be extended, has limited vegetation and is heavily disturbed. A small amount of natural vegetation exists on the site of the proposed BESS and immediate surrounds, to the extent of the powerline re-alignment. No RDL (Critically endangered, endangered or vulnerable) or ODL floral species were observed within the study area (including protected species under the Northern Cape Nature Conservation Act, Act No. 9 of 2009). No CBA's and ESA's overlap the study area according to the Northern Cape Critical Biodiversity Areas (2016) Map, and as verified by the Ecological Specialist during the specialist site visit.

It is possible that a permit will be required, in terms of the Northern Cape Nature Conservation Act, 2009, to cut / damage or destroy indigenous vegetation, in particular in the areas located within 10 m of the public road. This requirement will be confirmed during the site walk through, during the pre-construction phase, following which the appropriate permit(s) will be applied for, if necessary.

Due to the localised nature of the Project, the spatial extent of the impact is limited to the site. However, if rehabilitation of disturbed areas is not adequately conducted, further impact to areas outside the site boundary could occur due to erosion or increased risk of fires. The extent of the impact has therefore, been assigned a rating of "Regional". The duration of the impact is also limited to the construction phase which will occur within the short to medium term. Furthermore, the intensity of the impact is rated as "Low Medium – negative" due to the slight effect of the impact on natural processes and functioning. The probability of the impact occurring has been rated as "likely" due to unavoidable clearance required for the Project.

The implementation of mitigation measures will limit the construction activities to the footprint and restrict further disturbance and fragmentation of vegetation. These measures will reduce the extent and duration of the impact to the "Site" and "Short term", respectively.

The following table outlines the potential impact significance of the degradation and fragmentation of vegetation communities during the construction phase:

Table 10-10 Summary of Impact Significance: Increased Degradation and Fragmentation of Vegetation Communities

Impact Description	Significance before mitigation	Significance after mitigation
	Construction Phase	
Increased degradation and fragmentation of vegetation communities	Low negative	Very Low negative

Recommended mitigation and rehabilitation measures for impacts on vegetation communities include the following:

- Any priority species encountered must be identified and rescued prior to any excavation or construction activities;
- As far as possible, the project aspects must be contained (and restricted) to within the footprint areas of the existing substation. This will require that existing access roads be used, and no new access routes are permitted (excluding the road extension from the substation as part of this Project);
- Additional areas of indigenous vegetation (outside of the required clearance), even secondary communities should under no circumstances be fragmented or disturbed further or used as an area for dumping of waste;
- All laydown, storage areas etc should be restricted to within the Project areas and all access roads must be kept within this area or from existing access roads;
- The footprint area must be kept clear of alien vegetation. The typical alien vegetation species found within the study area is *Prosopis glandulosa var. torreyana* (Honey Mesquite) ;
- Cleared areas for construction must be continually monitored to ensure no potential erosion can occur; and

- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species.

10.5.2.2 Introduction and spread of alien invasive species

The site comprises bare patches of gravelly sandy soil, sparsely covered with grasses and scrubby vegetation. The vegetation on site is mostly scattered low shrubs and grasses, with open sandy and dolomitic stone areas. A few large shrubs and trees are also scattered throughout the area. Several alien plants species are also present including the invasive *Prosopis glandulosa var. torreyana* (Honey Mesquite).

The project will result in an increase in the risk of alien invasive plants establishing on site spreading to the surrounding areas during and after construction. The extent of the impact has therefore, been assigned a rating of "Regional". Due to the presence of the invasive *Prosopis glandulosa var. torreyana* (Honey Mesquite) on site, the potential for invasive alien plant infestation is relatively high. Therefore, the probability of the impact occurring has been rated as "Probable". The implementation of mitigation measures will limit the spread and proliferation of alien invasive species to a reduced extent ("Site") and duration ("Short").

The following table outlines the potential impact significance of the introduction of alien species during the construction phase:

Table 10-11 Summary of Impact Significance: Introduction and Spread of Alien Invasive Species

Impact Description	Significance before mitigation	Significance after mitigation
Construction Phase		
Introduction and spread of alien invasive species	Medium negative	Low negative

Recommended mitigation and rehabilitation measures for the introduction and spread of alien invasive species include the following:

- Implementation of the Alien Vegetation Management Plan (attached to the EMPr) for the project areas;
- Monitor the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish;
- Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction earthworks in that area and returning it where possible afterwards; and
- Rehabilitate or revegetate disturbed areas in accordance with the Rehabilitation Plan for the substation and surrounding areas.

10.5.2.3 Displacement, loss and fragmentation of the faunal communities due to habitat degradation/ destruction

Based on findings from the ecological assessment undertaken for the Project, no faunal species of conservation concern were encountered within the study area. The general habitats of the study area and immediate surroundings are not ideal for most priority faunal species (species of conservation concern). The nature of the Project will have minimal to negligible negative impact outside of the study area and much of the study area is already within a disturbed environment. However, the impact is assessed in mind of the existing faunal species and habitats found (or likely to be found) within the area.

The construction activities could result in habitat degradation which could further displace and fragment faunal communities. If construction activities are not limited to the site, additional impacts beyond the footprint area would occur. Therefore, the extent of the impact has been rated as "Regional". The impact could also result in loss of faunal species due to negligence on site which will further alter ecosystem functioning and reduce species abundance beyond the development phases .This will result in an increase in the intensity and duration of the impact to a "Medium negative" and "Medium Term" rating, respectively.

The implementation of mitigation measures will increase awareness of faunal species on site as well as educate individuals on site on how to proceed with faunal interactions and the presence of burrows. Additionally, if construction activities are also limited to the site, the intensity and duration of the impact will be reduced to a "Low Medium-negative" and "Short to Medium Term" rating.

The following table outlines the potential impact significance on faunal communities during the construction phase:

Table 10-12 Summary of Impact Significance: Displacement, Loss and Fragmentation of Faunal Communities

Impact Description	Significance before mitigation	Significance after mitigation
Construction Phase		
Displacement, loss and fragmentation of the faunal communities due to habitat degradation/ destruction	Medium negative	Low negative

Recommended mitigation and rehabilitation measures for impacts on faunal communities include the following:

- No trapping, killing or poisoning of any wildlife is to be allowed on site;
- Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process. The intentional killing of any animals including snakes, insects, lizards, birds or other animals should be strictly prohibited;
- As far as possible, the project aspects must be contained (and restricted) to within the footprint areas of the existing substation. This will require that existing access roads be used, and no new access routes are permitted (excluding the road extension from the substation as part of this Project);
- If any faunal species are recorded during construction, activities should temporarily cease, and an appropriate specialist should be consulted to identify the correct course of action. Care must be taken not to interact directly with any wildlife encountered; and
- Any active animal burrows, nests etc. may not be disturbed and must be cordoned off and the relevant specialist consulted on how to proceed.

10.5.2.4 Displacement, loss and fragmentation of the avifaunal communities due to habitat degradation and powerline collisions

Based on the findings of the avifauna assessment, the site is mostly degraded and has been modified and disturbed by past and present human activities. The site supports very limited natural vegetation that serves as suitable avifaunal habitat and it is highly unlikely that the study area will be utilised by breeding birds. While natural vegetation does occur within the study area, it is sparse and would likely only be used by birds as transient habitat. The site does not contribute to any significant ecological processes nor does it retain important ecological functioning. Overall, the site is considered to be of low sensitivity in terms of avifaunal habitat, with a portion in the southern corner of the site showing slightly less disturbance and fewer alien plant species, considered medium-low. The site is surrounded by human land use activities and is therefore relatively isolated. Habitat connectivity with the surrounding natural areas is limited. In terms of powerline collisions, the re-alignment of the powerline is the only associated activity that could lead to the potential impact.

The construction activities may also result in habitat degradation and powerline collisions which could further fragment and reduce avifaunal communities. If construction activities are not limited to the site, additional impacts beyond the footprint area would occur. This could affect avifaunal nests and habitats located within the study area. Therefore, the extent of the impact has been rated as “Regional”. The impact could also result in loss of faunal species due to negligence on site which will further alter of ecosystem functioning and reduce species abundance beyond the development phases .This will result in an increase in the intensity and duration of the impact to a “Medium negative” and “Short to Medium Term” ratings, respectively.

The implementation of mitigation measures will increase awareness of avifaunal species on site as well as educate individuals on site on how to proceed with avifaunal interactions and the presence of nests. Additionally, if construction activities are also limited to the site, the intensity and duration of the impact will be reduced to a “Low negative” and “Short to Medium Term” rating.

The following table outlines the potential impact significance on avifaunal communities during the construction phase:

Table 10-13 Summary of Impact Significance: Displacement, Loss and Fragmentation of Avifaunal Communities

Impact description	Significance before mitigation	Significance after mitigation
Construction Phase		
Displacement, loss and fragmentation of the avifaunal communities due to habitat degradation/ destruction	Low negative	Very Low negative

Recommended mitigation measures for impacts on avifaunal communities include the following:

- Construction should commence in the dry winter period when birds are least active if possible;
- All construction activities must remain within the construction footprint. Construction camps, stockpiles, and temporary storage areas must remain within the study area and within the substation property. No natural vegetation in the surrounding areas must be cleared;
- During construction, if any active bird nests are encountered, the area must be cordoned off and the relevant specialist consulted on how to proceed;
- During construction no wild bird or animal may under any circumstance be hunted, handled, removed or be interfered with by construction workers or by maintenance staff during operations;
- During the powerline re-alignment, only pole structures that are approved as “bird friendly” by Eskom’s ENVIROTECH Forum should be used for the new pole positions; and
- Powerlines in the vicinity of the substation must be monitored on a regular basis for bird mortalities by electrocution or collision with the lines.

10.5.2.5 Degradation of the receiving air quality conditions

The construction activities will not contribute directly to emissions released into the atmosphere except possible short-term dust emissions during the construction phase. Emissions generated will be in the form of dust, carbon dioxide and other vehicle emissions generated by diesel powered machinery and trucks during the construction process i.e. tip trucks, TLB"s, excavators and dust from the movement of the construction vehicles. These emissions will be comprised primarily of CO_2 and will be of a low concentration.

These emissions could potentially migrate to surrounding areas if not monitored and lead to prolonged periods of dust exposure. Therefore, the extent and duration of the impact will be rated as “Regional” and “Short to Medium Term”, respectively.

The implementation of mitigation measures will monitor emissions and dust levels on site which will significantly reduce the intensity of the impact to “Very Low”.

The following table outlines the potential impact significance on the local air quality conditions during the construction phase:

Table 10-14 Summary of Impact Significance: Degradation of Receiving Air Quality Conditions

Impact description	Significance before mitigation	Significance after mitigation
Construction Phase		
Degradation of receiving air quality conditions	Low negative	Very Low negative

Recommended mitigation and rehabilitation measures for impacts on air quality include the following:

- Dust emissions must be monitored and comply with regulatory requirements, including the air quality management plan for the Siyathemba Municipality;
- Dust monitoring should be implemented on site and control measures implemented when needed
- Routinely spray all dust generating surfaces with water, a dust suppressant agent or similar to prevent dust generation;

- The clearing of vegetation must be limited to where necessary;
- Stockpiles (e.g. soil) must be maintained for as short a time as possible and should be enclosed by windbreak enclosures of a similar height to the stockpile. These can also be closed with nets and revegetated to prevent erosion. Stockpiles should be situated away from nearby receptors and should consider the predominant wind direction;
- During the transfer of material to stockpiles, the drop heights must be minimised to control the dispersion of materials;
- Handling of soils is not to be conducted during high winds;
- The Contractor will be solely responsible for the management and mitigation of dust generation;
- During periods of wind in excess of 35 km/h, soils should not be handled;
- Erect appropriate notification signs at construction areas to warn the public about the hazards around the construction site; and
- Construction vehicles must keep to the speed limits (25 km/h within the construction site).

10.5.2.6 Increased Noise Generation

Short term noise generation impacts are anticipated during the construction phase of the Project for the proposed BESS and associated infrastructure. It is however, anticipated that the noise will be localised and contained within the construction site and its immediate surroundings. No noise will be generated during the operational phase of the development. Furthermore, no sensitive noise receptors have been identified in the immediate site and surroundings.

However, if noise levels are not monitored on site this could potentially lead to an extended duration of the impact to the end of the construction phase i.e. Short to Medium Term. With the appropriate mitigation measures this can be reduced to a shorter duration i.e. Short Term.

The following table outlines the potential impact significance on the increased generation of noise during the construction phase:

Table 10-15 Summary of Impact Significance: Generation of Noise

Impact description	Significance before mitigation	Significance after mitigation
Construction Phase		
Increased generation of noise	Low negative	Very Low negative

Recommended mitigation measures for impacts on the generation of noise include the following:

- Noise levels should be monitored to ensure they comply with regulatory requirements;
- Construction activities should be limited to working hours (07h00-18h00) Monday to Saturday excluding public holidays (unless prior permission is provided by surrounding landowners);
- Vehicles and construction equipment should be kept in good working condition to limit excessive noise pollution;
- Limit the movement of construction vehicles to off-peak periods (where possible) and where sensitive receptors are situated;
- Noise monitoring is to be undertaken by the Contractor where there is a risk of noise levels being 7dB higher than ambient to receptors in the area of activities. Where the Contractor can manage the noise generation so that this risk is avoided or where activities are not close to the public, this monitoring will not be necessary; and
- Adhere to the Siyathemba Municipality Noise Policy with regards to prohibitions relating to disturbing noise, generator sets and construction noise, including the SANS 10103:2008 and Occupational Health and Safety Act requirements.

10.5.2.7 Soil contamination and erosion

During the construction phase, the BESS will be placed on site utilising and containing hazardous substances (NaS and VRF) as well as hazardous chemicals required for the associated activities. Notable construction impacts include increase in soil erosion, soil compaction and removal of vegetation. Potential impacts (pre-mitigation) may include contamination of soil and groundwater resources, pollution of surrounding farms and release of hydrocarbons into the atmosphere.

Construction activities may cause contamination of soil and groundwater resources if proper management is not practiced. Accidental spills of hydrocarbons (oils, diesel, etc.) or leakage of such substances from construction machinery or BESS components could migrate further away from the site and release hydrocarbons into the atmosphere. This could potentially lead to an impact with a “Regional” extent. Furthermore, the intensity of the impact will be higher (i.e. Medium negative) if contamination persists without proper control and emergency response measures.

The implementation mitigation measures will limit the spread of contamination and reduce the extent to the site, duration within the Short Term and intensity of the impact a Low negative impact.

The following table outlines the potential impact significance of soil contamination and erosion during the construction phase:

Table 10-16 Summary of impact significance: Soil contamination and erosion

Impact description	Significance before mitigation	Significance after mitigation
Construction Phase		
Soil contamination and erosion	Medium negative	Low negative

Recommended mitigation and rehabilitation measures for impacts of soil contamination and erosion include the following:

- 'The Contractor(s) are to develop an Emergency Response Plan which highlights the procedures to follow in the event of an emergency incident (fire, spills, etc);
- A Method Statement must be developed for the handling and transportation of the battery components and electrolytes. All cargo must be checked and transported to the site (by an authorisation transportation company);
- All electrolyte and active materials must be encapsulated by a protective covering;
- Where possible material must be pre-fabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage of chemicals and compounds on site;
- All hazardous substances to be kept in a bunded, impermeable and ventilated facility;
- All relevant staff are to be trained in the safe handling and spill management of all substances used on site;
- All relevant staff are to be trained in the management of hazardous substances;
- All small portable equipment which contains fuel or oil should be placed in a drip tray to prevent potential leaks from impacting on the soil or groundwater;
- Spill kits, absorbents and spill containment products must be kept on site and used where spills occur or there is a risk of contamination;
- All staff are to be provided with appropriate Personal Protective Equipment (PPE);
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site;
- Emergency numbers for spills management are to be available on site at all times;
- Spills which occur shall be immediately contained to prevent spreading, contaminated soil shall be removed where applicable and the area remediated using a suitable spill absorbent/remediation product;
- Records of all spillages shall be maintained.

- All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds;
- All stockpiles shall be stabilised, not be higher than 2m, and must blend in with the surrounding topography;
- Spoil must be used as backfill to rehabilitate areas impacted upon by earthwork activities;
- The Rehabilitation Plan attached to the EMPr must be implemented to protect topsoil from erosion;
- Excavated and graded bare areas should not be left for long period without been constructed; and
- Graded bare soil and stockpiles should be protected and located away from stormwater drainage lines to avoid siltation and sedimentation.

10.5.2.8 Increased construction vehicle traffic on local roads

The movement of vehicles in and out of the construction site will make use of existing pathways and access routes. The site will be accessed through the R357 and existing unnamed roads which will inherently increase vehicle traffic. No additional/new access routes will be established due the construction activities.

The implementation of mitigation measures will ensure construction vehicles take cognisance of safety measures regarding pedestrians and other motorists. However, these mitigation measures will not reduce the extent and duration of the impact (which is rated as " Site" and "Short Term", respectively).

The following table outlines the potential impact significance of increased vehicle traffic on local roads during the construction phase:

Table 10-17 Summary of impact significance: Increased construction vehicle traffic on local roads

Impact description	Significance before mitigation	Significance after mitigation
Construction Phase		
Increased construction vehicle traffic on local roads	Very Low negative	Very Low negative

Recommended mitigation measures on vehicle traffic related to construction vehicles include the following:

- Appropriate notification signs shall be erected at entrances to the construction site to warn visitors and pedestrians about the hazards around the construction site and the presence of heavy vehicles, where appropriate;
- Construction vehicles are to keep to the speed limits (25 km/h on the construction site);
- All vehicles must travel along designated routes;
- No additional access routes are permissible (only existing routes); and
- Roads must be maintained in an acceptable condition for the safe travel of the public and project personnel.

10.5.2.9 Local skills transfer and increased awareness of renewable energy

The Project has the potential to educate individuals on the positive outcomes of renewable energy, battery storage and ultimately contribute towards creating a carbon conscious society.

The implementation of mitigation measures will increase the extent of the impact beyond the site i.e., Regional. IAPs which are not located within the immediate surroundings will be able to access the report and facilitate knowledge transfer of renewable energy technologies.

The following indicates the potential benefit associated with the increase in awareness of renewable energy during the construction phase:

Table 10-18 Description of Consequence Criteria: 10.5.2.9 Local skills transfer and increased awareness of renewable energy

Impact description	Significance before mitigation	Significance after mitigation
Construction Phase		

Local skills transfer and increased awareness of renewable energy	No impact	Low positive

Recommended mitigation measures related to the impact include the following:

- Ensure Interested and Affected Parties are aware of the project and how renewable energy contributes towards a lower carbon footprint; and
- Provide clear and concise information about BESS technology and the associated benefits.

10.5.2.10 Increase in employment opportunities

The Project has the potential to create employment opportunities for activities associated with the BESS establishment. These opportunities will not be directly linked to the BESS installation however, subcontractors will be appointed at the discretion of Eskom for activities such as site clearance, road widening and realignment requirements.

The implementation of the mitigation measures will increase the probability of the impact to a “Possible” rating which will therefore have a “Very Low positive” significance after mitigation.

The following table outlines the potential impact significance associated with an increase in employment opportunities during the construction phase:

Table 10-19 Summary of impact significance: Increase in employment opportunities

Impact description	Significance before mitigation	Significance after mitigation
Construction Phase		
Increase in employment opportunities	No impact	Very Low positive

Recommended mitigation measures related to the impact include the following:

- Prevent nepotism/ corruption in local recruitment structures;
- Proportionally divide any potential local unskilled labour opportunities with the assistance of the Ward Councillors. These opportunities include the performance of general and basic construction activities (e.g., digging trenches, foundations, and the erection of notices, etc.);
- Promote employment of women; and
- Monitor employment targets over the duration of construction.

10.5.2.11 Reduction in visual aesthetics

The construction activities may cause damage to the existing vegetation found at the substation however, since the landscape has already been transformed, the visual impact is determined to be negligible (post mitigation). During the construction phase the movement of the technical team and the operation of construction equipment and machinery may negatively impact on the visual attributes of the landscape. The construction equipment, construction camps and workforce will be elements that are uncharacteristic to the visual environment.

A new BESS is considered a relatively small addition to the visual environment which is already impacted by existing substation and powerline infrastructure. A mining complex and distant community of observers are located within Copperton however, viewer incidence is expected to be very low.

The impact on the landscape character is considered minimal with limited interference to the existing visual environment. The solar farming activities surrounding the site is considered visually pleasing of which the Project will not create a visual disturbance.

The following table outlines the potential visual impact significance during the construction phase:

Table 10-20 Summary of impact significance: Reduction in visual aesthetics

Impact description	Significance before mitigation	Significance after mitigation
Construction Phase		

Reduction in visual aesthetics	Low negative	Very Low negative

Recommended mitigation measures on visual impacts related to construction vehicles include the following:

- Keep dust levels down by regularly wetting dirt roads and exposed soil areas;
- Remove rubble and other waste that is generated by the construction process as soon as possible and dispose at an appropriate dump site;
- Implement rehabilitation of disturbed areas as soon as possible to limit the duration of exposed soil surfaces;
- Monitor the rehabilitated areas for at least 6 months to ensure a sufficient vegetation cover is established that will prevent erosion from occurring;
- Keep the construction camp neat and tidy at all times. Remove any waste from the site or contain it in an enclosed area out of sight from sensitive viewpoints.

10.5.2.12 Damage or destruction of archaeological and/or palaeontological resources

No archaeological/palaeontological or other heritage resources were identified within the development area during the specialist site visit and investigation. The potential impact of the proposed extension of the existing substation on the archaeological heritage remains, sites, and features is regarded as low; however, the recommendations and mitigation measures must be taken into consideration before the commencement of the proposed development activities. There will always remain the possibility of uncovering chance finds during excavation activities.

It is considered unlikely that archaeological/palaeontological or other heritage resources will be identified during the construction phase activities. However, the intensity of the impact can be reduced from “Medium negative” to “Low negative” with the implementation of mitigation measures.

The following table outlines the potential impact significance to archaeological and/or palaeontological resources during the construction phase:

Table 10-21 Summary of impact significance: Damage or destruction of archaeological and/or palaeontological resources

Impact description	Significance before mitigation	Significance after mitigation
Construction Phase		
Damage or destruction of archaeological and/or palaeontological resources	Low negative	Very Low negative

Recommended mitigation measures on visual impacts related to construction vehicles include the following:

- Should any archaeological or physical cultural property heritage resources be exposed during excavation for the purpose of construction, construction in the vicinity of the finding must be stopped until heritage authority has cleared the development to continue;
- Should any archaeological, cultural property heritage resources be exposed during excavation or be found on development site, a registered heritage specialist or PHRA official must be called to site for inspection;
- Under no circumstances may any archaeological, historical or any physic cultural property heritage material be destroyed or removed form site;
- Should remains and/or artefacts be discovered on the development site during earthworks, all work will cease in the area affected and the Contractor will immediately inform the Construction Manager who in turn will inform PHRA; and
- Should any remains be found on site that is potentially human remains, the PHRA, Eskom and South African Police Service should be contacted.

10.5.2.13 Pollution of the receiving environment due to inappropriate management and handling of waste

Construction rubble/ solid waste will be temporarily stored on site in designated waste skips and then removed by an appropriate waste contractor appointed by the main construction contractor to an approved and licensed landfill

site. Waste must be separated at source into recyclable and non-recyclable materials and distributed for recycling where applicable. The re-use of construction waste materials will minimize the amount of waste that will need to be disposed of at registered municipal waste facilities. In the event of hazardous waste, the waste should be stored in a closed bunded area and disposed to a hazardous waste facility by a registered and licensed service provider.

Impacts from waste management are likely to be of a local extent and are rated as “Site” in the extent criteria. Substantial volumes are unlikely to be generated from the construction activities and are therefore, rated as “Medium negative” intensity. The probability of the impact occurring is rated as “Possible” due to common improper waste management measures on site.

The implementation of mitigation measures which include the application of waste management procedures and best practices will reduce the intensity and probability of the impact to “Low negative” and “Unlikely” ratings, respectively.

The following table outlines the potential impact significance from inappropriate management and handling of waste during the construction phase:

Table 10-22 Summary of impact significance: Pollution of the receiving environment due to inappropriate management and handling of waste

Impact Description	Significance before mitigation	Significance after mitigation
Construction Phase		
Pollution of the receiving environment due to inappropriate management and handling of waste	Medium negative	Very Low negative

Recommended mitigation measures on the impacts of the inappropriate management and handling of waste include the following:

- Regular litter picking and general waste bins must be readily available for litter disposal and general housekeeping;
- All solid waste generated during the construction process must be placed in a designated waste collection area within the construction camp and must not be allowed to blow around the site, be accessible to animals, or be placed in piles adjacent the waste skips / bins;
- All solid waste must then be disposed of at the nearest licensed landfill and safe disposal certificates obtained. Separate waste skips/ bins for the different waste streams must be available on site and be clearly marked;
- The waste containers must be appropriate to the waste type contained therein and where necessary should be lined and covered. This will be managed through the site specific EMPr and monitored by the ECO;
- No waste (hazardous or general) will be disposed of in the trenches around the construction footprint. All hazardous material must be carefully stored and then disposed of offsite at the licensed hazardous landfill site;
- All excess material and rubble must be removed from the site so not to restrict the rehabilitation process;
- Adequate toilet facilities must be provided for all staff members as standard construction practice in a 1:15 ratio (one (1) toilet for up to fifteen (15) workers with separate toilet(s) for male(s) and female(s)). Monitor the sewerage facilities for spillages, and handle any spillages as hazardous waste;
- Chemical toilets must be placed within the construction camp. The chemical toilets to be provided must be from a registered company and all sewage must be disposed of at an appropriate facility. Safe disposal certificates must be kept on record; and
- Machinery must be properly maintained to keep oil leaks in check.

10.5.3 Operational Impacts

As mentioned in section 4.5, the operational phase related impacts are assessed and discussed in the sub-sections below in terms of the worst-case scenario informed by the envelope of criteria.

The envelope of criteria for the Project involves the delivery of a BESS solution at the Cuprum Substation (at the location identified for the most feasible connection and off take requirements), along with the associated

infrastructure development and adjustments (see Chapter 3 Project Overview) in order to connect this facility to the existing Eskom energy grid. This will ensure that, regardless of which technology option is implemented in the end (should positive EA be granted for the Project), the environmental impacts assessed as part of this BAR will be for the worst-case scenario. Therefore, the implementation of either technology option will either hold the same or less significant environmental impacts to the receiving environment.

10.5.3.1 Loss and displacement of indigenous vegetation due to BESS failure

The main concern associated with BESS infrastructure is the risk of overcharging, undercharging, overheating and short circuits. These risks, in certain instances, are caused by malfunctioning of the monitoring system, control system, internal equipment and extreme high temperatures. This could potentially lead to insulation failure(s) and ultimately result in a fire and/or explosion. It is also further understood that Li-ion batteries exhibit thermal runaway properties which results in an accumulation of excess heat creating more heat, which may end in a fire and/or explosion.

There is still limited data to demonstrate the probability of a malfunction or failure rates in batteries. Therefore, the assessment takes into account the worst-case scenario and focuses on the possibility of battery failure and the resultant impact thereof with a conservative estimate on the likelihood and probability. The physical and chemical characteristics of the battery is also highlighted as part of the impact description. However, as mentioned previously, the impact will take into account the worst-case scenario and not assess the individual battery technology options.

Li-ion and NaS batteries are set up in battery modules and stacked separately from one another. In the case of a failure and resultant fire, the failed module may damage surrounding modules. However, it is uncertain whether the fire damage caused to surrounding modules will spread the fires amongst the modules. VRF are not flammable and therefore, the risk of fire/explosion is significantly reduced and will not result in an impact to indigenous vegetation.

If a fire and/or explosion were to occur, the fire may spread to the surrounding indigenous vegetation. This vegetation would be lost in the short term which could lead to the proliferation of invasive alien vegetation that inhibit indigenous vegetation from re-establishing. The extent of the impact is therefore, rated as “Regional”, as vegetation loss may extend beyond the site, whilst the intensity of the impact is rated as “Medium – High” due to the temporary loss of indigenous vegetation (which also takes into account the disturbed nature of the site). The duration of the impact will also be prolonged due to the displacement of vegetation after occurrence of the fire. The duration has therefore, been assigned a rating of “Medium Term”. The probability of the impact occurring is not definitively known at this stage and has therefore, been assigned as Improbable”.

The implementation of mitigation measures will reduce the potential of a fire/explosion occurring as well as adequately prepare site personnel for fire events. This will reduce the extent, duration, and intensity of the impact. This is due to mitigation measures structured around limiting the spread of the fire, reactive and proactive measures to accommodate for a fire event and reduction in the occurrence of BESS failure due to monitoring and maintenance programs.

The following table outlines the potential impact significance on indigenous vegetation due to BESS failure during the operational phase:

Table 10-23 Summary of impact significance: Loss and displacement of indigenous vegetation due to BESS failure

Aspect	Without Mitigation	With mitigation
Operational Phase		
Loss and displacement of indigenous vegetation due to BESS failure	Low negative	Very Low negative

Recommended mitigation measures for impacts on the loss and displacement of indigenous vegetation due to BESS failure include the following:

- An operating and maintenance programme must be implemented in some manner which includes identification of overcharge, overheating and short circuits. The applicant must further investigate insulation material to be used around the modules:
- Short circuit detection and protection must be implemented in some manner in the BESS technology selected;

- Fire detection and suppression systems must be installed;
- Handling of the battery modules must be undertaken in accordance with the operating manual and OEM instructions;
- Auditing of all operating and maintenance functions should occur by a professional product engineer;
- Staff should be trained and accredited to effectively handle plant fires and explosions;
- Fire extinguishers must be available at all points of storage of flammable product;
- The fire extinguishers must be checked on a monthly basis to ensure they have not been used or damaged from surrounding construction activities;
- Basic firefighting equipment shall be kept and maintained at all construction fronts at all times. Basic firefighting equipment shall not be restricted to fire extinguishers, but shall take cognisance of site-specific conditions;
- The Contractor shall assign the position of Fire Officer to one of its senior staff members who shall be competent and adequately trained to fulfil the position of Fire Officer. Fire Officer must be able to detect fires and undertake regular monitoring;
- The Fire Officer shall be responsible for ensuring immediate and appropriate actions in the event of a fire and shall ensure that employees are aware of the procedures to be followed. The Fire Officer will be responsible for contacting emergency services for assistance;
- Any fires that occur shall be reported to the applicant immediately and reported in turn to the relevant authorities;
- All relevant staff shall receive training on fire prevention and safety in the event of a fire. Annual refresher courses shall be presented to all staff;
- Details of the Siyathemba Fire Department should be recorded on site and updated quarterly;
- Ensure that the necessary materials and equipment for dealing with oil, fuel and hazardous substance spills and leaks as well as potential fires are available on site and up to date at all times;
- No open fires shall be permitted on or off-site, except for activities authorised by the Applicant. All authorised fires shall occur at designated fireplaces, which shall be suitably resourced to contain and suppress any potential run-away fire;
- No on-site burning of any waste materials, vegetation, litter or refuse shall be permitted;
- The disposal of cigarette butts into the surrounding environment shall not be permitted; and
- Conduct fire and emergency drills every six months during the Construction Phase and record details within the environmental and safety file.

10.5.3.2 Loss and fragmentation of the faunal and avifaunal communities due to BESS failure

The potential for a fire and/or explosion is described in Section 10.5.3.1. In the instance of a fire, the fire may spread to the surrounding vegetation and fauna leading to potential loss of indigenous vegetation, habitats and both faunal and avifaunal species. Proliferation of alien invasive species could arise as a result of the fire and compete for space and resources with re-establishing indigenous vegetation which certain fauna and avifaunal species rely on as a food source.

If a fire and/or explosion were to occur, the fire may result in the direct loss and fragmentation of fauna and avifauna through spreading to areas beyond the site and result in further disturbance to faunal and/or avifaunal habitats. This could ultimately lead to the direct loss of faunal and/or avifaunal species within and beyond the site, resulting in the extent of the impact being rated as “Regional”, whilst the intensity of the impact is rated as “Medium-High negative” due to the permanent loss of faunal and/or avifaunal species (which also considers the disturbed nature of the site). The duration of the impact will also prolonged due to the fragmentation of fauna and avifauna after occurrence of the fire and into the development phases of the Project. The duration has been assigned a rating of “Medium term”. The probability of the impact occurring is not definitively known at this stage and has therefore been assigned as Improbable”.

The implementation of mitigation measures will reduce the potential of a fire/explosion occurring as well as adequately prepare site personnel for fire events. This will reduce the extent, duration and intensity of the impact due to mitigation measures structured around limiting the spread of the fire, reactive and proactive measures to accommodate for a fire event and reducing the occurrence of BESS failure due to monitoring and maintenance programs.

The following table outlines the potential impact significance from loss and fragmentation of the faunal and avifaunal communities due to BESS failure during the operational phase:

Table 10-24 Summary of impact significance: Loss and fragmentation of the faunal and avifaunal communities due to BESS failure

Impact description	Significance before mitigation	Significance after mitigation
Operational Phase		
Loss and fragmentation of the faunal and avifaunal communities due to BESS failure	Low negative	Low negative

Recommended mitigation measures on the impacts of the loss and fragmentation of the faunal and avifaunal communities due to BESS failure include the following:

- Short circuit detection and protection must be implemented in some manner in the BESS technology selected:
- Fire detection and suppression systems must be installed;
- Handling of the battery modules must be undertaken in accordance with the operating manual and Original Equipment Manufacturer (OEM) instructions;
- All nests should be removed from the site and any species of conservation concern;
- Ensure that the necessary materials and equipment for dealing with oil, fuel and hazardous substance spills and leaks as well as potential fires are available on site and up to date at all times;
- The Contractor shall assign the position of Fire Officer to one of its senior staff members who shall be competent and adequately trained to fulfil the position of Fire Officer. Fire Officer must be able to detect fires and undertake regular monitoring;
- The Fire Officer shall be responsible for ensuring immediate and appropriate actions in the event of a fire and shall ensure that employees are aware of the procedures to be followed. The Fire Officer will be responsible for contacting emergency services for assistance;
- Fire extinguishers must be available at all points of storage of flammable product;
- The fire extinguishers must be checked on a monthly basis to ensure they have not been used or damaged from surrounding construction activities;
- Basic firefighting equipment shall be kept and maintained at all construction fronts at all times. Basic firefighting equipment shall not be restricted to fire extinguishers, but shall take cognisance of site-specific conditions; and
- The Contractor must aim to undertake basic firefighting training with at least 50% of the staff based on site.

10.5.3.3 Reduced health conditions for surrounding communities and residents

The potential for a fire and/or explosion is described in Section 10.5.3.1. In the instance of a fire, chemical contained inside the battery modules would decompose and produce gases such carbon monoxide, hydrogen fluoride, hydrogen chloride, methane, ethane, ethylene, and propylene. These emissions may spread and impact the health of surrounding residents and farmers. Examples of health-related impacts include, but are not limited to, smoke inhalation, asthma and respiratory tract infection(s). In the instance of an explosion, site personnel and nearby motorists could be in potential danger if emergency safety measures are not put in place. Damage to the surrounding infrastructure will also inevitably occur as a result of a fire and/or explosion.

The extent of the impact has therefore been rated as “Regional” due to the potential for emissions to reach areas beyond the site. The intensity and duration of the impact has been rated as “Medium” and “Long Term”, respectively. The impact of a fire/explosion could result in damage to surrounding infrastructure (i.e. Cuprum Substation,

powerlines, roads, motorist) and the natural environment (i.e. vegetation and fauna) which will alter the surroundings whilst the duration of the impact could last for the full operational lifetime of the BESS infrastructure.

The implementation of mitigation measures will reduce the occurrence of BESS failure due to regular maintenance and proper handling. Therefore, the probability of the impact will be reduced to "Unlikely". Additionally, the extent and intensity of the impact will also be reduced as the fire/explosion will be localised to the site with implementation of fire control measures and the upskilling individuals on site to handle fire incidents. This will reduce the extent and intensity of the impact to a rating of the "Site" and "Low-Medium negative" respectively.

The following table outlines the potential impact significance as reduced health conditions for surrounding communities and residents due to BESS failure during the operational phase:

Table 10-25 Summary of impact significance: Reduced health conditions for surrounding communities and residents due to BESS failure

Impact description	Significance before mitigation	Significance after mitigation
Operational Phase		
Reduced health conditions for surrounding communities and residents	Low negative	Very Low negative

Recommended mitigation measures on the impacts as a result of damage to natural and physical surroundings due to BESS failure include the following:

- Short circuit detection and protection must be implemented in some manner in the BESS technology selected;
- Fire detection and suppression systems must be installed;
- Handling of the battery modules must be undertaken in accordance with the operating manual and OEM instructions;
- Conduct fire and emergency drills periodically with all staff based at Cuprum Substation. Staff must be aware of the Emergency Response Plan (ERP) approved for the Project;
- Ensure staff are medically trained with regards to First Aid. Staff must be able to identify airborne chemicals (i.e., smell);
- In the case of a fire, staff must understand the process to be undertaken once an individual inhales smoke (Health and Safety Plan); and
- All associated infrastructure must be maintained regularly however hazardous material must follow a strict protocol for storage and handling in accordance with the EMPr.

10.5.3.4 Powerline collisions, electrocutions, and disturbances to avifaunal communities

The site supports very limited natural vegetation that serves as suitable avifaunal habitat and it is highly unlikely that the study area will be utilised by breeding birds. While natural vegetation does occur within the study area, it is sparse and would likely only be used by birds as transient habitat. The site is considered to be of low sensitivity in terms of avifaunal habitat, with a portion in the southern corner of the site showing slightly less disturbance and fewer alien plant species, considered medium-low. The realignment of the powerline will also result in the establishment of wooden monopole structures which could result in avifaunal collisions and electrocutions. However, the likelihood of occurrence of the impact is low as mentioned in the avifaunal assessment.

Due to the unavoidable impacts related to bird mortalities in the operational phase, the impact will not change in significance with the implementation of mitigation measures. However, the mitigation measures could help Eskom monitor and investigate bird mortalities in the future and implement further mitigation measures to reduce the cumulative impact of powerline collisions and electrocutions.

The following table outlines the potential impact significance as a result of powerline collisions, electrocutions, and disturbances to avifaunal communities during the operational phase:

Table 10-26 Summary of impact significance: Powerline collisions, electrocutions, and disturbances to avifaunal communities

Impact description	Significance before mitigation	Significance after mitigation

Operational Phase		
Powerline collisions, electrocutions, and disturbances to avifaunal communities	Low negative	Low negative

Recommended mitigation measures on the impacts as a result of collisions, electrocutions and disturbances to avifaunal community due to powerlines include the following:

- Powerlines in the vicinity of the substation must be monitored at least once a year for bird mortalities by electrocution or collision with the lines;
- In the event of bird mortalities, an Eskom representative should undertake a preliminary investigation as to whether additional measures, e.g. bird reflectors, can be implemented to prevent further bird mortalities.

10.5.3.5 Contamination of soil and groundwater resources due to hazardous chemical spills

Due to the electrolyte material containing hazardous chemicals, there is potential for spills/leakages from the storage containers of the electrolyte which could contaminate soil and groundwater resources. The physical and chemical characteristics of the battery is also highlighted as part of the impact description. However, as mentioned previously, the impact will consider the worst-case scenario and not assess the individual battery options.

The NaS batteries make use of hazardous materials, including metallic sodium, which is combustible if exposed to water. When sodium reacts with water this produces sodium hydroxide which is considered ecotoxic (SRK, 2019). Contamination of soil and groundwater resources may be caused by spills/leakages associated with the hazardous material, primary containment failure or a fire and/or explosion event.

Vanadium is a nontoxic chemical however the electrolyte in VRF batteries is caustic and poses corrosive and environmental hazards similar to lead-acid batteries. It must be further noted that the liquid electrolyte is not flammable and is stored in tanks separately from the battery components. In the event that a leakage or spill occurs from these tanks, large volumes of electrolyte containing a sulphuric acid-based solution will contaminate soil and groundwater resources.

Contamination of groundwater could potentially migrate off-site therefore, an extent rating of “Regional” has been assigned. In consideration of the worst-case scenario, sodium hydroxide could potentially contaminate groundwater leading to ecotoxic conditions. The intensity of the impact has therefore, been rated as “High-negative”. The duration of the impact occurring is rated as ‘Long Term’ as the impact of sodium hydroxide can be attenuated over a 15-year period (under the right conditions) (SRK, 2019).

The implementation of mitigation measures can further reduce the intensity, extent, and duration of the impact by the providing containment measures, leak detection monitoring and response plans (i.e. spill management).

The following table outlines the potential impact significance as a result of contamination of soil and groundwater resources due to a hazardous chemical spill (NaS electrolyte) during the operational phase:

Table 10-27 Summary of impact significance: Contamination of soil and groundwater resources due to hazardous chemical spills

Impact description	Significance before mitigation	Significance after mitigation
Operational Phase		
Contamination of soil and groundwater resources due to hazardous chemical spills	Medium negative	Low negative

Recommended mitigation measures on the impacts as a result of contamination of soil and groundwater resources due to hazardous chemical spills include the following:

- A primary and secondary containment system should be placed around the BESS. This should include a bunded platform which can contain up to 110% of the liquid contents;
- Leak Detection must be monitored according to manufacturing requirements;

- A maintenance schedule should be developed and implemented prior to operation. Regular inspections should be undertaken by an experienced professional to determine the state of the battery and whether emergency replacement or maintenance is required;
- The Contractor(s) are to develop an Emergency Response Plan which highlights the procedures to follow in the event of an emergency incident (fire, spills, etc);
- Where possible material must be pre-fabricated and then transported to site to avoid the risks of contamination associated with mixing, pouring and the storage of chemicals and compounds on site;
- All other hazardous substances to be kept in a bunded, impermeable and ventilated facility;
- All relevant staff are to be trained in the safe handling and spill management of all substances used on site;
- All relevant staff are to be trained in the management of hazardous substances;
- All small portable equipment which contains fuel or oil should be placed in a drip tray to prevent potential leaks from impacting on the soil or groundwater;
- Spill kits, absorbents and spill containment products must be kept on site and used where spills occur or there is a risk of contamination;
- At least one (1) staff member should be available on site at all construction times that have been trained on how to use the spill kit. Proof of training to be kept on site;
- All staff are to be provided with appropriate Personal Protective Equipment (PPE);
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site as per manufacturer requirements;
- Emergency numbers for spills management are to be available on site at all times;
- Spills which occur shall be immediately contained to prevent spreading, contaminated soil shall be removed where applicable and the area remediated using a suitable spill absorbent/remediation product; and
- Records of all spillages shall be maintained in the incident register.

10.5.3.6 Increased reliability of energy services and grid strengthening

The proposed BESS at the Cuprum Substation will strategically serve as a storage point for several integrated substations and networks, including current and future renewable projects. The proposed BESS will also service and form part of the electrical demand for the revived Prieska Copper Mine and SKA project within the NDP area. Therefore, the BESS will provide an increase in the reliability of energy services for current and future planned projects.

The Project will support ancillary business services within the area and increase electrical capacity of the Cuprum Substation. This will also result in strengthening of the grid which will ultimately support growth and expansion within the area.

The implementation of mitigation measures will further enhance the positive impact by increasing the overall intensity and extent of the impact by ensuring the BESS functions optimally and supports existing developments and future projects within the broader area.

The following table outlines the potential impact significance which will increase the reliability of energy services and grid strengthening during the operational phase:

Table 10-28 Summary of impact significance: Increased reliability of energy services and grid strengthening

Impact description	Significance before mitigation	Significance after mitigation
Operational Phase		
Increased reliability of energy services and grid strengthening	No impact	Low positive

Recommended mitigation measures on the impacts which will increase the reliability of energy services and grid strengthening include the following:

- Ensure the BESS and associated infrastructure are maintained regularly and operate efficiently to reach full extent of the positive impact; and
- Ensure compliance to all environmental permits, management and rehabilitation plans in order to reach optimal functioning and safety targets

10.5.3.7 Change in visual aesthetics due to the installation of the BESS

The impact on the landscape character is considered minimal with limited interference to the existing visual environment. The solar farming activities surrounding the site is considered visually pleasing and it is understood the Project will not create a significant visual disturbance to the landscape character. Improper waste management practices could cause a visual disturbance if not properly managed on site.

The implementation of the mitigation measure to improve proper waste management and disposal of replaced equipment would reduce the probability of the occurrence of the impact.

The following table outlines the potential impact significance of a change in visual aesthetics during the operational phase:

Table 10-29 Summary of impact significance: Change in visual aesthetics due to the installation of the BESS

Impact description	Significance before mitigation	Significance after mitigation
Operational Phase		
Change in visual aesthetics due to the installation of the BESS	Very Low negative	No impact

Recommended mitigation measures on changes to visual aesthetics due to the installation of the BESS include the following:

- All waste should be regularly removed from site as well as all damaged/replaced equipment associated with the BESS and additional infrastructure

10.5.4 Decommissioning Impacts

Decommissioning of the BESS and associated infrastructure has not been determined as a viable option for Eskom in the foreseeable future. Eskom have therefore, planned to undertake maintenance activities regarding the BESS and associated infrastructure.

In the instance whereby replacement components are required for the BESS, the supplier must dispose the replaced components in line with legislative requirements.

If at any stage Eskom wishes to decommission the BESS and associated infrastructure, the EMPr will be used as a guideline document together with the necessary required EA for the decommissioning activities.

10.5.5 Cumulative Impacts

Cumulative impacts may result from actions which may not necessarily be significant on their own, however, are significant when considered in combination with other impacts. As mentioned previously, the impact considers the worst-case scenario which assesses the battery option with the highest significance (without mitigation).

Please refer to the sub-sections below for further information on the anticipated cumulative impacts of the development.

10.5.5.1 Increased disturbance of indigenous vegetation and faunal displacement

The study area is heavily disturbed and contains alien invasive species. Vegetation clearance and disturbance during the construction phase may result in the introduction of additional alien invasive species. This may, in combination with the pressure already experienced throughout the region, result in further alien invasive plant species being established leading to a reduction of indigenous vegetation and the faunal species they support.

As a result, the cumulative impact will therefore have an extent and duration of “Regional” and “Long Term”, respectively. Implementation of the mitigation measure will reduce the spread of alien invasive species beyond the footprint areas and reduce the duration to “Short -Medium Term” with the removal of these species when found on site. The intensity of the impact will remain unchanged due to the heavily disturbed nature of the site.

The following table outlines the potential cumulative impact significance on vegetation communities and the faunal species they support:

Table 10-30 Summary of impact significance: Indigenous vegetation disturbance and faunal displacement

Impact description	Significance before mitigation	Significance after mitigation
Cumulative		
Cumulative impact on indigenous vegetation disturbance and faunal displacement	Low negative	Very Low negative

Recommended mitigation measures on the cumulative impact on vegetation include:

- An Alien Invasive Management Plan should be used for the lifecycle of the Project coupled with regular monitoring and removal of invasive species. Eskom have previously developed a document known as ‘Monitoring, Control and Eradication Plan for Eskom Land (Policy No: ENV16-R175’). This document can be used once as an Alien Invasive Management Plan once updated with site-specific conditions relevant to this Project.

10.5.5.2 Contribution to climate change reduction

The Project will positively influence climate change reduction during the lifespan of operation through the following:

- Provide storage for excess energy and improve reliance on grid infrastructure through peak clipping and arbitrage;
- Provide energy storage to support and dissipate electricity surrounding substations linked to Cuprum Substation;
- Reduce dependence on fossil fuel-based energy generation infrastructure;
- Integrate existing and future planned renewable energy into the electricity grid; and
- Reduce the national carbon footprint and greenhouse gas emissions of electrical infrastructure.

The extent and duration of the impact has been rated as “International” and “Long Term”, respectively, due to effects of climate change operating on an international level and the impacts lasting beyond the development phases. No further mitigation measures have been proposed for the impact, other than implementing the Project.

The following table outlines the potential impact significance associated with the contribution to climate change reduction of the BESS during the operational phase of the Project.

Table 10-31: Summary of significance: Contribution to climate change reduction

Impact description	Significance before mitigation	Significance after mitigation
Cumulative		
Contribution to climate change reduction	Medium positive	Medium positive

10.5.5.3 Increased energy efficiencies throughout the Eskom electricity grid

The Project will increase the reliability of the electricity grid and support surrounding substations as well as current renewable projects for the storage of energy. The Cuprum Substation also forms part of an integral component of the IPP Strategic Plan which will further incorporate future planned renewable projects into the Kronos/Cuprum network. This will result in a cumulative impact on energy efficiencies on the surrounding regions due to increase electricity supply. The Project may also further supplement electrical demand of expansion projects and growth within the region. Inevitably, the Project will increase awareness on the benefits of renewable energy and contribute towards reaching a carbon conscious society.

The extent and duration of the impact has been rated as “Regional” and Long Term”, respectively, due to effects of energy efficiencies that will be experienced at a regional level with Cuprum supporting surrounding substations and

renewable projects beyond Copperton and the impacts lasting beyond the development phases. No further mitigation measures have been proposed for the impact, other than implementing the Project.

The following table outlines the potential impact significance associated with the increased energy efficiencies throughout the Eskom electricity grid during the operational phase of the Project.

Table 10-32: Summary of significance: Increased energy efficiencies throughout the Eskom grid

Impact description	Significance before mitigation	Significance after mitigation
Cumulative		
Cumulative impact on energy efficiencies	Medium positive	Medium positive

10.5.6 Impact Summary

This section provides a summary of the impact significance ratings associated with assessment of the worst-case scenario. The significance ratings are further separated into pre-mitigation and post-mitigation categories across the construction and operational phases. Cumulative impacts are also tabulated below for reference. Decommissioning activities have not been determined to be a viable option and therefore, have not been assessed further in this report.

As mentioned in Section 10.5, the construction and operational phase related impacts are assessed in terms of the worst-case scenario potential impacts informed by the envelope of criteria. The envelope of criteria for the Project involves the delivery of a BESS solution at the Cuprum Substation (at the location identified for the most feasible connection and off take requirements), along with the associated infrastructure development and adjustments (see Chapter 3 Project Overview) in order to connect this facility to the existing Eskom energy grid. The envelope of criteria then feeds into the worst-case scenario as assessed in this BAR, and further used to develop appropriate and project specific mitigation measures for implementation

This approach investigates the worst-case scenario environmental impacts for the development of the BESS at the specific location, across the three (3) potential technology options, whilst remaining impartial as to which battery option the specific impacts are related to. This will ensure that, regardless of which technology option is implemented in the end (should positive EA be granted for the Project), the environmental impacts assessed as part of this BAR will be for the worst-case scenario. Therefore, the implementation of either technology option will either hold the same or less significant environmental impacts to the receiving environment.

The following tables provides a tabulated summary of the construction, operational and cumulative impacts associated with the Project and the respective significance ratings from pre-mitigation and post-mitigation measures.

Table 10-33 Impact Summary Table: Construction Phase: Assessment of the worst-case scenario

Environmental Impacts	Significance	
	Pre-mitigation	Post-mitigation
Increased degradation and fragmentation of vegetation communities	Low negative	Very Low negative
Introduction and spread of alien invasive species	Medium negative	Low negative
Displacement, loss and fragmentation of the faunal community due to habitat degradation/destruction	Medium negative	Low negative
Displacement, loss and fragmentation of the avifaunal community	Low negative	Very Low negative
Degradation of receiving air quality conditions	Low negative	Very Low negative
Increased noise generation	Low negative	Very Low negative
Soil contamination and erosion	Medium negative	Low negative
Increased construction vehicle traffic on local roads	Very low negative	Very Low negative
Increase in employment opportunities	No impact	Very Low positive

Environmental Impacts	Significance	
	Pre-mitigation	Post-mitigation
Local skills transfer and increased awareness of renewable energy	No impact	Low positive
Reduction in visual aesthetics	Low negative	Very Low negative
Damage or destruction of archaeological and/or palaeontological resources	Low negative	Very Low negative
Pollution of the receiving environment due to inappropriate handling and management of waste	Medium negative	Very Low negative

Table 10-34 Impact Summary Table: Operational Phase: Assessment of the worst-case scenario

Environmental Impacts	Significance	
	Pre-mitigation	Post-mitigation
Loss and displacement of indigenous vegetation due to BESS failure	Low negative	Very Low negative
Loss and fragmentation of the faunal and avifaunal community due to BESS failure	Low negative	Low negative
Reduced health conditions for surrounding communities and residents	Low negative	Very Low negative
Powerline collisions, electrocutions, and disturbances to avifaunal communities	Low negative	Low negative
Contamination of soil and groundwater resources due to hazardous chemical spills	Medium negative	Low negative
Increased reliability of energy services and grid strengthening	No impact	Low positive
Change in visual aesthetics	Very Low negative	Very Low negative

Table 10-35 Impact Summary Table: Cumulative Impacts: Assessment of the worst-case scenario

Environmental Impacts	Significance	
	Pre-mitigation	Post-mitigation
Cumulative impact on vegetation	Low negative	Very Low negative
Cumulative impact on climate change	Medium positive	Medium positive
Cumulative Impact on energy efficiencies	Medium positive	Medium positive

11. Environmental Management Programme

An EMPr is an environmental management tool used to prescribe management mechanisms or methods for the prevention of undue or reasonably avoidable adverse environmental impacts and for the enhancement of the positive environmental benefits of a development. It is used to guide and regulate environmental performance through all stages of development, including planning, design, construction, operation, rehabilitation and maintenance, and eventual decommissioning. The EMPr is a legally required and binding document in the same manner as a licence or EA and is required prior to undertaking an activity.

The document is site specific to ensure that it complies with the requirements of reasonable protection of the environment as imposed by Section 28 of NEMA in particular, which refers to duty of care. The EIA Regulations (2014), as amended, are used as a guideline for the content of the EMPr and as well as Section 24N of NEMA

The Draft EMPr has been included in Appendix G of this BAR. The EMPr outlines the impacts and mitigation measures for the construction, operation and maintenance and decommissioning phases of the Project. More specifically, the following is included in the EMPr as per Appendix 4 of the EIA Regulations (2014) as amended:

- Summary of Impacts: this summary includes the predicted negative environmental impacts for which mitigation is required and positive impacts requiring enhancement;
- Description of mitigation measures: the EMPr identifies feasible and cost-effective mitigation measures to reduce the significance of negative impacts to acceptable and legal levels. Mitigation measures are described in detail and are accompanied by designs, equipment descriptions and operating procedures, where appropriate, as well as descriptions of technical aspects for implementing the mitigation measures;
- Description of monitoring programme: the monitoring programme indicates the linkages between impacts, indicators to be measured, measurement methods and definition of thresholds that will signal the need for corrective actions;
- Emergency Action Plan: the identification of possible accidents during the construction and operation phase of the Project, with measures on how they will be prevented and/or managed;
- Institutional arrangements: these arrangements depict and define the responsibilities for mitigation and monitoring actions;
- Legal enforceability: the contents of the EMPr are legally enforceable; and
- Implementation schedule and reporting procedures that specify the timing, frequency and duration of the mitigation measures. It includes the requirements for record keeping, reporting, review, auditing and updating the EMPr.

The EMPr document is based on the findings (including mitigation measures) of this Basic Assessment (BA) process conducted in terms of the Environmental Impact Assessment (EIA) Regulations (2014), as amended. The EMPr remains in draft format until the CA approves the document of which some additional EA conditions will be incorporated into the EMPr.

12. Environmental Impact Statement

The BA process for the development of the BESS and associated infrastructure at the Cuprum Substation has described the *status quo* of the receiving environment and assessed the expected environmental and social impacts associated with the establishment of the BESS and associated infrastructure. The impacts were identified with input from key specialist studies. This process has enabled an all-inclusive integrated assessment of the impacts to the surrounding natural and social environment during the projected construction and operational phases of the Project. The Impact Assessment investigated the design, construction, operational, decommissioning and cumulative impacts associated with the Project.

Potential key consequences to the receiving environment can broadly be defined as a loss of faunal and floral species as a result of habitat disturbance, contamination of soil and groundwater resources as a result of spillages and a risk of fire and explosion as a result of system failure. It is recognised the consequences may be medium to high without the implementation of appropriate mitigation measures however, it has been illustrated that with the implementation of the mitigation measures and the Environmental Management Programme (EMPr), all the identified impacts can be mitigated to acceptable levels.

As discussed in the meeting between Eskom and the DFFE on 14 October 2021, (refer to Appendix E for meeting minutes), due to the tender and procurement processes associated with the BESS infrastructure, a preferred technology cannot be recommended as part of this DBAR and associated Specialist Reports. The technology option will be chosen upon finalisation of the procurement and bid process. While **the Project does not specify a BESS technology to be implemented,** the worst-case scenario (considering all possible technologies) has been assessed as defined in Section 10.

A summary of the impact assessment findings is provided in the sub-sections below per phase of the development.

Construction Phase:

The impacts associated with degradation of vegetation, introduction of alien species, displacement of faunal and avifaunal communities are unavoidable due to the clearance of vegetation required for placement of the BESS and associated infrastructure. The specialist has however noted that the study area is devoid of vegetation and highly disturbed with no sensitive habitats. No RDL or ODL floral species were observed within the study area (including protected species under the Northern Cape Nature Conservation Act, Act No. 9 of 2009). Additionally, no CBA's and ESA's overlap the study area according to the Northern Cape CBA (2016) Map.

Furthermore, based on the ecological assessment and baseline information, no faunal species of conservation concern were encountered (refer to Appendix D). The general habitats of the study area and immediate surroundings are not ideal for most priority faunal species (species of conservation concern). The avifaunal assessment also corroborated the ecological assessment indicating that the site supports very limited natural vegetation that could serve as an avifaunal habitat and it is highly unlikely that the study area will be utilised by breeding birds. These impacts are therefore assigned a **Low negative to Medium negative** significance rating (pre-mitigation) and a **Very Low negative to Low negative** significance rating (post-mitigation). Please refer to Table 10-33 for full list of individual construction impacts and related impact significance before mitigation and after mitigation.

The impacts associated with general construction activities of bulk infrastructure i.e. water pipeline, road extension and powerline realignment have been assessed. It is understood that all materials relating to the BESS and associated infrastructure will be transported to the site. Due to relatively short duration, extent and intensity of these associated impacts (refer to Section 10.5.2), these impacts are assigned a **Low negative** significance rating (pre-mitigation) and a **Very Low negative** significance rating (post-mitigation).

It is not confirmed however whether the BESS will be assembled on site or transported to the site fully assembled (or partially assembled). In the event that the BESS is not assembled prior to arriving on site, depending on the battery option selected, electrolyte material could spill/leak onto the soil and potentially cause contamination of soil and groundwater resources. The implementation of mitigation measures does however reduce the intensity, extent, and duration of the impact by providing containment measures, leak detection monitoring and response plans (i.e. spill management). The EAP has therefore rated these impacts as **Medium negative** significance rating (pre-mitigation) and a **Low negative** significance rating (post-mitigation).

Positive social impacts were identified as part of the assessment of the construction phase namely the potential for the Project to educate individuals on the positive outcomes of renewable energy, battery storage and ultimately contribute towards creating a carbon conscious society. Potential employment opportunities were also identified as an additional social impact. Due to the relatively low public interested in the Project and lack of control over the employment process, these impacts are assigned a **Very Low to Low positive** significance rating (post mitigation).

Operational Phase:

The main concern with BESS infrastructure, in general, is the risk of overcharging, undercharging, overheating and short circuits within the Battery Management System. These risks, in certain instances, are caused by malfunctioning of the monitoring system, control system, internal equipment and extreme high temperatures. This could potentially lead to insulation failure(s) and ultimately result in a fire and/or explosion.

The EAP therefore assessed the worst-case scenario across all potential battery options to investigate the environmental impact of the Project and accommodate for the lack of alternatives. Therefore, only the worst-case scenario was assessed as informed by the envelope of.

It is unknown which technology would be more susceptible to fire and/or explosion. Research is limited and inconclusive, at the stage of compiling this report, as to which technology is less and more likely to result in a fire and/or explosion. The physical and chemical characteristics of the battery is also highlighted as part of the impact summary. However, as mentioned previously, the impact assessment considers the worst-case scenario across all battery types collectively and therefore did not assess the battery technology options individually. The different battery options are however again presented below for reference purposes.

Li-Ion Batteries	Sodium Sulphur Batteries	VRF Batteries
• Li-ion batteries consist of a solid electrolyte and therefore the risk of soil contamination (due to the electrolyte) is not applicable. • These batteries exhibit thermal runaway properties which results in an accumulation of excess heat creating more heat which could in a fire and/or explosion. • It is also further understood that the energy density of the cells and the combustibility of the organic-based electrolyte make these batteries a fire hazard and safety risk.	• Sodium Sulphur (NaS) batteries consist of a solid electrolyte however the risk of soil contamination is still prevalent due to the hazardous materials contained within the batteries. This includes metallic sodium which is combustible if exposed to water and produces sodium hydroxide (ecotoxic). • The NaS battery is also composed of highly reactive components that produce corrosive and flammable substances (SRK, 2019). These flammable substances could result in emissions, in the event of a fire, which could potentially spread and impact the health of surrounding residents and farmers. • Examples of potential health-related impacts include, but are not limited to, smoke inhalation, asthma and respiratory tract infection(s). According to SANS: 10234 GHS, • NaS batteries contain sulphur dichloride, monochloride and tetrachloride which, when exposed to, can cause skin and respiratory irritation.	• The VRF battery is composed of a liquid electrolyte which is not flammable and therefore negates the risk of a fire and/or an explosion. • Vanadium is a nontoxic chemical however the electrolyte in VRF batteries is caustic and poses corrosive and environmental hazards similar to lead-acid batteries. • In the event that a leakage or spill occurs from these tanks, large volumes of electrolyte containing a sulphuric acid-based solution will contaminate soil and groundwater resources.

There is still limited data to demonstrate the probability of a malfunction or failure rates in battery options. The assessment therefore investigated the potential significance of impacts as a result of the BESS failure in line with a conservative estimate of the probability and likelihood of the impact occurring. These impacts include the loss of and disturbance to fauna, avifauna, and indigenous vegetation as well as damage to the physical surroundings. Due to the large emphasis placed on reducing the probability of BESS failure and potential fires and/or explosions through the implementation of the appropriate mitigation measures, the impact has been significantly reduced (post-mitigation). These impacts are therefore assigned a **Low negative** significance rating (pre-mitigation) and a **Very Low negative** significance rating (post-mitigation

Due to the electrolyte material within the batteries containing hazardous chemicals, there is also a potential for spills/leakages from the storage containers of the electrolyte (in relation to the worst-case scenario) which could contaminate soil and groundwater resources. The implementation of mitigation measures can however reduce the intensity, extent, and duration of the impact by providing containment measures, leak detection monitoring and response plans (i.e., spill management). These impacts are therefore assigned a **Medium negative** significance rating (pre-mitigation) and a **Low negative** significance rating (post-mitigation).

Additional impacts assessed for the operational phase, which are common to all activities, include disturbances to avifaunal communities, aesthetic management, and visual impacts. Due to the relatively low to medium sensitivity of the site in relation to avifaunal species and minimal interference to the existing visual environment, these impacts are assigned a Low **negative** significance rating (post-mitigation).

The improved quality of life as a result of increased reliability of energy was also assessed as a positive social impact which was subsequently rated as a **Low positive** significance rating.

Decommissioning Phase:

Decommissioning impacts are excluded in the assessment as decommissioning of the BESS is not a viable option for Eskom. Eskom have indicated that the supplier will be responsible for disposal of the replaced components in line with legislative requirements.

Again, for reference, the Li-Ion batteries are modularized and packaged systems which offer ease of system removal from the site for disposal at end of life. The materials used in Li-ion batteries are typically considered non-hazardous waste and may be disposed at a licensed facility. NaS batteries contain sodium, sulphur, beta-alumina ceramic electrolyte and sulphur polysulfide which are disposed of by routine industrial processes or recycled at the end of the battery life. VRF batteries are non-toxic and therefore the components should be disposed of through normal non-hazardous waste processes however the electrolyte is considered hazardous and must be disposed by a licensed hazardous waste facility.

Cumulative impacts were also assessed for the development which includes impacts on vegetation, climate change and energy efficiency. The study area is heavily disturbed and contains alien invasive species. Any construction activities on a site of this nature i.e., a disturbed site, may result in a proliferation of alien invasive species on site. The cumulative impact is thus rated as a **Low negative** significance rating before mitigation and a **Very Low negative** post mitigation.

In terms of climate change and energy efficiency impacts, the proposed BESS infrastructure will positively influence climate change during the lifespan of operation and improve energy efficiencies within the region. The cumulative impact is rated as a **Medium positive** significance rating consequence due to the international extent and duration of the impact. No further mitigation measures have been recommended.

No-go Alternative

The principle of the “No go” alternative, is, at its simplest, that the benefits of the proposed activity will not be realised with the status quo remaining and neither will the associated negative impacts/risks materialise. This alternative would imply that the current status quo, without the proposed BESS, would remain.

Should the *status quo* of the site remain, this will imply that Eskom will not be able to strengthen the electricity distribution network, integrate renewable energy and reduce investment in conventional generation methods (i.e., coal-based power stations) through this Project. Furthermore, if Eskom is not able to implement the BESS development as an alternative to the Kiwano CSP project, they will run commercial risks for not complying with the funding criteria of their loan agreement with the WB. This may result in their loan agreement being terminated.

In addition, Eskom will not be able to align their development activities to the objectives of the 2019 IRP for electricity, as well as meet the IPP Strategic Plan for the Kronos/Cuprum network.

Since the potential impacts associated with the development can be mitigated to acceptable levels, the “no–go” alternative is therefore not considered to be the preferred alternative.

13. Conclusion and Recommendations

The Project bears a **Low negative** to **Very Low negative** environmental impact on the receiving environment with the implementation of the proposed mitigation measures. Emphasis has however been placed on the safety concerns associated with BESS technology and the lack of inconclusive research undertaken. This report therefore recommends mitigation measures which can significantly reduce the related environmental impact as well as guide safety procedures for operating the BESS technology.

The Project will strengthen the electricity distribution network, integrate and store renewable energy, as well as reduce investment in conventional generation methods (i.e., coal-based power stations). The Project will also educate individuals on the positive outcomes of renewable energy, battery storage and ultimately contribute towards creating a carbon conscious society.

The BA process, the associated assessment of impacts and the identification of residual risks further allows for concluding the following:

- The envelope of criteria for the Project speaks to the delivery of a BESS solution at the Cuprum Substation (at the location identified for the most feasible connection and off take requirements), along with the associated infrastructure development and adjustments (see Chapter 3 Project Overview) to connect this facility to the existing Eskom energy grid. It further defines a worst-case scenario which has been assessed as part of this BAR and used to develop appropriate and project specific mitigation measures for implementation. The assessment therefore did not compare the different battery options that are available for the BESS solution but rather assessed the worst-case scenario across all potential battery options to investigate the environmental impact of the Project and accommodate for the lack of alternatives;
- Construction related impacts have been assessed for the BESS and associated infrastructure. Due to the highly disturbed nature and devoid vegetation on site, the significance of the change to the receiving environment can be reduced to no impact with the implementation of mitigation measures;
- Operational related impacts have been assessed for the BESS and associated infrastructure. Despite the limited availability of data to demonstrate the probability of a malfunction or failure rates in the battery options, this assessment proceeded to include investigating the potential significance of impacts as a result of the BESS failure. Although it is recognised that the consequence of battery malfunction or failure may be significant, the implementation of appropriate mitigation measures reduces the likelihood of the consequence realising and the significance of the change to the receiving environment can therefore be reduced to a Low Negative impact;
- During the operational phase, safety must be prioritised in relation to emergency response plans, fire drill procedures and equipment available on site. The recommendations provided in relation to the maintenance, monitoring and replacement procedures should be treated as critical for the BESS to mitigate potential fires and/or explosions;
- An assessment to quantify the positive impact of storing excess energy from renewable sources and the resultant reduction in greenhouse gas emissions has not been undertaken. However, the impact of the Project has been assigned a Medium Positive significance rating;
- Decommissioning activities have not been included in the assessment as Eskom do not plan to decommission the BESS. Additional recommendations and information regarding safe disposal of the battery components have been provided in Section 10.5.4; and
- The implementation of the no-go alternative will result in the no negative environmental impacts related to the proposed development. The positive impacts of the Project will also not be realised which include strengthening the electricity distribution network, integrate and store renewable energy as well as reduce investment in conventional generation methods (i.e., coal-based power stations). Eskom have committed to the WB that the BESS projects would be implemented as an alternative to the Kiwano CSP project in order to comply with the WB funding set of criteria for the Major Build program. If Eskom are not able to establish the BESS project, the WB funding criteria will not be met and could potentially result in termination of the loan agreement.

In conclusion, no environmental fatal flaw(s) were identified by the EAP or specialists which would prevent the proposed BESS, substation extension, water pipeline, powerline realignment and road development. The development is considered the best practicable environmental option for the site.

13.1 Recommendation of the EAP

The Project has been assessed in accordance with the EIA Regulations, 2014, as amended in line with the NEMA.

The EAP is of the opinion that the proposed BESS and associated infrastructure Project will not result in any significant negative environmental or social impact to the receiving environment. No fatal flaw(s) were identified by the EAP or specialists.

It is recommended by the EAP that the Project therefore be authorised and implemented in line with the requirements of the EMPr and project specific mitigation measures proposed.

The following list of recommendations have been proposed by the EAP:

- The activity must commence within a period of ten (10) years from the date of issue of the Environmental Authorisation, if commencement of the activity does not occur within that period, the authorisation lapses and a new application for Environmental Authorisation must be made in order for the activity to be undertaken;
- Construction must be completed within five (05) years of the commencement of construction activities on the site;
- A project-specific Draft Environmental Management Programme (EMPr) has been compiled according to (but not limited to) the impacts and mitigation measures included in this assessment and the specialist studies;
- The Draft EMPr must be finalised and submitted to the DFFE for approval upon selection of a technology option, following the completion of the procurement processes, and prior to the commencement of construction activities;
- The EMPr is a legally binding document and the mitigation measures stipulated within the document and Basic Assessment Report will be implemented by the appointed contractor;
- An independent ECO should be present for monthly site inspections and audits during the construction phase to monitor the implementation of the EMPr and the EA once issued;
- The EMPr for the Project must be implemented and included as a binding document for the development phases and contractor(s);
- No development activities, contained within this report, should take place prior to obtaining the EA;
- The holder of the EA is responsible for ensuring compliance with the conditions by any person acting on his / her behalf, including an agent, sub-contractor, employee or any person rendering a service to the holder;
- Notwithstanding this environmental authorisation, the holder must comply with any other statutory requirements that may be applicable to the undertaking of the listed activities;
- All workers must attend an information sharing programme prior to the commencement of construction activities to inform them of the potential impacts associated with HIV / AIDS;
- Information sharing programme must inform all workers of the available health care facilities within the surrounding areas;
- All noise and sounds generated during all phases of the proposed development must comply with the relevant SANS codes and standards;
- Limit construction vehicle speed to the appropriate speed limit (25km/hr) associated with the roads utilised and vehicle restrictions;
- Suitable signage must be established at the site before commencement of any land clearing or construction activities, to highlight the need to protect sensitive biophysical features on the site;
- All construction activities must remain within the construction footprint. Construction camps, stockpiles, and temporary storage areas must remain within the study area and within the substation property. No natural vegetation in the surrounding areas must be cleared;
- Additional areas of indigenous vegetation (outside of the required clearance), even secondary communities should under no circumstances be fragmented or disturbed further or used as an area for dumping of waste;
- All relevant legislation and requirement of other organs of state departments (National, Provincial, Local (By-Laws), in particular of Section 28 (duty of care) of NEMA, must be complied with;

- The site must be rehabilitated after construction back to its original state, if not possible to a state that conforms to the principles of sustainable development;
- All laydown, storage areas etc should be restricted to within the project areas and all access roads must be kept within this area or from existing access roads;
- A pre-construction walk-through of the approved development footprint must be conducted to ensure that sensitive habitats and species are avoided where possible;
- A search and rescue plan must be developed for any TOPs or species of conservation concern that have the likelihood of occurring in the study area;
- The SAHRA Archaeology, Palaeontology and Meteorites Unit must be alerted when site work commences;
- Strict and clear reporting procedures for chance findings must be followed by applicant and contractors throughout the period of construction;
- If any faunal species are recorded within the construction footprint during the construction phase, activities should temporarily cease, and an appropriate specialist should be consulted to identify the correct course of action. Care must be taken not to interact directly with any wildlife encountered;
- During construction, if any active bird nests are encountered, the area must be cordoned off and the relevant specialist consulted on how to proceed;
- The Contractor(s) are to develop an Emergency Response Plan which highlights the procedures to follow in the event of an emergency incident (fire, spills, etc);
- A Method Statement must be developed for the handling and transportation of the battery components and electrolytes. All cargo must be checked and transported to the site (by an authorisation transportation company);
- Should any archaeological or physical cultural property heritage resources be exposed during excavation for the purpose of construction, construction in the vicinity of the finding must be stopped until heritage authority has cleared the development to continue;
- If flow batteries are used for the Project, A primary and secondary containment system should be placed around the BESS. This should include a bunded platform which can contain up to 110% of the liquid contents;
- A Leak Detection must be monitored according to manufacturing requirements;
- A maintenance schedule should be developed and implemented prior to operation. Regular inspections should be undertaken by an experienced professional to determine the state of the battery and whether emergency replacement or maintenance is required;
- An operating and maintenance programme must be developed during the operation phase which includes identification of overcharge, overheating and short circuits. The applicant must further investigate insulation material to be used around the modules;
- Handling of the battery modules must be undertaken in accordance with the operating manual and OEM instructions; and
- The Contractor shall assign the position of Fire Officer to one of its senior staff members who shall be competent and adequately trained to fulfil the position of Fire Officer. Fire Officer must be able to detect fires and undertake regular monitoring.

Appendix A Maps

Appendix B Site Photographs

Appendix C Facility Illustrations

Appendix D Specialist Reports

Appendix E Public Participation Process

Appendix F Impact Assessment

Appendix G Environmental Management Programme

Appendix H Details of EAP and Expertise

Appendix I Specialist Declaration

Appendix J Additional Information

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