Witzenberg

GA Environment

FINAL BASIC ASSESSMENT REPORT FOR THE PROPOSED INSTALLATION OF A BATTERY ENERGY STORAGE SYSTEM (BESS) AT THE EXISTING ESKOM SUBSTATION IN WITZENBERG, WITZENBERG LOCAL MUNICIPALITY, WESTERN CAPE PROVINCE

March 2020

Eskom

Environmental best practice and sustainability

FINAL BASIC ASSESSMENT REPORT

for

THE PROPOSED INSTALLATION OF A BATTERY ENERGY STORAGE SYSTEM (BESS) AT THE EXISTING ESKOM SUBSTATION IN WITZENBERG, WITZENBERG LOCAL MUNICIPALITY, WESTERN CAPE PROVINCE

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PROJECT INFORMATION

Title:	The Proposed Installation of a Battery Energy Storage System (BESS) at the Existing Eskom Substation in Witzenberg, Witzenberg Local Municipality, Western Cape Province
Competent Authority:	Department of Environment, Forestry and Fisheries (DEFF)
Applicant:	Eskom Holdings SOC Ltd
Environmental Assessment Practitioner:	GA Environment (Pty) Ltd.
Compiled by:	Nyaladzi Nleya
Reviewer:	Dirk Prinsloo
Date:	03 March 2020

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0	**18th February 2020**	Final report for Internal Review	Nyaladzi Nleya	Dirk Prinsloo
1	**27th February 2020**	Final for DEFF Review	Nyaladzi Nleya	Nkhensani Khandlhela

SIGNING OF THE ORIGINAL DOCUMENT

Original	Prepared by	Reviewed by	Approved by
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LEGISLATIVE REQUIREMENTS FOR A BASIC ASSESSMENT REPORT

The table below provides the requirements for a Basic Assessment report in terms of the EIA Regulations (Appendix 1) with reference to the relevant sections of this report where these requirements are addressed.

Section	Content	Reference in report
A Basic Assessment Report (BAR) must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-		
3 (1) (a)	details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Section 1.9 Appendix H
3 (1) (b)	the location of the activity, including: (i) the 21-digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section1.1
3 (1) (c)	a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Section1.1 and Appendix A
3 (1) (d)	a description of the scope of the proposed activity, including (i) all listed and specified activities triggered and being applied for; and (ii) a description of the activities to be undertaken including associated structures and infrastructure	Section 1.6
3 (1) (e)	a description of the policy and legislative context within which the development is proposed including- (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments	Section 2
3 (1) (f)	a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location	Section 1.4
3 (1) (g)	a motivation for the preferred site, activity and technology alternative	Section 1.5

3 (1) (h)	a full description of the process followed to reach the proposed preferred alternative within the site, including: (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated. (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity	Section 5
3 (1) (i)	(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including- (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures	Section 7
3 (1) (j)	(j) an assessment of each identified potentially significant impact and risk, including-	Section 8

	(i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated	
3 (1) (k)	where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report	Section 8 and Appendix F1
3 (1) (l)	an environmental impact statement which contains- (i) a summary of the key findings of the environmental impact assessment; (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	Section 9.1
3 (1) (m)	based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr	Appendix G
3 (1) (n)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	Section 9
3 (1) (o)	a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed	Section 1.11
3 (1) (p)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation	Section 9
3 (1) (q)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised	Section 9
3 (1) (r)	an undertaking under oath or affirmation by the EAP in relation to: the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs;	Appendix D

	(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties.	
3 (1) (s)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	Not Applicable
3 (1) (t)	any specific information that may be required by the competent authority	Not Applicable
3 (1) (u)	any other matters required in terms of section 24(4)(a) and (b) of the Act	Not Applicable

AFFIRMATION OF ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

I ***Nkhensani Khandlhela***, an EAP employed by ***GA Environment (Pty) Ltd*** declare that the information provided in this report is correct and relevant to the activity/ project, that comments from Interested and Affected Parties have been incorporated into this report, that the report has included inputs from Specialists and that all relevant project information was made available to Interested and Affected Parties.

SIGNATURE OF EAP **DATE 26 February 2020**

EXECUTIVE SUMMARY

1 INTRODUCTION

GA Environment (Pty) Ltd has been appointed by Eskom Holdings SOC Ltd to undertake a Basic Assessment for all activities associated with the Installation of a Battery Energy Storage System (BESS) at the Existing Witzenberg Substation. The existing Substation is located within the jurisdiction of Witzenberg Local Municipality in the Western Cape Province where Eskom are proposing to establish an adequate BESS facility to achieve optimum results for the strengthening of the Witzenberg network based on physical space and local network constraints.

Eskom are considering several potential of energy storage technologies to increase access to reliable, affordable electricity within the Witzenberg area. According to the BESS Technical Due Diligence and Planning Report for Witzenberg Substation, a 11MW storage system with a 9 hour discharge period is required to support the local load. Depending on the preferred technology alternative selected, a minimum footprint of 2016 m² (footprint of BESS installation area which consists of 32 containers x 63m² = 2016 m²) will be required. The footprint does not include working areas and storage areas.
An additional 864 m² will be utilized for work areas and additional infrastructure such as cable trenches, foundations, air-conditioning units, inverters and general access for operation and maintenance equipment and vehicles in-between containers.

Depending on the preferred technology alternative, the installation of grid-scale battery storage at the existing Witzenberg Substation will require several containers of the preferred battery technology to be installed. Each battery contains aqueous or organic electrolyte which is considered a “dangerous good” as per the definition contained in the Government Notice No. 983 (Listing Notice 1, of 2014, amended). The electrolyte of the various assessed technologies contains a substance listed in terms of the SANS 10234: Globally Harmonized System of classification and labelling of chemicals (GHS). Regardless of quantity, the presence of such chemicals has been identified to have an environmental and human hazard and as such must be assessed. In order to achieve a 9MWh storage system, batteries with a combined volume capacity of 80 cubic metres or more but not exceeding 500 cubic metres will be required. Therefore, an Environmental Authorisation (EA) through the Basic Assessment Process must be obtained from the Department of Environment, Forestry and Fisheries prior to construction.

It is important to highlight that a total working area of 864m² (**Table 1**) will be catered for within the Substation for Contractors site camps, additional access routes, vehicle turning area as well as laydown area for construction material.

Table 1: Footprint Areas required for BESS

Infrastructure	Footprint Area Required
Battery Energy Storage System (BESS) Containers	32 containers x 63m² = 2016 m²
Access routes and vehicle turning area	128 m²
Contractor's site camps and laydown areas	636 m²
Installation of a 1x40MVA 132/11kV transformer	100 m²
TOTAL	**2 880 m²**

The clearing of vegetation for the proposed footprint will not be required as the majority of the proposed area within the Substation is disturbed and has been cleared as presented in **Figure 1 below.**

Figure 1:Cleared area within the Witzenberg Substation proposed for BESS footprint

It must be highlighted that as highlighted in Table 1 above, the proposed BESS footprint has taken into consideration the space requirement for the installation of a 1x40MVA 132/11kV transformer at the Witzenberg Substation which is required in order to connect the BESS to the existing 132kV network. The charging period during the high peak season was set from 22h00 to 07h00 to allow for sufficient discharging energy during the local peak hours and to cater for the loss in energy due to the Round-Trip Efficiency.

Eskom is interested in evaluating the potential of energy storage technologies to increase access to reliable, affordable electricity in South Africa, encouraging policies to support the adoption of energy storage technologies, and exploring opportunities to invest in energy storage projects. The key benefits of the proposed Battery Energy Storage System include:

- The adoption of energy storage technologies could provide a cost-effective way of improving the capacity of South Africa's electricity grid;
- Peak load shaving where an area's load profile exhibits one or two high peaks during the day, the presence of which puts strain on the national electricity generation fleet. By charging batteries during off-peak times (during the night and/or at mid-day) and discharging them to supply the load at peak time, it may be possible to reduce overall system demand and prevent more costly and environmentally unfriendly alternatives, such as building new peaking generation stations.
- The successful integration of renewable electricity generation sources, especially intermittent power sources such as solar and wind;
- Voltage support to distribution networks within remote areas with poor voltage regulation;
- Fast track the process to upgrade an aging fleet of coal-fired power stations for environmental compliance, and to replace those stations reaching end of life;
- Offset the need to use diesel and other fossil fuels for peaking and baseload power; and
- Reliability improvement in cases where a network is performing poorly due to a single electrical infeed and frequent weather or age related faults, a BESS installation may be operated in micro-grid configuration to supply a local load until such time as the network can be returned to its normal state.

2 LEGISLATIVE FRAMEWORKS

All legal provisions and the legal context for the proposed development presented in this document include a review of legislation, regulations, policies and guidelines, which are relevant to, or have implications, for the proposed project. The National, Provincial and Local Government legislation is

presented in the report. Examples of each of these are as per the provisions of the National Environmental Management Act, 1998 (Act No. 107 of 1998), the Environmental Impact Assessment Regulations, 2014 as amended and SANS 10234: Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 2008.

2 BASIC ASSESSMENT AND PUBLIC PARTICIPATION PROCESS

The proposed development activity will trigger the NEMA Listed Activity, during the operation, "handling or storage of a dangerous good, where such storage has a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres". Depending on the proposed technology used, the Witzenberg Substation will accommodate a 11MWh BESS installation, with a minimum of 82m³ of electrolyte if only solid-state battery is installed and between 272m³ and a maximum of 500m³ if a flow battery is installed.

A Basic Assessment process must be undertaken in terms of the NEMA Environmental Impact Assessment (EIA) Regulations, 2014 as amended as the surrounding environment could potentially be impacted during the construction and operation phases of the BESS. Activity 14, Listing Notice 1 of the above-mentioned regulations is triggered and is detailed as follows:

- *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.*

Due to the triggered activities, it is necessary to obtain an Environmental Authorisation for the above-mentioned listed activities. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with the listed activities must be considered, investigated, assessed and reported to DEFF as the Competent Authority (CA).

It must be highlighted that the proposed development will occur within the boundaries of the existing Witzenberg Substation as the existing footprint can accommodate the combined footprint including site camp, access roads and laydown and storage areas of approximately 2 880 m². The clearance of vegetation to accommodate the proposed footprint and working areas will therefore not be required.

The Draft Basic Assessment report was issued for public and competent authority review in the month of November 2019. The comments raised by the CA as well as various Interested and Affected Parties (I&APs) have been recorded and addressed in the Final BAR. The PPP that commenced in September 2018 is summarised as follows:

- An advertisement in both English and Afrikaans was placed on page 7 of the Witzenberg Herald Newspaper published on Friday, February 1, 2019;
- Hardcopy and softcopy versions of the Notification Letter were distributed to all adjacent landowners, i.e. within a 2km distance from the existing Substation.
- The Draft Basic Assessment Report (DBAR hereafter) was placed at the Prince Alfred's Hamlet Library for the legislated period of at least 30 days from 4th November 2019 until 6th December 2019. The following commenting authorities were provided with a copy of the report in both electronic as well as hardcopy format:
    - Department of Environment, Forestry and Fisheries
        - Legal Authorisations and Compliance Inspectorate
        - Chemicals and Waste Management branch
    - Western Cape Department of Environmental Affairs and Development Planning;
    - Cape Winelands District Municipality;
    - Witzenberg Local Municipality;
    - Department of Water and Sanitation; and
    - Cape Nature.
    - Heritage Western Cape
- SMS, e-mail notifications and telephone calls were utilised to notify all registered I&AP's about the availability of the report.

3 DESRIPTION OF THE AFFECTED ENVIRONMENT

An understanding of the overall character and other sensitivities that were identified in the surrounding environment is pertinent to the project. The Biophysical aspects discussed are *Climate, Geology, Protected Areas, Regional Vegetation and Conservation Plan Area*, and *the hydrological* and *Important Bird Areas* information. The Socio-Economic conditions, Demographics, employment levels as well as housing and service delivery are also discussed in this report.

4 SPECIALIST STUDIES AND MANAGEMENT PLANS

In accordance with the requirements of Appendix 6 of the NEMA EIA Regulations, 2014 as amended, and a review of the DEFF Screening tool Specialist studies requirements, the need for only one

Specialist Study was identified based on the EAP's assessment of the site. A *Fresh Water Impact Assessment* was undertaken for the following reasons;

- The site is located adjacent to two watercourses;
- The proposed battery technology can potentially impact on existing species adjacent to the Substation and it is crucial for the specialist study to indicate and confirm the presence of surface water resources present on and or adjacent to the site;
- Determine the conservation status and value of the area as identified by the relevant biodiversity plans, bioregional planning documents; and
- Potential clearance or relocation of rare or endangered aquatic species or habitats encountered.

The key finding of the specialist study is that water quality impairment as a result of storm water run-off or contaminated spills from the site. These can be mitigated by conducting the construction phase during the summer months when surface water run-off from the site is less likely. Furthermore, good housekeeping and good management of potential contaminants is very important.

An assessment to determine the risk of the proposed activity upon the water resources in the vicinity was not conducted. The risk assessment is a tool to determine the level of authorisation which a Section 21 (c) and Section 21 (i) water use will require. However, the specialist determined that the proposed activity does not trigger a water use provided the activity is restricted to the already developed footprint of the Substation. This was confirmed formally by the Department of Water and Sanitation on the 12th of August 2019.

With regards to the Management Plans for the project, an Environmental Management Programme (EMPr) has been compiled to provide mitigation measures for all potential issues that are likely to emanate from the project.

5 ALTERNATIVES

In terms of Section 24 of NEMA, the proponent is required to demonstrate that alternatives have been described and investigated in sufficient detail during the BA process. It is important to highlight that alternatives must be practical, feasible, reasonable and viable to cater for an unbiased approach to the project and in turn to ensure environmental protection. A total of three alternatives types were assessed for the project. These alternatives were provided by the client. These were the no-go option, technology alternative and site alternative. The advantages and disadvantages of each of these alternatives as well as the reason for the preferred alternative are presented in this report.

4 ENVIRONMENTAL IMPACTS

In accordance with Government Notice R. 982, promulgated in terms of Section 24 of the National Environmental Management Act, 1998 (Act 107 of 1998), the EAP is required to assess the significance of potential impacts in terms of the following criteria:

- Nature of the impact;
- Extent of the impact;
- Intensity of the impact;
- Duration of the impact;
- Probability of the impact occurring;
- Reversibility of impacts; and
- Impact on irreplaceable resources; and
- Cumulative impacts.

The potential impacts identified and discussed were divided into two themes which are as follows.

- *Theme 1: Impacts on the Biophysical Environment* - (impacts on surrounding indigenous plant species, fauna, soil and surface and ground water)*;* and
- *Theme 2: Impacts on the Human Environment*- (impacts on existing Substation and surrounding infrastructure and services, visual impacts, dust and air quality, noise, heritage, health and safety)

Cumulative impacts were also discussed in this report and the table below indicates a summary of impacts identified.

Table 2: Impact Assessment Summary Table

Impact description	Type of impact	Project phase	Significance without mitigation	Significance with mitigation
IMPACT 1: Loss of intact habitat and associated indigenous vegetation	**NEGATIVE (- VE)**	Construction	Medium	Low
		Operational	Low	Low
IMPACT 2: Permanent loss of Fauna	**NEGATIVE (- VE)**	Construction	Medium	Low
		Operational	Low	Low
IMPACT 3: Impact on water resources	**NEGATIVE (- VE)**	Construction	Medium	Low
		Operational	Low	Low

IMPACT 4: Traffic Impacts	**NEGATIVE (- VE)**	Construction	Medium	Low
		Operational	Low	Low
IMPACT 5: Soil erosion and compaction	**NEGATIVE (- VE)**	Construction	Medium	Low
		Operational	Low	Low
IMPACT 6: Dust generation	**NEGATIVE (- VE)**	Construction	Medium	Low
		Operational	*Not applicable*	
IMPACT 7: Introduction and proliferation of alien and invasive floral species	**NEGATIVE (- VE)**	Construction	Medium	Low
		Operational	Low	Low
IMPACT 8: Unearthing of features of heritage, cultural or archaeological value	**NEGATIVE (- VE)**	Construction	Medium	Low
		Operational	Low	Low
IMPACT 9: Health and safety impacts	**NEGATIVE (- VE)**	Construction	Medium	Low
		Operational	Medium	Low
IMPACT 10: Temporary employment opportunities	**POSITIVE (+VE)**	Construction	Low	Medium
		Operational	Low	Medium

6 CONCLUSIONS AND RECOMMENDATIONS

This FBAR provides a broader description of the biophysical, Infrastructural and socio-economic issues associated with the development of battery energy storage infrastructure at the existing Witzenberg Substation. A comprehensive public participation process was conducted and is also presented in this report.

The FBAR has presented an assessment of the impacts of each of the proposed activities as well as ascertain the potential cumulative impacts of the development in its entirety. Mitigation measures for each of the impacts are discussed to ensure that positive impacts can be optimised, and negative impacts minimised in order for the project to be integrated into the environment in a sustainable manner. The installation of BESS infrastructure by making use of Solid-State Battery Technology (Alternative 2A) was found to be the desired alternative as it requires a smaller footprint when compared to Flow Batteries, requires less electrolyte and technically performs well. Li-ion batteries have been found to be the most appropriate solid state battery technology as it is relatively mature commercial technology and are now the dominant electrical storage technology although other solid state batteries have been found to have similar impacts and can be used with very little impact on the environment as compared to flow batteries.

The EAP's key recommendations outlined in the report are as follows

i. An Environmental Control Officer must be appointed to monitor all construction activities and ensure the demarcation of all applicable areas and ensure compliance with the Environmental Authorisation and approved EMPr;
ii. Inspection of BESS equipment packaging for damage, must be done before and after transportation and a record of this kept on file;
iii. The buffers around the two streams, as recommended in the Freshwater Impact Assessment compiled by BlueScience (Pty) Ltd dated March 2019 should be adhered to and treated as "no-go" areas, and the construction and operational phase activities must be strictly controlled to ensure that disturbance is restricted to the existing substation's footprint.
iv. Operation of plant and site vehicles should be done with care to minimize any damage to terrestrial plants on adjacent properties;
v. Accredited waste facilities to be contracted for accepting / recycling the waste from defective BESS equipment;
vi. The Substation must have a waste clean-up agreement with accredited service provider whereby all electrolyte spillages must be removed no later than 24hours after their occurrence.
vii. During the operational phase, it is recommended that ongoing monitoring of battery containers for possible leaks should take place regularly.
viii. Adhere to all recommendations outlined in the Fresh Water Impact Assessment Report and all Management Plans.

FINAL BASIC ASSESSMENT REPORT FOR THE PROPOSED INSTALLATION OF A BATTERY ENERGY STORAGE SYSTEM (BESS) AT THE EXISTING WITZENBERG SUBSTATION

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LIST OF ABBREVIATIONS / ACRONYMS

BA	Basic Assessment
BAR	Basic Assessment Report
BESS	Battery Energy Storage System
BPEO	Best Practicable Environmental Option
CA	Competent Authority
CBA	Critical Biodiversity Area
DBAR	Draft Basic Assessment Report
DEFF	Department of Environment, Forestry and Fisheries
DSI	South Africa Department of Science and Technology
DWA	Department of Water and Sanitation
EAP	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Ecological Support Areas
GHG	Green House Gas
IDC	Industrial Development Corporation of South Africa Limited
I&APs	Interested and Affected Parties
IPP	Independent Power Producer
Li-ion	Lithium ion
MW	Megawatt
MWh	Megawatt-hour
NERSA	The National Energy Regulator of South Africa
NEMA	National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998),
NEMA	National Environmental Management Act (Act 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEM:PAA	National Environmental Management: Protected Areas Act (Act 57 of 2003)
RFB	Redox Flow Battery
RI&APs	Registered Interested and Affected Parties
SANBI	South African National Biodiversity Institute
PPP	Public Participation Process
SADOE	The South African Department of Energy
SANEDI	The South African National Energy Development Institute
VRB	Vanadium Redox Battery

GLOSSARY OF TERMS

This section provides a catalogue of terms and definitions, which may be used in this report and, or other documents drafted for the project.

Term	Definition	Reference
Battery Energy Storage System	A battery energy storage system is a system that stores energy via the use of a battery technology for it to be used at a later time.	Parsons,2017
Clearing/Clearance	Clearing/Clearance refers to the removal of vegetation through permanent eradication and in turn no likelihood of regrowth. 'Burning of vegetation (e.g. fire- breaks), mowing grass or pruning does not constitute vegetation clearance, unless such burning, mowing or pruning would result in the vegetation being permanently eliminated, removed or eradicated'.	Department of Environmental Affairs, 2017. Clearance of Indigenous Vegetation Explanatory Document
Competent Authority	In respect of a listed activity or specified activity, means the organ of state charged by this Act with evaluating the environmental impact of that activity and, where appropriate, with granting or refusing an environmental authorisation in respect of that activity.	National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) as amended, NEMA 1998 hereafter
Critical Biodiversity Area	Areas that are deemed important to conserve ecosystems and species. For this reason, these areas require protection.	South African National Biodiversity Institute (SANBI)
Dangerous goods	Means goods containing any of the substances as contemplated in South African National Standard No. 10234, supplement 2008 1.00: designated "List of classification and labelling of chemicals in accordance with the Globally Harmonized Systems (GHS)" published by Standards South Africa, and where the presence of such goods, regardless of quantity, in a blend or mixture, causes such blend or mixture to have one or more of the characteristics listed in the Hazard Statements in section 4.2.3, namely physical hazards, health hazards or environmental hazards;	NEMA, EIA Regulations, 2014, as amended
Duty of Care	Every person who causes, has caused or may cause significant pollution or degradation of the environment to take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environmental is authorised by law	NEMA, 1998

Term	Definition	Reference
	or cannot reasonably be avoided or stopped, to minimise and rectify such pollution and degradation of the environment. "	
Decommissioning	means to take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily recommissioned;	NEMA, EIA Regulations, 2014, as amended
Environment	the surroundings within which humans exist and that are made up of— (i) the land, water and atmosphere of the earth; (ii) micro-organisms, plant and animal life; (iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and (iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.	National Environmental Management Act 1998 (Act No. 107 of 1998), as *amended*, NEMA hereafter
Environmental Assessment Practitioners	The individual responsible for the planning, management, coordination or review of environmental impact assessments, strategic environmental assessments, environmental management programmers or any other appropriate environmental instruments introduced through regulations.	NEMA, 1998
Flow Batteries	A flow battery, or redox flow battery, is a type of electrochemical cell where chemical energy is provided by two chemical components dissolved in liquids contained within the system and separated by a membrane. Ion exchange occurs through the membrane while both liquids circulate in their own respective space	Parsons,2017
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.	NEMA, EIA Regulations, 2014, as amended
Interested and Affected Parties (IAPs)	a) any person, group of persons or organisation interested in or affected by such operation or activity; and (b) any organ of stale that may have jurisdiction over any aspect of the operation or activity.	NEMA, 1998
Phased Activity	Means an activity that is developed in phases over time on the same or adjacent properties to create a single or linked entity, but excludes any activity for which an environmental authorisation has been obtained in terms of the Act or the Environment Conservation Act, 1989 (Act No. 73 of 1989);	NEMA, EIA Regulations, 2014, as amended
Protected Area	A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or other	International Union for

Term	Definition	Reference
	effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values.	Conservation of Nature (IUCN)
	These are areas aimed at the protection and conservation of areas which are ecologically viable and have high biodiversity. Example of Protected Areas include but are not limited to National Parks, Nature Reserves, world heritage sites and marine protected areas	National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
Public Participation Process	In relation to the assessment of the environmental impact of any application for an environmental authorisation, means a process by which potential Interested and Affected Parties are given opportunity to comment on, or raise issues relevant to, the application.	NEMA, 1998, as amended
Solid State Batteries	A solid-state battery is a battery technology that uses solid electrodes and a solid electrolyte, instead of the liquid or polymer gel electrolytes found in lithium-ion or lithium polymer batteries. Materials proposed for use as solid electrolytes in solid-state batteries include ceramics, and solid polymers	Parsons, 2019
Species of Conservation Concern	IUCN Red List definition: Threatened species, and other species of significant conservation importance: Extinct, Extinct in the Wild, Near Threatened, Data Deficient. In South Africa, the following additional categories are added: Rare, Critically Rare.	SANBI

1 INTRODUCTION

1.1 Background

GA Environment (Pty) Ltd has been appointed by Eskom Holdings SOC Ltd to undertake a Basic Assessment for all activities associated with the construction of the Battery Energy Storage System (BESS) within the boundaries of the existing Witzenberg Substation located on Portion 3 Farm Doorn Plaat 316 within the Witzenberg Local Municipality. The proposed development at the Witzenberg Substation forms part of 47 sites located within the Western Cape, Eastern Cape and Kwazulu Natal earmarked for the installation of BESS Infrastructure in order to provide voltage support to the main electricity grid and reduce demand for electricity during peak hours. The BESS project is part of several projects co-financed by development finance institutions (DFI) lenders including the World Bank and the Clean Technology Fund (CTF) in evaluating the potential of energy storage technologies to increase access to clean, reliable and affordable electricity in South Africa.

According to The South African Department of Energy (SADOE), South Africa's existing electricity infrastructure is insufficient to meet demand, which has resulted at times in load shedding (planned rolling blackouts) and excessive use of diesel to run peaking plants in order to provide a consistent supply of electricity. Power outages across the country have resulted in significant losses in business revenue which has a direct impact on the economy and socio-economic status of the country.

Significant further expenditure will be required in the years ahead to expand new generation sources (coal, hydroelectric, and renewable), upgrade the transmission grid, address the electricity distribution maintenance backlog, upgrade an aging fleet of coal-fired power stations for environmental compliance, and to replace power stations reaching end of life. It has been suggested that the adoption of energy storage technologies could provide a cost-effective way of improving South Africa's electric grid. Specifically, the adoption of energy storage could potentially offset the need to use diesel and other fossil fuels for peaking and baseload power and increase the capacity of South Africa's electric grid to successfully integrate renewable electricity generation sources, especially intermittent power sources such as solar and wind (Parsons,2017).

In order to get maximum benefit from the BESS, The Eskom Planning Team have recommended the installation of the energy storage capacity on the Distribution networks in order to provide local voltage support and provide an alternative to strengthening the network. The project is expected to be executed in two phases, namely:

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

The Witzenberg network is currently constrained due to the low 132kV voltage and as a result the entire network is prohibited from accepting customer load applications. It is for this reason that the Witzenberg Substation forms part of 24 Substations across the Western Cape where Eskom has proposed the installation of BESS infrastructure in order to achieve a BESS capacity of 459 MWh. Several types of battery technologies are under consideration whereby the appropriate type for each Substation will be determined based on its environmental impacts, grid strengthening requirements and available space at each Substation. These batteries will not be assembled on site but will be installed on site as a unit in a shipping container or similar based on the specifications of the battery (Refer to **Appendix B** for Facility Illustrations).

The site is located within the existing Witzenberg Substation located on Portion 3 Farm Doorn Plaat 316 with 21-digit Surveyor General Code of C01900000000031600003. The site is located approximately 6km North of Prince Alfred's Hamlet and 16km North of Ceres with site centre coordinates 33°13'43.19"S; 19°19'4.45"E. It is accessible from the Witzenberg Valley Road and is approximately 1km South West of the R303 that connects Prince Alfred's Hamlet and Ceres. Refer to **Figure 2** and **Appendix A** for the Locality Map of the site.

The site is on the edge of the Koue Bokkeveld plateau whereby the surrounding slopes are rugged in nature. Two streams flow past the site, on its eastern and western boundaries with the western stream flowing through a culvert across the Witzenberg Valley Road. Both streams arise on rugged slopes to the north west of the site where upstream of the road the eastern tributary is impounded. The slopes are steep and east facing, but as the streams flow off the steep mountain slopes they turn south to flow past the site and down, off the Koue Bokkeveld Plateau (Grobler,2019).

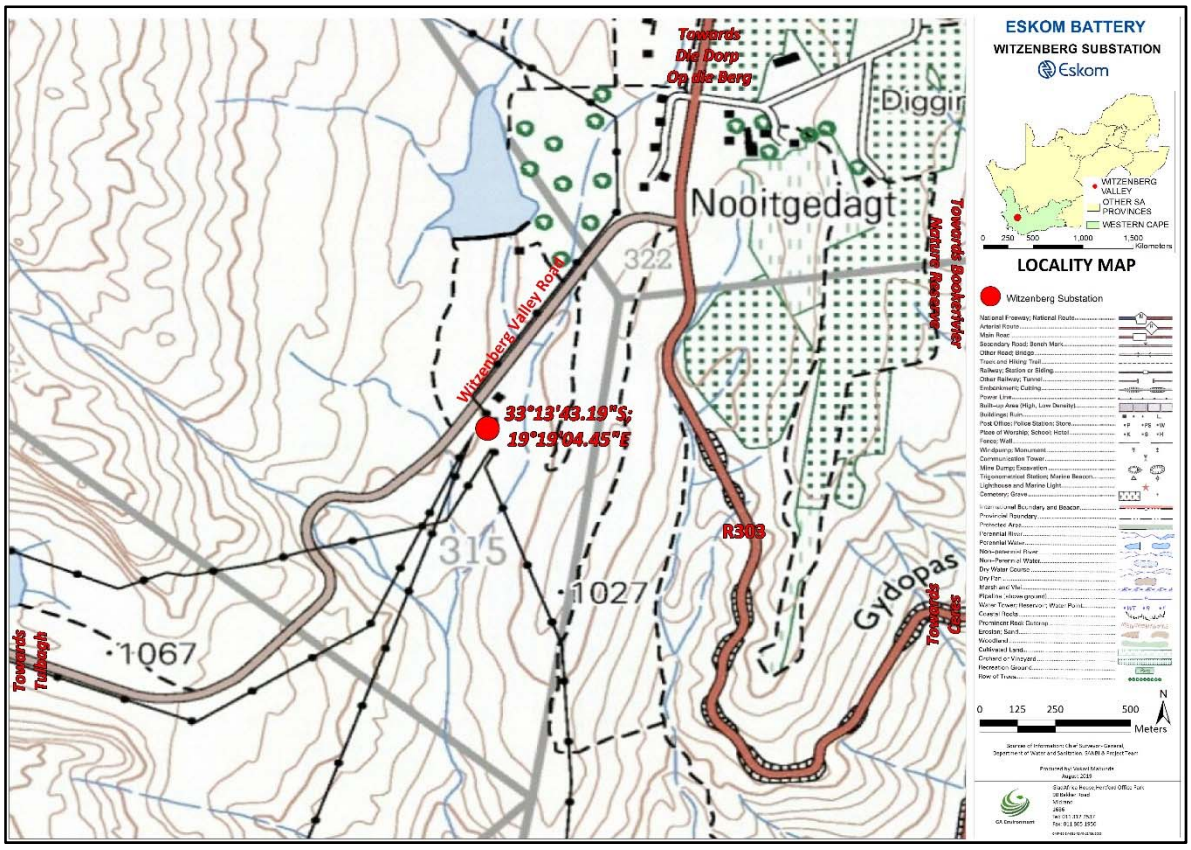

Figure 2: Locality Map of the Witzenberg Substation

The 132kV voltage at Witzenberg Substation is below 95% and the strengthening solution which was expected in 2017 has been delayed due to financial constraints. At this stage, the expected completion date for the project is unclear. As a result, the entire Witzenberg network has been severely affected which not only affects Eskom sales but has a disastrous consequence on several customers that have been turned down for additional increases and developments since 2014 (Raghavan, 2019).

The Witzenberg network as highlighted in **Figure 3** , peaks in summer where the majority load is from agricultural activities which is the dominant land use in the immediate surroundings of the Substation. The balance of the electricity supplied supports the residential load. According to data obtained from the Eskom Planning Team, The Witzenberg 132/66kV Substation peaked at 78.8MVA in March 2017 and is expected to grow at a rate of 1616kVA/year as based on the latest revised Ceres Spatial Development Plan. The detailed load forecast for the 132kV and 11kV load at Witzenberg Substation over the next 10 year period, assuming the conventional strengthening is not implemented, indicates that this Substation will not only be able to accept new customers but also will not be able to support existing customers at peak hours. Presently, Witzenberg Substation has a relatively flat profile throughout the day where the high demand runs for about 13 hours from 8am to 9pm (Raghavan,2019).

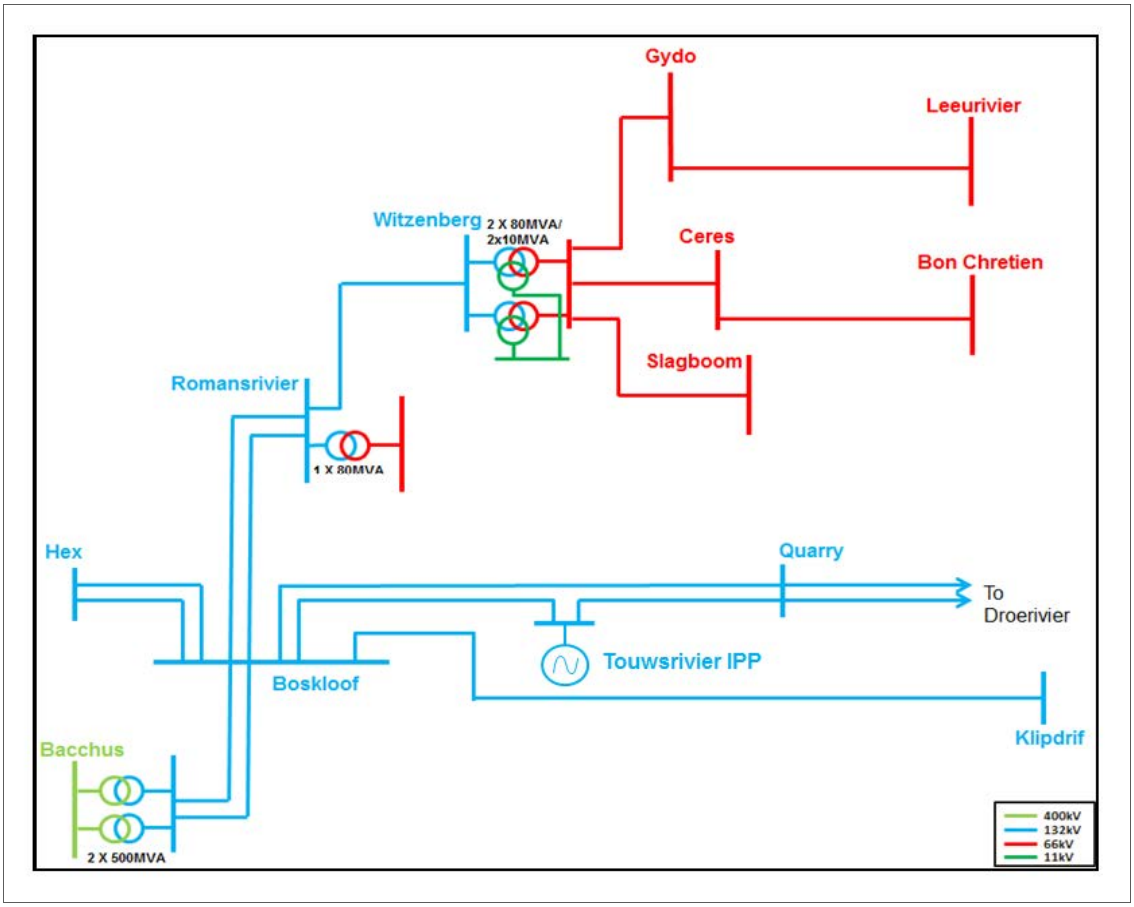

Figure 3: Single line diagram of the Witzenberg network

According to Eskom, the proposed BESS is financed by the World Bank and other co-financers and the proposed installation of BESS infrastructure at Witzenberg Substation forms part of Phase 1 of a two phased project to address electricity demands. Phase 2 of the project (which does not form part of this application) will consist of Solar Photo Voltaic (PV) generating power plants combined with centralized & distributed battery storage to further strengthen the main electricity grid.

It is important to highlight that the BESS system does not only constitute the generation of electricity but instead allows for the storage of electricity for use at a later stage when generation is not possible or has been halted. The BESS process involves the conversion of electrical energy into another form of energy such as chemical or kinetic energy, store it temporarily and then converted back to electrical energy, through the existing infrastructure at the Witzenberg Substation as shown in **Figure 4** therefore giving the utility considerable flexibility and control. A graphic illustration of the BESS system is in presented in **Figure 5** below.

Figure 4:Highlights the orientation of the control house, switches, breakers within the Witzenberg Substation

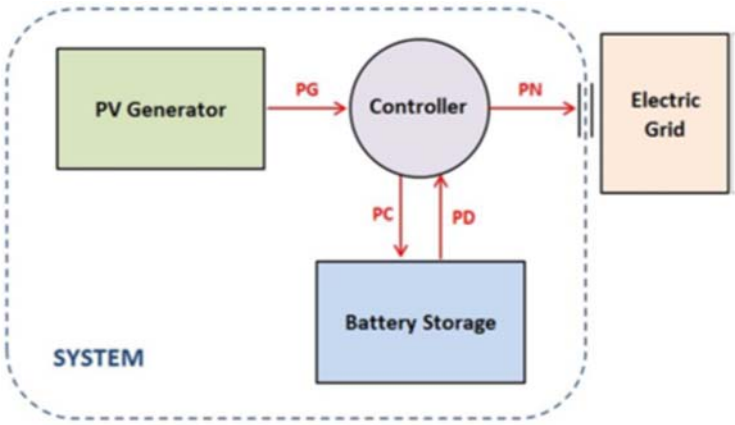

Figure 5: BESS generation and connection to the generation unit as well as the Electric grid

1.2 Status quo of the site and surrounding land uses

The existing Witzenberg Substation is located in an area where the adjacent land use is either farming land or vacant land. The site is located close to a watercourse and activities outside the Substation

may impact upon the watercourse. The western stream flows past the north western corner of the Substation site before turning south west and flowing away from the site. The stream flows through the road via two pipe culverts. Downstream of the road, the stream is also fed by storm water runoff from the road surface. (Grobler,2019).

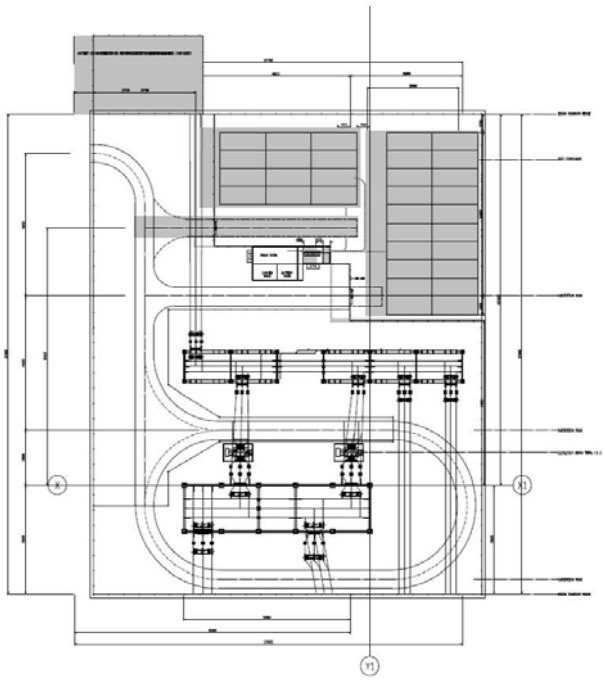

Figure 6: Layout of Witzenberg Substation

The exact date in which the Substation was commissioned is not known however Substation layout plans made available to GA Environment suggest that the Substation was constructed approximately May 1984. It is installed with 2x80MVA 132/66kV transformers which supply the Gydo and Leeurivier areas to the north, Slagboom to the west, and Ceres and Bon Chretien to the south. It also supplies an 11kV load off the tertiaries (2x10MVA) of the transformers (Raghavan, 2019).

The shaded area in the **Figure 6** above depicts the space availability and location for BESS at Witzenberg Substation. The Substation designer has indicated that 64 BESS containers can be accommodated at the site. For this application, 32 containers will be installed with additional footprint required for work area, laydown area and Contractors site camp. **Figure 7** shows existing infrastructure within the Substation around which the BESS facility will be installed.

Figure 7:A view of existing infrastructure within the Witzenberg Substation

Additional photographs of the site can be referred to in **Appendix C.**

1.3 Technical Aspects of the proposed infrastructure

Eskom proposes to install grid-scale battery storage at the existing Witzenberg Substation site, mainly as opportunity for capital deferment, which would otherwise require Eskom to embark on normal network strengthening through building new networks and major refurbishments. The proposed BESS site will occupy a footprint of approximately 2880m². The overall footprint includes access roads and a working area.

The main commercially available Battery Energy Storage Systems which the Environmental Assessments will look at are:

- **Solid State Batteries**: which is battery technology that uses solid electrodes and a solid electrolyte, instead of the liquid or polymer gel electrolytes. Examples of such batteries include Electrochemical capacitors, Lithium-ion, Nickel-cadmium, Sodium Sulphur) which are suitable in many applications that are utilised a more robust and adaptable energy grid. A Facility illustration of a Lithium-ion BESS facility is highlighted in **Figure 8**.

- **Flow Batteries**: which is battery technology that uses electrochemical cells where chemical energy is provided by two chemical components dissolved in liquids contained within the system and separated by a membrane. Ion exchange occurs through the membrane while both liquids circulate in their own respective space. Examples of such batteries include Vanadium Redox flow batteries and Zinc-Bromine flow Batteries could be connected in parallel for use in much larger applications.

The chemical composition of these types of technologies is considered hazardous, containing toxic materials. All the batteries will be containerized and makes provision for secondary containment to accommodate any spill as a result of normal operation and maintenance.

Figure 8: Facility Illustration of the footprint of a 10MW BESS Facility

The proposed Witzenberg BESS is planned to have an installation storage capacity of 11MW whilst a required storage of a maximum volume of 500m³ of electrolyte. The Substation currently operates on an 132kV feeder. The number of containers to be stored within the Substation and the development area is dependent on the type of technology that is selected and approved for the site. According to the Eskom Planning Team, 32 containers with a footprint of 63m² will be required to meet the power requirements for the Witzenberg Substation in Phase 1 of the project.

The entire existing Substation site footprint will be the construction area, (including lay-down areas and storage areas) and all available land space up to the extent of the property boundary will utilised

to accommodate the BESS containers and associated infrastructure. The footprint of each BESS technology alternative includes the associated infrastructure. All of the BESS alternatives are stackable, which can reduce the required footprint, however this is limited within the Substation's yards, where sufficient safety height clearance from high voltage electrical infrastructure is required.

The footprint for each battery container has been estimated at 63m² per MWh of BESS based on manufacturer capabilities. An additional 864m² will be utilized for work areas and additional infrastructure such as cable trenches, foundations, air-conditioning units, inverters and general access for operation and maintenance equipment and vehicles in-between containers.

The footprint of 63m² per container and volume 16m³ of electrolyte (which is comprised of a blend of one or more of the hazardous substances listed in SANS 10234 and Supplementary standard has been calculated from various industry technology supplier information. The **Table 2** below provides the footprint and volume for every 1MW with no efficiency factor taken into consideration as well as 1MW installation with a 60% efficiency factor:

Table 3: Battery electrolyte composition (taken from Eskom document: March 2019)

	Solid-State (Li-Ion)		Zinc-Bromide Flow			Vanadium Redox Flow		
	Footprint (m²)	**Volume (m³)**	**Footprint (m²)**	**Volume (m³)**	**Electrolyte (l)**	**Footprint (m²)**	**Volume (m³)**	**Electrolyte (l)**
1 MW with NO Efficiency Factor	90	16	200	54	54 400	152	168	168 000
1 MW with 60% Efficiency Factor	150	27.2	333	91	90 667	253	280	280 000

It is proposed that Witzenberg Substation will accommodate a 11MW BESS installation, with a minimum of 81.60m³ of electrolyte if only solid-state battery is installed and between 272m³ a maximum of 500m³ if flow battery is installed. The following additional Infrastructure is required for the BESS site:

- Network integration equipment (e.g. power cables, control cables, isolators, circuit breakers, transformers, etc.) will be required to connect the new BESS to existing infrastructure at the Substations;
- Each site may also require additional fencing, security equipment, lighting, and/or control room upgrades;

- Where possible, the BESS containers will be placed on the existing Substation platform. Where there is insufficient space, the Substation platform will be extended (compacted fill, earth protection layer and stone chip) to accommodate the BESS containers. All works will, however, occur within the Eskom property;
- Existing access roads to the Substations may also need to be lengthened, realigned or upgraded to ensure easy access to the BESS, specifically for low-bed trucks during construction to deliver and install the BESS containers onto the platform;
- A temporary laydown area and site camp will be required at the site during construction.
- Underground cables within the existing Substation footprint will connect the BESS to the Substation and feeder bay extensions;
- Storm-water management measures to be implemented on site; and
- Installation of lightning masts.

Refer to the Facility Illustrations appended in **Appendix B.**

1.4 Need and Desirability for the proposed project

In terms of 3(1)(f) of Appendix 1 of NEMA 2014 EIA Regulations, as amended, a Basic Assessment must include a discussion of the need and desirability for a proposed project. Needs and desirability support the Environmental rights as set out in Section 24 of the Constitution, as well the relevant municipal plans such as Municipal Integrated Development Plans (IDP), Spatial Development Frameworks (SDF) and Environmental Management Frameworks (EMF). Needs and desirability supports Sustainable development by ensuring that the proposed activity is ecologically, economically and socially sustainable. *As discussed, under **Section 1.1** of this report, the establishment of the BESS site is required for Eskom to meet its requirements for the provision of clean, reliable and affordable electricity in South Africa.*

In addition to the benefits of the BESS as discussed in **Section 1.1,** the BESS will also increase access to reliable, affordable electricity in South Africa, encouraging policies to support the adoption of energy storage technologies, the following are the additional benefits of the BESS Technology:

- The key benefits of the proposed Battery Energy Storage System include:
- The adoption of energy storage technologies could provide a cost-effective way of improving the capacity of South Africa’s electricity grid;

- The successful integration of renewable electricity generation sources, especially intermittent power sources such as solar and wind;
- Address the electricity distribution maintenance backlog;
- Fast track the process to upgrade an aging fleet of coal-fired power stations for environmental compliance, and to replace those stations reaching end of life;
- Loss reduction by local load/generation balancing; and
- Reliability improvement in cases where a network is performing poorly due to a single electrical infeed and frequent weather or age related faults.

1.5 Need and Desirability for the proposed project location

Despite the benefits of BESS listed in **Section 1.4**, this technology cannot simply be classified as Renewable energy as it has a 10 to 15 year cycle unlike energy that comes from sources that are continually replenished, such as sunlight, wind, rain, tides, waves, and geothermal heat. However due to its location within the Western Cape where the nearest Solar PV farm is located 25kms from the Witzenberg Substation, by improving the overall efficiency of the power grid, storage accelerates the broader adoption of similar renewable energy.

This makes the location of the Witzenberg Substation ideal for future integration with similar wind and solar farms. Technical reasons for which the Witzenberg Substation site was selected include:

- Adequate space within the Substation to accommodate battery containers; and
- Prime distribution Substation within the Western Cape which requires network strengthening to support the local farmer's needs.

1.6 Applicable NEMA Listed Activity

The Witzenberg Substation is located within an area classified as a Protected Area and therefore impacts on indigenous vegetation and fauna must be assessed. As mentioned, the proposed development activity has triggered the NEMA Listed activity with regards to the *handling or storage of a dangerous good, where such storage has a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres*. A Basic Assessment process must be undertaken in terms of the NEMA Environmental Impact Assessment (EIA) Regulations, 2014 as amended as the surrounding environment could potentially be impacted during the construction and operation phases of the BESS. Activity 14, Listing Notice 1 of the above-mentioned regulations is triggered and in terms of Section 24(1) of NEMA, the potential impacts on the environment that are associated with listed activities

must be considered, investigated, assessed and reported to DEFF as the Competent Authority (CA hereafter) based on Section 43(2) of NEM:WA, 2008, as the Licensing Authority for the Witzenberg BESS site. The Basic Assessment process for the Witzenberg BESS site, will be conducted in accordance with Section 19 -20 and Appendix 1 of the NEMA EIA regulations, 2014, as amended.

1.7 The objectives of the Basic Assessment Process

The main objectives of the Basic Assessment, in terms of the regulatory requirements stipulated in *Appendix 1* of the 2014 NEMA EIA Regulations, are to:

(a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
(b) identify the alternatives considered, including the activity, location, and technology alternatives;
(c) describe the need and desirability of the proposed alternatives;
(d) through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine—

(i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
(ii) the degree to which these impacts—
(aa) can be reversed;
(bb) may cause irreplaceable loss of resources; and
(cc) can be avoided, managed or mitigated; and

(e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to—

(i) identify and motivate a preferred site, activity and technology alternative;
(ii) identify suitable measures to avoid, manage or mitigate identified impacts; and
(iii) identify residual risks that need to be managed and monitored.

1.8 Structure of the Basic Assessment Report

This report has also considered the requirements outlined in Appendix 1 of the NEMA EIA Regulations 2014, as amended regarding the content of the Basic Assessment Report (BAR hereafter). In

addressing these requirements, this BAR is divided into **10 Chapters**, the contents of which will be presented as follows in this report:

- **Chapter 1** introduces the background to the development proposal and profiles its proponents. Furthermore, this chapter provides an indication of the BA process that will be followed as well as providing insights into the legislative requirements that have resulted in the need for this process;
- **Chapter 2** provides the legislative framework for the BA process and the context of the proposed development. The legislative framework includes national and provincial legislation as well as planning framework which will have to be considered in the BA process;
- **Chapter 3** is a detailed description of the adopted Basic Assessment Methodology for the project;
- **Chapter 4** is a description of the receiving environment associated with the proposed activities;
- **Chapter 5** is a description and comparative assessment of the alternatives that were considered for the project;
- **Chapter 6** details the Public Participation Process undertaken for the project. It also summarises key outcomes of the process;
- **Chapter 7** discusses the Impact Assessment Methodology;
- **Chapter 8** is a description and assessment of environmental impacts; and
- **Chapter 9** provides the Environmental Impact Statement conclusion to the report as well as recommendations.
- **Chapter 10** presents a Bibliography for the report.

1.9 Project Team

This section of the BAR provides the, including contact details, of the key stakeholders (Applicant's representative, Environmental Assessment Practitioner and the Project Reviewer. These details are outlined in **Table 4** below.

Table 4: Application details

Applicant's representative	Environmental Impact Practitioner	Project Reviewer
Name: Donald Matjuda	**Name:** Nyaladzi Nleya	**Name:** Dirk Prinsloo

Designation: Environmental Assessment Practitioner Tel: (021) 980 3364 Cell: 0832397462 **e-mail:** MatjudD@eskom.co.za	**Designation**: Environmental Impact Assessment Practitioner **Tel:** 011 312 2537 **Fax:** 011 805 1950 **e-mail:** environment@gaenvironment.com/ nyaladzin@gaenvironment.com	**Designation**: Principal Environmental Assessment Practitioner Tel: 021 462 6047 **e-mail**: dirkp@gaenvironment.com

This BAR was prepared by **Nyaladzi Nleya,** an Environmental Assessment Practitioner (EAP) employed by GA Environment. His CV is included as **Appendix H** of this report. **Nyaladzi** holds a B.Sc. (Hons) in Applied Environmental Science degree with 10 years of working experience in the Environmental Management Field. Nyaladzi specialises in, among various environmental management tools, Integrated Environmental Management (IEM), Environmental Impact Assessments (EIAs), Basic Assessments (BAs). Nyaladzi has working knowledge of Spatial Analyses and Mapping with the use of ArcGIS. He has been involved in various footprint and linear projects, mixed-use developments as well as Conservation Planning and Biodiversity Management.

1.10 Specialist studies

The Basic Assessment process included a specialist Fresh Water Impact Assessment undertaken by a Wetland Specialist whose details are indicated in **Table 4.**

Table 5: Specialist Studies and contact details

Fresh Water Impact Assessment		
Company Name	Contact Person	Contact Details
Blue Science	Mr Dana Grobler	dana@bluescience.co.za Tel: (021) 851 0555

The Terms of reference for the specialist are discussed in **Chapter 3.6** and the specialist study is attached as **Appendix F1** of this report**.**

1.11 Assumptions, Gaps and Limitations

The following key gaps, assumptions and limitations were made when conducting the BA:

- The applicants preferred supplier and type of technology is not known at this stage of the project and therefore Eskom has not stated a preference to any type of technology, or supplier.
- Eskom has the necessary skills and know-how to oversee the maintenance of the BESS site while ensuring the protection of the natural environment;
- Eskom will ensure that construction activities are monitored by an Environmental Control Officer (ECO);
- The necessary Environmental and SABS legislation, guidelines and standards will be considered during the design and operation of the BESS site; and
- The scope of this BAR is limited to the installation of BESS infrastructure within the Witzenberg Substation site and does not include areas outside the perimeter fence of the existing Substation.

It can be thus concluded that other than the gaps in knowledge, assumptions provided above, and the information presented in various sections of this report, the information used in this report was adequate for the purposes of the current impact assessment.

2 LEGISLATIVE FRAMEWORK

This section of the BAR discusses applicable legal provisions and the legal context for the proposed Witzenberg BESS site. It provides a review of legislation, regulations, policies and guidelines, which are applicable to, or have implications, for the proposed project. The contents of this report are based on a review of the information that was available at the time of the compilation of the report. The discussion in this chapter is by no means an exhaustive list of the legal obligations of the applicant in respect of environmental management for the proposed development.

2.1 National Legislation

2.1.1 Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)

The environmental right is mentioned in Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996). This states the following:

"...*everyone has the right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation, and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*".

The State must therefore respect, protect, promote and fulfil the social, economic and environmental rights of everyone and strive to meet the basic needs of previously disadvantaged communities. The Constitution therefore recognises that the environment is a functional area of concurrent national and provincial legislative competence, and all spheres of government and all organs of state must cooperate with, consult and support one another if the State is to fulfil its constitutional mandate.

The issuing of an environmental authorisation for the storage and handling, of a dangerous good at the existing Witzenberg Substation will ensure that the environmental right enshrined in the Constitution contributes to the protection of the biophysical and socio- economic environment.

2.1.2 National Environmental Management Act, 1998 (Act No. 107 of 1998)

In order to bring section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) into realisation, the National Environmental Management Act, 1998 (NEMA) (Act No. 107 of 1998) was promulgated to serve to *'provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance*

and procedures for co-ordinating environmental functions exercised by organs of state; to provide for certain aspects of the administration and enforcement of other environmental management laws; and to provide for matters connected therewith'. NEMA is main Environmental Legislation in South Africa and other Specific Environmental Management Acts (SEMA's) support its objectives.

Examples of SEMA's include the following:

- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008);
- National Water Act, 1998 (Act No. 36 of 1998);
- National Heritage Resources Act, 1999 (Act No. 25 of 1999);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004); and
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)

Some specific Environmental Management Legislation is also discussed in Sections 2.1.3 to 2.1.8. The key principles of NEMA as outlined in Section 2 can be summarised as follows:

- sustainability must be pursued in all developments to ensure that biophysical and socio-economic aspects are protected or;
- there must be equal access to environmental resources, services and benefits for all citizens including the disadvantaged and the vulnerable. Adverse environmental impacts shall be distributed fairly among all citizens;
- environmental governance must include the participation of all Interested and Affected Parties who must be catered for to allow their effective participation;
- Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- The polluter pays principle must be applied in all cases where any person has caused pollution or undertaken any action that led to the degradation of the environment.

2.1.2.1 National Environment Management Act, 1998

The National Environmental Management Act (Act No. 107 of 1998) has been amended numerous times to better meet its overall objective of the protection of the environment.

The amendments to NEMA include but are not limited to:

- National Environmental Management Act, (Act No. 56 of 2002);
- National Environmental Management Act (Act No. 8 of 2004);
- National Environmental Management Act (Act No. 46 of 2003);

2.1.2.2 NEMA Environmental Impact Assessment Regulations

In terms of section 24(2) of NEMA, the Minister and or any MEC in concurrence with the Minister may identify activities which require authorisation as these activities may negatively affect the environment. The Act requires that in such cases the impacts must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorising, permitting, or otherwise allowing the implementation of an activity. The NEMA EIA Regulations guide the processes required for the assessment of impacts of Listed Activities.

The requirement for the undertaking of Environmental Impact Assessments and Basic Assessments began in 1997 with the promulgation of the EIA Regulations under the Environment Conservation Act, 1989 (ECA) (Act No. 73 of 1989). These were followed by the 2006, 2010 and 2014 regulations. **Table 5** is a summary of the progression of the EIA regulations to date.

Table 6: Summary of the South African EIA regulations from inception to date

EIA Regulations	Government Gazette
EIA Regulations promulgated in terms of the ECA, Act No 73 of 1989	GNR 1182 & 1183: Government Gazette No 18261, 5 September 1997
Amendment of the ECA EIA Regulations	GNR 670 and GNR 672 of 10 May 2002, Government Gazette No 23401
2006 EIA Regulations promulgated in terms of the NEMA, Act No 107 of 1998	GNR 385, 386 and 387 Government Gazette No 28753, Pretoria, 21 April 2006
2010 EIA Regulations promulgated in terms of the NEMA, Act No 107 of 1998	GNR 543, 544, 545 and 546 Government Gazette No 33306, Pretoria, 18 June 2010
2014 EIA Regulations promulgated in terms of the NEMA, Act No 107 of 1998	GNR 982, 983, 984 and 985 Government Gazette No 38282, Pretoria, 04 December 2014
Current Amendment of the 2014 EIA Regulations promulgated in terms of the NEMA, Act No 107 of 1998	GNR 982, 983, 984 and 985 Government Gazette No 40772, Pretoria, 07 April 2017

The Basic Assessment for the proposed installation of BESS at the Witzenberg Substation is being undertaken in terms of the NEMA EIA Regulations, 2014, as amended on the 07th April 2017 (**Table 6**).

Table 7: Applicable listing in terms of the EIA Regulations for BESS installation at the Witzenberg Substation

Government Notice No 983 Listing Notice 1		
Activity No(s):	The relevant Basic Assessment Activity as set out in Listing Notice 1 (GN R983)	Describe the portion of the proposed project to which the applicable listed activity relates.
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 chemical composition of the electrolyte for each battery technology is considered hazardous, containing toxic materials. The combined capacity of containers housing the batteries will exceed 80 cubic meters but will be less than 500 cubic metres.

2.1.3 National Environmental Management: Waste Act 59 of 2008 (Act No. 59 of 2008)

This Act aims to regulate waste management to protect human health and the environment by putting measures in place to prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources. The Applicant shall ensure compliance with this Act by implementing practical measures to avoid or reduce unnecessary generation of waste and where the waste is generated measures such as re-using, recycling and recovery of 1waste shall be encouraged. These general principles of responsible waste management are also incorporated in the EMPr to manage waste related activities during construction.

The National Norms and Standards for the Storage of Waste was promulgated in terms of the provision stipulated in the NEMWA, and came into effect on the 29 November 2013, GN No. 926. The National Norms and Standards for the Storage of Waste aims to regulate both the storage of general and hazardous waste. The schedule provides standards for the location, construction and design as well as the operation of waste management facilities. Furthermore, the schedule provides the minimum requirements for the both above ground and underground waste storage facilities and containers.

In the event that malfunctioning batteries must be stored on site as waste, this must be undertaken as per the requirements of the Norms and Standards.

2.1.4 National Environmental Management: Biodiversity Act (Act 10 of 2004): National Threatened or Protected Species Regulations and Species Lists, 2015

The objective of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) is to provide for the management and conservation of South Africa's biodiversity within the framework of NEMA; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute; and for matters connected therewith. The objectives of NEM: BA are:

- Within the framework of the National Environmental Management Act, to provide for:
  - the management and conservation of biological diversity within the Republic and of the components of such biological diversity;
  - the use of indigenous biological resources in a sustainable manner; and
  - the fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources;
- To give effect to ratified international agreements relating to biodiversity which are binding on the Republic;
- To provide for co-operative governance in biodiversity management and conservation; and
- To provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

Chapter 4, Part 2 of the National Environmental Management: Biodiversity Act (NEMBA; Act 10 of 2004) provides for the listing of Threatened or Protected Species (TOPS). Species listed as such, in terms of the TOPS Regulations (2015) and the TOPS Lists of Species (2015), are further classified as Threatened (Critically Endangered, Endangered and Vulnerable) or Protected. The Act defines these classes as follows:

- *Critically Endangered species*: any indigenous species facing an extremely high risk of extinction in the wild in the immediate future;
- *Endangered species*: any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species;
- *Vulnerable species:* any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species; and
- *Protected species*: any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Witzenberg Substation is located within an area classified as a Protected Area and the impact of the proposed BESS infrastructure and the applicability of regulations governing Protected Species must apply.

The TOPS Regulations (2015) further regulate the permit system set out in NEMBA as it applies to restricted activities involving specimens of listed threatened or protected species, where restricted activities involve those activities that have a direct impact on listed species such as hunting, catching, collecting, picking, chopping off, damaging or destroying, importing and export from Republic, possessing, keeping or exercising physical control over, breeding or propagating, conveying or translocating, selling or buying, receiving or donating or any other prescribed activity involving a TOPS specimen.

An understanding of NEMBA is crucial to the project as the site is located within a Protected Area where TOPS may occur.

2.1.5 National Heritage Resources Act, 1999 (Act No. 25 of 1999)

The objective of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) is to introduce an integrated system for the management of national heritage resources. The identification, evaluation and assessment of any cultural heritage site, artefact or find in South Africa is required by this Act. Section 38 of this Act pertains to Heritage resources management and Section 38(1) states the following

Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as—

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50 m in length;

(c) any development or other activity which will change the character of a site—

(i) exceeding 5 000 m2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Although the proposed BESS site and additional infrastructure does not trigger any activity under section 38 of the National Heritage Resources Act, other sections of the Act were consulted and it was established that Section 36 of the act provides for the protection of graves and burial grounds, where these are encountered. A through assessment of the Witzenberg site during each site visit did not reveal any graves of burial grounds within the Substation or immediate surroundings. Should any graves be uncovered during the construction phase of the project, the applicant and appointed ECO must ensure in terms of section 38(6) of the Act, the responsible heritage resources authority Provincial Heritage Western Cape (HWC) as well as the South African Police Service (SAPS).

2.1.6 National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)

The National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) provides for a range of protected areas: protected environments, special nature reserves and natures reserves. South Africa has much valuable biodiversity outside of protected areas, but this is disappearing at an alarming rate. It has been recognised that in order to effectively conserve South Africa's biodiversity, conservation efforts must focus outside of formerly protected reserves, considering 80% of the country's most scarce and threatened habitats are privately owned. It is clearly not possible for government to purchase all the land identified as high priority in terms of habitat or threatened ecosystems to add it to our system of state-owned protected areas.

This requires a new approach to conservation extension and a shift away from reactive extension (i.e. responding to problems and enforcing regulations and permitting procedures) to proactive extension (i.e. engaging with a landowner before a problem is created) where stewardship is encouraged. For these purposes, extension officers need to be better equipped with people skills relating to relationship building, conflict resolution, land negotiation, as well as hands-on knowledge, in the form of practical guidelines for managing natural ecosystems.

As previously mentioned, the proposed Witzenberg Substation is located in an area classed as a Protected Area in terms of the National Environmental Management: Protected Areas, 2003 (NEMPAA; Act No. 57 of 2003) (MPE EMF, 2007).

2.1.7 National Forests Act, 1998 (Act No. 84 of 1998): Protected Tree Species, 2017

In terms of the National Forests Act (Act No. 84 of 1998) certain tree species can be identified and declared as protected. According to this Act, protected tree species may not be cut, disturbed, damaged or destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold

except under a licence granted by the Department of Agriculture, Forestry and Fisheries (DAFF) or a delegated authority. Applications for such activities should be made to the responsible official in each province. Each application is evaluated on merit (including site visits) before a decision is taken whether or not to issue a licence (with or without conditions). Such decisions must be in line with national policy and guidelines. An updated list of protected tree species was published under section 12(1) (d) of the National Forests Act (Act No 84 of 1998) on 8 September 2017.

The applicability of the National Forests Act to the project is in the event that disturbance or removal of Threatened of protected tree species is required to make allowance for the BESS site or associated infrastructure.

2.1.8 Carbon Tax Act No 15 of 2019

The Carbon Tax Act gives effect to the polluter-pays-principle for large emitters and helps to ensure that firms and consumers take the negative adverse costs (externalities) into account in their future production, consumption and investment decisions. Firms are incentivized towards adopting cleaner technologies over the next decade and beyond.

The Government of South Africa has outlined its strong commitment to play its part in global efforts to mitigate GHG emissions as outlined in the National Climate Change Response Policy (NCCRP) of 2011 and the National Development Plan (NDP) of 2012. South Africa subsequently set its own domestic targets as outlined in the Nationally Determined Contribution (NDC), which was incorporated as the South African commitment in the Paris Agreement (convened by the United Nations Framework Convention on Climate Change (UNFCCC). South Africa ratified the Paris Agreement in November 2016. The carbon tax forms an integral part of ensuring that South Africa meets these targets. The carbon tax will initially only apply to scope 1 emitters in the first phase. The first phase will be from 1 June 2019 to 31 December 2022, and the second phase from 2023 to 2030.

The introduction of the carbon tax will also not have any impact on the price of electricity for the first phase. This will result in a relatively modest carbon tax rate ranging from R6 to R48 per tonne of CO2 equivalent emitted, which is a relatively low tax rate to further provide current significant emitters time to transition their operations to cleaner technologies through investments in energy efficiency, renewables and other low carbon measures.

A review of the impact of the tax will be conducted before the second phase, after at least three years of implementation of the tax, and will take into account the progress made to reduce GHG emissions in line with our NDC Commitments.

2.1.9 Other National Legislation concerning or related to the environment

Various other laws regarding the protection of the environment that are relevant to this BA include:

- Environment Conservation Act, 1989 (Act No. 73 of 1989) (as amended);
- Hazardous Substances Act, 1973 (Act No. 15 of 1973);
- Land Administration Act, 1995 (Act No. 2 of 1995);
- Water Services Act, 1997 (Act No. 108 of 1997); and
- Occupational Health and Safety Act, 1993 (Act 85 of 1993).

2.2 South African National Standard (SANS)

A standard is an agreed, repeatable way of undertaking specific tasks in a measured and accurate manner. It is a published document that contains a technical specification or other precise criteria designed to be used consistently as a rule, guideline, or definition. Standards increase the reliability and the effectiveness of many goods and services we use.

The South African Bureau of Standards (SABS) has more than sixty years of experience in its core function, namely, the development of national standards and maximising the benefits of international standards through adoptions, which enhances the competitiveness of the South African industry and advance international trade.

2.2.1 SANS 10234-A: Classification and labelling of chemicals in accordance with GHS

The handling, storage and management of the electrolyte (dangerous goods) contained in the battery containers must be undertaken in terms of the SANS standard 10234-A: List of classification and labelling of chemicals in accordance with the Globally Harmonized System (GHS).This standard ensures that staff that will operate and maintain the battery infrastructure are protected from hazards to their health and safety. This standard will ensure improved quality and reliability and better operation and compatibility between products and services.

Although some batteries maybe refilled on site the majority will be imported in containers with a secondary compartment to prevent leakage or spillage of electrolyte. The maintenance and management of BESS infrastructure must be harmonized in terms of the SANS 10234 standard to ensure the safe handling of hazardous substances, including waste, and safe transportation. This standard gives, in tabular form, the GHS classification and label elements of the most commonly used chemicals. The classification and labelling of each chemical assists in providing a guideline on how each chemical must be handled and actions that must be undertaken in the event that workers might be exposed to them during maintenance or transportation of the

batteries and the potential exposure thereto.

2.3 International Treaties

A treaty is an agreement under international law entered into by actors in international law, namely sovereign states and international organizations. A treaty may also be known as an (international) agreement, protocol, covenant, convention, pact, or exchange of letters, among other terms (Slomanson, 2019). Regardless of terminology, all these forms of agreements are, under international law, equally considered treaties and the rules are the same. Treaties are Instruments in written form only. The party is a state that has consisted to do this or that as reflected in the treaty. In essence a treaty is a voluntary decision to place limitation over their sovereignty. Most countries would enter treaties through an international body such as the United Nations.

Internationally, once in force, treaties are binding on the parties and become part of international law. Treaties are one of the oldest forms of international law. They show the relation and agreements that states have. However, with the development and the expansion of international law and an international presence, treaties have taken a larger role in international relations. Unlike treaties from previous eras, treaties today can include almost any country or living thing in the world.

2.3.1 The Basel Convention on the Control of Transboundary Movements of Hazardous wastes and Their Disposal

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted on 22 March 1989 by the Conference of Plenipotentiaries in Basel, Switzerland, in response to a public outcry following the discovery, in the 1980s, in Africa and other parts of the developing world of deposits of toxic wastes imported from abroad.

Awakening environmental awareness and corresponding tightening of environmental regulations in the industrialized world in the 1970s and 1980s had led to increasing public resistance to the disposal of hazardous wastes and to an escalation of disposal costs. This in turn led some operators to seek cheap disposal options for hazardous wastes in Eastern Europe and the developing world, where environmental awareness was much less developed, and regulations and enforcement mechanisms were lacking. It was against this background that the Basel Convention was negotiated in the late 1980s, and its thrust at the time of its adoption was to combat the “toxic trade”, as it was termed.

The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as

"hazardous wastes" based on their origin and/or composition and their characteristics. The provisions of the convention center around the following principal aims:

- the reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes, wherever the place of disposal;
- the restriction of transboundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environment;
- tally sound management; and
- a regulatory system applying to cases where transboundary movements are permissible.

The first aim is addressed through a number of general provisions requiring States to observe the fundamental principles of environmentally sound waste management (article 4). A number of prohibitions are designed to attain the second aim: hazardous wastes may not be exported to Antarctica, to a State not party to the Basel Convention, or to a party having banned the import of hazardous wastes (article 4). Parties may, however, enter into bilateral or multilateral agreements on hazardous waste management with other parties or with non-parties, provided that such agreements are "no less environmentally sound" than the Basel Convention (article 11). In all cases where transboundary movement is not, in principle, prohibited, it may take place only if it represents an environmentally sound solution, if the principles of environmentally sound management and non-discrimination are observed and if it is carried out in accordance with the Convention's regulatory system.

The regulatory system is the cornerstone of the Basel Convention as originally adopted. Based on the concept of prior informed consent, it requires that, before an export may take place, the authorities of the State of export notify the authorities of the prospective States of import and transit, providing them with detailed information on the intended movement. The movement may only proceed if and when all States concerned have given their written consent (articles 6 and 7). The Basel Convention also provides for cooperation between parties, ranging from exchange of information on issues relevant to the implementation of the Convention to technical assistance, particularly to developing countries (articles 10 and 13). The Secretariat is required to facilitate and support this cooperation, acting as a clearing-house (article 16). In the event of a transboundary movement of hazardous wastes having been carried out illegally, i.e. in contravention of the provisions of articles 6 and 7, or cannot be completed as foreseen, the Convention attributes responsibility to one or more of the States involved, and imposes the duty to ensure safe disposal, either by re-import into the State of generation or otherwise (articles 8 and 9).

Eskom and the appointed Contractors must ensure they engage with DEFF and Eskom have to obtain the relevant permit if the preferred technologies and its constituents trigger the requirements of this treaty as it's a lengthy process with multiple stakeholders and information requirements.

3 BASIC ASSESSMENT METHODOLOGY

The NEMA Regulations of 2014, as amended identify three separate administrative processes for EIAs, depending on the nature of the activity. A Basic Assessment process (Listing Notice 1) is identified for those activities that have less of a possible detrimental impact to the environment. A Scoping and EIA process (Listing Notice 2) is necessary for those activities, which are identified as having more of a possible detrimental impact on the environment, whereas Listing Notice 3 relates to identified activities that would require environmental authorisation prior to the commencement of those activities in specific identified geographical areas only. The Basic Assessment process required for the clearing of indigenous vegetation include the undertaking of a Basic Assessment in line with the NEMA EIA Regulations, 2014.

3.1 Registration of the Application with the Competent Authorities

An Application Form for Environmental Authorisation was completed and will be submitted together with the DBAR to the DEFF for review and consideration.

3.2 Public Participation Process

A Public Participation Process (PPP) consistent with Chapter 6 of the NEMA EIA Regulations 2014, as amended (Government Notice R. 982 in Government Gazette No. 40772 of 07 April 2017) was followed for the project. The PPP undertaken for the project included the following:

- the identification of Interested and Affected Parties;
- the compilation of an I&AP database;
- the placement of site notices at visible and accessible locations close to the site;
- the placement of a newspaper advertisement in a local newspaper
- the distribution of Notification Letters to adjacent land owners and other parties on an on-going basis since the notification period commenced in September 2018.

The details of the PPP undertaken to date is discussed in detail in **Chapter 6** of this report.

3.3 Draft Basic Assessment report

The Draft Basic Assessment Report was compiled and issued out for Public and Authority review for the legislated period of at least 30 days from **6th November 2019 until 6th December 2019**. It is important to highlight that the review period was determined in line with the reckoning of days as defined in Regulation 3 of the NEMA EIA Regulations, 2014, as amended. A hardcopy of the DBAR was placed for I&AP's at the Prince

Alfred's Hamlet Library. The following commenting authorities were provided with a copy of the report in both electronic as well as hardcopy format:

- Western Cape Department of Environmental Affairs and Development Planning;
- Cape Winelands District Municipality;
- Witzenberg Local Municipality;
- Department of Water and Sanitation; and
- Cape Nature.
- Heritage Western Cape

Proof of submission of reports to these Authorities has been provided in **Appendix E4**.

3.4 Requirement to submit a report generated by the national web-based environmental screening tool

On 5 July 2019, The Department of Environment, Forestry and Fisheries gave Notice of the Requirement to submit a Report generated by the National Web-based Environmental Screening Tool in terms of section 24(5)(h) of the NEMA, 1998 (Act No 107 of 1998) and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended. The submission of this report is compulsory when submitting an application for environmental authorisation in terms of regulation 19 and regulation 21 of the Environmental Impact Assessment Regulations, 2014 effective from 4 October 2019. A Screening Report was generated on 22 August 2019 and has been attached as **Appendix I** of this report. The main findings to be discussed from the screening report are listed below.

3.4.1 Proposed Development Area Environmental Sensitivity

The following summary of the development footprint environmental sensitivities were identified in the Environmental Screening Report. The footprint environmental sensitivities for the proposed development footprint (**Table 7**) as identified and were verified on site by the EAP and appointed specialist.

Table 8: Environmental Sensitivity of Project Area (DEFF Screening Tool)

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme		X		
Aquatic Biodiversity Theme				X
Archaeological and Cultural Heritage Theme		X		
Civil Aviation Theme			X	
Palaeontology Theme			X	
Defence Theme				X
Terrestrial Biodiversity Theme	X			

The Terrestrial Biodiversity Theme is noted, and it is imperative that this Basic Assessment assesses the potential impacts and ensure that the proposed activity does not impact on areas outside the Witzenberg Substation.

3.4.2 Specialist Assessments Identified

Based on the environmental sensitivities of the proposed project area summarised in **Table 7**, the following list of specialist assessments were identified by the Environmental Screening Report. The majority of Specialists studies identified in **Table 8** were not undertaken as the proposed installation of BESS infrastructure will occur within the Substation and is unlikely to have an impact beyond its confines.

Table 9: Specialist Assessments Identified

No	Specialist Assessment	EAP Motivation
1	Agricultural Impact Assessment	The proposed installation of BESS infrastructure will not affect agricultural land as it will take place within the existing Substation.
2	Archaeological and Cultural Heritage Impact Assessment	The footprint for BESS infrastructure is within a developed Substation which measures less than 5000m² and will unlikely occur cultural or heritage artefacts.
3	Palaeontology Impact Assessment	Although the site has rock outcrops the existing infrastructure and a site assessment by the EAP suggests that a Specialist Assessment is not required.
4	Terrestrial Biodiversity Impact Assessment	The footprint for BESS infrastructure is within a developed Substation and will not have a direct impact on Terrestrial Biodiversity.
5	Aquatic Biodiversity Impact Assessment	A Fresh water Impact Assessment was undertaken by BlueScience and attached to this report as **Appendix F1**.
6	Hydrology Assessment	The installation of BESS infrastructure will unlikely affect ground or water. The Fresh Water Impact Assessment has been determined sufficient to address the impacts to surface water and stormwater drainage impacts. A stormwater management plan must be developed for each BESS infrastructure once the technology to be used is finalised.
7	Traffic Impact Assessment	The Witzenberg Substation is easily accessible from the Witzenberg Valley Road where little in terms of traffic count was noted during a site visit. It is unlikely that the development will have an impact on traffic in this area.

8	Geotechnical Assessment	The BESS infrastructure will not require deep foundations and its weight/load is less or matches existing infrastructure within the Substation.
9	Health Impact Assessment	The proposed BESS infrastructure will be introduced to the Substation in containers with secondary containment and do not pose a threat to human health as confirmed by several background studies quoted in the BAR have been undertaken.
10	Socio-Economic Assessment	The BESS infrastructure is a development in line with the existing Substation infrastructure and therefore does not introduce an impact that must be assessed for Socio-economic reasons.
11	Air Quality Impact Assessment	The proposed BESS infrastructure does not produce emissions and therefore this assessment is not required.

3.5 Specialist Studies

In accordance with the requirements of Appendix 6 of the NEMA EIA Regulations, 2014 as amended, and the National web-based environmental screening tool, the need for a Fresh Water Impact Assessment was identified for the following reasons;

- The Witzenberg Substation is located adjacent to two watercourses, there are associated potential impacts upon freshwater ecosystems.
- The site is located within an area classed as a Protected Area (see Map in **Appendix A)**; and
- The site is located adjacent to what could be considered a Pristine Area (see site photographs in **Appendix C).**

The Terms of reference for the Fresh Water Impact Assessment were as follows:

- Take cognizance of, and comply with, the substantive content requirements outlined within Appendix 6 of GN R982, which outlines the legal minimum content requirements for specialist studies in terms of the 2014 NEMA EIA Regulations;
- Indicate and confirm the presence of surface water resources present on and or adjacent to the site (including but not limited to perennial rivers, non-perennial rivers, permanent wetland(s), seasonal wetland(s) and artificial wetland(s)), and where relevant provide a description of each. Watercourses must be illustrated on an aerial photograph or suitable map;
- An overview of the ecological status of the watercourses that would potentially be affected by the proposed activities;

- Comments on any rare or endangered aquatic species or habitats encountered or likely to be present in the affected areas should also be identified;

The Fresh Water Impact Assessment Report is attached in **Appendix F** of this BAR.

3.6 Other Supporting Documents to the Basic Assessment

As part of the Basic Assessment for the ESKOM BESS site, an Environmental Management Programme (EMPr), has been compiled in line with Appendix 4 of the NEMA EIA Regulations, 2014, as amended. The EMPr provides guidelines to Eskom as the Project Developers, the Contractor as well as various other members of the technical team on how best to implement the mitigation measures for the proposed activity the site in order to avoid adverse environmental impacts. Refer to **Appendix G** of this Basic Assessment Report for the EMPr.

3.7 Issuing of the Environmental Authorisation

As discussed, since the application will require input from the DEFF, it is understood that following the review of the Final Basic Assessment Report, an Environmental Authorisation (EA) will be issued in terms of Section 24 of NEMA. This Environmental Authorisation will be issued to Eskom as the applicant. It should be noted that the EA may state that the activity may not commence before certain conditions are complied with. The EA may also include any other conditions that DEFF considers necessary for the protection of the environment.

3.8 Appeal Period

After a decision has been reached by DEFF, Chapter 2 of the National Appeal Regulations 2014 makes provision for any affected person to appeal against the decision. Within 20 days of being notified of the decision by DEFF, the appellant must submit the appeal to the appeal administrator. An appeal panel may be appointed at the discretion of the delegated organ of state to handle the case. The appeal panel will then submit its recommendations to that organ of state for a final decision on the appeal to be reached. GA Environment will communicate the decision of the Provincial Authority and the manner in which appeals should be submitted to the MEC and to all I&APs as soon as reasonably possible after the final decision has been received.

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT

This Chapter serves to describe the environmental setting of the area identified whilst the environmental issues that were identified to be of significance are discussed in **Chapter 8** of this report. The Chapter will also provide a description of the overall character and other sensitivities that were identified in the surrounding environment. It must be highlighted that only aspects that are relevant to the project in terms of the environmental setting as well as the nature of the proposed activities are discussed in this section of the report. This Chapter will present both the Biophysical and the Socio-Economic Conditions of the site and its geographical setting.

4.1 Biophysical aspects

4.1.1 Climate

The site has a Mediterranean climate and normally receives about 450 - 600 mm of rain per year (**Figure 9**), mostly during winter. The lowest rainfall (9 mm) is in January and the highest (94 mm) in June. The average midday temperatures for range from 8.9°C in July to 21°C in February (**Figure 10**). The annual rainfall is also substantially higher on the western slopes of the valley than on the eastern slopes. The annual evaporation for the quaternary catchments investigated are 1 850 mm. The average midday temperatures for the area range from 19°C in July to 29°C in January/February. The region is the coldest during July when the mercury drops to 7°C on average during the night (Grobler,2019).

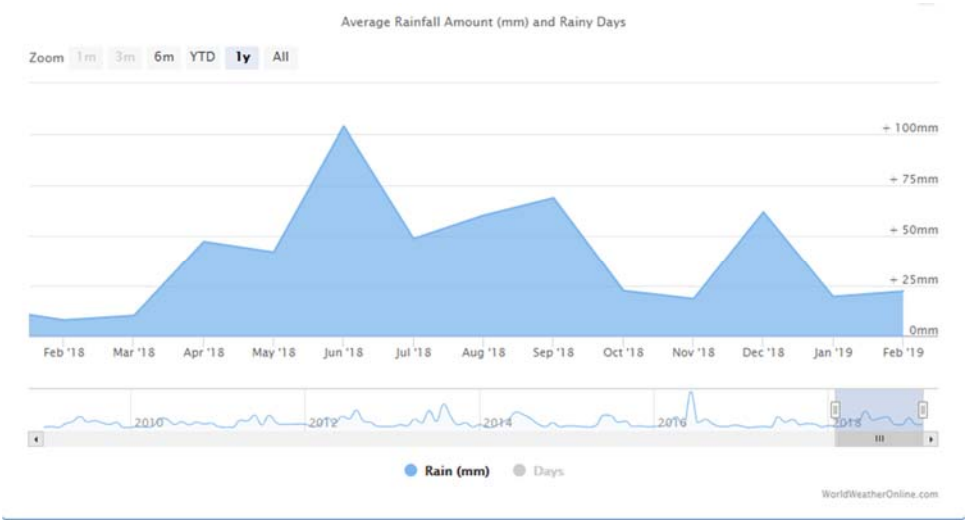

Figure 9: Average rainfall amount in Witzenberg (world weather Online)

An understanding of Climatic conditions, particularly rainfall is crucial to the development as it has an impact on the BESS technical requirements and assist in the planning for construction which should ideally take place during low rainfall in summer.

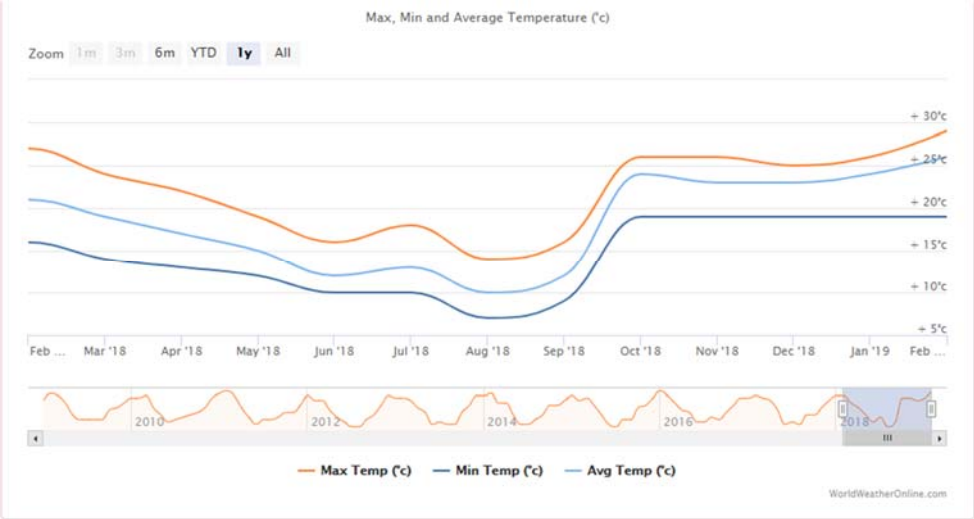

Figure 10: Average Temperature (world weather Online)

4.1.2 Geology

The site is underlain by the *Arenite* formation as shown in the map attached in **Appendix A.** The site is predominantly characterised by rock outcrops as presented in **Figure 11** below**.** Additional photographs of the site indicating the rocky conditions are attached in **Appendix C.**

Figure 11: View towards the north showing the rocky nature of the site

Where deemed necessary for the development, Eskom is advised to undertake Geotechnical studies prior to the construction of the BESS site in order to ensure stability of the proposed infrastructure particularly in instances where containers may have to be placed on top of each other. At the time of the compilation of this report, Eskom planners had not indicated the need for the study.

4.1.3 Protected Areas

The existing Witzenberg Substation is located in an area classed as a Protected Area due to its location within the Winterhoek Mountain catchment Area. The Groot Winterhoek Wilderness is known for its rugged, wild landscape, with exceptional rock formations carved by the elements. The greater Groot Winterhoek conservation area is particularly important for protecting mountain fynbos and wildlife. The greater Groot Winterhoek conservation area is particularly important for protecting mountain fynbos and wildlife. It is also one of Cape Town's sources of fresh, clean water, and is a World Heritage Site.

4.1.4 Heritage

The study area covers the existing Substation which is less than 5000m² and therefore does not trigger any activity under section 38 of the National Heritage Resources Act. The surrounding area is known to be rich in history, with ancient rock paintings by the San and Khoi people, and the oldest farm established in 1875. Early settlers in the area used animals to transport produce and supplies between Porterville and Saron. Their tracks are still visible above Driebosch and Weltevrede. As Groot Winterhoek's name suggests, winters are cold and wet. Winter nights are very cold, with temperatures below freezing. Summers are moderate, but hikers should always be prepared for sudden cold and mist (IDP 2019, Witzenberg Municipality).

4.1.5 Regional Vegetation

4.1.4.1 Regional Vegetation

The study area which constitutes the existing Substation is devoid of any vegetation as the vacant sections are rock and have been cleared of vegetation. The adjacent properties consist of vegetation of a matrix of low, evergreen shrubland with emergent sparse, moderately tall shrubs and a conspicuous graminoid layer. *Proteoid, restioid* and *asteraceous* fynbos types are dominant, with closed-scrub fynbos common along the river courses. *Ericaceous* and *restioid* fynbos found in seeps. The site lies on the southern edge of the Koue Bokkeveld plateau. The drainage through the site arises to the north and west and flows past the site down to the Ceres valley. The Hansiesberg mountain range lies west and north of the site.

Mucina and Rutherford (2006) mapped the natural vegetation types in South Africa on a national scale. The vegetation mapped on the site is Winterhoek Sandstone Fynbos. This vegetation type occurs across the Winterhoek mountains (**Figure 12**) as well as surrounding ranges such as the Skurweberg and Hansiesberg. It occurs across the lower to upper slopes at altitudes ranging from 350 – 1800 meters above mean sea level (mamsl). The soils it occurs on are sandy, acidic and of sandstone origin. The vegetation is typically a closed restio land with sparse low shrubs (**Figure 13**). The vegetation on adjacent properties is fairly intact with a low density of alien trees, however, aliens *Pinus pinaster* and *Acacia mearnsii* were observed along the stream channel. The existing footprint of the Substation where new infrastructure is proposed is already developed and is devoid of vegetation.

Based on an assessment of the Substation site it must be noted that mostly alien vegetation (**Figure 14**) was noted within and in sections around the Substation. It is important to note that due to the Substation's proximity to the identified plant species there is the possibility that some of these species may migrate and blossom within the sandy areas of the Substation. Should these plant species have to be disturbed, damaged, relocated, etc. a permit would have to be obtained from the from the Department of Environment, Forestry and Fisheries (DEFF) and CapeNature prior to its removal.

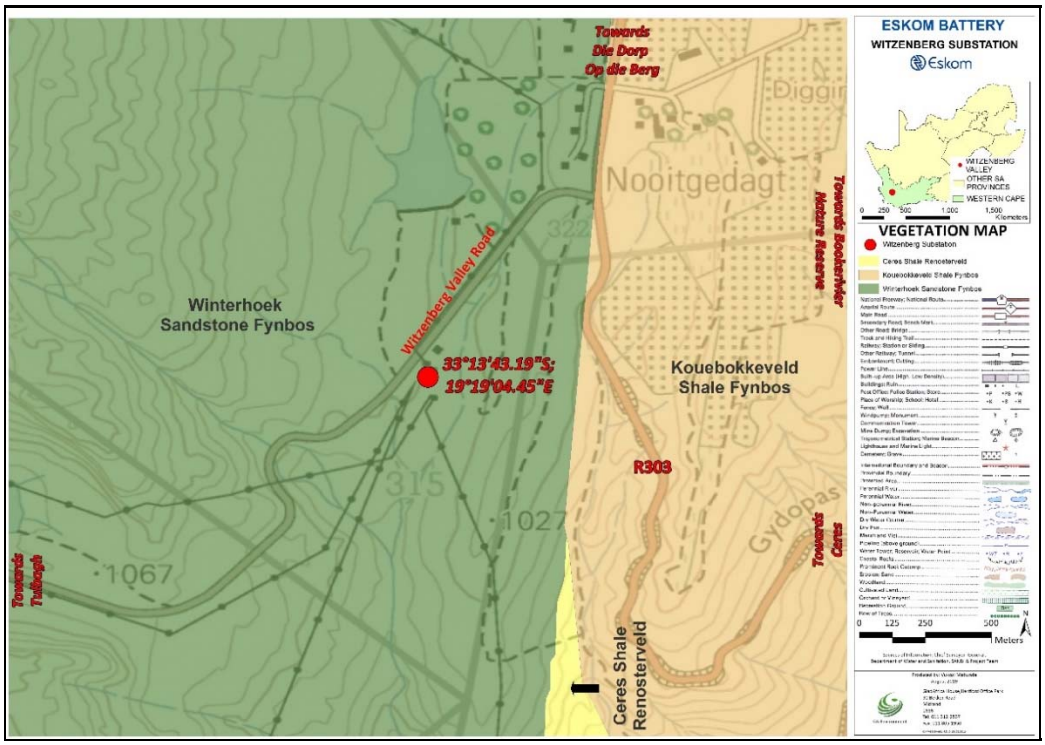

Figure 12: Vegetation classes within the Witzenberg area

Figure 13:Closed-scrub fynbos noted within adjacent land north of the Substation

With regards to trees, none of these occur within the site or in the vicinity. Based on information received from the Department of Agriculture, Forestry and Fisheries (DAFF), *Alien Acacia saligna* and *Hakea sericea* are prominent in this area. If any protected trees are found, such species may not be cut, disturb, remove or damage without a license in terms of National Forests Act 84 of 1998.

Figure 14:Moderately tall shrubs noted west of the Substation

4.1.6 Hydrological Characteristics

The freshwater features in close proximity to the site consist of two unnamed watercourses which flow past the eastern and western boundaries of the sub-station. The western stream is considered to be largely natural, with the only impact upon it being the Witzenberg Valley Road, through which it passes via pipe culverts. This stream is considered to be of moderate ecological importance and sensitivity. The eastern stream is modified by an instream dam above the study site which has affected the flow, sediment transport, channel form and riparian vegetation. Although these impacts have taken place it still retains fairly intact riparian habitat. It is considered to be moderately modified but also of moderate ecological importance and sensitivity.

As the proposed activity is restricted to the already developed footprint of the Substation, the only potential impact is water quality impairment as a result of storm water run-off or contaminated spills from the site. These can be mitigated by conducting the construction phase during the summer months when surface water run-off from the site is less likely. Furthermore, good housekeeping and good management of potential contaminants is very important (Grobler 2019).

4.2 Socio economic conditions

Although the site is located within the Witzenberg Local Municipality, this report will focus on the Socio-Economic Conditions of Ward 10 where the site is located. Ward 10 has an area of 343.8 km² and a population 10110 (Census 2011).is bounded by Ward 4 and 98 to the North, Ward 1 to the East and 58, 3 & 7 to the south. The North West border is located to the immediate west of Ward 55. The total area covered by Ward 55 is 112.1 and the density is 253.9 people per km².

Ward 10 comprises of mainly small farming communities with large tracts of vacant land. The information presented in this section and pertaining to these aspects was obtained from Statistics South Africa 2011 census and has been contextualised for the Witzenberg BESS site. It is important to note that the 2011 census data were used in this report for the following key reasons:

- According to Statistics South Africa SA, the latest census data available is that of 2011 and the next census data generated will be for 2021. It must further be highlighted that while Stats SA desires to undertake a Census after every five years, (meaning that after the 2011 census, another census was supposed to have been undertaken in 2017), this was not undertaken due to the lack of capacity.

4.2.1 Key Demographics

According to the 2011 census, the population of Ward 10 was 10110. Of these 71% were coloured, 26% black and 2% white as depicted in **Figure 15**. Of the total population 65% were between the ages of 18 and 64 with 52% of the population consisting of males (Census, 2011).

Figure 15: Ward 10 Demographics (https://wazimap.co.za/profiles/ward-10)

4.2.2 Employment levels

In 2011, 73.5% of the community members within Ward 55 were employed with 86% of these employed in the forma sector. The average annual income is R 15000 which is half of the average annual income of the entire Cape Winelands District which is R 30 000.00. (Census, 2011; Stats SA, 2018; as presented in **Figure 16** below.

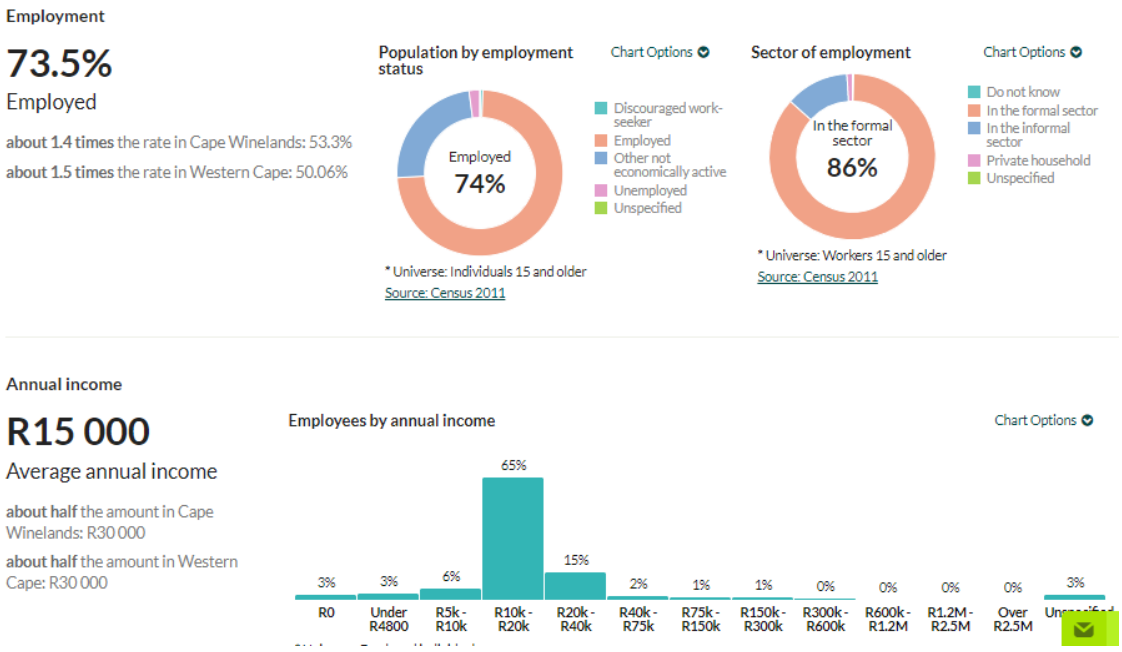

Figure 16: Ward 10 Employment and Income Statistics (https://wazimap.co.za/profiles/ward-10)

4.2.3. Housing and Service Delivery

Thirty-Six (36%) of households obtain water from a local service provider whereas 30% obtained water from boreholes highlighting the number of farms in the ward (**Figure 17**). 83% have access to flush or chemical toilets whilst 1.5% of the population have no access to toilets.

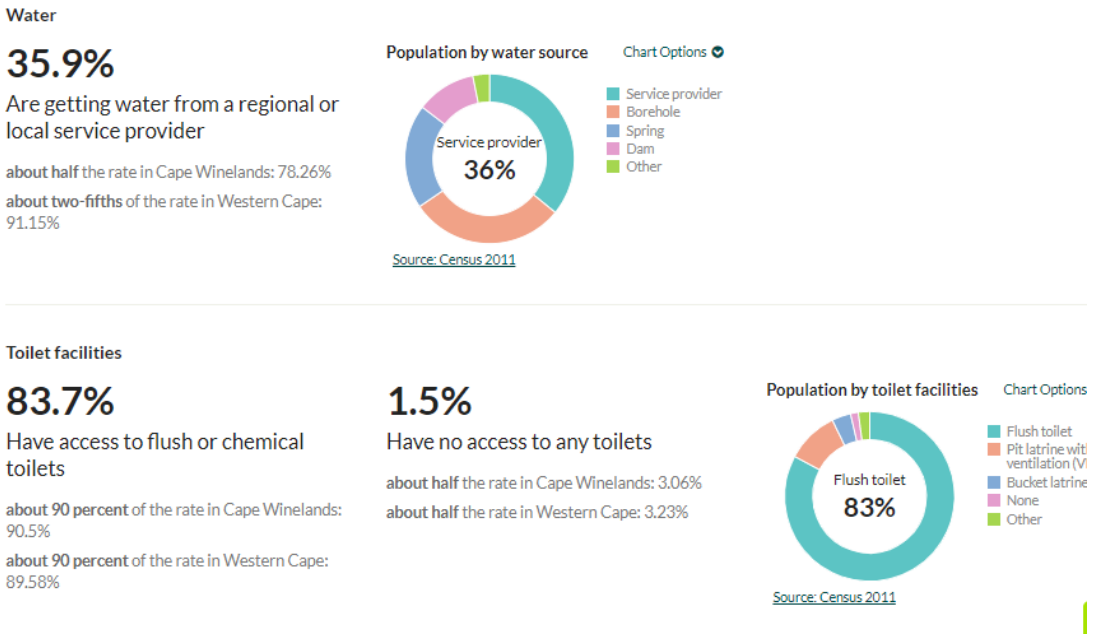

Figure 17: Ward 10 Housing and Service Delivery

5 ALTERNATIVES

In terms of the EIA Regulations published in Government Notice (GN) R982 of 2014, as amended in 2017, feasible and reasonable alternatives must be identified and considered within the Basic Assessment process. According to the above-mentioned, an alternative is defined as *"…in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the:*

(a) property on which or location where it is proposed to undertake the activity;

(b) type of activity to be undertaken

(c) design or layout of the activity;

(d) technology to be used in the activity;

(e) operational aspects of the activity; and

Includes the option of not implementing the activity."

The purpose of alternatives as defined in the Department of Environmental Affairs and Tourism's (now Department of Environment, Forestry and Fisheries) 2004 Integrated Environmental Information Series on the Criteria for determining alternatives in EIA, ' *is to find the most effective way of meeting the need and purpose of the proposal, either through enhancing the environmental benefits of the proposed activity, and or through reducing or avoiding potentially significant negative impacts.'*

In terms of Section 24 of NEMA, the proponent is required to demonstrate that alternatives have been described and investigated in sufficient detail during the BA process. It is important to highlight that alternatives must be practical, feasible, reasonable and viable to cater for an unbiased approach to the project and in turn to ensure environmental protection.

The role of alternatives is to find the most effective way of meeting the need and purpose of the proposal, either through enhancing the environmental benefits of the proposed activity, and or through reducing or avoiding potentially significant negative impacts.

In order to ensure full disclosure of alternative activities, it is important that various role players contribute to their identification and evaluation. Stakeholders have an important contribution to make during the Basic assessment Process and each role is detailed as follows:

The role of the environmental practitioner is to:

- encourage the proponent to consider all feasible alternatives;

- provide opportunities for stakeholder input to the identification and evaluation of alternatives;
- document the process of identification and selection of alternatives;
- provide a comprehensive consideration of the impacts of each of the alternatives; and
- document the process of evaluation of alternatives.

The role of the proponent is to:

- assist in the identification of alternatives, particularly where these may be of a technical nature;
- disclose all information relevant to the identification and evaluation of alternatives;
- be open to the consideration of all reasonable alternatives; and
- be prepared for possible modifications to the project proposal before settling on a preferred option.

The role of the public is to:

- assist in the identification of alternatives, particularly where local knowledge is required;
- be open to the consideration of all reasonable alternatives; and
- recognise that there is rarely one favoured alternative that suits all stakeholders and that alternatives will be evaluated across a broad range of criteria, including environmental, social and economic aspects.

The applicability of each alternative type to the proposed project is outlined in **Table 9** below. It must be highlighted that the alternatives presented in the table are derived from both the the EIA Regulations (2014) as amended as well as the Department of Environmental Affairs and Tourism's (now Department of Environment, Forestry and Fisheries) 2004 Integrated Environmental Information Series on the Criteria for determining alternatives in EIA. Where the alternative is applicable to the project, it will be further discussed in this report.

Table 10: Alternatives types

ALTERNATIVE	COMMENT
No-go Option	This alternative must be discussed on all projects as it allows for an assessment of impacts should the activity not be undertaken. Refer for **Alternative 1 in Chapter 5.1.**
Technology/Process alternatives	These are also known as technological and equipment alternative and will be discussed as they are applicable to the project in terms of the suitable BESS equipment to be installed at the Witzenberg Substation. Refer to **Alternative 2 in Chapter 5.2**
Activity alternatives	These are at times referred to as project alternatives which in the case of this project entails the storage and handling of a dangerous good. There are no other alternatives to this activity as this will defer to the no-go option which is discussed in Alternative 1 in Chapter 5.1
Location/ property alternatives	The location of the Witzenberg Substation is based on an assessment by Eskom planners of a suitable distribution Substation for the installation of BESS infrastructure. Several other sites within the western cape have been considered in order to obtain an overall BESS capacity of 459 MWh. The Witzenberg Substation is the only suitable Substation within the Ceres area and this alternative is discussed as **Alternative 3 in Chapter 5.3**
Demand alternatives	**Not applicable** to the project as it is more applicable to the demand for a product or service. An example of this would be where there is a need to provide more drinking water. Examples of alternatives can be through managing demand through various methods or providing additional drinking water.
Input alternatives	**Not applicable** to the project but mainly to industries where input raw material and in turn outputs product are crucial to operations
Site layout alternatives	Alternatives for the BESS site footprint site layout have not been provided as the only layout provided by the applicant meets the IPP requirements.
Scale alternatives	Scale alternatives for the project will only be applicable in the event that site clearance and expansion of the existing Substation is required to support a higher MWh output for the BESS site. The applicant has provided a specific output quantum of 11MW which must be achieved for the Witzenberg Substation site and therefore no other scale alternatives can be assessed.
Operational Alternatives	The installation of BESS infrastructure will be undertaken as a once off activity during the construction phase of the project. The area reserved for installation of BESS equipment will not change during the operation phase and for this reason, operational activities are **not applicable** to the project.

5.1 Alternative 1: The No-Go Option

The no-development alternative would entail a situation where the installation of the BESS infrastructure will not occur and therefore no need to store and handle dangerous goods where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres. The environment will remain as is with no impacts however If the 'no-go option' is

considered, such could lead to the failure of Eskom to meet the requirements of evaluating the potential of energy storage technologies to increase access to reliable, affordable electricity in South Africa.

Based on the above, the no-go option is therefore not feasible.

5.2 Alternative 2: Process Technology Alternative

Various terms are used for this type of alternative including process or equipment alternative. The purpose of considering such alternatives is to include the option of achieving the same goal by using a different method or process. Generally, specialist input is required to identify process alternatives. The proponent should be encouraged to explore all possible alternatives, including the Best Practicable Environmental Option (BPEO). The BPEO can be defined as the option that provides the most benefit or causes the least damage to the environment, at a cost acceptable to society in the long term as well as in the short term.

The information used to discuss the various BESS technology has been obtained from the Market assessment report undertaken by Parsons in 2017. The report titled *South Africa Energy Storage Technology and Market Assessment (Public Version)* was prepared to provide advisory services to the IDC to help guide and promote the adoption of energy storage technologies in South Africa.

5.2.1 Solid State Batteries (Alternative 2a)

A solid-state battery is a battery technology that uses solid electrodes and a solid electrolyte. Materials proposed for use as solid electrolytes in solid-state batteries include ceramics (e.g. oxides, sulphides, phosphates), and solid polymers. Solid-state batteries are traditionally expensive to make, and manufacturing processes are noted to be immune to economies of scale. Solid-state battery technology is believed to be capable of higher energy density because of the use of lithium metal anode. They also avoid the use of dangerous or toxic materials found in commercial batteries, such as organic electrolytes. Because most liquid electrolytes are flammable and solid electrolytes are non-flammable, solid-state batteries are believed to be safer, requiring less safety systems and, further increasing energy density.

5.2.1.1 Lithium Ion Batteries

A lithium-ion (Li-ion) battery is a rechargeable electrochemical battery. Lithium ions are transferred between the electrodes during the charge and discharge reactions. A Li-ion cell consists of three main components: cathode and anode electrodes and an electrolyte that allows lithium ions to move from

the negative electrode to the positive electrode during discharge and back when during charge. When the battery is charging, lithium ions flow from the positive metal oxide electrode to the negative graphite electrode. When the battery is discharging, the ions flow in reverse.

Li-ion batteries have been deployed in a wide range of energy-storage applications, ranging from energy-type batteries of a few kilowatt-hours in residential systems with rooftop PV arrays to multimegawatt containerized batteries to provide grid ancillary services. Li-ion batteries can meet all the identified use cases for South Africa.

The modularity of the Li-ion cells allows them to be constructed as modules and scaled as shown in **Figure 18** below. Battery packs can then be combined with inverters and controls systems and packaged into BESS at manufacturing facilities. When packaged into standard shipping container sizes, shipping the BESS around the world via truck, rail, or ship is greatly facilitated. Containerized BESS can be sited on pads or simple foundations and electrically connected to switchgear. Containerization significantly reduced the costs for local labour and on-site construction.

Figure 18: Lithium Ion BESS Facility

Small BESS for residential and light industrial or office buildings are essentially maintenance free and require little on-site monitoring. This is particularly true for systems that are monitored remotely, and maintenance staff can be dispatched as needed. The greatest maintenance issue for Li-ion batteries is generally the monitoring and replacement of individual cells/modules later in life as replacement is required.

Modularized and packaged systems offer ease of system removal from site for disposal at end of life. Site contamination is unlikely, and site restoration would include infrastructure removal and revegetation. The materials used in Li-ion batteries are typically considered non-hazardous waste. The metals in the system can be recycled, but they do not represent a high salvage value.

Li-ion batteries are a relatively mature commercial technology and are now the dominant electrical storage technology in automotive applications for both electric vehicles and hybrids. Although manufacturers are still experimenting with formulations and fabrication techniques to improve performance, reliability and reduce costs, the overall performance of this technology is reasonably well developed and understood.

5.2.1.2 Lead Acid Batteries

Lead-acid batteries are one of the oldest and most mature energy storage technologies. Lead-acid is inexpensive compared to newer technologies, and lead-acid batteries are still widely used. They typically have lower cycle lifetimes and depths of discharge than other battery types and contain toxic materials that have negative environmental impacts. Advanced lead-acid batteries introduce a carbon anode that reduces maintenance requirements, extends life expectancy, and improves cell uniformity, which increases both battery life expectancy and cost [0239]. In many applications, lead-acid is being replaced by advanced lead acid.

Dilute sulfuric acid (H_2SO_4) is the electrolyte in lead-acid batteries. In a fully charged lead-acid battery, the electrolyte is approximately 25% sulfuric acid and 75% water. Despite having a very low energy-to-weight ratio and a low energy-to-volume ratio, lead-acid batteries can supply high surge currents, which means that the cells have a relatively large power-to-weight ratio. Lead-acid is inexpensive compared to newer technologies, and lead-acid batteries are still widely used. Large-format lead-acid designs are widely used for storage in backup power supplies in cell phone towers, high-availability settings such as hospitals, and stand-alone power systems.

Maintenance requirements for lead acid batteries include float charging, equalization charging, water replacement, and cell post maintenance. To prevent self-discharge, voltage is continuously applied to the already-charged battery to generate a small current. Equalization charging corrects the inconsistency in state of charge between individual battery cells by charging the battery at a high voltage for an extended period. Corrosion of the external metal parts of the lead–acid battery results

from a chemical reaction of the battery terminals, lugs, and connectors. Acid fumes that vaporize through the vent caps (often caused by overcharging) and insufficient battery box ventilation can allow the sulfuric acid fumes to build up and react with the exposed metals.

Some lead compounds are extremely toxic. Long-term exposure to even tiny amounts of these compounds can cause brain and kidney damage, hearing impairment, and learning problems in children. Lead–acid battery recycling is effectively practiced in most parts of the world. In the South Africa, almost all battery lead is recycled, although a small percentage still shows up in landfills. During the recycling, an effective pollution control system is a necessity to control lead emission. Continuous improvement in battery recycling plants and furnace designs is required to keep pace with emission standards for lead smelters.

5.2.1.3 Electrochemical capacitor (EC)

Electrochemical capacitor (EC) technology stores direct electrical charge in the material rather than converting the charge to another form, such as chemical energy in batteries or magnetic field energy in superconducting magnetic energy storage; this makes the storage process reversible, efficient, and fast. Sometimes referred to as “electric double-layer” capacitors, these devices also appear under trade names such as “Supercapacitor” or “Ultracapacitor.” The phrase “double-layer” refers to ECs physically storing electrical charge at a surface-electrolyte interface of high-surface-area carbon electrodes.

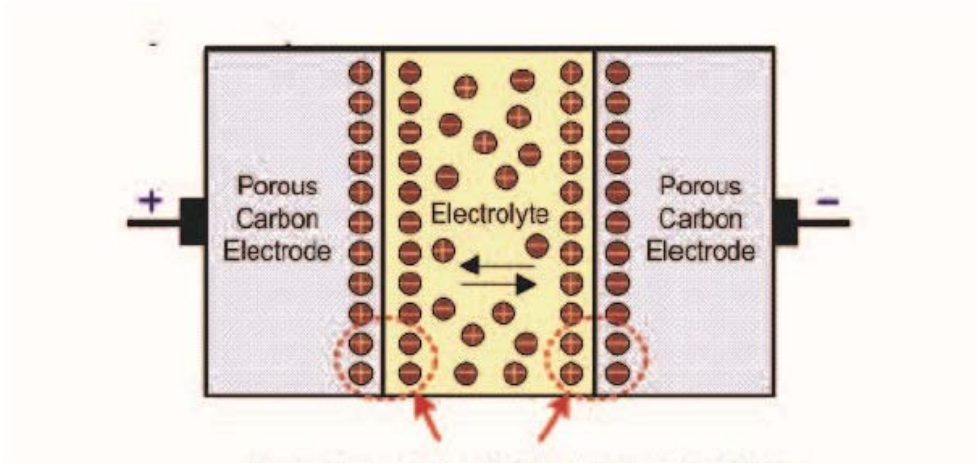

Figure 19: Electrochemical double layer capacitor

As shown in **Figure 19** above, when the two electrodes of an EC are connected in an external current path, current flows until complete charge balance is achieved. The capacitor can then be returned to its charged state by applying voltage. Because the charge is stored physically with no chemical or

phase changes taking place, the process is fast and highly reversible, and the discharge-charge cycle can be repeated virtually without limit. Because of the large surface area and the thin double layer, these devices can have very high specific and volumetric capacitances. This enables them to combine a previously unattainable capacitance density with an essentially unlimited charge-discharge cycle life. Thus, cells are connected in series for higher voltage operation, exactly like battery cells.

The safety issues associated with ECs include electrical, chemical, fire, and explosion hazards. Electrical and chemical hazards are similar to those common to batteries. The voltages of double layer capacitors are often lethal and should be treated with the same precautions as other high-voltage devices. Some capacitors have aqueous electrolyte, which eliminates the possibility of hazardous fires but allows for the possibility of chemical burns similar to those from other electrochemical storage devices. Some capacitors with an organic electrolyte pose a fire threat and health threats if the electrolyte is inhaled, ingested, or contacts skin.

ECs will have important applications for smoothing variable renewable sources and for fast response DC voltage regulation. These systems are increasingly incorporated into hybrid ESSs that seek to enhance overall system performance by matching complementary characteristics of differing technologies. Additionally, there may be applications for braking energy recuperation systems for electric rail. All of these applications will be important in South Africa.

5.2.1.4 Nickel Cadium Batteries

The NiCd (or NiCad) battery is a rechargeable battery using nickel oxide hydroxide and metallic cadmium as electrodes. NiCd batteries have an alkaline potassium hydroxide electrolyte. As with any other rechargeable battery systems, NiCd batteries operate on the principle that electrochemical reactions at each electrode are reversible; this enables energy to be stored during charging and released during discharging. The overall reaction schematically depicts a simple transfer of OH-ion between Ni(OH)2 and Cd, depending on whether the cell is being charged or discharged.

NiCd batteries contain cadmium, which is a toxic heavy metal and therefore requires special care during battery disposal. In the United States, part of the battery price is a fee for its proper disposal at the end of its service lifetime. In the European Union, used industrial NiCd batteries must be collected by their producers to be recycled in dedicated facilities. Because cadmium is a heavy metal, it can cause substantial pollution when discarded in a landfill or incinerated. Because of this, many countries now operate recycling programs to capture and reprocess old batteries.

NiCd batteries cannot compete with recent improvements in Li-ion batteries. Better performance and lower cost will make Li-ion a more attractive technology in the future for utility-scale applications in South Africa.

5.2.1.4 Risk Assessment Summary

An overall risk assessment for Solid State batteries has been conducted and is summarised below

Table 11: Solid State Batteries Risk assessment Summary

Risk Description	Cause	Impact	Existing controls
Accident whilst being transported	Accident caused by driver or 3rd party. Poor road conditions.	1. Spillage of electrolyte / dangerous substances. 2. Contamination of environment / soil / flora.	1. Transport company accredited to transport dangerous goods on public roads. 2. Proper securing of cargo. 3. Route planning and necessary approvals and permits.
1. Accident whilst being stored on site / warehouse.	1. Not adhering to storage instructions.	1. Spillage of electrolyte / dangerous substances. 2. Contamination of environment / soil / flora.	1. Store according to OEM instructions. 2. Storing in line with Environmental Management Programme. 3. Electrolyte and active materials are encapsulated by protective covering.
1. Accident whilst being handled (off-loaded or installed) on site / warehouse.	1. Not adhering to handling instructions. 2. Not taking care whilst handling equipment.	1. Spillage of electrolyte / dangerous substances. 2. Contamination of environment / soil / flora.	1. Handle according to OEM instructions. 2. Handling in line with Environmental Management Programme. 3. Use of correct equipment for off-loading by accredited operators. 4. Installation by accredited staff. 5. Electrolyte and active materials are encapsulated by protective covering.
1. Actual vegetation clearing for the placement the plant and access roads.	Required for construction activities and placement of plant.	1. Destruction of indigenous and protected vegetation. 2. Temporary land clearing for construction material / equipment. 3. Impact on surrounding communities.	1. Activities in line with Environmental Management Programme.
1. Non-compliance to Water Use License or not permitted.	Not adhering to EMP requirements.	1. Legal contravention 2. Financial penalties	1. Activities in line with Environmental Management Programme.
1. Abuse of potable water supplies.	Not adhering to EMP requirements.	1. Legal contravention 2. Financial penalties	1. Activities in line with Environmental Management Programme.
1. Waste generation due to construction activities. 2. Different waste types will be generated.	Construction activities.	1. Incorrect / Illegal handling and disposal of different types of waste. 2. Spillage of electrolyte /	1. Activities in line with Environmental Management Programme and Waste Management Plan.

		dangerous substances. 3. Contamination of environment / soil / flora or injury to fauna. 4. Impact on surrounding communities.	
Augmentation of plant will lead to waste generation of electronics and dangerous substances that need to recycled or disposed of.	1. Augmentation of plant to meet operational performance requirements. 2. Equipment / component failures.	1. Incorrect / Illegal handling and disposal of different types of waste. 2. Spillage of electrolyte / dangerous substances. 3. Contamination of environment / soil / flora or injury to fauna.	1. Activities in line with Waste Management Controls in the Environmental Management Programme.
Short circuit condition in the plant.	1. Failing of insulation. 2. Failure during switching.	1. Safety and fire risk 2. Explosion could lead to spread of debris over a large area. 3. Emission of toxic gasses. 4. Equipment damage 5. Interruption of customer power supply.	1. Short circuit detection and protection devices. 2. Fire detection and suppression systems installed

Detailed Risk Assessment including likelihood ranking and potential exposure is provided in **Appendix B2**.

5.2.2 Flow batteries (Alternative 2b)

Flow batteries require mechanical systems (pumps, pipes, and tanks) and are inherently more complex than a solid-state battery. The most expensive components within the flow battery are generally the reaction stacks. The greatest advantage of the flow battery is the potential to scale up to longer duration discharge cycles more cost efficiently than solid-state batteries. The most successful and prevalent of these batteries use vanadium and zinc-bromine chemistries. Several flow battery systems have been sold or have gone bankrupt before they achieved a market competitive commercial offering. Flow battery manufacturers across all chemistries are expected to continue to refine product offerings while reducing the initial costs of their products and demonstrating long-term reliability. Discussed below are the different types of flow batteries that have been considered for the BESS.

5.2.2.1 Redox Flow Batteries

A redox flow battery (RFB) is a rechargeable battery in which the energy is stored in one or more electrolyte species dissolved into liquid electrolytes. The electrolytes are stored externally in tanks and pumped through electrochemical cells that convert chemical energy directly into electrical energy and vice versa, on demand. The power density is defined by the size and design of the electrochemical cell; the energy density or output depends on the size of the electrolyte tanks which are highlighted in **Figure 20** below.

Figure 20: Redox Flow BESS equipment

The separation of power and energy also provides design flexibility in the application of RFBs. The power capability (stack size) can be directly tailored to the associated load or generating asset. The storage capability (size of storage tanks) can be independently tailored to the energy storage need of the specific application. In this way, RFBs can economically provide an optimized storage system for each application. In contrast, the ratio of power to energy is fixed for integrated cells at the time of design and manufacture of the cells. Economies of scale in cell production limit the practical number of different cell designs that are available. Hence, storage applications with integrated cells will usually have an excess of power or energy capability.

Redox Flow batteries are reaction stacks separated from one or more of the electrolytes held in external storage tanks as highlighted in the schematic flow diagram in **Figure 21** below. Either one or both active materials are always in solution in the electrolyte. Flow batteries have unique characteristics in terms of the power (rate at which energy changes) and energy (volume of energy) they provide. Power (in kW) is a function of the number of cells that are stacked; energy (kWh) is a function of the electrolyte volume, which is circulated by pumps. Flow batteries are generally less affected by overcharge or discharge.

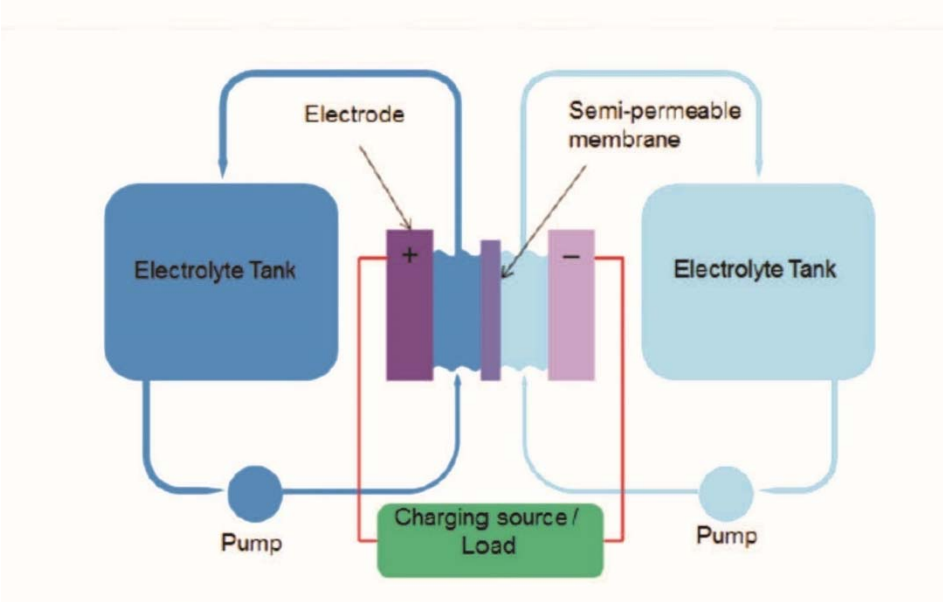

Figure 21: Schematic for Typical Flow Battery

This means they can be used without significant degradation of performance. This is even the case when using the majority of energy capacity (deep discharge) uncommon for most battery types and a distinct advantage for this type of battery. On the other hand, tanks, piping, and pumps associated with electrolyte storage and flow add costs and maintenance to the plumbing and pipe work adds to the cost, and the electrolyte may be prone to leaks and must be contained.

An additional advantage of flow batteries is that flow can easily be stopped during a fault condition. As a result, system vulnerability to uncontrolled energy release in the case of RFBs is limited by system architecture to a few percent of the total energy stored. This feature is in contrast with packaged, integrated cell storage architectures (lead-acid, NaS, Li-ion) in which the full energy of the system is connected at all times and available for discharge. One of the primary barriers to the deployment of flow battery systems has been the reluctance of the utilities to allow the interconnection of untried/unproven storage devices on the utility grid. Much of this reluctance is based on the early failures of flow battery systems that were

5.2.2.2 Vanadium Redox Flow Batteries

The vanadium redox flow battery (VRFB) is based on redox reactions of different ionic forms of vanadium. During battery charge, V3+ ions are converted to V2+ ions at the negative electrode through the acceptance of electrons. Meanwhile, at the positive electrode, V4+ ions are converted to V5+ ions through the release.

The vanadium electrolytes are stored in separate large electrolyte tanks outside the cell stack. The

tanks must be composed of materials that are resistant to corrosion in the very low pH environment. In the past, off-the-shelf plastic or fiberglass tanks, such as those used to store gasoline, have been used to store electrolyte.

In practice, vanadium redox batteries are constructed by stacking several cells together in series to form a battery stack. Electrodes are placed on either side of a bipolar plate, which separates each cell from the next cell. The bipolar plate acts as the current conducting mechanism between the negative electrode of one cell and the positive electrode of the next. The positive electrode of the most positive cell in the stack and the negative electrode of the cell at the other end of the stack form the positive and negative ends of the battery and are connected to the power conditioning system. The cells in the battery are electrically connected in series, but in most designs the electrolyte flows through the cells in parallel. The number of cells used in the complete battery depends on the desired voltage level of the final battery.

The normal operating temperature of a VRB ranges from about 10° to 40°C. Active cooling subsystems are employed if ambient temperatures exceed 40° to 45oC. For new installations, monthly visual inspections of piping and tanks are required, with detailed inspection at 6-month intervals. Pumps and HVAC systems require inspection every 6 months. Pump bearings and seals may require replacement at 5-year intervals. Electronic parts such as boards, sensors, relays, and fuses, may require replacement as necessary.

Without extended field experience, the system maintenance requirements have not been thoroughly established. However, a typical system has only two moving parts pumps on the positive and negative sides. Thus, maintenance costs are relatively low. Further, the VRB system.

5.3 Alternative 3: Location Alternative

Location alternatives could be considered for the entire BESS project proposal or for a component of a proposal whereby a distinction is drawn between alternative locations that are geographically quite separate, and alternative locations that are in close proximity to each other. For this application 23 Substation sites have been considered within the Western Cape. However, a single application could not be submitted for all sites within the Witzenberg Grouping as confirmed by DEFF during the pre-application meeting and therefore separate applications for each proposed BESS must be submitted per individual Substation.

It must also be noted that due to the construction date of the Witzenberg Substation pre ECA and NEMA, there is no Environmental authorisation in place. It thus becomes imperative to assess each proposed BESS site individually in order for DEFF to have a full understanding of each application. The

Witzenberg site was selected as per suitability assessments undertaken by the technical planners and presented to the EAP. The suitability of this site is based on factors such as economic constraints, distance to markets, availability of infrastructure that may influence the choice of location for a project (Glasson et al., 1999). Location alternatives are particularly relevant in change of land use applications or 'greenfield' developments. The proposed construction of BESS is as per the existing land use and as such does not warrant the assessment of an alternative location.

Location alternatives are unlikely to be important when a potential project under consideration such as the development of BESS at Witzenberg Substation forms part of an overarching strategic planning project. It is for this reason that this alternative will not be assessed any further.

Table 12: Flow Battery Risk Assessment Summary

Risk Description	Cause	Impact	Existing controls
1. Accident whilst being transported	1. Accident caused by driver or 3rd party. 2. Poor road conditions.	1. Spillage of electrolyte / dangerous substances. 2. Contamination of environment / soil / flora.	1. Transport company accredited to transport dangerous goods on public roads. 2. Proper securing of cargo.
1. Accident whilst being stored on site / warehouse.	1. Not adhering to storage instructions.	1. Spillage of electrolyte / dangerous substances. 2. Contamination of environment / soil / flora.	1. Store according to OEM instructions. 2. Storing in line with Environmental Management Programme. 3. Electrolyte and active materials are encapsulated by protective covering.
1. Accident whilst being handled (off-loaded or installed) on site / warehouse.	1. Not adhering to handling instructions. 2. Not taking care whilst handling equipment.	1. Spillage of electrolyte / dangerous substances. 2. Contamination of environment / soil / flora.	1. Handle according to OEM instructions. 2. Handling in line with Environmental Management Programme. 3. Use of correct equipment for off-loading by accredited operators. 4. Installation by accredited staff. 5. Electrolyte and active materials are encapsulated by protective covering.
1. Accident whilst being stored on site / warehouse.	1. Not adhering to storage instructions.	1. Spillage of electrolyte / dangerous substances. 2. Contamination of environment / soil / flora.	1. Store according to OEM instructions. 2. Storing in line with Environmental Management Programme.
1. Accident whilst being handled (off-loaded or installed) on site / warehouse.	1. Not adhering to handling instructions. 2. Not taking care whilst handling equipment.	1. Spillage of electrolyte / dangerous substances. 2. Contamination of environment / soil / flora.	1. Handle according to OEM instructions. 2. Handling in line with Environmental Management Programme. 3. Use of correct equipment for off-loading by accredited operators. 4. Installation by accredited staff.
1. Actual vegetation clearing for the placement the plant and access roads.	Required for construction activities and placement of plant.	1. Destruction of indigenous and protected vegetation. 2. Temporary land clearing for construction material / equipment.	1. Activities in line with Environmental Management Programme.

		3. Impact on surrounding communities.	
1. Non-compliance to Water Use License or not permitted.	Not adhering to EMP requirements.	1. Legal contravention 2. Financial penalties	1. Activities in line with Environmental Management Programme.
1. Abuse of potable water supplies.	Not adhering to EMP requirements.	1. Legal contravention 2. Financial penalties	1. Activities in line with Environmental Management Programme.
1. Waste generation due to construction activities. 2. Different waste types will be generated.	Construction activities.	1. Incorrect / Illegal handling and disposal of different types of waste. 2. Spillage of electrolyte / dangerous substances. 3. Contamination of environment / soil / flora or injury to fauna. 4. Impact on surrounding communities.	1. Activities in line with Environmental Management Programme and Waste Management Plan.

6 PUBLIC PARTICIPATION PROCESS

The NEMA (1998) EIA Regulations, 2014, as amended, prescribe that the Basic Assessment process must include the undertaking of public participation in accordance with the Chapter 6 of the Regulations. The purpose of the Public Participation Process is to provide all potential and / or registered Interested and Affected Parties (I&APs hereafter), including the competent authority and any other stakeholder or organ of state, an opportunity to become involved in the Basic Assessment process and provide comments during the various phases of the project. Involvement by I&APs is critical, as it contributes to a better understanding of the proposed project among I&APs, raises important issues that need to be assessed and provides local insight that will enhance the Basic Assessment process. This chapter of the report provides details on the Public Participation Process followed during the Basic Assessment process for the installation of BESS infrastructure at the Witzenberg Substation.

6.1 Stakeholder Pre-Consultation

In order to address the requirements of public participation in accordance with **Chapter 6** of the EIA Regulations and the Public Participation Guideline as contemplated in section 24J of the NEMA, GA Environment undertook an exercise to identify key stakeholders.

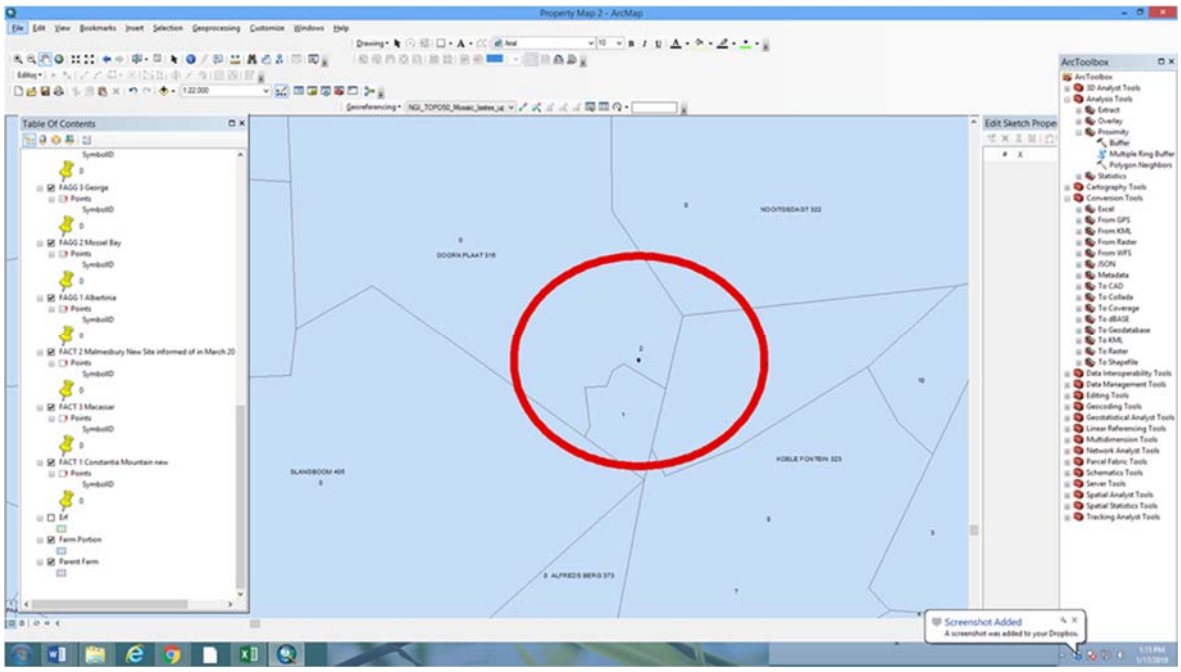

Figure 22:Adjacent properties identified within a 1km radius of the Witzenberg Substation

The substation is located close to huge farms where a few are unoccupied. GA Environment consulted the land owner located within a kilometre of the substation (DuToit Agri Pty Ltd, Portions 0 of the Farm Doorn plaat 316). Efforts were made to contact all other farm owners located within a 5km radius through the Ceres business Initiative Forum which looks after the interest of farm owners in the area. Proof of consultation with the affected adjacent farm owner and the Ceres Business Initiative has been attached as **Appendix E2**. Due to the remote location of the Substation, adjacent landowners within a 1km radius of the Witzenberg Substation were identified through GIS cadastral data. Search works, a web-based search application was used to confirm property owner details of which contact information for farms located in excess of 5km away from the substation could not be obtained. Further efforts were made to obtain the contact details of other respective landowners located further away through consultation with the ward councillor and the Ceres Business Initiative (CBI). Upon receipt of verifiable contact details, each adjacent landowner will be formally notified as per Regulation 41 (1)(ii) of the EIA Regulations. Refer to the Interested and Affected Parties Register in **Appendix E5.**

6.2 Identification of Interested and Affected Parties

Interested and Affected Parties (I&APs) were identified through various means from the inception phase of the project. These included the placement of an advertisement *in both English and Afrikaans which was published in the Friday, February 1, 2019 edition of the Witzenberg Herald Newspaper which is* distributed in the Witzenberg Area. Other activities included the placement of Site Notices, the distribution of hardcopy Notification Letters as well as electronic versions by e-mail.

6.3 Notification Letters

Regulation 41(2)(b) of the NEMA (1998) EIA Regulations, 2014, as amended requires that written notification be given to various parties who include the following:

> *(i) the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken;*
> *(ii) owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken;*
> *(iii) the municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in*

the area;

(iv) the municipality which has jurisdiction in the area;

(v) any organ of state having jurisdiction in respect of any aspect of the activity;

and

(vi) any other party as required by the competent authority;

Hardcopy versions of the Notification Letters were compiled however the remote location of the Substation meant that no adjacent landowners could receive these letters. The document provided a background on the proposed development and information on how one can register as an I&AP on the project in order to be able to be kept abreast of all developments related to the project.

It must be noted that the notification letter circulated in February 2019 erroneously mentioned that BESS infrastructure would be used to reduce load shedding. This has been amended in this notification letter and it must be stated that the proposed BESS infrastructure will be used to stabilise the electricity grid and will have no bearing on the occurrence or impact of load shedding in the area. A copy of the revised Notification Letter is attached as **Appendix E2.**

6.4 Newspaper Advertisement

Regulation 41(2)(c) and (d) of the NEMA (1998) EIA Regulations, 2014, as amended requires that PPP includes the placement of a Newspaper Advertisement to notify all potential I&AP's about the proposed project and to invite them to register as I&AP's and provide comments on the project. An advertisement in both English and Afrikaans was placed on page 7 of the Witzenberg Herald Newspaper published on Friday, February 1, 2019. It was determined that the Witzenberg Herald, a local newspaper would be sufficient as the impact of the proposed development will not extend beyond the boundaries of the Witzenberg area. The proof of the placement of the Newspaper Advertisement is attached as **Appendix E1.**

6.5 Notice Boards/Site Notices

In accordance with Regulation 41(4)(a) of the NEMA (1998) EIA Regulations, 2014, as amended, notice boards of 60cm X 42cm (i.e. A2 Sizes) were prepared and placed on various locations in and around the site in conspicuous places. A total of five notices were placed on site on the 12th of February 2019. **Figures 22 and 23** below are examples of some of the locations on which notice boards were placed.

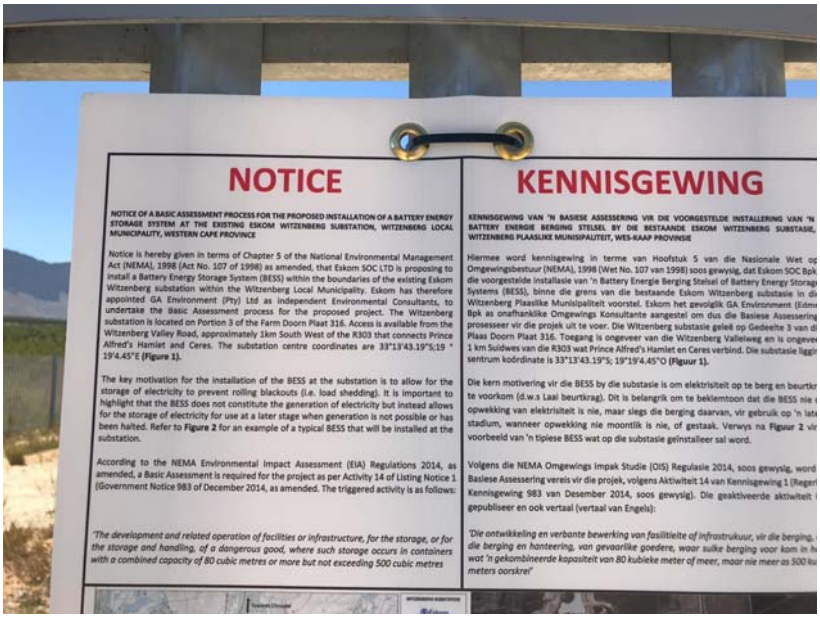

Figure 23: Close up picture of site Notice Boards placed on the western section of the perimeter fence

Figure 24: Notice board placed at the Substation gate

Refer to **Appendix E3** for a copy of the Site Notice and proof of placement.

6.6 Availability of Draft Basic Assessment Report for review

The Draft Basic Assessment report was issued for public and competent authority review in the month of November 2019. The comments raised by the CA as well as various Interested and Affected Parties (I&APs) were recorded in the Comments and Response Report (**Appendix E6**), recorded and addressed

in the Final BAR. The Draft Basic Assessment Report (DBAR hereafter) was placed at the Prince Alfred's Hamlet Library for the legislated period of at least 30 days from 6th November 2019 until 6th December 2019. The following commenting authorities were provided with a copy of the report in both electronic as well as hardcopy format:

- Department of Environment, Forestry and Fisheries
    - Legal Authorisations and Compliance Inspectorate
    - Chemicals and Waste Management branch
- Western Cape Department of Environmental Affairs and Development Planning;
- Cape Winelands District Municipality;
- Witzenberg Local Municipality;
- Department of Water and Sanitation; and
- Cape Nature.
- Heritage Western Cape

Proof of submission, consultation and comments received from the various authorities have been provided in **Appendix E4**.

6.7 I&AP's Register and Comments & response report

During the Initial Assessment that was undertaken between March 2019 and August 2019, a register for Interested and affected persons, organizations and organs of state identified was opened. As part of the Basic Assessment phase of the project, the register remains open for the duration of the BA process and is constantly maintained. All comments received from registered I&APs are acknowledged and accompanied by a response addressed in an objective manner. The Comments and responses must be recorded in the comments and response report that is submitted with the BAR. The I&APs Register is included in **Appendix E5**. The Comments and Responses Report is attached as **Appendix E6.**

During the Draft BAR review phase, contact was made with the respective Biodiversity representatives of DEFF and the Western Cape Department of Environmental Affairs and Development Planning (DEADP). DEADP indicated that the report must be sent to cape Nature from which comments were received. DEFF representatives from the Biodiversity Directorate requested shapefiles to confirm if the site would fall under the National department's jurisdiction after which no further consultation was received. Correspondence in this regard has been provided in **Appendix E4**.

Comments have been received mainly from authorities with jurisdiction of which they have favoured the development provided specific mitigation measures are put in place to prevent the pollution of the soil, water courses downstream and impact to flora Fauna. These recommendations have been

addressed in the Final BAR and the EMPr.

6.8 Focus Group Meetings

During the pre-application phase, several pre-application meetings have taken place between the competent authority, DEFF and Eskom representatives. Several issues have been discussed particularly those around the proposed development. Eskom sought clarification whether Listing Notice 1, Activity 14 will be triggered of which DEFF proposed to Eskom that a risk averse approach should be applied due to the uncertain nature regarding the different technology alternatives.

DEFF further clarified that the proposed activity would not be considered an expansion activity, because the existing Witzenberg Substation does not have an EA and this is a different activity that would have to obtain an Environmental Authorisation separately. The Witzenberg Substation is located in a remote area whereby the nearest community is in Ceres several kilometres away from the Substations.

7 IMPACT ASSESSMENT METHODOLOGY

The main objective of this section is to provide independent and scientifically sound information on the impacts identified during the BA. Based on the requirements of the impact assessment, impacts identified, and issues and concerns raised are assessed with regard to their significance. The impact assessment is aimed at determining the impacts associated with the proposed development and the prescription of mitigation measures. Other impacts associated with the proposed development are discussed in detail in this section. The significance of the potential impacts is described in terms of their *nature, extent, duration, intensity* and *probability*.

In this report, impacts with a low significance are considered to have no influence on the decision to proceed with the proposed development. Impacts with a moderate significance will influence the decision, unless they can be effectively mitigated to a low significance, whereas impacts with a high significance - despite mitigation - would influence the decision to proceed with the proposed development.

7.1 Impact Mitigation Hierarchy

The Impact Mitigation Hierarchy provides steps that must be used in mitigating adverse impacts of a project and in turn ensuring environmental protection. There are various levels of preference for mitigation options with the most preferred method and the first step as avoidance and the least and final method as offset. Refer to **Figure 24** for an illustration of the Mitigation Hierarchy

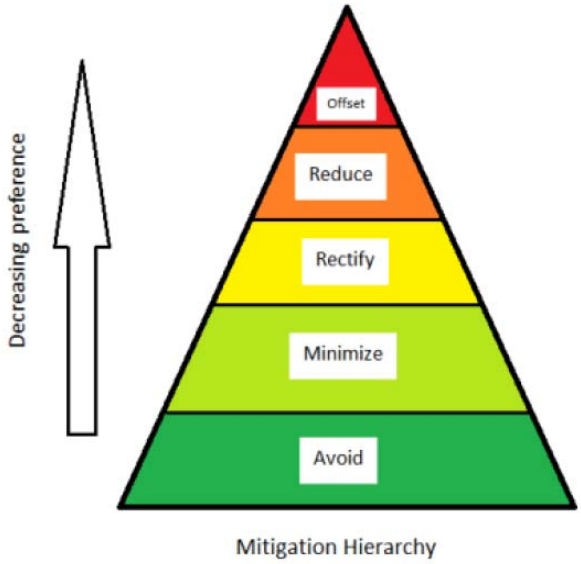

Figure 25: Mitigation hierarchy showing levels of preference (Eco Intelligent, 2016)

Each of the mitigation types will be discussed and contextualised to the planned installation of infrastructure at the BESS site in Witzenberg.

Step 1: Avoidance- Although this is the most preferred form of mitigation on projects to avoid adverse environmental impacts as it will not result in the installation of BESS infrastructure, this is not suitable solution to the strengthening of the electricity grid and improving electricity distribution.

Step 2: Minimisation- This entails the reduction of adverse environmental impacts through various means as it based on the recognition that environmental impacts cannot be fully avoided in the proposed activity. The minimisation of adverse impacts will be adopted for the installation, operation and decommissioning of the BESS site. The Mitigation measures proposed are discussed in Chapter 8 of this report as well as in the Environmental Management Programme attached as **Appendix G.**

Step 3: Rectification- Where an impact has already taken place, rectification entails the implementation of corrective measures to avoid further adverse environmental impacts. Rectification will apply in cases where Contractors or maintenance employees may have erroneously undertaken construction activities outside the existing Substation or when the proposed mitigation measures are not adhered to or unforeseen impacts arise.

Step 4: Reduction- This is applicable where the above-mentioned rectification is not possible. Rectification requires new management practices and/or changes in methodology to ensure environmental protection.

Step 5: Environmental Offset- although this does not apply to the proposed development as the majority of potential impacts are localised within the existing Substation, it is meant to cater for the effects of the development through compensation of biodiversity losses by measures such as the establishment of new plants on another area outside the BESS site where it is not possible to avoid the clearance of vegetation or rehabilitate the disturbed areas.

7.2 Impact Assessment Methodology

In accordance with Government Notice R. 982, promulgated in terms of Section 24 of the National Environmental Management Act, 1998 (Act 107 of 1998), the EAP is required to assess the significance of potential impacts in terms of the following criteria:

- Nature of the impact;
- Extent of the impact;
- Intensity of the impact;

- Duration of the impact;
- Probability of the impact occurring;
- Reversibility of impacts; and
- Impact on irreplaceable resources; and
- Cumulative impacts.

Activities within the framework of the proposed development and their respective construction, operation, decommission and rehabilitation phases, give rise to certain impacts. For the purpose of assessing these impacts, the project has been divided into three phases from which impacting activities can be identified, namely:

Construction phase:

This phase refers to all the construction related activities on site during installation of BESS infrastructure, until the contractor leaves the site.

Operation phase:

This phase refers to the period in which the BESS will be operated in support of the National Grid. This includes maintenance activities over a 15 year period where the end of life for the batteries would be reached.

Decommissioning and Rehabilitation phase:

This includes all activities associated with the closure and decommissioning of the proposed development, including any removal of BESS infrastructure and rehabilitation that may need to occur. This includes all activities undertaken to ensure that the environmental integrity of the site is maintained and preserved after Rehabilitation has taken place.

The assessment of the impacts will be conducted according to a synthesis of criteria required by the integrated environmental management procedure. The methodology that will be used comprises of the following four steps:

- Step 1: Identification of positive and negative impacts of the project;
- Step 2: Identification of the significance rating of the impact before mitigation;
- Step 3: Identification of the mitigation measure and the mitigation efficiency; and
- Step 4: Identification of the significance rating of the impact after mitigation;

Activities that will be undertaken to give effect to the proposed development gives rise to certain impacts. For the purpose of assessing these impacts, the project has been divided into the following phases discussed in **Table 10.**

Table 13: Project phases in a development

PHASES OF A PROJECT IN WHICH IMPACTS WILL OCCUR
Status Quo
The study area as it currently exists.
Preconstruction phase
All activities undertaken before construction phase including planning, specialist studies and assessments. All activities on site up to the start of construction, not including the transport of materials, but including the initial site preparations. This also includes the impacts that would be associated with planning.
Construction phase
All Activities during the installation of BESS infrastructure including the delivery of materials
Operation phase
All activities post construction including the operation and maintenance of the proposed BESS infrastructure.
Decommissioning and Rehabilitation phase (post-closure phase)
All activities undertaken to ensure the removal of batteries at the end of their life cycle and the site is restored to its original state as humanely possible.
The activities arising from each of the relevant phases have been included in the impact assessment tables. The assessment endeavours to identify activities that would require environmental management actions to mitigate the impacts arising from them. The criteria against which the activities were assessed are given in the next section.

7.3 Assessment Criteria

The assessment of the impacts has been conducted according to a synthesis of criteria required by the guideline documents to the EIA regulations (2006) and integrated environmental management series published by the Department of Environmental Affairs and Tourism (DEAT) currently Department of Environment, Forestry and Fisheries (DEFF). In addition to this, it is a requirement of the National Environmental Management Act (NEMA) 2014 Regulations as amended, Appendices 1 and 2 that an

Impact and Risk Assessment process be undertaken for the Basic Assessments and Environmental Impact Reporting. The Assessment Criteria is based on the following:

- Nature of impact;
- Extent;
- Duration;
- Intensity;
- Probability;
- Determination of significance; and
- Reversibility of impact.

Each of these are explained in **Table 11** below.

Table 14: Assessment Criteria

ASSESSMENT CRITERIA
i). Nature of Impact
This is an appraisal of the type of effect the proposed activity would have on the affected environmental component. The description should include what is being affected, and how.
b) Extent
The physical and spatial size of the impact. This is classified as: **i) Site** The impact could affect the whole, or a measurable portion of the site. **ii) Local** The impacted area extends only as far as the activity, e.g. a footprint of the specific activity **iii) Regional** The impact could affect areas such as neighbouring farms, transport corridors and the adjoining towns.

c) Duration
The lifetime of the impact; this is measured in the context of the lifetime of the proposed project. **i) Short term** The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than any of the phases.

c) Duration

ii) Medium term

The impact will last up to the end of the phases, thereafter it will be entirely negated.

iii) Long term

The impact will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter.

iv) Permanent

The only class of impact which will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.

d) Intensity

Is the impact destructive or benign? Does it destroy the impacted environment, alter its functioning, or slightly alter it? These are rated as:

i) Low

The impact alters the affected environment in such a way that the natural processes or functions are not affected.

ii) Medium (Moderate)

The affected environment is altered, but function and process continue, albeit in a modified way.

iii) High

Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases. This will be a relative evaluation within the context of all the activities and the other impacts within the framework of the project.

e) Probability

This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:

i) Improbable

The possibility of the impact occurring is very low, due either to the circumstances, design or experience.

ii) Probable

There is a possibility that the impact will occur to the extent that provisions must be made.

iii) Highly probable

It is most likely that the impacts will occur at some or other stage of the development. Plans must be drawn up before the undertaking of the activity.

iv) Definite

The impact will take place regardless of any prevention plans, and mitigation actions or contingency plans are relied on to contain the effect.

f) Reversibility of impact

Natural or human aided intervention:

(i) Irreversible

The impact will be permanent.

(ii) Short term

The impact is reversible within two years after construction.

(iii) Long term

The impact is reversible within 2 to 10 years after construction.

g) The degree to which the impact can cause irreplaceable loss of resources

(i) Low

The impact results in the loss of resources but the natural, cultural and social processes/functions are not affected.

(ii) Medium

The loss of resources occurs but natural cultural and social processes continue, albeit in a modified manner.

(iii) High

The impact results in irreplaceable loss of resource.

h) Significance of impact with or without mitigation

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The classes are rated as follows:

i) No significance

The impact is not substantial and does not require any mitigation.

ii) Low

The impact is of little importance but may require limited mitigation.

iii) Medium (Moderate)

The impact is of importance and therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.

iv) High The impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable.

In order to maintain consistency, all potential impacts that have been identified during the BA process will be listed in impact assessment tables. The assessment criteria used in the tables will be applied to all of the impacts and a brief descriptive review of the impacts and their significance provided in the text of the report. The overall significance of impacts will be determined by considering consequence and probability.

8 DESCRIPTION AND ASSESSMENT OF ENVIRONMENTAL IMPACTS

A Basic Assessment Report (BAR) must contain all the information that is necessary for a good understanding of the nature of issues identified during the Basic Assessment (BA) process. The BAR must include a description of environmental issues and potential impacts, including cumulative impacts, mitigation measures that have been identified and other aspects as outlined in Appendix 4 of the NEMA EIA Regulations, 2014 as amended. This chapter also describes the environmental issues and impacts as identified during the BA Process for the construction of the BESS site. The proposed mitigation measures are discussed in this Chapter as well as well as in the EMPr attached as **Appendix G** of this report.

The main objective of this section is to provide independent and scientifically sound information on the impacts identified during the Basic Assessment (BA) Process. Based on the requirements of the impact assessment, impacts identified, and issues and concerns raised are assessed with regard to their significance. The impact assessment is aimed at determining the impacts associated with the proposed development and the prescription of mitigation measures. Other impacts associated with the proposed development are discussed in detail in this section. It must be highlighted that the Impact Assessment Methodology discussed in **Chapter 7** of this report was used to assess the identified impacts.

In both themes, the potential impacts for all construction (activities related to rehabilitation) as well as the Monitoring phases of the projects are assessed. Although a site of about 2016 m^2 is required for the BESS site footprint, the impact assessment undertaken covered an area of about 2880 m^2 to accommodate additional activities such as the site camps, access roads and other construction related facilities. It must be noted that the Impact Assessment Methodology as presented in **Chapter 7** of this report will be used to assess the impacts in terms of:

- nature, significance and consequences of the impact and risk;
- extent and duration of the impact and risk;
- probability of the impact and risk occurring;
- the degree to which the impact and risk can be reversed;
- the degree to which the impact and risk may cause irreplaceable loss of resources; and
- the degree to which the impact and risk can be avoided, managed or mitigated.

The cumulative impacts of the project will also be discussed.

In this report, impacts with a *low significance* are considered to have no influence on the decision to proceed with the proposed development. Impacts with a *moderate significance* will influence the decision unless they

can be effectively mitigated to a low significance, whereas impacts with a *high significance* despite mitigation would influence the decision to proceed with the proposed development. The impacts discussed in this section were identified by the Project Team (including specialists) and were augmented by input from the I&APs during the various project phases. The potential impacts identified and elaborated on in this chapter have been presented as follows:

- Theme 1: Impacts on the Biophysical Environment; and
- Theme 2: Impacts on the Human Environment.

For the purposes of this assessment, this impact assessment will **only** focus on the impacts that are likely to occur during the construction and operational phases of the BESS site based on the location of the site and the site sensitivities determined from desktop and field assessment. Alternative 2A and 2B have been assessed and for this reason, impacts such as Job opportunities for locals will not be assessed as they are not significant. The reasons for each of these are as follows;

- *Job opportunities for locals*: The appointed Contractor will provide their own skilled personnel to undertake all proposed activities. Relevant training will be provided to all personnel. It must be noted that the Substation is a National Key Point and the employment of members of the public could compromise the security of some of the infrastructure
- *Avifauna:* None of the proposed containers are likely to exceed 2 meters in height and therefore will have little to no impact on the flight paths of birds in the area. Furthermore, no birds were noted on site during the two site visits undertaken by the EAP between September 2018 and March 2019. Batteries do not emit Electromagnetic Fields (EMF's) and are therefore will not cause a negative impact on the orientation of birds or result in any change in behaviour and illnesses in humans and animals.

8.1 Theme 1: Impacts on the Biophysical Environment

8.1.1 Impacts on indigenous plant species

As part of the establishment of the BESS site and associated infrastructure, indigenous plant species within the Substation or in its immediate vicinity will be directly or indirectly impacted by the proposed activities. According to the Bioregional plans the site is located within a Protected Area and thus measures must be put in place to prevent the loss of plants, whereas some rocks will also need to be removed to cater for the proposed infrastructure. Possible impacts on CBA, Protected area,SWSAs,FEPA,Focus area for PAES were assessed as per screening tool and found that no further studies are required due to the absence of

vegetation within the Substation area. It is anticipated that the disturbance to indigenous vegetation may be related to the temporary activities and facilities such as:

- Movement of construction vehicles
- Working areas inside the BESS site and the access road; and
- Contractor's camp, laydown areas and toilets.

Table 12 presents an assessment of the impacts associated with the removal of indigenous plant species.

Table 15: Assessment of impacts related to the removal of indigenous plant species

Project phase	Nature of impact	Extent	Duration	Intensity	Probability	Reversibility	Irreplaceable loss of resources	Significance without mitigation	Significance with Mitigation
Solid State Batteries									
Construction	Negative	Site	Permanent	Low	Improbable	Irreversible	Low	Low	Low
Operational	Negative	Site	Short Term	Low	Improbable	Short Term	Low	Low	Low
Decommissioning	Negative	Site	Short Term	Low	Improbable	Short Term	Low	Low	Low
Flow Batteries									
Construction	Negative	Site	Permanent	Low	Improbable	Irreversible	Low	Low	Low
Operational	Negative	Site	Short Term	Low	Improbable	Short Term	Low	Low	Low
Decommissioning	Negative	Site	Short Term	Low	Improbable	Short Term	Low	Low	Low

The proposed mitigation measures to avoid adverse impacts arising as result of the removal of any identified indigenous plant species is as follows:

- An independent Environmental Control Officer must be appointed to monitor all construction activities, ensure the demarcation of all applicable areas and approve the locations of all temporary facilities, e.g. laydown areas, toilets, etc. which must all occur within the vicinity of the existing Substation;
- Location of Contractor 's camp and other temporary infrastructure must be undertaken in consultation with the ECO and where applicable, in consultation with the landowner to avoid placement of such infrastructure outside the boundaries of the Substation;
- Disturbed areas as noted within the Substation must be considered for the location of the camps;
- It is recommended that the width of the access road be limited to the minimum width required for vehicle access and that the development of two narrow road tracks be considered rather than a single, wider access road;
- Clearing of vegetation should only be limited to the following areas

a. The area designated for the construction of the BESS site. Only within the existing Substation. All areas on which vegetation clearing is planned must be demarcated and movement or personnel or vehicles must not be allowed outside these areas;
b. Parking areas for all construction vehicles should be limited to the existing Substation.

- Operational and maintenance activities are to be confined to the development footprint and no access through surrounding natural areas may be allowed;
- Construction workers must not remove flora or collect seed from any plants outside the areas on which vegetation clearing will be undertaken;
- There must be prevention of erosion, and where necessary rehabilitation of eroded area, particularly where these will not form part of the BESS site;
- Only indigenous plants must be used in the landscaping of the site where rehabilitation is required;
- Rehabilitation of disturbed areas must be undertaken as soon as possible construction has ended in the area that has been disturbed;
- Other edge effects from construction activities, such as alien and invasive floral species introduction, proliferation and spread, should be managed through the removal of the invasive species by uprooting and disposal in a covered container for disposal at a suitable facility. All alien seedlings and samplings must be removed as they become evident for the duration of construction and operational phases where the aliens occur in any of the areas cleared to cater for the proposed development;

Refer to the EMPr in **Appendix G** for additional Mitigation measures.

8.1.2 Impacts on Fauna due to construction activities

During the EAPs site visit, there were no animals noted in the area or droppings to suggest the site is a habitat or a foraging area. However rocky outcrops and rushes such as *Juncus lomatophyllus* and *Juncus effusu*s as well as *Pennisetum macrourum* grass around the Substation which could serve as habitats for fauna in the area. Based on the pristine nature of the areas around the Substation, it is possible that some faunal species do occur around the Substation. These may include insects, reptiles, etc. and it is anticipated that such will be disturbed and may move further from the Substation once construction commences. The impact assessment for the impacts on fauna is shown in **Table 13.**

Table 16:Assessment of impacts related to fauna

Project phase	Nature of impact	Extent	Duration	Intensity	Probability	Reversibility	Irreplaceable loss of resources	Significance without mitigation	Significance with Mitigation
Solid State Batteries									
Construction	Negative	Site	Short Term	Low	Improbable	Short Term	Low	Low	Low
Operational	Negative	Site	Short Term	Low	Improbable	Short Term	Low	Low	Low

Decommissioning	Negative	Site	Short Term	Low	Improbable	Short Term	Low	Low	Low
Flow Batteries									
Construction	Negative	Site	Short Term	Low	Improbable	Short Term	Low	Low	Low
Operational	Negative	Site	Short Term	Low	Improbable	Short Term	Low	Low	Low
Decommissioning	Negative	Site	Short Term	Low	Improbable	Short Term	Low	Low	Low

The proposed mitigation measures for the protection of the fauna that possibly occurs on site are as follows;

- All activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962) [APA];
- Any poaching or killing of any animals encountered during the construction or operational phase of the project must not be tolerated and the Contractor must be fined by the ECO where such incidents occur;
- Employees must be trained on how to deal with fauna species as intentional killing will not be tolerated. In the case of a problem animal e.g. snake, a specialist must be called in to safely relocate the animal; and
- All construction activities must be limited to daylight hours which are between 06:00 and 18:00 in the summer months and between 07:00 and 17:00 in the winter months unless otherwise stated in the environmental authorization and or as agreed with the landowner or as stipulated in other guiding documents by the Municipality or other key stakeholders.

8.1.3 Hydrology

The Substation is located adjacent to two watercourses, on its eastern and western boundaries. As the proposed activity is restricted to the already developed footprint of the Substation, the only potential impact is water quality impairment as a result of storm water run-off of contaminated electrolyte spills from the BESS containers. The required BESS equipment will have secondary and tertiary containment systems to prevent spills. However, in the event of leakage from the batteries due to fire or an explosion, a bund must be constructed around the containers to trap any spills and prevent them from entering the stormwater system. **Table 14** summarises the impacts between Alternative 2A and 2B.

Table 17: Assessment of impacts related to Hydrology

Project phase	Nature of impact	Extent	Duration	Intensity	Probability	Reversibility	Irreplaceable loss of resources	Significance without mitigation	Significance with Mitigation
Solid State Batteries									
Construction	Negative	Site	Long Term	High	Improbable	Irreversible	Low	Low	Low
Operational	Negative	Site	Long Term	High	Improbable	Irreversible	Low	Low	Low
Decommissioning	Negative	Site	Long Term	High	Improbable	Irreversible	Low	Low	Low

Flow Batteries									
Construction	Negative	Site	Long Term	High	Improbable	Irreversible	Low	Low	Low
Operational	Negative	Site	Long Term	High	Improbable	Irreversible	Low	Low	Low
Decommissioning	Negative	Site	Long Term	High	Improbable	Irreversible	Low	Low	Low

The proposed mitigation measures for the protection of water resources are as follows:

- Prior to the commencement of any site activities, the Contractor and the ECO must ensure that a stormwater cut of drain must be provided around the laydown areas and construction site to contain dirty water and prevent it from flowing downstream;
- Conduct regular inspections of infrastructure at regular intervals in order to identify any potential failure of infrastructure and repair immediately;
- Contaminated water should be directed into the correct disposal system and none should go into the storm water system;
- Water contaminated by contact with BESS equipment, as well as leachate must be contained within the site.

8.2 Theme 2: Impacts on the Socio-Economic Environment

8.2.1 Traffic on local roads

The movement of construction vehicles during the construction phase of the BESS site can result in an increase in traffic congestion on local roads. It must however be highlighted that the Witzenberg Valley Road is not a busy road and thus traffic will not cause a huge impact and can be managed with mitigation particularly during the construction phase. During the maintenance phase, traffic impacts will be significantly low. The assessment of this impact is indicated in **Table 15.**

Table 18: Assessment of traffic impacts

Project phase	Nature of impact	Extent	Duration	Intensity	Probability	Reversibility	Irreplaceable loss of resources	Significance without mitigation	Significance with Mitigation
Solid State Batteries									
Construction	Negative	Local	Medium Term	Medium	Probable	Short term	Low	Low	Low
Operational	Negative	Local	Short term	Low	Improbable	Short term	Low	Low	Low
Decommissioning	Negative	Site	Short Term	Low	Improbable	Short Term	Low	Low	Low
Flow Batteries									
Construction	Negative	Local	Medium Term	Medium	Probable	Short term	Medium	Low	Low
Operational	Negative	Local	Short term	Low	Improbable	Short term	Low	Low	Low
Decommissioning	Negative	Local	Short Term	Low	Improbable	Short Term	Low	Low	Low

The proposed mitigation measures for the management of traffic brought about by construction activities are as follows:

- There must be an erection of signage warning motorists about the presence of construction vehicles. These must be placed at the main entrance to the site off the Witzenberg Valley Road;
- Construction activities must be limited to daytime hours;
- Construction vehicles must not exceed speeds on 10km within the construction site;
- Construction vehicles travelling on public roads must adhere to speed limits;
- Construction vehicles must not dispose of soil of other material on roads. Where this occurs, the ECO and Contractor must ensure that the material must is removed before the end of the working day.

8.2.2 Impacts on BESS equipment and neighbouring property

Poor handling and management of BESS equipment during transportation and storage could result in damage to equipment or containment breach. This impact is mainly caused by not adhering to recommended handling and storage instructions and can potentially affect adjacent properties. **Table 16** is an assessment of the impacts on BESS equipment or adjacent properties which can be caused by a road accident caused by driver or 3rd party, Cargo not properly secured or bad road conditions.

Table 19: Assessment of impacts on BESS equipment and adjacent properties

Project phase	Nature of impact	Extent	Duration	Intensity	Probability	Reversibility	Irreplaceable loss of resources	Significance without mitigation	Significance with Mitigation
Solid State Batteries									
Construction	Negative	Local	Medium Term	Medium	Probable	Medium Term	Medium	Low	Low
Operational	Negative	Local	Medium Term	Low	Probable	Medium Term	Low	Low	Low
Decommissioning	Negative	Local	Medium Term	Low	Probable	Medium Term	High	Low	Low
Flow Batteries									
Construction	Negative	Local	Medium Term	Medium	Probable	Medium Term	Medium	Low	Low
Operational	Negative	Local	Medium Term	Low	Probable	Medium Term	Low	Low	Low
Decommissioning	Negative	Local	Medium Term	Low	Probable	Medium Term	High	Low	Low

The proposed mitigation measures to ensure the protection of infrastructure are as follows;

- Regular Inspection of packaging for potential damage;
- Route planning and obtaining all relevant permits from the local authorities;

- Adhere to SANS 10234 handling and transportation instructions;
- Agreement / contract with registered company for first response, site clean-up and rehabilitation; and
- All MSDS available for all the BESS equipment.

8.2.3 Dust and Air Quality Impacts

The proposed construction of the BESS site will bring about dust impacts. BESS equipment does not produce emissions thus will not cause air quality impacts. An assessment of the potential dust and air quality impacts of all phases are shown in **Table 17.**

Table 20: Assessment of air quality impacts

Project phase	Nature of impact	Extent	Duration	Intensity	Probability	Reversibility	Irreplaceable loss of resources	Significance without mitigation	Significance with Mitigation
Solid State Batteries									
Construction	Negative	Local	Medium Term	Medium	Probable	Short Term	Medium	Low	Low
Operational	Negative	Local	Medium Term	Low	improbable	Short Term	Low	Low	Low
Decommissioning	Negative	Local	Medium Term	Medium	Probable	Short Term	High	Low	Low
Flow Batteries									
Construction	Negative	Local	Medium Term	Medium	Probable	Short Term	Medium	Low	Low
Operational	Negative	Local	Medium Term	Low	improbable	Short Term	Low	Low	Low
Decommissioning	Negative	Local	Medium Term	Medium	Probable	Short Term	High	Low	Low

The proposed mitigation measures for dust and air quality are as follows:

- Implement dust suppression measures in all areas that will be affected by construction activities and where dust will be generated. Dust suppression must also be undertaken during windy and dry weather conditions;
- A continuous dust monitoring process needs to be undertaken during construction;
- Speed restriction of no more than 10km/h must be implemented for all construction vehicles within the construction site.; and
- All vehicles transporting friable materials such as sand must be covered by a tarpaulin or wetted down.

8.2.4 Noise Impacts

Construction sites are synonymous with noise impacts. High noise levels can have an adverse impact on both site labourers as well as the public, including occupiers of adjacent land. With regards to the Eskom BESS site although there are no sensitive noise receptors due to adjacent properties consisting of farm properties, impacts, mainly from the movement of vehicles as well as the construction activities will cause an impact. Fauna in the vicinity of the site may also be affected by noise. It is therefore important that this impact is assessed as presented in **Table 18.**

Table 21: Assessment of noise impacts

Project phase	Nature of impact	Extent	Duration	Intensity	Probability	Reversibility	Irreplaceable loss of resources	Significance without mitigation	Significance with Mitigation
Solid State Batteries									
Construction	Negative	Local	Short Term	Medium	Probable	Short Term	Medium	Low	Low
Operational	Negative	Local	Short Term	Low	improbable	Short Term	Low	Low	Low
Decommissioning	Negative	Local	Short Term	Medium	Probable	Short Term	Medium	Low	Low
Flow Batteries									
Construction	Negative	Local	Short Term	Medium	Probable	Short Term	Medium	Low	Low
Operational	Negative	Local	Short Term	Low	improbable	Short Term	Low	Low	Low
Decommissioning	Negative	Local	Short Term	Medium	Probable	Short Term	Medium	Low	Low

The proposed mitigation measures to address noise impacts in the undertaking of construction activities are as follows:

- The working hours stipulated in the Construction permit, where applicable, must be adhered to. Where this is not applicable, the following working hours must be adhered to: Monday to Friday 07:00 – 17:00 for weekdays. Working hours during weekends must be agreed between ESKOM and the Contractor.
- All construction plant and other equipment must be in a good working order to reduce possible noise pollution;
- Noise reduction is essential, and Contractors must endeavour to limit unnecessary noise, especially loud talking, shouting or whistling, radios, sirens or hooters, motor revving, etc.;
- Blasting must not take place on site under any circumstances

8.2.5 Heritage impacts

Construction activities such as excavations and grading could expose or damage features of heritage and cultural value beneath the surface. Although no heritage resources of value e.g. graves were observed during the site visits, it is vital that measures be put in place to address these matters should any resources be uncovered during site activities. Refer to **Table 19** for an assessment of potential impacts on heritage resources.

Table 22: Assessment of heritage resources impacts

Project phase	Nature of impact	Extent	Duration	Intensity	Probability	Reversibility	Irreplaceable loss of resources	Significance without mitigation	Significance with Mitigation
Solid State Batteries									
Construction	Negative	Site	Short Term	Medium	improbable	Short Term	Medium	Low	Low
Operational	Negative	Site	Short Term	Low	improbable	Short Term	Low	Low	Low
Decommissioning	Negative	Site	Short Term	Medium	improbable	Short Term	Medium	Low	Low
Flow Batteries									
Construction	Negative	Site	Short Term	Medium	improbable	Short Term	Medium	Low	Low
Operational	Negative	Site	Short Term	Low	improbable	Short Term	Low	Low	Low
Decommissioning	Negative	Site	Short Term	Medium	improbable	Short Term	Medium	Low	Low

In order to protect Heritage Resources on site, the following mitigation measures are proposed:

- Should any graves be uncovered during the construction phase of the project, the applicant and appointed ECO must ensure in terms of section 38(6) of the Act, the responsible heritage resources authority Provincial Heritage Western Cape (HWC) as well as the South African Police Service (SAPS).
- The ECO must train the Contractor to recognise any heritage features. Should there be a sign of such objects, construction must halt in that area immediately and a suitably qualified heritage specialist must be called to investigate through the ECO.

8.2.6 Health and Safety

The Construction activities planned for the BESS site will bring about various impact that can affect the Health and Safety of human beings. Some of the impacts are applicable to the Operational Phase where maintenance of the BESS site will be undertaken. Based on this, Health and Safety issues are crucial to the project. It must be highlighted that the detailed impacts and mitigation measures for Health and Safety will be assessed by the relevant trained personnel for the project. The overall assessment of this impact is summarised in **Table 21.**

Table 23:Assessment of health and safety impacts

Project phase	Nature of impact	Extent	Duration	Intensity	Probability	Reversibility	Irreplaceable loss of resources	Significance without mitigation	Significance with Mitigation
Solid State Batteries									
Construction	Negative	Local	Medium Term	High	Probable	Medium Term	Medium	Low	Low
Operational	Negative	Local	Medium Term	High	Probable	Medium Term	Medium	Low	Low
Decommissioning	Negative	Local	Medium Term	High	Probable	Medium Term	High	Low	Low
Flow Batteries									
Construction	Negative	Local	Medium Term	High	Probable	Medium Term	Medium	Low	Low
Operational	Negative	Local	Medium Term	High	Probable	Medium Term	Medium	Low	Low
Decommissioning	Negative	Local	Medium Term	High	Probable	Medium Term	High	Low	Low

The generic mitigation methods to ensure the Health and safety of all site personnel as well the public are as follows:

- The site and any excavations within it must be fenced off as safety mechanisms during the construction phase;
- Suitable Personal Protective Equipment (PPE) must be worn at all times by all employees on site during the construction and maintenance phases of the project;
- Inspection of BESS equipment packaging for damage, must be done before and after storage and a record of this kept on file;
- Operating and Maintenance Programme and document must be adhered to during the operation of BESS equipment and this must be audited monthly;
- Material Safety Data Sheet (MSDS) for all BESS equipment must be kept on site during Construction and operation and updated regularly; and
- Detailed Health and Safety issues will be addressed in reports compiled by the most relevant parties.

8.2.7 Decommissioning

At the end of the BESS facility life cycle, equipment will have to be removed and safely disposed. The potential damage to equipment or containment breach during decommissioning could lead to environmental impacts**.**

An assessment of decommissioning impacts is presented in **Table 22** below.

Table 24:Assessment of decommissioning impacts

Project phase	Nature of impact	Extent	Duration	Intensity	Probability	Reversibility	Irreplaceable loss of resources	Significance without mitigation	Significance with Mitigation
Solid State Batteries									
Construction	Negative	Local	Medium Term	Low	Probable	Medium Term	Low	Low	Low
Operational	Negative	Local	Medium Term	Low	Probable	Medium Term	Low	Low	Low
Decommissioning	Negative	Local	Medium Term	High	Probable	Medium Term	High	Low	Low
Flow Batteries									
Construction	Negative	Local	Medium Term	Low	Probable	Medium Term	Low	Low	Low
Operational	Negative	Local	Medium Term	Low	Probable	Medium Term	Low	Low	Low
Decommissioning	Negative	Local	Medium Term	High	Probable	Medium Term	High	Low	Low

In order to mitigate the potential visual Impacts, the following measures are proposed:

- Decommissioning strategy must be in place;
- Waste management plan must be in place;
- Waste streams identified and documented;
- Waste permits in place;
- Accredited waste facilities to be contracted for accepting / recycling the waste; and
- An BA for the decommissioning of the BESS plant will be required and could trigger the need for a waste management license.

8.3 Cumulative Impacts

The NEMA EIA Regulations (2014) defines a “cumulative impact” in relation to an activity, as the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities. This is required on the basis that the impact of an activity that in itself may not be significant but may become significant when

added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

The environmental impacts that will emanate from the activities associated with the construction and decommissioning of the BESS infrastructure have already been discussed in this BAR. The impacts on Human Health, Surface and ground Water are those of concern and where mitigation measures are not applied can lead to illness or death.

Mitigation measures to ameliorate these impacts during the construction, operational and decommissioning phases of the project have been discussed in some sections of this chapter and are prescribed in detail in the EMPr attached as **Appendix G** of this report.

9 CONCLUSION, ENVIRONMENTAL IMPACT STATEMENT AND RECOMMENDATIONS

Eskom is applying for an environmental authorisation to construct a BES site at the existing Witzenberg Substation. The issuing of an EA is crucial to the project as it will allow for the construction and subsequent operation and maintenance of the BESS site in order for Eskom to fulfil its mandate to provide increased access to clean, reliable and affordable electricity in South Africa and satisfy the conditions of the World Bank and the Clean Technology Fund (CTF) in evaluating the potential of energy storage technologies.

BESS can shift consumption of electricity from expensive periods of high demand to periods of lower cost electricity during low demand. This also allows facilities to make the most of time-of-use pricing and reduce tariff structure change risk to electricity cost. BESS also addresses Demand response for farming and industrial activities therefore not impacting on-site energy use or operations.

Based on the summary of environmental observations of the site, it is a conclusion of this report that the proposed construction of a BESS facility will have moderate impacts on the bio-physical environment provided all mitigation measures detailed in this report as well as the EMPR in are adhered to.

In the undertaking of any Basic Assessment Process, Public participation is a legislative requirement as set out in the NEMA EIA Regulations. The Public participation process involved sourcing of comments from I&AP, particularly adjacent land owners. It must be highlighted that to date, the project has not drawn sufficient attention to warrant public meetings or additional focus groups with exception of pre-application meetings held with DEFF. Consultation with all the key stakeholders including the Environmental groups that have interest on development around Witzenberg area was undertaken to inform them about the proposed project.

9.1 Environmental Impact Statement

The installation of BESS infrastructure, particularly given the classification of hazardous chemicals contained in the batteries is disruptive in nature, and the proposed mitigation measures must therefore be strictly adhered to. The key environmental impacts that may arise as result of the proposed activities include contamination of surface and ground water due to electrolyte spillages, health impacts on staff and communities living around the Substation and increased soil erosion due to increased surface water runoff etc. Each of the impacts can however be mitigated through the

measures indicated in Chapter 8 of this report as well as in the Environmental Management Programme attached as **Appendix G** of this BAR. These plans must be supplemented with additional conditions from the Environmental Authorization that will be issued by DEFF as the Competent Authority. **It is therefore a conclusion of the EAP that the applicant's preferred alternative (Installation of Solid-State Batteries) be approved, provided the mitigation measures outlined in this Basic Assessment are implemented.**

A total of three (3) alternatives were identified for the project as the No-Go Option, site location alternative and Process/Technology alternative. Each were discussed and the advantages and disadvantages presented. The proposed construction of the BESS in the identified site as discussed in the report emerged as the most feasible. Alternative 2A (Solid State Battery) is the preferred alternative as it requires a smaller footprint, less electrolyte and technically performs well.

Li-ion batteries have been found to be the most appropriate solid state battery technology as it is relatively mature commercial technology and are now the dominant electrical storage technology in automotive applications for both electric vehicles and hybrids. Although manufacturers are still experimenting with formulations and fabrication techniques to improve performance, reliability and reduce costs, the overall performance of this technology is reasonably well developed and understood.

By improving the overall efficiency of the power grid, BESS accelerates the broader adoption of renewable energy. On a more local level, an energy storage system has no emissions, so it can be placed anywhere in a facility with no immediate environmental or air quality impacts. And if paired with solar PV, not only will the power be GHG-free, the combined system allows Eskom and the country to reduce its carbon footprint and achieve its objective to reduce greenhouse gas (GHG) emissions in a sustainable, cost effective and affordable manner as outlined in the Carbon Tax Act No 15 of 2019.

Once the Environmental Authorization has been received for the proposed activities, Eskom can then proceed with the construction of the BESS site and associated infrastructure.

9.2 EAP's Recommendations

This Basic Assessment report has provided a comprehensive assessment of the potential environmental impacts associated with the proposed activity. These impacts have been identified by the EAP and the Fresh Water Impact Assessment report. The key findings of the Basic Assessment Process are discussed in this report. It is the considered opinion of the EAP that the installation of Solid-State Battery Technology infrastructure (Alternative 2A) is the most effective way of meeting the need and purpose of the proposed activity and will enhance the environmental benefits of the proposed activity through the provision of GHG free electricity and avoiding potentially significant negative impacts.

The feasible alternative for the proposed installation of BESS infrastructure at Witzenberg substation is the installation of Solid State Batteries, preferably Lithium ion batteries. These batteries require a small footprint and its technology has been found to be high performing and reliable and its constituents are less toxic as compared to lead batteries.

Impacts of high significance are not foreseen once proper mitigation measures have been implemented. It is therefore recommended that the environmental authorities subject the proposed application to the following conditions:

a. All adjacent landowners must be informed of the commencement of construction activities at least 30 days before the commencement;
b. An Independent Environmental Control Officer must be appointed to monitor all construction activities and ensure the demarcation of all applicable areas and approve the locations of all infrastructure;
c. The Contractor's site camp, must be located within the Substation;
d. Operation of plant and site vehicles should be done with care. No damage permitted to terrestrial plants on adjacent properties;
e. All operators and maintenance crew of the Substation must adhere to SANS 10234 standards in the handling and storage of BESS equipment.
f. Inspection of BESS equipment packaging for damage, must be done before and after transportation and a record of this kept on file;
g. Installation of leak detection monitoring systems;
h. On-site battery maintenance should only be undertaken on impermeable surfaces with secondary containment measures. Any resulting hazardous substances must be disposed of appropriately; and

i. A stormwater management plan must be developed to address the impacts of the BESS infrastructure once the technology to be used is finalised.

j. Inspection of BESS equipment packaging for damage, must be done before and after storage and a record of this kept on file;

k. Operating and Maintenance Programme and document must be adhered to during the operation of BESS equipment and this must be audited monthly.

l. Material Safety Data Sheet (MSDS) for all BESS equipment must be kept on site during Construction and operation and updated regularly;

m. Accredited waste facilities to be contracted for accepting / recycling the waste from defective BESS equipment;

n. Eskom and the appointed Contractor must engage DEFF to obtain the required permits and comply with the requirements of the Basel Convention.

o. It is recommended that ongoing monitoring of the ecological condition of the vegetation surrounding the Substation should take place monthly during construction and annually during the operation phase.

p. The Contractor must be trained to recognise any heritage features. Should there be a sign of such objects, construction must halt in that area immediately and a suitably qualified heritage specialist must be called to investigate through the ECO;

q. The length of the period for a positive Environmental Authorization should be no less than 10 years to allow for the appointment of a suitable Contractor and ensure all relevant protocols and permit requirements are addressed. The proposed development of BESS infrastructure at the existing Witzenberg substation is a Priority Infrastructure Project and it is contemplated that construction will commence no later than 2022 after the appointment of a suitable service provider.

r. Any event resulting in the spill or leak of hydrocarbons or any other hazardous substances into the soil and/or watercourses must be reported to all relevant authorities, including the Western Cape Provincial Governments Department's Pollution and Chemicals Management Directorate.(Ms Shehaam Brinkhuis (Shehaam.Brinkhuis@westerncape.gov.za; Tel: (021) 483 8309);

s. Only staff with applicable accreditation must be allowed to contain any spillages.

t. The Substation must have a waste clean-up agreement with accredited service provider whereby all electrolyte spillages must be removed no later than 24hours after their occurrence.

u. In terms of Regulation 8(a) of NEMWA the operations unit of the substation must ensure

that they retain copies, or be able to access copies/records, of the waste manifest documentation for a period of at least five (5) years."

v. Adhere to all conditions of the Environmental Authorisation issued by DEFF as well as any conditions of permits that may be required thereafter; and

w. Adhere to all recommendations outlined in the Fresh Water Impact Assessment Report (**Appendix F1),** and the Environmental Management Programme in **Appendix G,**

Based on the environmental assessment of the site conditions, and the potential impact of BESS infrastructure Alternative 2 (Solid State Batteries) has emerged as the most viable option subject to adherence to mitigation measures outlined in this report and the EMPr.

It is therefore strongly advised that the recommendations highlighted in this section be included as conditions of authorisation by the DEFF. GA Environment's recommendation following this Basic Assessment is that the applicant Eskom be granted an Environmental Authorisation for the installation of BESS infrastructure at the existing Witzenberg Substation subject to the condition that all Mitigation Measures provided be strictly adhered to and closely monitored by an independent EAP to avoid adverse environmental Impacts. **.**

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