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FINAL BASIC ASSESSMENT REPORT (FBAR)

PROPOSED ESKOM HOLDINGS (SOC) LIMITED BATTERY ENERGY STORAGE SYSTEM (BESS) PONGOLA SUBSTATION, LOCATED WITHIN THE uPHONGOLO LOCAL MUNICIPALITY, ZULULAND DISTRICT MUNICIPALITY, KWAZULU-NATAL

[MARCH 2020]

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Verification	Capacity	Name	Signature	Date
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Disclaimer:

This Basic Assessment Report has been based on information provided by Eskom Holdings (SOC) Limited. While due care is taken in presentation of information, 1World will not take responsibility for errors and/or exclusion of information. Two battery types are presented within the BAR namely Lithium-ion batteries and flow batteries. Eskom will not know the final technology solution that will be used until the tenders have been evaluated and the contract awarded. The Environmental Authorisation is required prior to going out to tender. The list of dangerous goods comes from the final technology selected. Once the Market comes back with solutions, Eskom will evaluate these options and will specify a preferred technology type. 1World acts as the independent Environmental Assessment practitioner (EAP) in this application and performs work in an objective manner.

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Executive Summary

1World Consultants (Pty) Ltd (1World) has been appointed by Eskom Holdings SOC Limited, as the independent Environmental Assessment Practitioner (EAP) tasked with undertaking an Application for Environmental Authorisation. A Basic Assessment Process has been followed for the proposed Eskom Distribution Battery Energy Storage System (BESS) to be located at the Eskom Pongola Substation, uPhongolo Local Municipality, Zululand District Municipality, KwaZulu-Natal.

The Distribution Battery Energy Storage project will directly contribute towards the following three (3) Eskom's strategic objectives:

- Ensure reliable supply of electricity to all South Africans;
- Securing adequate future electricity supply at the optimal cost of renewable energy for South Africa; and
- Directly and indirectly supporting the socio-economic development objectives of South Africa.

Eskom is considering several BESS technology alternatives; some are solid state batteries and others are flow batteries. A single battery technology, or a combination of the two technology alternatives, may be implemented at each site. The chemical composition of the batteries can be dangerous and hazardous. Eskom has to follow the World Bank procurement strategy and the disclosure of particular information that could influence market competitiveness. The market for grid connected energy storage systems is rapidly expanding and the various deployment of these systems prove to offer many benefits to the future smart grid. Electrical Energy Storage (ESS) is becoming increasingly important for integrating intermittent renewable energy sources, achieving a better balancing of the grid, reducing total generation cost and limiting investment in new infrastructure. Storage is also an important element in micro-grids and decentralized generation where it permits better planning and management of local energy consumption.

The proposed BESS project triggers the need for a Basic Assessment Report. The impacts associated with the proposed development are focused on both the construction and operational phases. Additionally, impacts to Wetlands, Biodiversity and Heritage aspects were also deliberated and this report now provides all required information to advise on the applied Environmental Authorisation from DEA. Some key impacts were:

- Traffic pressures and access
- Soil erosion
- Stormwater management
- Ground water pollution
- Surface water pollution
- Risk of alien invasive encroachment
- Flora
- Fauna
- Waste management
- Noise disturbance
- Air quality
- Visual quality
- Public health and safety
- Heritage impacts
- Socio-economic impacts

Specialist studies were conducted to aid in a thorough investigation of the impacts and included:

- A **Geotechnical Study** by Eskom Holdings SOC Limited;

- A **Wetland Assessment** by Malachite Ecological Services (Pty) Ltd to determine the impact the proposed development will have on watercourses;
- A **Biodiversity Assessment** by Malachite Ecological Services (Pty) Ltd to determine the potential impact the proposed development may have on flora and fauna;
- An **Application for Exemption for HIA** by JLB Consulting to ensure that no items of cultural or historical value would be impacted on by the construction;

A field survey was undertaken to analyse the site and identify water resources potentially at risk due to the proposed development. The Voyizana River is located 230m west of the substation site. A 500m buffer was implemented to delineate the identified watercourses. It must be noted that the Voyizana River and associated riparian zones are hydrologically isolated from the substation site. Impacts to the system are numerous and include anthropogenic development both in the form of infrastructure and agricultural activities. Any stormwater runoff from the proposed activity will be intercepted by numerous anthropogenic impoundments including the R66 road, two dirt roads, a canal used for irrigation purposes, as well as a sugarcane farm.

Habitats within the project area have been impacted through historic and current anthropogenic impacts over the years. The floral and faunal communities have been impacted significantly and the site provides limited to no conservation value. Although the site is associated with a low ecological sensitivity, there are several *Parthenium hysterophorus* scattered across the site. It is imperative that these species are eradicated through early detection to ensure they do not spread into the adjacent CBA. Several relatively small moribund termite mounds were noted across the site. These act as important refuge sites for reptile species. Prior to construction these must be excavated by a suitably qualified herpetologist and any fauna present must be relocated outside of the project area to a safe location. A single *Adansonia digitata* specimen was identified on the north western edge of the BESS project area. Any impacts to this tree will require the acquisition of permits.

Mitigation measures to minimise or eliminate impacts were identified by the specialists and EAP and were utilised towards the preparation of the Environmental Management Programme (EMPr). The EMPr must be read in conjunction with this BAR and is essential towards the protection of the environmental elements whilst establishing BESS.

A Public Participation Process (PPP) to review the BAR and EMPr involved consultation with the relevant authorities, the landowners affected along the way, community leaders and other identified Interested and Affected Parties (I&APs). Newspaper advertisements were published to inform the general public of the Basic Assessment Process. An advertisement was published in English and IsiZulu on 15 November 2019 in the Zululand Observer Newspaper. Site notices were erected at the site in November 2019. Public Meetings will only be held should it be requested.

This BAR has been prepared in Accordance with the EIA Regulations, 2017 and follows the requirements for a BAR in Appendix 1 of GNR 326.

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1. INTRODUCTION

1World Consultants (Pty) Ltd (1World) has been appointed, by Eskom Holdings SOC Limited, as the independent Environmental Assessment Practitioner (EAP) tasked with undertaking an Application for Environmental Authorisation. A Basic Assessment Process has been followed for the proposed Eskom Distribution Battery Energy Storage System (BESS) to be located at the Eskom Pongola Substation, uPhongolo Local Municipality, Zululand District Municipality, KwaZulu-Natal.

Eskom Holdings SOC Limited has identified distributed storage as an alternative to support renewable energy expansion in South Africa. Electricity generation from renewable sources is limited by the intermittency and variability of wind and solar resources, i.e. when wind blows and sun shines. Energy storage allows for the storing of electricity for later use even when the renewable resource is unavailable. The 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, therefore giving the utility considerable flexibility and control.

The Distribution Battery Energy Storage project will directly contribute towards the following three (3) Eskom's strategic objectives:

- Ensure reliable supply of electricity to all South Africans;
- Securing adequate future electricity supply at the optimal cost of renewable energy for South Africa; and
- Directly and indirectly supporting the socio-economic development objectives of South Africa.

Eskom will be faced with massive loan recalls and contract penalties if this project does not go-ahead. The World Bank and co-financiers approved distributed battery energy storage and Solar PV as an alternative to support renewable energy expansion in South Africa and to replace the terminated Kiwano CSP 100MW project. The Kiwano CSP (Concentrating Solar Power) plant project has been deemed too expensive to consider at this stage.

Given the global trends in the application of BESS to support National Electricity Grids, significant and scalable benefit can be derived in developing this technology application for South Africa.

Table 1: Summary of Site Details

Pongola Substation	
Project Applicant	Eskom Holdings SOC Limited
Ward	Ward 1
Local Municipality	uPhongolo Local Municipality
District Municipality	Zululand District Municipality
Property Description	Lelieshoek 45/730 HU
Substation Reference	Pongola 132 / 22kV Distribution Substation
Site Extent	26 233m²
New Development Footprint on the Ground Level	9 437m²

1.1. Terms of Reference

In October 2018, an Environmental and Social Management Framework (ESMF) in the context of Eskom's Distributed Battery Storage with Distributed Solar Photo-Voltaic (PV) project, was conducted. The aim was to provide the framework for environmental and social screening, scoping assessment, management, monitoring and reporting during the development, execution, operation and maintenance of this project. The ESMF addressed the South African environmental and social legislative framework as well as Eskom's policies, standards and guidelines that apply the relevant safeguards for this investment that could have an impact on biophysical and social environments in which it is undertaken.

Liaising with the Department of Environmental Affairs (DEA) was also conducted to gain clarity on the application of the EIA Regulations. This is as per Section 28 of the South African National Environmental Management Act which legally obligates Eskom to ensure environmental duty of care in all that it does. Clarification was sought from DEA with regard to several aspects:

- *Whether BESS was considered 'storage' activity (as per Activity 14); i.e. shipping container which houses the lithium-ion batteries vs container tanks for flow batteries*
- *Approach to EA Applications and Project Groupings (EIA Regulations Section 11 relating Combination of applications)*
- *Applicability of Listed Activities and Level of Assessment i.e. Basic Assessment or Scoping and EIA*
- *Alternatives (Site & Technology) & Preferred Alternative Status*
- *Export of hazardous waste (Basel Convention Application)*

DEA advised that each Operating Unit (OU) arrange a Pre-Application Meeting with appointed EAPs. An initial twelve (12) sites across KZN were screened for the implementation of BESS. However, only two (2) substations were given the go-ahead due to funding from the World Bank, as well as, Eskom internal discussions based on BESS implementation. Consequently, a meeting with DEA was requested by 1World and held for the two (2) substation sites in KwaZulu-Natal namely Pongola Substation and Elandskop Substation.

Ultimately, the outcome of an environmental authorisation process must be to provide the Competent Authority, the National Department of Environmental Affairs (DEA), with sufficient information to provide an informed decision on the Application, in terms of Environmental Authorisation (EA), in order to avoid or mitigate any detrimental impacts that the activity may inflict on the receiving environment.

1.2. Pre-application Meeting

A site inspection was conducted with officials from 1World and Eskom on 25/02/2019. The site inspection conducted, together with the desktop screening conducted informed this BA process and key discussion areas/topics. A pre-application meeting for two (2) substation sites was held on 05 July 2019, to confirm and clarify the above described issues. The following points summarise the pre-application meeting. Detailed minutes of the meeting together with the presentation can be reviewed under Appendix A.

- Detailed project background, introduction and scope was provided.
- The regional setting of each substation was presented whereby the location and municipalities were discussed.
- The Pongola substation was discussed in detail under the following subsections:
    - General location of the substation;
    - Environmental sensitivities as per the desktop screening report (i.e. CBA; biodiversity; vegetation type; wetlands and watercourses);
    - Anticipated specialist studies to be undertaken at the Pongola substation.

- The technology alternatives were discussed in conjunction with the listed activities identified. It was noted that it is important to understand the technology proposed as this directly influences the listed activities in terms of the EIA Regulations.

A Basic Assessment (BA) Process has been undertaken and the environmental outcomes, impacts and residual risks of the proposed Listed Activity/ies being applied for have been noted in this BA Report and assessed accordingly by the Environmental Assessment Practitioner (EAP). The requirements of the BA Process have been noted in Appendix 1 of the EIA Regulations, GNR 326 (2017) and are consequently adhered to in this report in the interests of best practice. The BA Report focuses on the potential impacts that may arise during the construction and operational phases and provides recommended mitigation measures.

1.3. Project Approach

The World Bank and co-financiers approved distributed battery energy storage as an alternative to support renewable energy expansion in South Africa and to replace the terminated Kiwano CSP (Upington CSP) 100MW project.

The Pongola substation is an existing Eskom distribution substation in KwaZulu-Natal. Pongola substation was identified to have sufficient space to accommodate BESS, without requiring further acquisition of land or rezoning. The proposed commission date for installation is December 2019.

The overall approach to the Basic Assessment Process included the following activities:

- Desktop Screening of the site in question, to identify environmental sensitivities and constraints, including proximity of airports;
- Specialist studies, as required per site, to further identify environmental constraints and elements of concern;
- Preparation of Basic Assessment Reports, that: -
    - Provide relevant background of the project,
    - Summarise key findings,
    - Identify and assess impacts of the project during installation and during operational phase,
    - Provide recommendations and mitigation measures for the responsible installation and operation of the facility,
    - Provide need and desirability, motivation and impact statement from an environmental perspective, and
    - Preparation of an Environmental Management Program (EMPr) for service providers and the Applicant to utilise as a guideline to allow and prohibit tasks, in keeping with the provided Environmental Authorisation that is granted.
- Public and Stakeholder Participation Process, which allows review of the afore-mentioned BAR, studies and EMPr, for positive engagement which allows holistic, legal and complete processes for the installation and operation of the facility,
- Application for Environmental Authorisation to the Department, which provides all the relevant information for the Competent Authority to make a decision regarding the development.

The Desktop Screening Report that was undertaken for the Pongola Substation can be reviewed under Appendix A. Following receipt of the DEA comment, the original screening report as generated on the online tool can also be reviewed under Appendix A.

The following sections are the Basic Assessment Report for review and acceptance.

2. ROLE PLAYERS IN THE BASIC ASSESSMENT PROCESS

2.1. Environmental Assessment Practitioner

Business name of EAP:	**1World Consultants (Pty) Ltd**		
Physical address:	**181 Winchester Drive, Reservoir Hills,**		
Postal address:	**P.O. Box 2311, Westville,**		
Postal code:	**3630**	Cell:	**082 640 4900**
Telephone:	**031 262 8327**	Fax:	**086 726 3619**
E-mail:	fatima@1wc.co.za		

Table 2: Names and Expertise of Representatives of the EAP

Name and Title	Qualifications and Affiliations	Role	Experience at Environmental Assessments
Mohamed Peer	B.Sc (Electrical Eng) Pr. Eng	Project Manager	13 years
Fatima Peer	B.Sc (Hons) Pr. Sci. Nat., IAIAsa	Senior EAP	10 years
Adila Gafoor	B.Soc. Sci. (Geog) IAIAsa	EAP	5 years
Roschel Maharaj	B.Sc IAIAsa	EAP	4 year
Wasila Vorajee	B.Sc (Hons) IAIAsa	Junior EAP	1 year

A Company Profile, Company Experience and CV's for 1World Consultants (Pty) Ltd is provided in Appendix B.

2.2. Project Specialists

Table 3: Names and Expertise of Specialists

Name of specialist	Professional Affiliations	Field of expertise	Section/s contributed to in this basic assessment report	Title of specialist report/s as attached in Appendix E
S. Sikhakhane	Civil Designer	Civil Designer	Summary of Specialist Study Findings and Impacts (Section 11)	Geotechnical Report: Pongola Substation Battery Energy Storage System
P. Chetty	Civil Design Manager Pr. Eng	Civil Design Manager		
Dr. Craig Widdows (Malachite Ecological Services (Pty) Ltd)	SACNASP Reg. No. 117852	Ecologist	Summary of Specialist Study Findings and Impacts (Section 11)	Biodiversity Assessment: Pongola Substation Battery Energy Storage System, Zululand District Municipality, KwaZulu-Natal
Rowena Harrison (Malachite Ecological Services (Pty) Ltd)	SACNASP Reg. No. 400715/15	Wetland Specialist	Summary of Specialist Study Findings and Impacts (Section 11)	Wetland Impact Assessment: Pongola Substation Battery Energy Storage System, Zululand District Municipality, KwaZulu-Natal
Jean Beater (JLB Consulting)	MA (Heritage Studies) MSc (Environmental Management) Association of South African Professional Archaeologists (No. 349)	Heritage Specialist	Summary of Specialist Study Findings and Impacts (Section 11)	Application for Exemption for Undertaking Phase 1 HIA for Battery Energy Storage System Pongola Substation, Uphongola Local Municipality, KwaZulu-Natal

The specialist declarations and CV's can be reviewed under Appendix B.

3. OBJECTIVES

According to the EIA Regulations (2017), Appendix 1 of GNR 326:

"The objective of the basic assessment process is to, through a consultative process—

(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"

4. LOCATION OF THE ACTIVITY

The proposed BESS facility is located within Ward 1 of the uPhongolo Local Municipality, at the existing Pongola Substation Site. The site details are as described in Table 4 below. Map 1 below depicts the general locality of the site projecting a larger overview of the project area. The site is currently used for a 132 / 22kV distribution substation. Further site details such as the 21-digit Surveyor General (SG) number for the property and site co-ordinates are provided in Table 4.

Table 4: Site Details

Property Description	Lelieshoek 45/730 HU		
Landowner	Eskom SOC Holdings Limited		
21-digit Surveyor General (SG) numbers	**Farm Name**	**Farm / Erf Number**	**21-Digit Code**
	Lelieshoek	730	NOHU00000000073000000
	Lelieshoek	746	NOHU00000000074600000
	Lelieshoek	746	NOHU00000000074600000
	Lelieshoek	746	NOHU00000000074600000
	Lelieshoek	730	NOHU00000000073000000
Property Size	26 233m²		
Development Footprint	9 437m²		
GPS Coordinates	27° 26' 54.08" S; 31° 38' 20.52" E		

The general area of the Pongola Substation and site area is depicted in Figures 1 and 2 respectively.

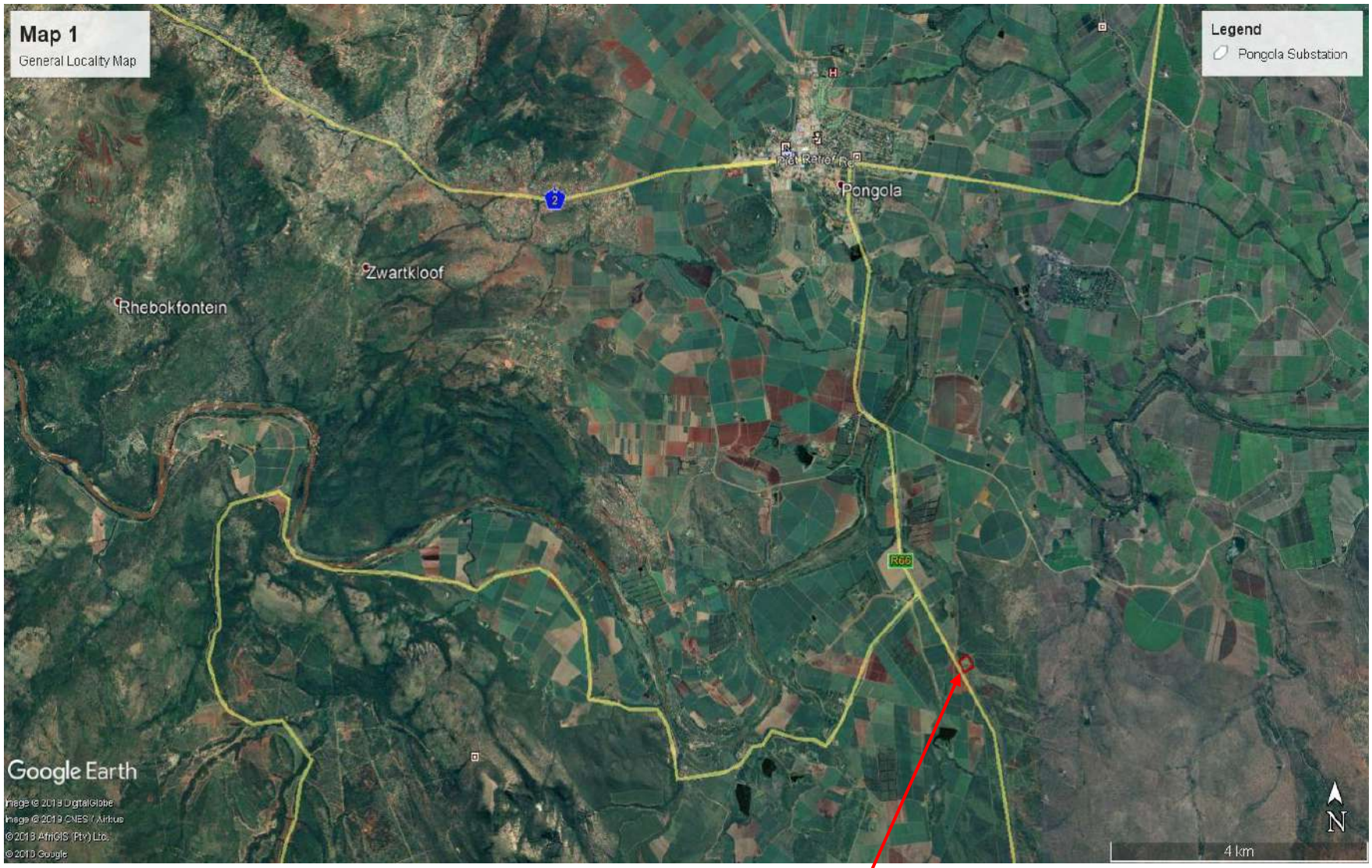

Figure 1: Greater uPhongola Municipality and Proposed Site Location (Red), (Google Earth Imagery, 2018)

Figure 2: Pongola Substation (Red), (Google Earth Imagery, 2018)

5. PROPOSED ACTIVITY

The proposed development is centered on the implementation of Battery Energy Storage System (BESS) proposed at the Pongola Substation. The project is further discussed below.

5.1. Project Description and Plans

The Pongola Substation has been identified and noted to have sufficient space to accommodate the proposed Battery Energy Storage System (BESS). No acquisition of land and rezoning is required. The following criteria was implemented to determine substations that qualify for the BESS project.:

- Network simulations identified constrained distribution feeders where BESS can provide a solution;
- Ownership of the property (Ph1 all Eskom Owned);
- Proximity of load customers to existing or confirmed future renewable generators (IPPs);
- Availability of sufficient Medium Voltage connection capacity for the BESS; and
- Availability of sufficient space at the substation for installation of the BESS containers.

Figure 3 below depicts the Pongola Substation site with a sketch (white Block) indicating the area for the BESS. Figure 4 below is a conceptual design of the Pongola Substation and the area proposed by BESS as provided by Eskom Holdings SOC Limited.

Figure 3: Pongola Substation and Proposed Area for BESS (white), (Eskom, 2019)

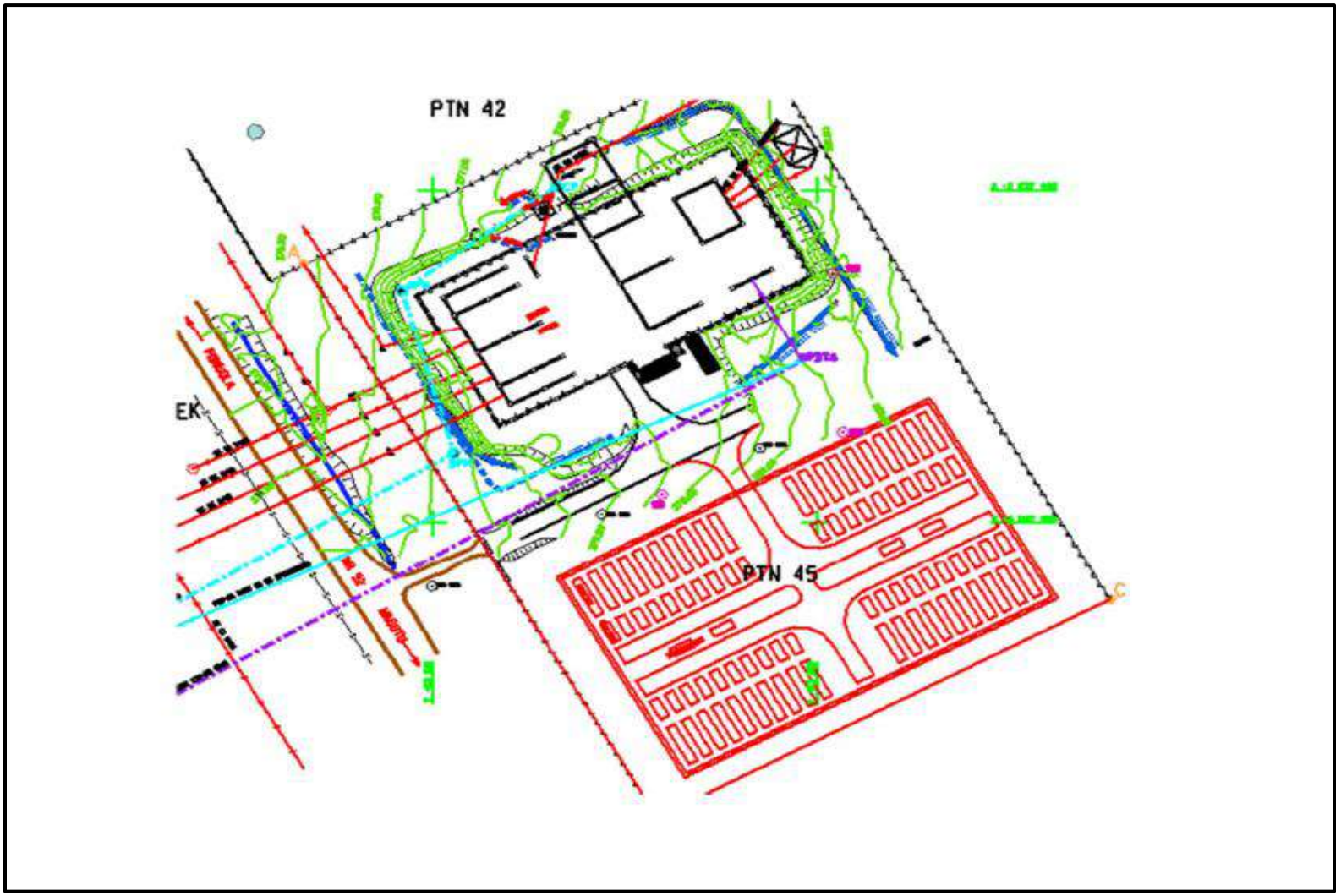

Figure 4: Conceptual Design of the Pongola Substation and Proposed Area for BESS (Red), (Eskom, 2019)

5.2. Layout and Sensitivity

Figure 5 below is a sensitivity map which indicates the location of the Pongola Substation in relation to environmental sensitivities such as Critical Biodiversity Areas (CBA's), wetlands, drainage lines, buffer zones, etc. The sensitivity map presented as Figure 5 below was produced using the SANBI Biodiversity GIS Website. The National Wetlands indicated in the map are as per latest data available on the SANBI website. Shapefiles of the delineated wetlands, the drainage lines, riparian zones, dams and 500m assessment area were provided by the specialist and uploaded onto the website in order to create a sensitivity map. As per the sensitivity map, the Pongola Substation is an existing substation and the map confirms that the proposed development is a fair distance away from sensitive areas. Although the proposed area that is to be cleared for BESS is classified as a CBA, the specialist confirmed that only a portion of the land is classified as indigenous. This conclusion is in line with the findings of the Biodiversity Study conducted. Aerial imagery and photos included in the Biodiversity study evidently indicates exposed soils. Furthermore, the dumping of poles is also evident and subsequently diminishing the ecological integrity of these areas, all of which has disturbed vegetation within the area in question. Table 5 below provides a breakdown in terms of areas of land considered disturbed and indigenous. This is presented on the KML/ KMZ files provided on a USB.

Table 5: Breakdown of Vegetation Classification

Vegetation Classification	Area (m^2)
Disturbed Vegetation	3 193m^2
Indigenous Vegetation	6 244m^2
Total Area to be Cleared	**9 437m^2**

Batteries will be housed in containers (e.g. shipping containers) which will be coupled together and placed on site. The batteries will charge at night and discharge at peak times. The GPS co-ordinates for individual batteries cannot be provided at this stage as this will only be confirmed once the battery system to be implemented is selected. The number of BESS implemented on site depends on the technology type. Certain types are self-contained containers (e.g. Li-ion) whereas others are sized according to the output required. For example, Vanadium will have tanks (usually two) which store the electrolytes. The capacity of the tanks will depend on the output requirements. There may be two large tanks or multiple smaller tanks on site.

Based on the above, co-ordinates are provided for the four (4) corners which will peg out the area proposed to be cleared, as per Table 6 below. The area that is to be cleared is depicted the in KML and KMZ file that is provided on the electronic/ USB copy.

Table 6: Co-ordinates of Battery Location

Point	Co-ordinates
1	27° 26' 55.03" S; 31° 38' 18.77" E
2	27° 26' 57.34" S; 31° 38' 20.23" E
3	27° 26' 53.32" S; 31° 38' 22.55" E
4	27° 26' 55.62" S; 31° 38' 23.91" E

Figure 5: Sensitivity Map for the Pongola Substation Site (SANBI GIS Tool, 2014)

5.3. Technology Type and Function

Eskom is responsible for 95% of South Africa's energy supply. The energy sector in South Africa has evolved over the recent years with the introduction of renewable energy power producers. Eskom has launched the new Battery Energy Storage System (BESS) project which is focused on storage technology and their evolution. Figure 6 below indicates the energy storage solutions identified over the years.

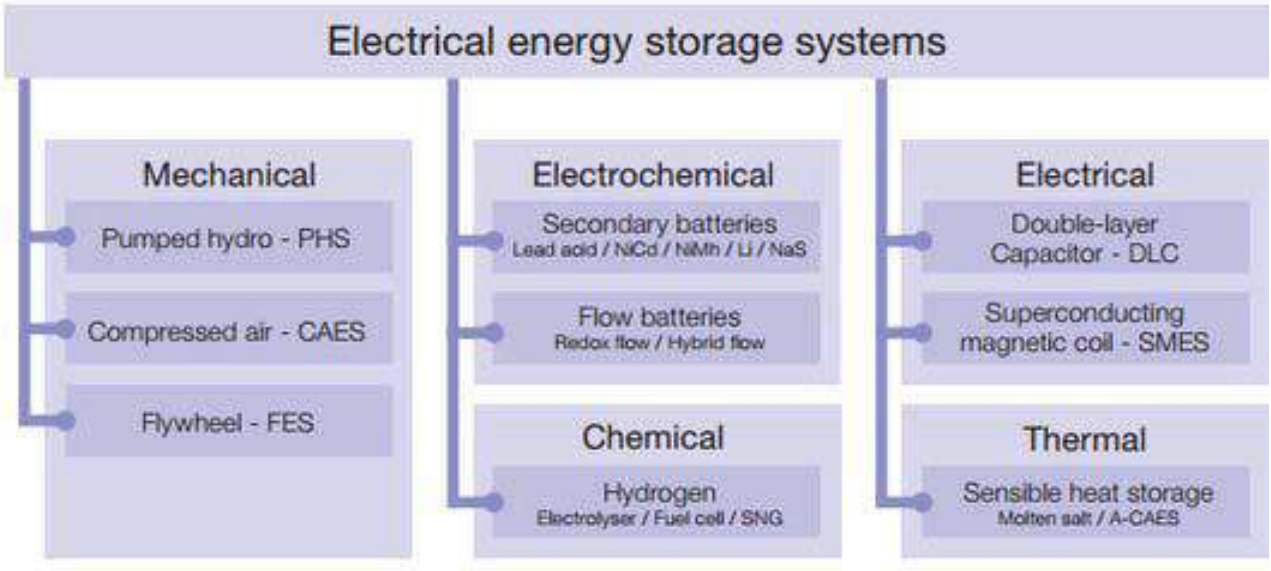

Figure 6: Electrical Energy Storage Systems (Eskom Technology, 2018)

BESS technology is categorised as Electrochemical and/or chemical solutions as per Figure 6 above. Research on battery technology is based on Lithium-ion and Flow Battery technologies. BESS technology is continuously developing and very fast leading to greater capacity and lower costs. The proposed battery energy storage system has not been classified as electricity generation nor distribution. The batteries are not able to charge itself. Electricity generation from renewable sources is limited by the intermittency and variability of wind and solar resources, i.e. when wind blows and sun shines. Energy storage allows for the storing of electricity for later use even when the renewable resource is unavailable. The process involves the conversion of electrical energy into another form of energy such as chemical energy, store it temporarily and then converted back to electrical energy, therefore giving the utility considerable flexibility and control.

Eskom is considering several BESS technology alternatives; some are solid state batteries and others are flow batteries. A single battery technology, or a combination of two or more technology alternatives, may be implemented at each site. The chemical composition of the batteries can be dangerous and hazardous. Eskom has to follow the World Bank procurement strategy and the disclosure of particular information that could influence market competitiveness.

Eskom does not anticipate exporting any hazardous waste for any of the technologies. The lifecycle of the technologies varies from 10 to 25 years. The supplier is responsible for recycling any hazardous waste emanating from the technology operation, maintenance and finally replacement as well as meet any legislative requirement this may require.

The proposed footprint to be cleared is inclusive of the BESS as well as areas that are necessary during construction such as laydown areas, material storage areas, waste storage areas and the site office. Eskom is considering two technology

alternatives. A preferred alternative cannot be stated at this stage. Eskom will be exploring the markets once the EA is granted by going out to tender. The results/ evaluation will influence the technology type that is selected to be implemented on site. The number if BESS on site (i.e. individual batteries) depend on the type of battery used. Certain types are self-contained containers (e.g. Li-ion) whereas others are sized according to the output required. For example, Vanadium (solid-state battery) will have tanks (usually two) which store the electrolytes. There may be two large tanks or multiple smaller tanks on site. However, this can only be confirmed once the technology type to be utilized is confirmed. The quantities and composition of the dangerous goods incorporated into the battery can only be determined once the technology alternative is selected. The quantities and combinations of hazardous substances will differ between the several manufactures; however, Eskom has confirmed that the dangerous goods will not exceed 500m^3.

5.4. Associated Activities and Infrastructure

A concept design report has been compiled by the Eskom Engineering team which focuses on the engineering requirements of the BESS. The implementation of BESS at the Pongola substation requires the following:

5.4.1. Earthing Requirements

- The earth grid shall be designed according to 240-134369472, Substation Earth Grid Design Standard.
- Unless otherwise specified, the Contractor shall supply the copper and all the material necessary for installing the earth grid.
- The Contractor shall further be responsible for the safekeeping of the copper.
- The existing earth grid 10mm Ø round copper will be extended and laid at 1000mm below ground level to accommodate the new additional equipment.
- New earth grid copper rods and earthing tails shall comply to Earthing Standard, D-DT-5240 latest revision.
- All new equipment will be connected to the main earth grid using 50 x 3mm flat copper earth straps.

5.4.2. General

- Civil scope of work shall include the design, detailing, micro siting, material procurement, layout, erection for the structural components of the BESS foundations as required, and conduit required for the complete BESS.
- Construction of roads, foundations, structures, buildings, installations and services required for the installation, commissioning, operation and maintenance of all equipment and plant which make up the Project Works.
- All foundations shall be erected according to Eskom's standard foundation drawings and be in accordance the relevant SANS 1200 documents and the latest revision of drawing D-DT-5240.
- Risk of collapse and keeping excavations free of water shall be included in the quoted rate.
- All BESS foundations and structures, if any are required, shall be designed by a qualified registered professional engineer.
- All final designs (Issued for Construction) drawings, specifications and calculations shall be wet-stamped by a Registered Civil/Structural licensed Engineer.
- The Contractor will self-perform or sub-contract with local Contractors the installation of the concrete pad/foundation and buried conduit installation based on the design provided by the BESS supplier.
- The Contractor shall supply, transport and off-load off all material and equipment necessary for completing all the civil works.
- The Contractor shall design the BESS yard to ensure that no electrolyte or any hazardous substance comes into contact with the soil.

5.4.3. Mounting System

a. The BESS Contractor shall install all BESS components per manufacturer requirements:
- All components shall be secured to floor or walls.
- Include structural load design calculations signed and sealed by a qualified professional engineer.
- All structural components shall be installed in a manner commensurate with attaining a minimum 25-year design life.
- Supply and erect complete foundations to standard Eskom drawings including formation, reinforcing, holding down bolts, back filling and compaction around the foundations.
- All material used for the foundations shall be in accordance to the relevant foundation drawings and SANS documents mentioned on these drawings.
- The tenderer shall supply all materials
- All holding down bolts shall be galvanised to ISO 1461 for all foundations.
- All holding down bolts shall be in accordance to SANS 1700 series with a strength grade of minimum 4.8.
- Supply and erect complete plinths and runways/slipway according to drawing D-DT-5240 including formation and reinforcing.
- A sump, leading to the oil holding dam shall be established inside all bund area.

b. Cable trenching and kerbing:
- Supply and install complete cable trench as shown on Foundation Drawing including back filling and compaction around the trenches in accordance to D-DT-5254.
- All ramps shall be a concrete slab reinforced with minimum steel as per SANS 1200 design document and D-DT-5254.
- Excavate, supply and construct 300 mm concrete pipes from the bund wall of each transformer to the oil holding dam.
- Construct applicable concrete manholes with covers, in accordance with drawing D-DT-5231. See design drawings for orientation of the manholes.
- Excavate, supply and construct an oil holding dam as per design drawings. Supply and install an oil holding dam. The outlet of the oil trap (bag filter) shall be connected to the bat wall.

c. Yard Stone:
- The yard stone for the substation shall be according to the 240-108982466, Standard for HV Yard Stones in Eskom Substation.

d. Herbicides, insecticides, etc. shall include:
- Treating of yard surface with Eskom approved herbicides, insecticides, etc.
- Forming of V-grooves along foundation walls and treating with additional insecticides approved by Eskom.
- All herbicides, insecticides, etc. and the application thereof shall be in accordance to Eskom's latest corporate Environmental Policy.
- A guideline for selecting herbicides used in substations shall be enquired from the Eskom's Environmental Department.
- Prior to the use of any herbicides, insecticides, etc. approval from Eskom's environmental representative shall be obtained.
- Consultation on herbicides and the effectiveness thereof, as well as advice on any other aspect of herbicides, can be obtained from Eskom's Environmental Department.

5.4.4. BESS Internal Roads and Terrace (Temporary and Permanent)

- The design and construction of BESS pads lay down areas, and Site access roads and terrace shall conform to the South African National Standards, local codes and regulations, and requirements specified below and in the Contract.

i. General Access and BESS Interlinking Roads
  - The Contractor shall design and construct the Project Works BESS interlinking roads in accordance with the Contract. Roadway material and construction shall meet all requirements of the performance criteria set forth in this Scope of Work.
  - The Contractor shall provide permanent roads to and within the Project Works to provide adequate access to each BESS and other associated Project facilities. The roads shall be designed in accordance with the design criteria for carrying all the vehicles likely to be used during construction and throughout the life of the Project Works. The Contractor shall rehabilitate his network of roads that provide access to the BESS sites prior to hand over to the Employer.

5.4.5. Fencing

- The Contractor shall erect and maintain, at its own expense, suitable and approved temporary fencing as the Contractor deems necessary to enclose his laydown area and works or maintain livestock boundaries. The Contractor shall supply and install the fence, the gates and signs as well as the necessary material for erecting the substation.
- Temporary fences shall be removed after the Completion of construction.
- Fencing will be done in accordance to risk profile per operating unit and it shall be constructed as per Eskom standard fencing drawings.
- The three tier fence shall be constructed along the perimeter of the existing substation, the extension of the substation as well as the BESS yard.

5.4.6. Foundations

- All new foundations will be installed in accordance SANS 1200 latest revision.
- All new foundation HD bolts to be aligned for casting of concrete to a tolerance of ± 2mm. Foundation tolerances to be in accordance with SANS 1200 G.6 GRADE II.
- All new foundations to have 25mm grout under baseplates only. Grout MIX 2:1. All HD bolts should have two nuts and two washers. Grout must be a feather finish to allow water to run free from the baseplate.

5.4.7. Trenching

- New control cable trench/es shall be added to accommodate the addition control cables.
- All new trenching will be installed in accordance SANS 1200 latest revision.

5.4.8. Steelwork

- The Contractor shall design, procure, for the structural components for the complete BESS unless otherwise specified, all steelwork shall be standard equipment supports according to 240-94743192, Eskom's standard equipment support drawings.
- Erecting Steelwork shall include:
  i. Supply and erect all steelwork shown on Steelwork Schedule and according to standard Eskom drawings.

ii. The steel for the supporting structures shall be in accordance to the specific support structure drawings.

5.4.9. Installation of Equipment

- All work shall be in accordance to OEM and/or Eskom standards and specifications.
- Unless otherwise specified, all installed equipment shall be labelled.
- All equipment shall be positioned and all necessary stringing and earth bonding shall be done according to the following drawings:
  - Station Electric Diagrams
  - Site Level and Drainage Plan
  - Sections and Clamps
- Structure to be erected, aligned, squared, plumbed and levelled to accuracy specified in SANS 1200 H 6.2.2.c 2 - CLASS II.
- All bolted connections to be cleaned and filled with jointing compound. No paint barrier allowed.

5.4.10. General Electrical Equipment

- The project works shall be capable of meeting utility voltage and frequency response requirements at the point of interconnection.
- The output of the BESS's shall be gathered via the Collection System Circuit(s) and delivered to the bus on the existing sub-station.
- The Contractor's scope of responsibility includes all work from the Battery/container/enclosure and associated equipment to the 22kV bus-bar.
- The Contractor shall provide all electrical equipment required for a fully functional BESS including the 22kV and below interconnection to Pongola Substation.

6. LEGISLATION AND GUIDELINES APPLICABLE

6.1. Applicable Listed Activities

In terms of the Environmental Impact Assessment (EIA) Regulations (2017), promulgated in terms of the National Environmental Management Act, 1998 (NEMA), certain Listed Activities are specified for which either a Basic Assessment (GNR 327 and 324 of 2017) or full Scoping and EIA (GNR 325 of 2017) is required. The following Listed Activity in Government Notice (GN) R327 (Listing Notice 1) and (GN) 324 (Listing Notice 3) of 2017 are triggered, requiring a Basic Assessment (BA) Process for the proposed BESS at the Pongola 132 / 22kV Distribution Substation, Zululand District.

Table 7: Relevant Activities from EIA Regulations 2017

EIA Regulations 2017			
Regulation Year	**Listed Activity NEMA**	**Description of Activity**	**Applicability to the Project**
2017	LN 1, Activity 14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	The Battery is not regarded as a facility or infrastructure for the storage, or storage and handling of a dangerous good, there may indeed be instances where a battery is not fully assembled and the electrolyte (or substances making up such electrolyte) intended for such battery, may potentially be stored on site, in a container (e.g. tanks), prior to filling. In this instance, where the electrolyte, or the substances making up the electrolyte, are stored in a container, such facility or infrastructure will indeed be regarded as a facility or infrastructure for the storage, or storage and handling of a dangerous good, for the purposes of the Regulations, as these would have as its purpose then, not the storage of energy, but indeed the storage of that substance (if indeed a dangerous good). A letter was received by Eskom (Mr Prince Moyo), confirming the applicability of Listed and specified activities which relate to the development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good. The letter can be reviewed under Appendix C of the Final BAR.
2017	LN 3, Activity 10	The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good,	The Battery is not regarded as a facility or infrastructure for the storage, or storage and handling of a dangerous good, there may

		where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres within KwaZulu-Natal: i. In an estuarine functional zone; ii. Trans-frontier protected areas managed under international conventions; iii. Community Conservation Areas; iv. Biodiversity Stewardship Programme Biodiversity Agreement areas; v. World Heritage Sites; vi. Within 500 metres of an estuarine functional zone; vii. A protected area identified in terms of NEMPAA, excluding conservancies; viii. Sites or areas identified in terms of an international convention; **ix. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;** x. Core areas in biosphere reserves; xi. Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; xii. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; **xiii. Outside urban areas:** (aa) Areas within 10 kilometres from national parks or world heritage sites or **5 kilometres from any terrestrial protected area** identified in terms of NEMPAA or from the core areas of a biosphere reserve; (bb) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or (cc) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland; or xiv. Inside urban areas:	indeed be instances where a battery is not fully assembled and the electrolyte (or substances making up such electrolyte) intended for such battery, may potentially be stored on site, in a container (e.g. tanks), prior to filling. In this instance, where the electrolyte, or the substances making up the electrolyte, are stored in a container, such facility or infrastructure will indeed be regarded as a facility or infrastructure for the storage, or storage and handling of a dangerous good, for the purposes of the Regulations, as these would have as its purpose then, not the storage of energy, but indeed the storage of that substance (if indeed a dangerous good). A letter was received by Eskom (Mr Prince Moyo), confirming the applicability of Listed and specified activities which relate to the development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good. The letter can be reviewed under Appendix C of the Final BAR.

		(aa) Areas zoned for use as public open space; or (bb) Areas seawards of the development setback line or within 100 metres from the high-water mark of the sea if no such development setback line is determined.	
2017	LN 3, Activity 12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan within KwaZulu-Natal: i. Trans-frontier protected areas managed under international conventions; ii. Community Conservation Areas; iii. Biodiversity Stewardship Programme Biodiversity Agreement areas; iv. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; **v. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;** vi. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas; vii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; viii. A protected area identified in terms of NEMPAA, excluding conservancies; ix. World Heritage Sites; x. Sites or areas identified in terms of an international convention; xi. Areas designated for conservation use in Spatial Development Frameworks adopted by	Approximately 9 437m^2 (0.94Ha) of vegetation will be cleared in an area classified as CBA to accommodate BESS. The specialist has confirmed the following: Disturbed Land = 3 193m^2 Indigenous Land = 6 244m^2 _____ Total = 9 437m^2 (0.94Ha) _____ The size of the total BESS footprint and areas necessary during construction such as laydown areas, material storage areas, waste storage areas, site office, contributes towards the 9437m^2 land that is required to be cleared.

		the competent authority or zoned for a conservation purpose; xii. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; or xiii. In an estuarine functional zone.	

Hence, a BA Process is required. The Application for Environmental Authorisation has been lodged with the national Department of Environmental Affairs on 14/11/2019. The Acknowledgement receipt was received from the Department on 14/11/2019 and can be reviewed under Appendix C. Eskom has received a letter with reference number IQ/20/0025. The letter highlights the interpretation and applicability of listed activities related to the operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good. Eskom then provided a letter which details the chronology of events leading to the conclusions drawn. These letters can be reviewed under Appendix C.

6.2. Policy and Legislative Context

Table 8 provides a list of all applicable legislation, policies and/or guidelines of any sphere of government that are relevant to the application as contemplated in the EIA regulations.

Table 8: Applicable Legislation, Policies and/or Guidelines

Title of Legislation, Policy or Guideline	*Administering authority*	*Date*
National Environmental Management Act (Act 107 of 1998) – for its potential to cause degradation of the environment (Section 28).	Department of Environmental Affairs	1998
Environmental Conservation Act (Act 73) – for potential environmental degradation.	Department of Environmental Affairs	1989
National Water Act (Act 36 of 1998) – for potential to cause pollution of water resources defined under the Act (Section 19).	Department of Water Affairs and Forestry	1998
Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) – for protection of agricultural resources and for control and removal of alien invasive plants.	National Department of Agriculture	1983
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) – for protection of biodiversity.	Department of Agriculture and Environmental Affairs & Ezemvelo KZN Wildlife	2004
The National Heritage Resources Act (Act No 25 of 1999 as amended) – for the identification and preservation of items of heritage importance.	South African Heritage Resources Agency	1999
KwaZulu-Natal Amafa and Research Institute Act, 2018 (Act No. 5 of 2018)	KwaZulu-Natal Amafa and Research Institute.	2018

EIA Regulations GNR 326 – for guidelines on the process to be followed and the format of the BAR.	Department of Economic Development, Tourism and Environmental Affairs	2017
Public Participation guideline in terms of NEMA EIA Regulations	Department of Economic Development, Tourism and Environmental Affairs	2017
National Climate Change Response Plan White Paper	Department of Environmental Affairs	2011
National Environmental Management: Waste Act	Department of Environmental Affairs	2008
National Environmental Management: Air Quality Act	Department of Environmental Affairs	2004
Spatial Development Framework	Zululand District	2018/2019
Integrated Development Plan	uPhongolo Municipality	2018/2019

7. NEED AND DESIRABILITY

Eskom will be faced with massive loan recalls and contract penalties if this project as alternative to CSP is not executed. Given the global trends in the application of BESS to support National Electricity Grids, significant and scalable benefit can be derived in developing this technology application for South Africa. BESS offers several benefits to Eskom and solutions to some of the challenges it faces:

- Unlocking constrained networks (Reduction in loading / congestion of upstream High Voltage networks)
- Reducing voltage drops and improve quality of supply
- Deferment or replacement of future capital expansion projects
- Supports mini grids in areas with limited access to bulk power
- Peak load reduction - 4 hours of battery storage increases dispatch time (thereby extending baseload and offset carbon emissions)

The Distributed Battery Storage with Distributed Photo Voltaic (PV) project will directly contribute towards the following three (3) Eskom's strategic objectives:

- Ensuring reliable supply of electricity to all South Africans,
- Securing adequate future electricity supply at the optimal cost of renewable energy for South Africa; and
- Directly and indirectly supporting the socio-economic development objectives of South Africa.

Eskom has proposed to implement the BESS technologies to effectively reduce carbon emissions as compared to coal fired power stations. BESS allows for improved emissions control and contributes towards large scale renewable energy development. The implementation of the BESS technology options will aid in releasing 'some' pressure on the current grids. The BESS technology types are space efficient ensuring that maintenance and management of the batteries can be undertaken at ease. Furthermore, the BESS infrastructure will blend in with existing land uses. Waste generation from BESS technology is expected to be minimal thus reducing impacts contributing towards pollution.

8. CONSIDERATION OF ALTERNATIVES

Ideally, alternatives are considered to evaluate the proposed plans against the No-Go option. Alternatives to the project site selection; layout plans as well as alternatives to construction methodologies and/ or materials used for the development are evaluated. The potential impacts of the preferred alternative are then evaluated in section 12 below.

8.1. Motivation for the Preferred Site, Activity and Technology Alternative

The proposed development triggers Listing Notice 1, GNR 327, and Listing Notice 3, GNR 324 of the EIA Regulations (2017). As per GNR 326 (2017), Appendix 1(2)(b) and 1(3)(g); alternatives for the proposed development to be identified and considered. Chapter 1 of the EIA Regulations provides an interpretation of the word "alternatives", which are options "in relation to a proposed activity, mean(ing) 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 the activity is proposed to be undertaken;
b) Type of activity to be undertaken;
c) Design or layout of the activity;
d) Technology to be in the activity; or
e) Operational aspects of the activity;
And includes the option of not implementing the activity."

Based on the above, the following alternatives are presented for the proposed BESS project at the existing Pongola 132 / 22kV Distribution Substation, Zululand District.

8.2. Alternatives to Site Selection – Preferred Site Alternative

Figure 7 below provides an aerial view of the existing Pongola Substation site, located within the uPhongola Local Municipality. No site alternatives have been proposed as the existing property is Eskom owned. The Pongola Substation is already existing, and BESS aims to supplement energy to this existing substation. It is therefore feasible for the proposed development to take place within this property.

Figure 7: Aerial Snapshot of the Existing Pongola 132/22kV Distribution Substation (Google Earth Image, 2018)

At 26 233m^2 in size, the site is large enough to accommodate the BESS infrastructure. The property is fenced; however, the site is categorized as "disturbed" with portions of the site classified as Critical Biodiversity Area (CBA). Agricultural activities on the site have never been established. The Pongola 132 / 22kV Distribution Substation was established in 1974, hence the site is regarded as significantly and irreversibly transformed. The BESS project for this site does not require expansion of the site footprint from current.

	Site Photographs	
	Snapshot	**Description**
1	 	**Snapshot 1:** depicts the access point to the Pongola Substation.

	Snapshot	Description
2		**Snapshot 2:** depicts the existing Pongola Substation
3		**Snapshot 3:** depicts the Southern Side of the Pongola Substation. Access gates can be seen in orange.

	Snapshot	Description
4		**Snapshot 4:** depicts the South Eastern side of the property adjacent to the Eskom Pongola Substation which is the area to be cleared for BESS.
5		**Snapshot 5:** depicts the Easterly side of the property, adjacent to the existing Pongola substation, to be cleared for BESS.

	Snapshot	Description
6	  	**Snapshot 6:** depicts area to be cleared for BESS. Extends to the boundary of the property adjacent to the Pongola Substation.

7		**Snapshot 7:** depicts the Northern side of the Pongola Substation (back). This area will not be cleared for BESS. The property adjacent to the Eskom substation abuts on two sides onto a game farm. The other western side abuts onto the R66 road.

8.3. Alternatives to Layouts and Designs

Figure 8 below is an Environmental Sketch of where BESS is proposed. The battery storage will remain within the property boundary.

No layout alternatives were considered as the proposed battery storage is restricted to the property. The site is also constrained in terms of layouts that allow maximum usage of the property.

Refer to Appendix C for conceptual designs.

Figure 8: Location of the Proposed BESS at the Pongola Substation

8.4. Preferred Technology Alternative

The market for grid connected energy storage systems is rapidly expanding and the various deployment of these systems prove to offer many benefits to the future smart grid. Electrical Energy Storage (ESS) is becoming increasingly important for integrating intermittent renewable energy sources, achieving a better balancing of the grid, reducing total generation cost and limiting investment in new infrastructure. Storage is also an important element in micro-grids and decentralized generation where it permits better planning and management of local energy consumption.

A complete BESS is regarded to include, but not be limited to:

- the core electrical energy storage medium (e.g., a battery bank),
- the Battery Management System (BMS),
- the associated bi-directional Power Conversion System (PCS),
- the Energy Management System (EMS),
- the Communications and alarms systems,
- the Balance-of-System (BoS) which includes the HVAC and auxiliary power system, and
- the associated Network Integration Equipment (NIE)

Requirements such as technology maturity, proven technical performance, track record, safety and environmental criteria are taken into consideration in selecting suitable technologies. Most BESS chemistries have a lifetime that is dependent on duty cycle. Lithium-ion batteries can last up to ten years, while flow batteries have a theoretically unlimited lifecycle.

A BESS specification includes critical parameters such container dimensions, weight, operating temperature range, chemistry, round-trip efficiency, fire safety systems, rated continuous power charge and discharge and communication protocols. The battery module, inverter and balance of system specifications are implied in these parameters.

Eskom is considering several BESS technology alternatives at the substations; some are solid state batteries and others are flow batteries.

8.4.1. Solid State Batteries: Solid State Batteries comprise of Lithium-ion, approximately 4.08 Cubic Meters per 1MWh (Exact amount of hazardous substance is unknown at this stage and will differ from supplier to supplier).

Solid state batteries consist of Lithium-ion, lead acid etc. Lithium-ion is used extensively in the Electrical Energy Storage systems. Current estimates indicate that approximately 85% of the electrochemical systems installed use Lithium-ion batteries. "Lithium-ion" refers to a wide array of chemistries in which Lithium-ions are transferred between the electrodes during the charge and discharge reactions. The construction/composition of the Lithium-ion battery varies from manufacturer to manufacturer. Lithium-ion has the smallest installation footprint when compared to the technologies for the similar energy capacity (African Development Bank Group, 2018).

Table 9 highlights the risk, advantages and disadvantages of Lithium-ion Battery technology.

Table 9: Risk, Advantages and Disadvantages of Lithium-ion Battery Technology (African Development Bank Group, 2018 & Eskom BESS Technology Standard, 2018)

Maturity Level	Risks / Barriers	Advantages	Disadvantages
Commercial	• Safety - thermal runaway • More expensive than Lead-Acid	High round trip efficiency	Limited but improving cycle life
		High energy-to-weight ratio	Deep discharge cycles lower lifetime
		Continuing performance improvements	Requires monitoring / Battery Management System
		Continuing manufacturing cost reductions	

Figure 9 below is a typical setting / layout of Solid-State Batteries.

Figure 9: Solid State Batteries

8.4.2. Flow Batteries:

Flow Batteries is where chemical energy is provided by two chemical components dissolved in liquids contained within the system and separated by a membrane. Typical systems use Vanadium or Zinc Bromine.

Flow Batteries comprise of Venadium Redox (52 500 litres per 1 MWh) and Zinc Bromide (1700 litres per pod; 13.6 Cubic Meters per 1MWh).

a. Vanadium Battery:
   - The vanadium redox battery (VRB), also known as the vanadium flow battery (VFB) is a rechargeable flow battery that employs vanadium-ions in different oxidation states to store chemical potential energy (African Development Bank Group, 2018).
   - The battery consists of an assembly of cells in which the two electrolytes are separated by a proton exchange membrane; both half-cells are additionally connected to storage tanks and pumps so that the electrolytes can be circulated through the cell (African Development Bank Group, 2018).

Table 10 lists the risks, advantages and disadvantages of Vanadium Battery technology.

Table 10: Risks, Advantages and Disadvantages of Vanadium Battery Technology (African Development Bank Group, 2018 & Eskom BESS Technology Standard, 2018)

Maturity Level	Risks / Barriers	Advantages	Disadvantages
Commercial	New at utility scale	Vanadium Redox battery can offer almost unlimited energy capacity simply by using larger electrolyte storage tanks.	Vanadium Redox technology is a relatively poor energy-to-volume ratio.
		The battery can be left completely discharged for long periods with no ill effects.	Requires mechanical systems
		If the electrolytes are accidentally mixed, the battery suffers no permanent damage.	High cost of Vanadium
		A single state of charge between the two electrolytes avoids the capacity degradation due to a single cell in non-flow batteries.	
		The electrolyte is aqueous and inherently safe and non-flammable.	

Figure 10 below is a typical Vanadium Redox Battery.

Figure 10: Flow Batteries - Vanadium Redox Battery

b. Zinc Bromine Battery:
   - Zinc Bromine flow battery uses a solution of Zinc bromide stored in two tanks the electrolyte is pumped from one tank to the other tank during the charging and discharging process.

Table 11 lists the risks, advantages and disadvantages of Zinc Bromine Battery technology.

Table 11: Risks, Advantages and Disadvantages of Zinc Bromine Battery Technology (African Development Bank Group, 2018 & Eskom BESS Technology Standard, 2018)

Maturity Level	Risks / Barriers	Advantages	Disadvantages
Demo	• Not proven at utility scale • Potential bromine toxicity • Limited module capacities • Dendrite formation	The battery can offer almost unlimited energy capacity simply by using larger electrolyte storage tanks.	Zinc Bromine technology is a relatively poor energy-to-volume ratio.
		The battery can be left completely discharged for long periods with no ill effects.	Lower round trip efficiency
		If the electrolytes are accidentally mixed, the battery suffers no permanent damage.	Requires mechanical systems
		A single state of charge between the two electrolytes avoids the capacity degradation due to a	Power and energy not fully independent

		single cell in non-flow batteries.	
		The electrolyte is aqueous and inherently safe and non-flammable.	Requires occasional full discharge for dendrite removal

Figure 11 below is a typical Zinc Bromide Battery.

Figure 11: Flow Batteries - Zinc Bromide

A single battery technology, or a combination of two or more technology alternatives, may be implemented at each site. The chemical composition of the batteries can be dangerous and hazardous and listed in SANS10234. Eskom does not anticipate exporting any hazardous waste for any of the technologies. The Lifecycle of the technologies vary from 10 to 25 years. The exact volume of dangerous goods will only be confirmed once the technology option or combination of technologies is known. However, Eskom has committed to ensuring that the amount of hazardous substances will not exceed more than 500m^3.

The battery storage systems will be containerized, and the containers installed primarily on already disturbed areas within existing electrical sub-stations, generating low environmental impacts. Additionally, the operation and maintenance of the facilities will be mostly carried out remotely. Therefore, no potential indirect or long-term environmental impacts are expected from the project (African Development Bank Group, 2018).

The battery storage technology is currently being piloted in South Africa. Should the technology prove successful, there is a potential of scaling up similar technology to allow increased capacity in energy storage from future wind and solar powered projects. This, in turn, will lead to increased access to energy in other geographical areas of South Africa. Electricity storage can also be used to help integrate more renewable energy into the electricity grid. Electricity storage can also help generation

facilities operate at optimal levels and reduce use of less efficient generating units that would otherwise run only at peak times. The added capacity provided by electricity storage can delay or avoid the need to build additional power plants or transmission and distribution infrastructure (African Development Bank Group, 2018).

8.5. No-Go Alternative

Eskom will be faced with massive loan recalls and contract penalties if this project does not go-ahead. The World Bank and co-financiers approved distributed battery energy storage and Solar PV as an alternative to support renewable energy expansion in South Africa and to replace the terminated Kiwano CSP 100MW project. The Kiwano CSP (Concentrating Solar Power) plant project has been deemed too expensive to consider at this stage. Given the global trends in the application of BESS to support National Electricity Grids, significant and scalable benefit can be derived in developing this technology application for South Africa.

The No-Go Alternative is the option of not undertaking the proposed Battery Energy Storage System (BESS) at the Pongola Substation. There would be no negative environmental implications that may have resulted from the construction phase. Based on the current needs and desirability, the anticipated environmental impacts to be caused by the proposed BESS project, a no-go alternative does not seem necessary. The No-Go Alternative also takes away the potential of increasing local employment and local business opportunities. This facility will stimulate positive economic benefits across the entire value chain and contribute towards the reduction of fossil fuels.

9. PUBLIC PARTICIPATION

The Public Participation Process (PPP) is a requirement in terms of the 2017 EIA Regulations of the National Environmental Management Act, 1998 (Act 107 of 1998) and it forms an integral part of any EIA process. This section provides information pertaining to the PPP that was conducted by 1World Consultants during this Basic Assessment Process. The purpose of this process is to gather information from the community and relevant Stakeholders that could ultimately affect the decision-making process concerning the planning, construction and operational phases of the proposed development. The community and public have been identified as I&APs and have been given the opportunity to participate in this process. Their comments, whether positive or negative, will influence the decision of the Authorities and the developer's final actions.

9.1. Objectives of the PPP

The PPP has the following objectives:

- To inform I&APs as well as all Stakeholders of the proposed development;
- To provide an opportunity for I&APs and Stakeholders to raise concerns and make suggestions;
- To promote transparency and an understanding of the project and its consequences;
- To serve as a structure for liaison and communication with I&APs and Stakeholders.

Any conclusions agreed upon must be socially, financially and technically acceptable and feasible in order to meet the requirements of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998), and the vision of the proposed development.

9.2. Public Participation Process Followed

The Draft BAR was subject to a 30-day commenting period. The complete I&AP database / register can be reviewed under Appendix D. The following was conducted:

9.2.1. Written Notifications

Interested and Affected Parties (I&APs) were identified and notified of the Basic Assessment. A Background Information Document (BID) was prepared and distributed via email. The BID provided information on the proposed development, the site and on the process to be followed by the EAP. A copy of the BID and proof of distribution can be reviewed under Appendix D.

9.2.2. Newspaper Advertisement

Newspaper advertisements were published to inform the public of the BA Process. The advertisements were published in English and IsiZulu in Zululand Observer Newspaper on Friday, 15/11/2019. Copies of the advertisements can be reviewed under Appendix D.

9.2.3. Site Notice Boards

Site notice boards were erected on the site and in surrounding areas on 21/11/2019. As per Chapter 6, Regulation 41(4)(a) of 2017, the size of the notice boards was approximately 60cm by 42cm (size A2). The notice boards were provided in English, IsiZulu and Afrikaans with illustrations of the property. The purpose of the notice board was to inform the community members of

the ongoing BA Application and the proposed development. Details of the EAP were also provided to facilitate public participation.

During the PPP conducted on 21/11/2019, the Pongola Local Municipality as well as the Pongola SAPA were consulted. Representatives were made aware of the proposed development and a BID was made available which included contact details of the EAP. The register was signed and can be reviewed under Appendix D.

The site notice boards were placed strategically at three points. The co-ordinates of the three locations are provided in Table 12 below:

Table 12: Location of Site Notice Boards

Location	Number of Boards Placed	Co-ordinates of the Location
1 – Pongola Local Library	1 x English Site Notice Board 1 x IsiZulu Site Notice Board 1 x Afrikaans Site Notice Board	27° 22' 39.82" S 31° 37' 2.39" E
2 – Along Main Road, Piet Retief Street	1 x English Site Notice Board 1 x IsiZulu Site Notice Board 1 x Afrikaans Site Notice Board	27° 22' 43.20" S 31° 36' 59.04" E
3 – Pongola Substation	1 x English Site Notice Board 1 x IsiZulu Site Notice Board 1 x Afrikaans Site Notice Board	27° 26' 54.83" S 31° 38' 17.96" E

Copies of the site notice boards as well as related photographic evidence can be reviewed under Appendix D of this BAR.

Figure 12 below indicates a broad overview of the locations at which site notice boards were placed. The distance between the Pongola Substation and the nearest town can be seen. Figure 13 below is a zoomed in image which indicates the locations at which site boards were placed within the Pongola Town.

Figure 12: Site Locations at which Site Notice Boards were Placed

Figure 13: Zoomed in Site Locations at which Site Notice Boards were Placed within the Town

9.2.4. Public Meeting

Public Meetings are held only if requested. No public meetings have been requested nor required following distribution of the BID, publication of the advertisement, erection of the site notice boards and distribution and conclusion of the 30-day commenting period.

9.3. Issues Raised by the I&APs

Copies of the draft BAR was circulated to the following I&APs for review and comment:

- KZN Department of Transport
- Ezemvelo KZN Wildlife
- Department of Water and Sanitation
- KwaZulu-Natal AMAFA and Research Institute
- KZN Corporate Governance and Traditional Affairs
- uPhongolo Local Municipality Ward Councilor - Ward 1
- Commission on Restitution of Land Rights
- National Department of Environmental Affairs
- National Department of Environmental Affairs (DEA) – Biodiversity and Conservation
- KZN Department of Economic Development; Tourism and Environmental Affairs: Ulundi
- Zululand District Municipality
- uPhongolo Local Municipality
- Department of Health Head Office – Pietermaritzburg (Health Care Waste Management)
- Department of Agriculture and Rural Development
- Pongola Sector Manager
- Pongola Technical Services Center
- Pakamisa Game Reserve
- Pongola Game Reserve
- Landowner Farm No. 730/ Portion 42
- Landowner Farm No. 730/ portion 0 (Remaining Extent)
- Landowner Farm No. 746/ Portion 0 (Remaining Extent)
- Landowner Farm No. 730/ Portion 23
- Landowner Farm No. 730/ Portion 24 (Remaining Extent)
- Landowner Farm No. 730/ Portion 45
- SAPS Shooting Range
- Eskom Pongola CNC

All registered I&APs were notified on the availability of the draft BAR. All I&APs were reminded that in terms of the EIA Regulations (2017), GNR 326 43(2), all State Departments that administer a law relating to a matter affecting the environment, specific to the Application, must submit comments within 30 days to the Environmental Assessment Practitioner (1World Consultants (Pty) Ltd). Should no comment be received within the 30-day commenting period, it is to be assumed that the relevant State Department has no comment to provide.

Comments received on the BID and draft BAR are summarized below. All comments received as well as the corresponding response letters are presented in a Comments and Responses Report (C&RR) which can be reviewed under Appendix D.

Issues / Comments Raised Following Review of the BID:

1. Commission of Restitution of Land Rights

Issues / Comments Raised Following Review of the Draft BAR:

1. KwaZulu-Natal AMAFA and Research Institute
2. uPhongolo Local Municipality
3. National Department of Environmental Affairs
4. Ezemvelo KZN Wildlife
5. KZN Department of Economic Development, Tourism and Environmental Affairs – Ulundi

10. ENVIRONMENTAL ATTRIBUTES

10.1. Geographic Location

The uPhongolo Municipality is one of the five local municipalities situated within the northern area of Zululand, in northern KwaZulu-Natal. uPhongolo Municipal area covers 3 239 KM^2 and incorporates Pongola Town, Ncotshane, and Belgrade, as well as areas under Traditional Councils namely, Ntshangase, Simelane, Ndlangamandla, Msibi, Sibiya and Gumbi. The population is estimated to 127 238 according to the 2011 Census). This municipality is highly influenced by provincial and district development trends and development within the Zululand Municipality has significant implications for both the province and the district. As such, spatial planning for the future development of uPhongola Municipality takes into account development trends and patterns that are taking place at both provincial and district level (IDP, 2018/2019).

10.2. Climate

The area is characterized by summer rainfall patterns where the mean annual precipitation is approximately 605mm occurring mainly between November and March. The wettest time of the year is January with an average of 94mm and the driest is July with 11mm. Therefore, watercourses have a higher flow rate during the summer months. Temperatures range from 25.2˚C in February to 16.1˚C in July. The coldest month is experienced in June where minimum temperature reaches 8.2˚C on average.

10.3. Land Cover

The N2 National road corridor passes through uPhongolo municipal area as a national link between Gauteng, Richards Bay and Durban. It also connects with Swaziland just to the north of the municipal area. Natural beauty, existence of tourism related development, and future tourism development potential within the municipal area are the main attributes. These attributes are putting the municipal area at an excellent position to reap the benefits of an intensive tourism programmed.

Grazing land occurs in the form of large tracks of vacant land located between different settlements. The larger north western part of uPhongolo Municipality is managed by Tribal Authorities, whilst the eastern part of the Municipality consists of privately-owned farms. Only a few areas have official cadastral boundaries and include Pongola Town and Ncotshane. The settlements not situated within the area of a Tribal Council include Magudu, Candover, Nkonkoni, Kingholm and Ithala Reserve.

10.4. Soils and Vegetation

According to the desktop screening conducted, the existing soil type is classified as National Soils. National soils are red soils with high base status and are freely drained, structureless soils. The project area is located within the Savanna Biome and consists of a single vegetation type, Zululand Lowveld, which is categorized as least threatened to vulnerable. However, it is important to note that Pongola Substation is an existing substation where land is largely transformed. The Pongola Substation site is surrounded by a private game reserve with portions of the site falling within areas classified as Critical Biodiversity Areas (CBAs).

10.5. Biodiversity

uPhongolo Municipality has a number of environmental sensitive areas, of which two are formally protected. Ithala Game Reserve is located on the south western boundary of the municipality directly South of the Phongolo River. Pongola poort dam is situated on the eastern boundary of the Municipality. Biodiversity Priority 1 Areas are mainly concentrated in the eastern side of the municipality, between the R66 and the Pongola Poort Dam. A very limited number of small Priority 1 Biodiversity Area

pockets are situated adjacent to the Ithala Game Reserve and the eDumbe Local Municipality Boundary. Biodiversity Priority Area 3 is scattered throughout the municipality area and is situated mainly on the western boundary of the Ithala Reserve and surrounding the areas of Kwadlangobe, and Oranjeldal. Areas to the north west of Pongola, where sugarcane farming is taking place, has also a large concentration of Priority Biodiversity 3 areas. No Biodiversity Priority 2 areas are observed (IDP, 2018/2019).

The Pongola substation is surrounded by a private game reserve and as such the site has a high level of biodiversity. During the site inspection conducted on 25/02/2019, snake pits were observed across the substation site. Mice and rodents are also common species which occasionally occupy the site.

10.6. Wetlands and Watercourses

Several wetlands were found in proximity of the development site with the Voyizana River within 500m from the Pongola Substation i.e. located approximately 230m west of the project area. The R66 runs along the substation acting as a natural barrier between the substation and the river. Stormwater infrastructure currently exists on site and directs water away from watercourses and wetlands. It is unlikely that either construction and/or operational impacts would be experienced by these watercourses due to the location away from the Pongola Substation. The project area lies within the W44A quaternary catchment within the Pongola-Mtamvuna Water Management Area. The major rivers include the Pongola, Mhlatuze, Mfolozi, Mkuze, Thukela, Mvoti, Umgeni, Umkomazi, Umzimkulu and Mtamvuna rivers. The Phongola River and associated tributaries (Mdlavenga and Voyizana Rivers) is the primary drainage system within the quaternary catchment.

10.7. Hydrology

The uPhongolo municipality has a mixture of two precipitation sectors which is linked to the varying topography within the Municipal area. On average the two sectors average between 722 to 826mm per annum and 538 to 721mm per annum respectively. Selected pockets have a higher average precipitation of 913 to 1011mm per annum. The mountainous areas situated to the west of the municipality have higher precipitation levels, thus play an important role in feeding uPhongolo and Mkuze Rivers. Catchments are the areas of land where rainwater drains downhill into a body of water, such as a river, lake or dam. The drainage basin includes both the streams and rivers that convey the water as well as the land surfaces from which water drains into those channels and is separated from adjacent basins by a catchment divide. Ecological aspects need to be taken into account when considering Catchment Areas/Drainage Basins. Water that is accumulated within the catchment areas, flows to water bodies namely rivers and dams which is ultimately utilised to provide potable water for household purposes.

10.8. Energy / Electricity

uPhongolo Municipality is the electricity/energy provider to its communities. However, electricity within the uPhongolo Municipality is sourced by connection to the Eskom grid or non-grid electricity. In aim of moving towards green technology, Eskom has committed to implementing the Battery Energy Storage System (BESS) at the existing Pongola Substation.

11. SUMMARY OF SPECIALIST STUDY FINDINGS AND IMPACTS

11.1. Geotechnical Investigation

A geotechnical investigation was conducted on 04 September 2019 include the BESS scope and requirements. According to the Geological Mapping conducted, there are two types of rocks in the area surrounding the substation:

- The lower, dominantly volcanic succession is called the Nsuze Group.
- The Nsuze Group is overlain by sedimeantary succession of Mozaan Group.

During the fieldwork, Dynamic Cone Penetrometer (DCP) Tests were undertaken to evaluate the strength of underlying in-situ material. The test position is indicated in Figure 14 below.

Figure 14: Test Site Locations

In terms of the soil classification, dry loose cohesion less soil or very soft to soft cohesive soil was observed.

The Geotechnical Report can be reviewed under Appendix E.

11.2. Wetland Impact Assessment

A field survey was undertaken by Malachite Ecological Services on 05 September 2019 to analyze the site and identify water resources potentially at risk due to the proposed development. Based on the desktop research as well as the site inspection, the following must be noted.

The study area is located within the Pongola-Mtamvuna Water Management Area (WMA). The major rivers include the Pongola, Mhlatuze, Mfolozi, Mkuze, Thukela, Mvoti, Umgeni, Umkomazi, Umzimkulu and Mtamvuna rivers. Surrounding communities rely of these rivers for their freshwater supply throughout the year. Therefore, these rivers experience high-water demand related stress. The project area is situated within the north eastern portion of the W44A Quaternary Catchment. The Phongolo River and associated tributaries (Mdlavenga and Voyizana Rivers) are the primary drainage system within the quaternary catchment. The Voyizana River is located approximately 230m west of the substation site.

Based on the four wetland indicators:

a. Terrain Unit Indicator;
b. Soil Form Indicator;
c. Soil Wetness Indicator; and
d. Vegetation Indicator

no wetland systems were delineated within the substation site or within 500m of the site.

Watercourse Classification:

The watercourses are classified into three separate types of channels that is based on the position relative to the zone of saturation in the riparian area. Watercourse classification is as follows:

i. Those that do not have baseflow (A Section).
ii. Those that sometimes have baseflow (B Section) or non-perennial.
iii. Those that always have baseflow (C Section) or perennial.

An A section channel is located 350m to the south of the substation site which flows in a westerly direction before entering into the sugarcane forming area. The Voyizana River originates approximately 10km to the south of the substation site and flows in a northerly direction before flowing into the Phongolo River approximately 2.5km north of the substation site. The Voyizana river is a perennial river and classified as a C Section channel.

A 500m buffer/ assessment area was implemented around the substation site. As per the watercourse and riparian zone delineation, the watercourses identified are displayed in Figure 15 below. The flow direction is indicated in Figure 16 below.

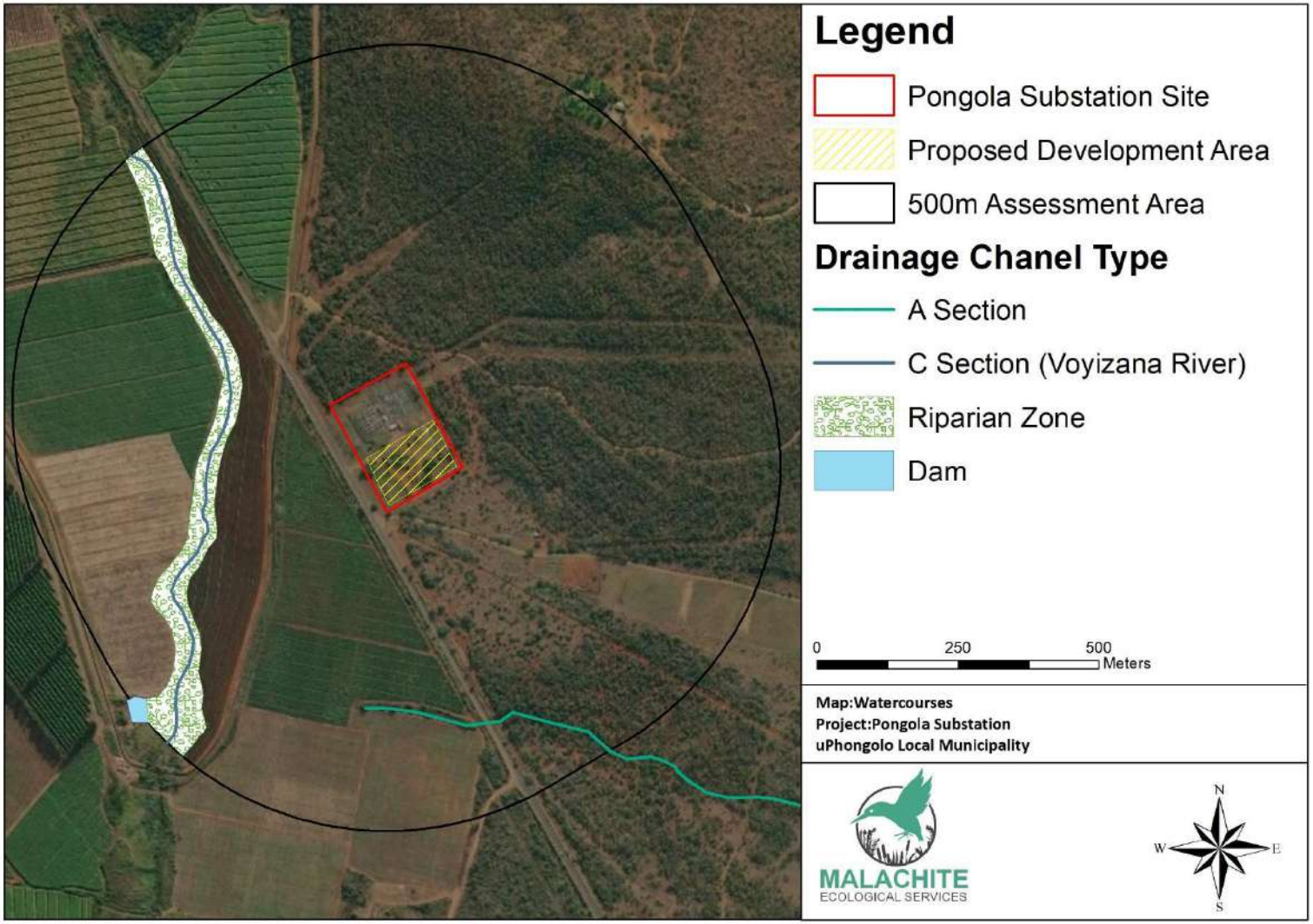

Figure 15: Watercourses within 500m Buffer of the Development Site (Malachite Wetland Assessment, 2019)

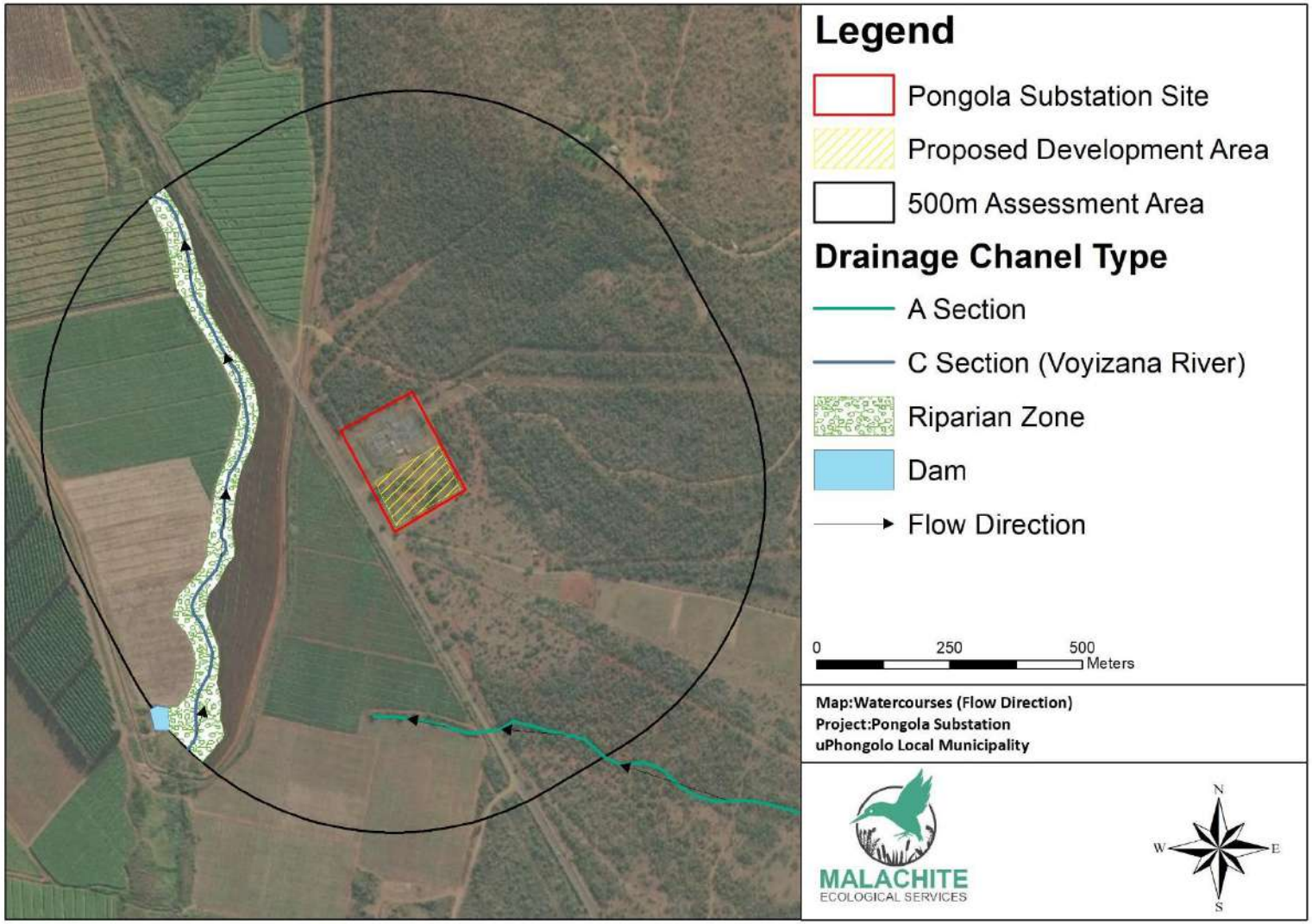

Figure 16: Flow Direction of the Identified Watercourses (Malachite Wetland Assessment, 2019)

The Voyizana River is situated downstream of the proposed development. It must be noted that the Voyizana River and associated riparian zones are hydrologically isolated from the substation site. Impacts to the system are numerous and include anthropogenic development both in the form of infrastructure and agricultural activities. Any stormwater runoff will be intercepted by numerous anthropogenic impoundments including the R66 road, two dirt roads, a canal used for irrigation purposes, as well as a sugarcane farm as per Figures 17 and 18 below.

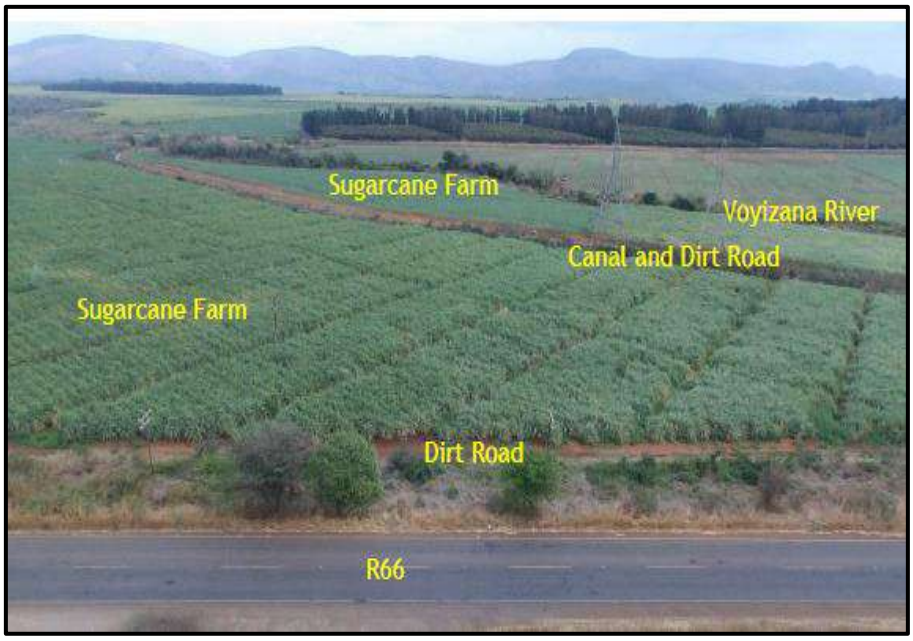

Figure 17: Anthropogenic Impoundments Identified Between the Substation Site and the Voyizana River (Malachite Wetland Assessment, 2019)

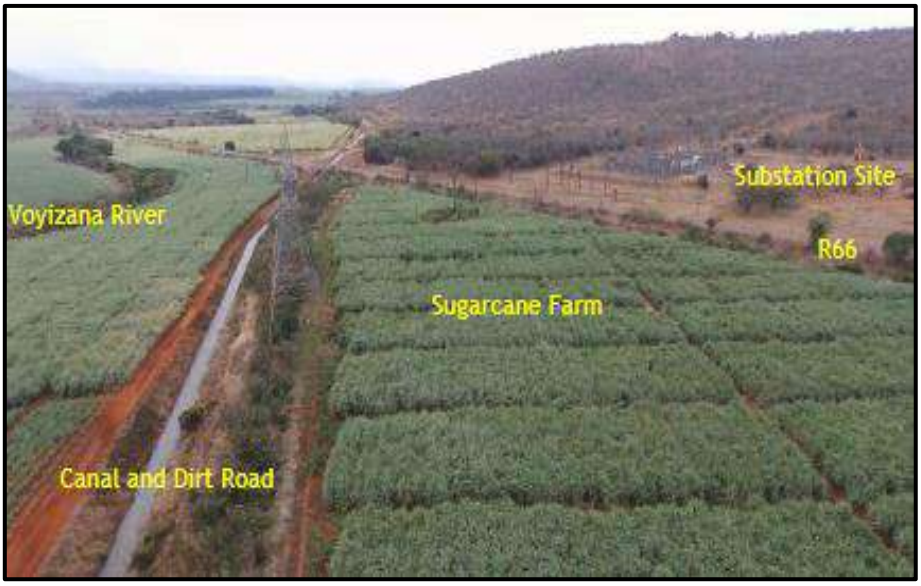

Figure 18: A Different View of the Impoundments Between the Substation and Voyizana River (Malachite Wetland Assessment, 2019)

The Voyizana River will not be impacted by the proposed development. Therefore, the specialist is of the opinion that the proposed development should go ahead.

The wetland assessment can be reviewed under Appendix E.

11.3. Biodiversity Assessment

Malachite Ecological services (Pty) Ltd has undertaken a Biodiversity Assessment at the Pongola Substation site. The aim of conducting a biodiversity assessment is to assess vegetation communities present within the project area through site investigation and impact assessments.

According to the 'Schedule of Threatened Terrestrial Ecosystems in South Africa' (promulgated under NEMBA, Government Notice 1002 of 2011), the eastern portion of the project area is located within the Black Rhino Range Threatened Ecosystem (KZN 41) and classified as Vulnerable. The site was screened against Important Bird and Biodiversity Areas (IBAs) and it was concluded that the study area is not associated with or in close proximity to any IBAs.

11.3.1. Vegetation Communities (Flora):

The project area is located within an existing Eskom substation site and as such has been impacted through land transformation, site clearing, dumping of construction materials, compaction of soils (through the creation of an internal road) and continued disturbance. The floristic composition has been altered significantly with little representation of the Zululand Lowveld. Alterations of natural habitats often hinder the ability of these systems to provide ecosystem services.

Species diversity within the substation site was low, comprising of scattered indigenous and exotic trees, mixed grasses and ruderal herbaceous species. Smaller trees/shrubs were more abundant than larger trees. The herbaceous layer was poorly developed and for the most part lacked indigenous species possibly due to continued site impacts and clearing. The graminoid component was comprised of a mixture of species (mostly those quick to colonize disturbed habitats) likely introduced to the site from other sites during the dumping of construction materials and continued site access.

Alien Invasive Plant Species: The presence of alien invasive plant species was observed on site potentially due to the disturbances on site over the year. It was noted that there are several ***Parthenium hysterophorus*** plants within the project site. These alien invasives must be eradicated through early detection and an ongoing monitoring plan.

Protected Trees: During the site investigations a single, relatively young ***Adansonia digitata*** was recorded within the project area which is a Protected Tress under the National Forests Act (Act No. 84 of 1998). It is located on the north-western edge of the BESS site (27°26'55.20"S 31°38'18.56"E) close to the entrance to the substation. Should this tree be impacted (pruned or removed) by the proposed project, a permit must be granted by the relevant authorities. ***Sclerocarya birrea subsp. caffra*** was noted outside the southern boundary fence and no part of this tree must be impacted by the project.

11.3.2. Faunal Component:

Mammals: The majority of species likely to be present within the project area are common within southern Africa and have a wide geographic distribution. These are predicted to be dominated by small-medium sized mammals that are able to get into the fenced off substation site. These species are likely to display some degree of ecological, behavioral and demographic plasticity. These species include Namaqua Rock Mouse, Tete Veld Rat, Rusty Spotted Genet, Slender Mongoose and Natal Multimammate Mouse.

Herpetofauna: The project site is not associated with any important amphibian habitats and is unlikely to support any noteworthy populations. Several relatively small termite mounds were noted within the project area and act as important refuge sites.

Furthermore, piles of construction materials and moribund vegetation attract small mammals and subsequently reptiles such as snakes. It is predicted that alterations to the original reptilian composition have already occurred to some degree within the project area due to anthropogenic disturbances associated with the substation site. The project area is not likely to support species of conservation concern however, mitigation measures have been recommended section 14 below to ensure reptiles currently using the project area are not adversely affected during the construction phase.

Avifauna: Although species such as the White-backed Vulture, Lappet-faced Vulture, African Crowned Eagle and Martial Eagle are likely to use the larger project area as part of their foraging range or through transient movements, the proposed project will not have a negative impact on local populations. This is largely due to their breeding and nesting strategies coupled with the nature of the BESS project.

11.3.3. Ecological Sensitivity Assessment

Habitats within the project area have been impacted through historic and current anthropogenic impacts over the years. The floral and faunal communities have been impacted significantly and the site provides limited to no conservation value. Although the site is associated with a low ecological sensitivity, the following key findings must be noted:

a. There are several ***Parthenium hysterophorus*** scattered across the site. It is imperative that these species are eradicated through early detection to ensure they do not spread into the adjacent CBA.
b. Several relatively small moribund termite mounds were noted across the site. These act as important refuge sites for reptile species. Prior to construction these must be excavated by a suitably qualified herpetologist and any fauna present must be relocated outside of the project area to a safe location.

The location of both the ***Parthenium hysterophorus*** and Termite Mounds can be seen in Figure 19 below.

c. A single ***Adansonia digitata*** specimen was identified on the north-western edge of the BESS project area. Any impacts to this tree will require the acquisition of permits. Refer to Figure 20 below.

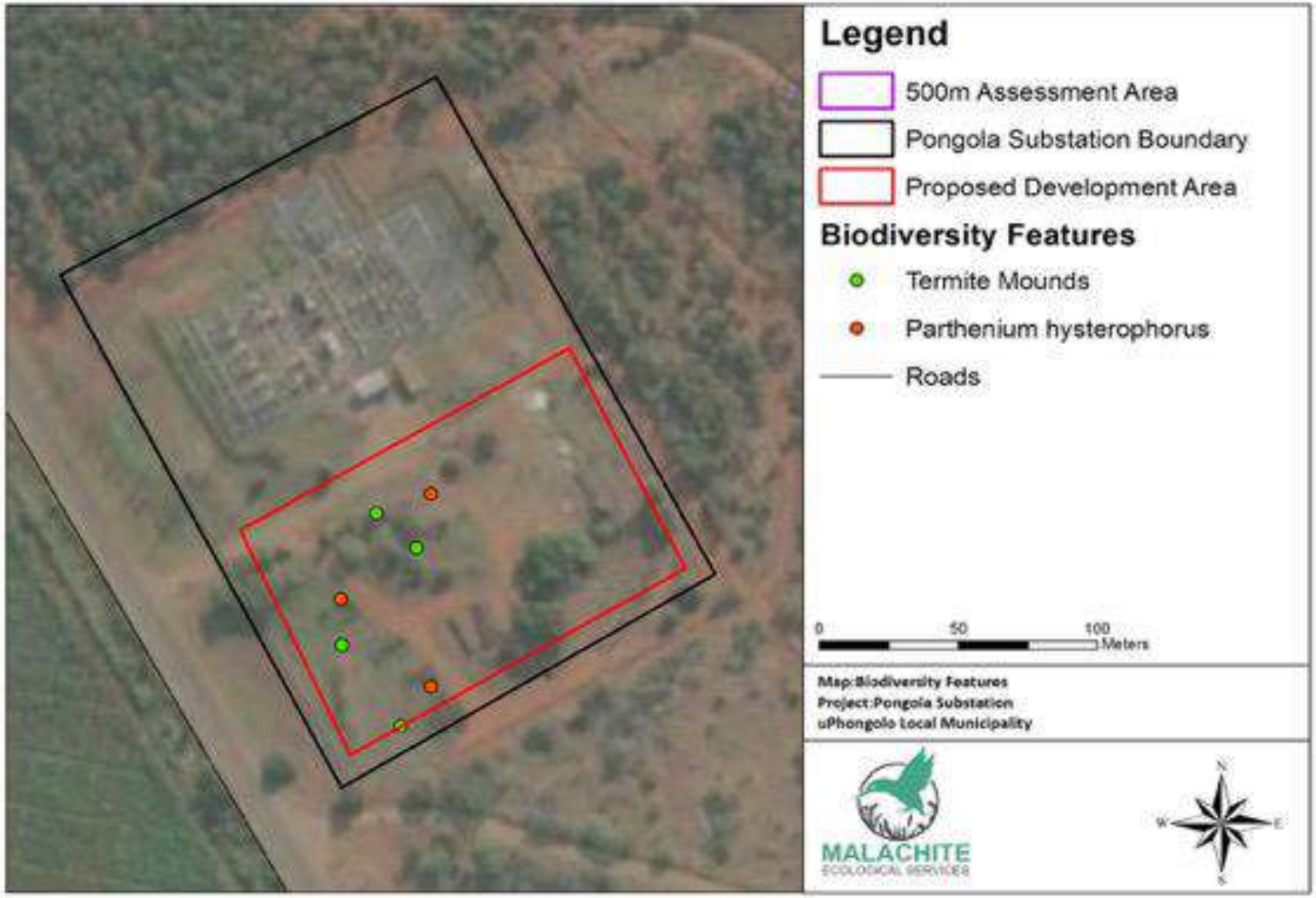

Figure 19: Biodiversity Features (Malachaite Biodiversity Assessment, 2019)

Figure 20: Location of Adansonia digitata

Impacts that are associated with the project are associated with the degradation of habitats within the development footprint. However, large portions of the land have already been transformed resulting to a low ecological sensitivity. Therefore, the specialist is of the opinion that the proposed development proceeds.

The complete specialist study can be reviewed under Appendix E.

11.4. Heritage Impact Assessment

An application for exemption for undertaking a Phase 1 Heritage Impact Assessment was conducted by JLB Consulting. The proposed development of the BESS will take place within an existing substation facility which indicates that the area is already disturbed by the construction and operation of the Pongola substation. Google Earth images indicate significant transformation of the substation site. Figure 21 below shows that the substation site falls into an area of moderate fossil sensitivity which implies a desktop Paleontological study is required. However, due to the transformation and disturbance of the project site, it is recommended that no further studies be undertaken but that a protocol for fossil finds is necessary. Section 14 highlights the conditions and protocol for fossil finds.

1 in 250 000 geological formation layers are courtesy of the Council for GeoScience
For more information, go to How to Use the Palaeontological (fossil) Sensitivity Map

Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 21: Fossil Sensitivity of the Project Area

Due to the disturbed nature of the proposed site for BESS, it is unlikely that intact heritage resources will be found in the project area, therefore, it is the specialist recommendation that the exemption from undertaking a Phase 1 HIA is approved.

The exemption application can be reviewed under Appendix E.

12. IMPACT ASSESSMENT

Impact assessment takes into account the nature, scale and duration of positive and negative effects on the environment. All activities that are related to the proposed construction and operation of the proposed development that could have some impact on the environment were identified. These impacts can be environmental, socio-economic or cultural in nature. Impacts are often not only confined within the direct scope of the proposed activity and can accumulate as a network of indirect impacts on the surrounding area. Different impacts are associated with the construction and operational phases of the proposed activity.

The following potential impacts were identified for the construction phase:

- Traffic pressures and access
- Soil erosion
- Stormwater management
- Ground water pollution
- Surface water pollution
- Risk of alien invasive encroachment
- Flora
- Fauna
- Waste management
- Noise disturbance
- Air quality
- Visual quality
- Public health and safety
- Heritage impacts
- Socio-economic impacts

The following potential impacts were identified for the operational phase:

- Stormwater Management
- Surface runoff
- Flora
- Fauna
- Air Emissions
- Noise and disturbance
- Visual quality
- Safety of Employees

The project is likely to induce only site-specific environmental and/or social impacts. The project is proposed to be implemented at relatively contained areas.

12.1. Methodology

EIA Regulation and GNR 326 (2017) prescribes the requirements and aims of environmental impact assessments. In terms of the regulations, the following objectives are specified:

- Determine the nature, significance, consequence, extent, duration and probability of impacts; and
- The degree to which these impacts:
  - Can be reversed,
  - May cause irreplaceable loss of resources, and
  - Can be avoided, managed or mitigated

The impacts of any development including the construction and operational phases are identified, using the following definitions:

Term	Description
Significant Impact	*an impact that may have a notable effect on one or more of the aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence.*
Cumulative impact	*In relation to an activity, means the past, present 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.*

The potential impacts are listed and assessed for significance. Significance is assessed by scoring each impact based on four variables viz. probability, severity, duration and spatial impact. The four variables, with their score criteria are detailed below:

Table 13: Impact Risk Assessment Scoring Matrix

Score	Frequency/ Probability (FR) (Frequency or likelihood of activities impacting on the environment)	Severity (SV) (Degree of change to the baseline environment in terms of reversibility of impact; Sensitivity of receptor, duration of impact and threat to environment and health standards)	Duration (DR) (Length of time over which activities will cause change to the environment)	Spatial Scope (SS) (Geographic overage)
1	Almost Never / impossible	Insignificant / not harmful / totally reversible	One day to a month	Activity Specific
2	Very seldom / highly unlikely	Small / potentially harmful / reversible within 05 years	One month to a year	Site specific
3	Infrequent / seldom	Significant / slightly harmful / needs specific mitigation to reverse in a time span of between 05 and 15 years	One year to ten years	Area
4	Often / regular	Great / harmful / irreversible	Life of project	Regional
5	Daily / Highly regular	Disastrous / extremely harmful / totally irreversible and damaging	Post closure	National

The impacts are also scored taking any mitigation into consideration. The impacts are scored and scaled for significance as follows:

Impact Rating	Score Range	Description
Negligible	3 or less	The impact is unimportant / indiscernible and hence insignificant – little or no mitigation adequately addresses the impact.
Low	4 to 9	The impact is of little importance since it is easily and adequately mitigated.
Medium	10 to 15	The impact is considerable and requires adequate mitigation to reduce potential damage to the environment.
High	16 or more	the impact is adverse and may never be adequately mitigated. The impact has a high probability of causing cumulative effects of other less significant impacts. It may be considered to be a fatal flaw of the project and requires intense consideration.

12.2. Impacts Identified

The impacts of the construction and operational phases for the proposed BESS project are summarised in the tables below. The duration of the construction phase is ±12 months while the duration of the rehabilitation phase is ±3 month.

Table 13.1: General Construction Activities Impacts

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	General Construction Activities - Potential harm to the environment due to workers or contractors being unaware of how their activities may impact the environment or due to unauthorised access to the site.	Direct	**Without**	5	5	2	3	15	**Medium**
			With	3	3	2	2	10	**Medium**
			Mitigation measures: • The contractor must ensure that all employees, including sub-contractors and their employees, are required to attend on-site Environmental Awareness Training prior to commencing work on site. • Follow-up Environmental Awareness Training are required for new subcontractors or crews prior to commencing work or for specific activities that may potentially impact the environment, or if work is being undertaken in sensitive environments. • The contractor must maintain accurate records of any training undertaken. • Training must cover all aspects of the EMPr, procedures to be followed, the sensitivity of the site and importance of adhering to "no-go" areas. • The ECO must monitor the contractor's compliance with the requirement to provide sufficient environmental awareness training to all site staff. • Environmental signage must be displayed on the site including – "no smoking", "fire hazards", etc. • Emergency numbers must be clearly displayed. • Access to fuel and other equipment stores must be strictly controlled. In terms of frequency, these mitigation measures ensure that the impacts change from a possible daily occurrence to a seldom event. In terms of severity, these mitigation measures change from being harmful to be slightly. However, the mitigation measures including ongoing environmental awareness training are predicted to be sufficient.						
Construction	Earthworks –	Direct	**Without**	4	4	3	2	13	**Medium**
			With	3	2	2	2	9	**Low**

<table>
<tr><td></td><td>Excavation, trenching and site establishment for implementation of BESS.</td><td></td><td colspan="7">Mitigation measures:

• All trenches must be clearly demarcated and barricaded on site at all times
• Trenches must have one sloped side to allow animals which fall in to get out.
• The earthworks operation must be carried out by a suitably qualified contractor.

These impacts, without mitigation, have the potential to damage the environment on a regular basis but with mitigation are expected to drop significantly both in frequency and severity.</td></tr>
<tr><td rowspan="3">Construction</td><td rowspan="3">Storage, mixing, and disposal of cement and concrete -

Potential water and/or soil pollution due to incorrect management of concrete and cement.</td><td rowspan="3">Direct</td><td>Without</td><td>3</td><td>2</td><td>2</td><td>2</td><td>9</td><td>Low</td></tr>
<tr><td>With</td><td>3</td><td>2</td><td>1</td><td>2</td><td>8</td><td>Low</td></tr>
<tr><td colspan="7">Mitigation measures:

• No mixing of concrete or cement directly on the ground is permitted. The mixing of concrete will only be done on a mixing tray or on impermeable sheeting.
• Ready-mix trucks are not permitted to clean chutes on site. Cleaning into foundations or a dedicated cleaning pit is permitted.
• Both used and unused cement bags are to be stored in weatherproof containers so as not to be affected by rain or runoff.
• Contaminated soil resulting from concrete or cement spills is to be removed immediately after the spillage has occurred and placed on the appropriate rubble stockpile.
• Clean stormwater must be kept away from areas where it could be contaminated and must be directed to the stormwater drainage system.

These impacts, without mitigation, have a low impact to the environment and with mitigation is expected to be reduced further.</td></tr>
</table>

Table 13.2: Soil Erosion

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	Soil erosion - Heavy rains result to high levels of erosion. Loss of stockpiles, instability of soils and associated loss of vegetation may also result. Ecological disturbances from high levels of erosion are also possible.	Cumulative	**Without**	4	3	3	3	13	**Medium**
			With	2	2	2	2	8	**Low**
			Mitigation measures: • Project management of construction activities must be done to ensure that only small and/or necessary portions will be disturbed at any given time. Vegetation must not be removed until necessary. • Soil erosion measures must be placed on sensitive areas like banks, slopes and towards the property boundary. • All stockpiles must be covered with suitable material to prevent loss of sediment via wind/ water. • Topsoil (top 300mm layer minimum) must be removed prior to the construction by earthmoving equipment. Topsoil must be stored in heaps of not higher than 2m in a way that prevents damming. Stored topsoil must not be compacted. • Topsoil must not be used as fill material for backfilling of excavations on site. • Minimize the amount of area that needs to be disturbed and the amount of time spent on sensitive areas. • Offsite runoff around disturbed areas must be diverted to reduce the amount of stormwater which comes into contact with exposed soils, as a result there will be less erosion. In terms of frequency, these mitigation measures ensure that the impacts change from a regular occurrence to a highly unlikely event. In terms of severity, these mitigation measures change from being slightly harmful to be being potentially harmful. However, the mitigation measures including ongoing environmental awareness training which are predicted to be sufficient.						
Construction	Stockpiling of topsoil and cleared vegetation: Potential loss of valuable topsoil due to inadequate stockpiling practices; potential loss of indigenous vegetation; potential erosion of cleared	Cumulative	**Without**	4	3	2	2	11	**Medium**
			With	3	2	1	1	7	**Low**
			Mitigation measures: • Topsoil must be stockpiled for eventual return during topsoil back-filling and rehabilitation. These must be weed free and must not stand for a prolonged period of time. • Sub-soil and topsoil must be stored separately onsite. • Topsoil is to be stockpiled in discrete areas and retained for future landscaping efforts. • Topsoil stockpiles must not exceed 2m in height and must be protected from wind, erosion and runoff by covering with						

	areas.		a suitable fabric approved by the ECO. In terms of frequency, these mitigation measures ensure that the impacts change from a regular occurrence to a seldom event. In terms of severity, these mitigation measures change from being slightly harmful to be being potentially harmful. However, the mitigation measures including ongoing environmental awareness training which are predicted to be sufficient.

Table 13.3: Biodiversity Impacts

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	Risk of alien invasive encroachment into disturbed areas - Alien species are able to easily invade a wide range of ecological niches thereby altering natural systems.	Cumulative	**Without**	4	4	3	3	14	**Medium**
			With	2	2	2	2	8	**Low**
			Mitigation measures: • Protect as much indigenous vegetation as possible. • Ongoing alien plant control must be undertaken particularly in the disturbed areas. Areas which have been disturbed will be quickly colonised by invasive alien species. Ongoing management must be undertaken for the clearing/eradication of alien species. • Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge. These impacts, without mitigation, have the potential to damage the environment on a regular basis but with mitigation are expected to drop significantly both in frequency and severity.						
Construction	Flora - Damage and removal of existing indigenous vegetation.	Direct	**Without**	5	3	2	2	12	**Medium**
			With	2	2	1	1	6	**Low**
			Mitigation measures: • Sensitive flora must be identified prior to construction and must be marked. • Comments from Ezemvelo and Environmental protection bodies must be kept in consideration in order to protect the flora on the site and surrounds. • Prior to the clearing of the site, the ECO and if necessary, the Biodiversity Specialist must ensure that all plants of conservation significance are relocated for possible reuse. • A site boundary that currently exists must be maintained to identify the limits of the construction site.						

<table>
<tr><td></td><td></td><td></td><td colspan="7">• Burning of removed vegetation is prohibited.
• Sealant, coatings, adhesives and glazing's, can be toxic to flora, if released into the environment. Therefore, the products used must be stored and used carefully, to save resources as well as protect the environment.
• The ECO must ensure that a list of any indigenous trees/ shrubs which must be removed is provided. This list must include the tree/ shrub species and the number of each species.
With correct implementation of these mitigation measure, the frequency can be reduced from a daily occurrence to a highly unlikely event. While severity will be reduced from significant to small.</td></tr>
<tr><td rowspan="3">Construction</td><td rowspan="3">Fauna -

Hunting/ Fishing/ Poaching by construction workers.</td><td rowspan="3">Indirect</td><td>Without</td><td>5</td><td>4</td><td>3</td><td>2</td><td>14</td><td>Medium</td></tr>
<tr><td>With</td><td>3</td><td>3</td><td>2</td><td>2</td><td>10</td><td>Medium</td></tr>
<tr><td colspan="7">Mitigation measures:

• Identify sensitive fauna on the site prior to construction.
• Trapping/snaring/killing of animals including snakes and reptiles is prohibited.
• Sealant, coatings, adhesives and glazing's, can be toxic to fauna, if released into the environment. Therefore, the products used must be stored and used carefully, to save resources as well as protect the environment.

In terms of frequency, these mitigation measures ensure that the impacts change from a daily occurrence to a seldom occurrence. In terms of severity, these mitigation measures change from being great to slightly harmful.</td></tr>
<tr><td rowspan="3">Operational</td><td rowspan="3">Vegetation Loss due to Fire Outbreak</td><td rowspan="3">Indirect</td><td>Without</td><td>3</td><td>3</td><td>3</td><td>2</td><td>11</td><td>Medium</td></tr>
<tr><td>With</td><td>2</td><td>2</td><td>2</td><td>1</td><td>7</td><td>Low</td></tr>
<tr><td colspan="7">Mitigation measures:

• Appropriate fire-fighting equipment must be kept on site at all time and must be easily accessible.
• No smoking must be allowed near batteries especially during maintenance and management of batteries.
• Relevant signage must be placed near flammable substances.

With correct implementation of these mitigation measure, the frequency can be reduced from a regular occurrence to a highly unlikely event. While severity will be reduced from slightly harmful to potentially harmful.</td></tr>
</table>

Operational	Impact to Fauna on	Indirect	**Without**	2	2	2	1	7	**Low**

	site		**With**	2	2	2	1	7	**Low**
			Mitigation measures: • Any fauna encountered on site must be safely located off the site towards the identified CBA. • There must be no trapping/ killing or hunting of animals on site. With correct implementation of these mitigation measure, the frequency can be reduced from a regular occurrence to a highly unlikely event. While severity will be reduced from slightly harmful to potentially harmful.						

Table 13.4: Stormwater Impacts

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	Stormwater management – Increase run-off as a result of construction activities and bare, exposed ground. This may potentially result to increased siltation and erosion.	Direct	**Without**	4	4	3	3	14	**Medium**
			With	3	3	2	2	10	**Medium**

			Mitigation measures:
			
			• Stormwater infrastructure currently exists on site; however, the following measures must be implemented:
			  ○ The earthworks operation must be carried out by a suitably qualified contractor.
			  ○ Temporary v-drains must be used where necessary;
			  ○ The use of shade clothes strategically positioned along the environmental sensitive areas so that no contamination with respect to dust and litter enter.
			• Clean storm water must be directed away from ablution facilities where it could be contaminated and must be directed to the storm water drainage system.
			
			In terms of frequency, these mitigation measures ensure that the impacts change from a regular occurrence to a seldom event. In terms of severity, these mitigation measures change from being harmful and great to being slightly harmful. Mitigation measures including ongoing environmental awareness training are predicted to be sufficient.						

Operational	Stormwater Management and	Indirect	**Without**	3	3	3	2	11	**Medium**
			With	2	1	2	2	7	**Low**

	Maintenance of Structures - Proper management maintenance must be conducted throughout the lifespan of the operational phase.		**Mitigation measures:** • Surface water off paved surfaces must be directed towards the stormwater inlets. • All rainwater must be directed into the infiltration chambers. • Clean storm water must be directed away from areas where it could be contaminated and must be directed to a storm water drainage system. • The storm water drainage system must be maintained and not contaminated by other waste sources. These impacts, without mitigation, will have an infrequent occurrence but can be reduced to a highly unlikely event with severity being small upon implementation of the mitigation measures.

Table 13.5: Impacts on Groundwater and Surface-water

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	Ground water and surface water pollution Pollution of ground and surface and water may result from hazardous chemical substance spills.	Direct	**Without**	5	5	4	3	17	**High**
			With	3	2	3	3	11	**Medium**
			Mitigation measures: • Chemical substances must be mixed or handled on impervious surfaces or bunded areas. Concrete must be mixed on impervious surfaces when necessary. There must be a contained/ designated area for washing out and cleaning of concrete mixing equipment, to further prevent pollution. In addition, wash waters from site must be collected and disposed of off-site. • An adequate number of chemical toilets for the staff must be provided and serviced regularly. The positioning of the toilets must be authorized by the ECO. • Spills that result in the contamination of ground water must be reported immediately to the ECO • Spills must be managed in the following manner: - Stop the spill - Contain the spill - Report significant spills to DWS and the Local Municipality Water and Sanitation Department. - Remove spilled material for treatment/disposal. - Determine any possible impact to soils, groundwater, storm water, etc. - Undertake any necessary remedial actions						

			- Document the spill - Employees involved in spill control must be using PPE In terms of frequency, these mitigation measures ensure that the impacts change from a daily occurrence to a seldom event. In terms of severity, these mitigation measures change from being disastrous to potentially harmful.						
Construction	The cleaning of vehicles, equipment and construction areas.	Direct	**Without**	4	3	2	2	11	**Medium**
			With	2	2	1	2	7	**Low**
			Mitigation measures: • No washing of vehicles or equipment is permitted on site. • Cleaning of equipment is to take place within designated areas. • A dedicated cleaning area is to be demarcated to facilitate washing of all cement and painting equipment. • No wastewater must be disposed on site, onto the soil or into any water body. • Soil contaminated with hazardous substances, fuel or oil must be treated as hazardous waste and removed from site. In terms of frequency, these mitigation measures ensure that the impacts change from a regular occurrence to a highly unlikely event. In terms of severity, these mitigation measures change from being slightly harmful to small.						
Operational	Ground and Surface Water runoff - Proper management and disposal of waste must occur during the lifespan of the project, including during the operational phase of BESS.	Cumulative	**Without**	3	2	2	2	9	**Low**
			With	2	1	1	1	5	**Low**
			Mitigation measures: • The fire protection system must be implemented on site. • It is ideal for a leak detection system to be installed for the BESS facility. • Secondary containments must be put in place for BESS. • Spill kits must be kept on site for small spills and must be easily accessible. • If the event of spills and leaks, the contaminated area must be cleaning and collected in a container or leak proof bag for easy disposal at a registered landfill site. • Regular visual inspections must be conducted by the developer to monitor the wear and tear of the battery. • The applicant must ensure regular maintenance of all drainage systems within the project area as they help in improving site drainage, and reduce pollutants entering surface waters and groundwater. • Proper management and disposal of waste must occur during the lifespan of the project, including during the						

			operational phase. The applicant must ensure regular maintenance of all drainage systems within the road upgrade as they help in improving site drainage, and reduce pollutants entering surface waters and groundwater. With correct implementation of these mitigation measure, the frequency can be reduced from a seldom occurrence to a highly unlikely event. While severity will be reduced from potentially harmful to insignificant.

Table 13.6: Traffic

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	Increased Traffic Frequency on Road Infrastructure – Potential wear of access roads, potential unpermitted transport of materials and potential loss of materials being transported. Presence of construction vehicles and personnel leading to traffic congestion.	Direct	**Without**	5	4	3	3	15	**Medium**
			With	4	3	2	3	12	**Medium**
			Mitigation measures: • All construction vehicles must be roadworthy. • All loads must be securely fastened when being transported. • All speed limits and other traffic regulations on the public roadways must be adhered to. • Construction vehicles and personnel must adhere to business hours. This may be relaxed to accommodate abnormal vehicles so they may not hinder daily life and/or regular traffic. • Construction vehicles must use the agreed route to and from site. The Pongola Substation has one entry- exit point which must be adhered to. • Pointsmen to guide traffic for entry and exit of construction vehicles must be used where required. • Safety measures such as appropriate pavements, speed humps, signage boards for construction site and vehicles and for workmen must be implemented to slow down traffic within the development. • Construction phase must be as short as possible. Reliable building contractors must be employed to avoid delays. • Vehicles must park on demarcated site only. With correct implementation of these mitigation measure, the frequency can be reduced from a daily occurrence to a seldom occurrence. While severity will be reduced from slightly harmful to potentially harmful.						

Table 13.7: Waste Management Impacts

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	Storage, spillage and disposal of hazardous chemicals: Potential hazardous chemical spills, resulting from incorrect management of resources, can cause soil, surface water and groundwater pollution.	Direct	**Without**	5	4	4	3	16	**High**
			With	3	2	2	2	9	**Low**

			Mitigation measures:
			
			• The following action must immediately take place in the event of spills:
			  ○ Immediately set up a barrier to alert unauthorised personnel to keep out;
			  ○ Eliminate all possible sources of leakages;
			  ○ Immediately begin containment by placing absorbent material on the spill;
			  ○ Setup decontamination zone to ensure proper decontamination procedures.
			• Proper handling, storage and disposal of hazardous chemicals. All fuels and flammable materials must be handled safely, stored safely and clearly labelled.
			• Flammable materials must comply with standard fire safety regulations.
			• Drip trays must be used to collect spillage from equipment, vehicles and plant. These must be emptied regularly into secondary containers.
			• Fuels and flammable materials must be handled in a safety conscious manner.
			• Safety signage including “No Smoking”, “No Naked Lights” and “Danger”, and product identification signs, must be clearly displayed on the Battery system.
			
			In terms of frequency, these mitigation measures ensure that the impacts change from a possible daily occurrence to a seldom event. In terms of severity, these mitigation measures change from great to potentially harmful in the event that the mitigation measures were not sufficient. However, the mitigation measures including ongoing environmental awareness training are predicted to be sufficient.						

Construction	Waste and littering around the site - Improper storage/ disposal of waste and litter may contaminate/ pollute	Cumulative	**Without**	5	3	2	2	12	**Medium**
			With	2	2	1	1	6	**Low**
			Mitigation measures: • Refuse skips must be used and must be covered with shade cloth to ensure the containment of waste. • Refuse bins must be provided for domestic waste (lunch litter) and placed in designated eating areas and any other areas where deemed necessary to control littering.						

	identified sensitive areas and the surrounding area.		• Refuse bins must not overflow and must be emptied regularly. No littering is permitted on site. • Building rubble must be kept separate from other construction waste. • Accumulation of large stockpiles of rubble and waste is not permitted. Waste must be removed at regular intervals at a minimum frequency of once a week. • All waste must be disposed of at approved landfill sites, no burning or burying is permitted. • Personnel must be trained in etiquette regarding littering and waste management. • Hazardous waste bins must be clearly marked, stored in a contained bunded area (or have a drip tray) and covered (either stored under a roof or the top of the container must be covered with a lid). • A hazardous waste disposal certificate must be obtained from the waste removal company as evidence of correct disposal. • On-site chemical toilets must be provided for domestic purposes during construction phase. • The contractors are responsible for the maintenance of the chemical toilets. • Waste must be collected by an accredited waste company and disposed of at an appropriate and licensed waste disposal facility. • Littering is prohibited and general housekeeping must be enforced. These impacts, without mitigation, have a daily occurrence that can be reduced to a highly unlikely event. The severity with mitigation is reduced from slightly harmful to small.						
Operational	Generation of waste material- The potential generation of general waste from battery usage.	Indirect	**Without**	4	3	3	2	12	**Medium**
			With	2	2	2	1	7	**Low**
			Mitigation measures: • The Service Manager must ensure that waste containers are provided for the collection of general waste at various points on the premises. • All containers must be kept in a clean and hygienic manner that prevents harboring of pests. With correct implementation of these mitigation measure, the frequency can be reduced from a regular occurrence to a highly unlikely event. While severity will be reduced from slightly harmful to potentially harmful.						

Operational	Accidental spillage of hazardous chemicals	Direct	**Without**	4	4	2	2	12	**Medium**
			With	2	2	1	1	6	**Low**

	or materials such as Lithium, zinc and vanadium		**Mitigation measures:** • Proper storage of chemicals must be within a lockable, well ventilated building. • Storage areas for hazardous chemicals must comply with standard fire safety regulations. • Safety signage including "No Smoking", "No Naked Lights" and "Danger", and product identification signs, must be clearly displayed in areas housing chemicals such as the battery. • Adequate fire-fighting equipment must be available close at hand and no smoking is permitted within the vicinity of storage areas. • Chemicals must be properly labeled and handled in a safety conscious manner. • Bunded walls to retain possible spillages. To contain leaks, a primary container (tank) is within the battery technology itself, the secondary containment is the battery container, the tertiary containment is the concrete surface and / or bund. These impacts, without mitigation, have the potential to damage the environment on a regular basis but with mitigation are expected to drop significantly both in frequency and severity.

Table 13.8: Fire Suppression

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	Fire risks during construction	Direct	**Without**	3	3	3	3	12	**Medium**
			With	2	2	2	2	8	**Low**
			Mitigation measures: • Basic fire-fighting equipment, fire extinguishers, must be placed at strategic locations on site (e.g. at the site office, flammable material store and watchman's container). • Equipment must be maintained in good working order to the satisfaction of local fire authorities. • No open fires are permitted. A dedicated braai facility must be approved by the ECO, if the campsite is in close proximity to firefighting equipment. At no time must a braai fire be left unattended. • Burning of removed vegetation is prohibited. • Smoking is prohibited near places where any readily combustible or flammable materials are present. Notices must be prominently displayed prohibiting smoking in such areas. • Welding, flame cutting, and other hot work must be undertaken in places where safety precautions are in place (i.e. not						

<table>
<tr><td></td><td></td><td></td><td colspan="7">near potential sources of combustion and with a fire extinguisher immediately accessible).
• All flammable materials must be stored in a lockable storage area.
• Combustible materials must not accumulate on the construction site.
• Cooking must be restricted to bottled gas facilities in designated areas approved by the ECO. This facility must be supervised and strictly controlled.

These impacts, without mitigation, have a daily occurrence that can be reduced to a highly unlikely event. The severity with mitigation is reduced from slightly harmful to small.</td></tr>
<tr><td rowspan="3">Operational</td><td rowspan="3">The batteries comprise of various chemical compositions and run the risk of outbreaks of fire.</td><td rowspan="3">Direct</td><td>Without</td><td>3</td><td>3</td><td>3</td><td>3</td><td>12</td><td>Medium</td></tr>
<tr><td>With</td><td>2</td><td>2</td><td>2</td><td>2</td><td>8</td><td>Low</td></tr>
<tr><td colspan="7">Mitigation measures:

• Eskom must implement a Fire Management and Protection Plan for the BESS facility for each technology alternative.
• Appropriate fire-fighting equipment must always be available on site and serviced at regular intervals.
• Gas fire suppression must be used as acid is a part of the battery composition.
• Equipment must be maintained in good working order to the satisfaction of local fire authorities.
• No open fires are permitted on site.

In terms of frequency, these mitigation measures ensure that the impacts change from a possible daily occurrence to a seldom event. In terms of severity, these mitigation measures change from great to potentially harmful in the event that the mitigation measures were not sufficient. However, the mitigation measures including ongoing environmental awareness training are predicted to be sufficient.</td></tr>
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Table 13.9: Noise Impact

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance

Construction	Noise disturbance - The presence of personnel and machinery will present a nuisance to the area.	Direct	**Without**	4	3	2	2	11	**Medium**
			With	2	2	2	1	7	**Low**
			Mitigation measures: • Construction activities must be limited to normal construction industry working hour – avoid nighttime hours. • A registered contractor providing a project schedule must be employed. Penalties for extending the timeline must be enforced to try and minimise the period of impact. • In addition, construction vehicles and machinery must be fitted with the appropriate noise muffling devices and must be appropriately maintained to ensure that the machines and vehicles do not produce excessive noise disturbance. • No loud music is allowed on site. With correct implementation of these mitigation measure, the frequency can be reduced from a daily occurrence to a very seldom occurrence. While severity will be reduced from slightly harmful to potentially harmful.						
Operational	Noise and disturbance from the battery unit.	Indirect	**Without**	2	2	3	2	9	**Low**
			With	1	1	2	1	5	**Low**
			Mitigation measures: • All noise generating plant such as air conditioning, fans, etc. are to comply with noise standards. In terms of frequency, these mitigation measures ensure that the impacts change from a seldom event to highly unlikely. In terms of severity, these mitigation measures change from being potentially harmful to not harmful.						

Table 13.10: Air Quality Impacts

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	Air Quality -	Direct	**Without**	4	4	2	3	13	**Medium**
			With	3	2	1	3	9	**Low**

	Dust generated from construction vehicles and on-site activities.		**Mitigation measures:** • Dust control measures/suppression of dust must be implemented timeously by the contractor. • Water trucks must be utilized to wet exposed road surfaces or stockpiled areas. The dust levels must be kept as minimal as possible to ensure minimal impact to the environment. • Vehicles must be kept in good condition to minimise vehicular fumes. If excessive emissions are observed, the Contractor must remove the vehicle from the site. • Dust and mud must be controlled at vehicle exit and entry points to prevent the dispersion of dust and mud beyond the site boundary. • Speed limit sign boards must be erected during the construction phase to limit dust emissions. These impacts, without mitigation, have the potential to damage the environment on a regular basis but with mitigation are expected to drop significantly both in frequency and severity.						
Construction	Installation and use of ablution facilities- Release of odours as a result of the chemical toilets on-site.	Direct	**Without**	4	4	2	3	13	**Medium**
			With	3	3	1	2	9	**Low**
			Mitigation measures: • Chemical toilets must be cleaned on a regular weekly basis. • Servicing receipts must be maintained and kept on site within the site environmental file. • Sufficient ablution facilities must be provided – minimum of 1 toilet per 20 workers. • Toilets must have properly closing doors and supplied with toilet paper. • Chemical toilets must be serviced weekly. The contractor is to ensure that no spillage occurs and that the contents are removed from site according to approved methods. These impacts, without mitigation, have the potential to damage the environment on a regular basis but with mitigation are expected to drop significantly both in frequency and severity.						

Operational	Release of emissions from battery.	Indirect	**Without**	2	2	3	2	9	**Low**
			With	2	2	2	1	7	**Low**

			Mitigation measures: • The Service Manager must ensure that any emissions must be kept to a minimal. • Regular maintenance and monitoring of the batteries must be undertaken to prevent leaks and abnormal emissions. • Regular site inspections must be conducted by supervisors. With correct implementation of these mitigation measure, the frequency can be reduced from a regular occurrence to a highly unlikely event. While severity will be reduced from slightly harmful to potentially harmful.

Table 13.11: Visual Impacts

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	Visual Quality - The substation is located on the outskirts of the Pongola town; however, motorists may not appreciate the presence of a construction site in the vicinity.	Direct	**Without**	3	3	3	3	12	**Medium**
			With	2	2	2	2	8	**Low**
			Mitigation measures: • The site must be well maintained and neat. • The contractor must adhere to project schedule in order to minimise the length of the construction period. • Inspections of the site by an Environmental Control Officer are required. With correct implementation of these mitigation measure, the frequency can be reduced from a seldom occurrence to highly unlikely. While severity will be reduced from slightly harmful to potentially harmful.						
Operational	Visual Quality – The battery storage is placed in an organized manner that is aesthetically pleasing.	Indirect	**Without**	3	3	2	2	10	**Medium**
			With	2	2	1	2	7	**Low**
			Mitigation measures: • All flood lighting must comply with relevant municipal standards. • No unauthorized or un-approved structures must be erected. • Regular inspections must be conducted by the Client to monitor the wear and tear of the batteries. In terms of frequency, these mitigation measures ensure that the impacts change from a seldom event to highly unlikely. In terms of severity, these mitigation measures change from being slightly harmful to potentially harmful.						

Table 13.12: Health and Safety Impacts

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	Public safety and health – Occupational safety, security and health of staff and public in general.	Direct	**Without**	4	3	3	2	12	**Medium**
			With	2	2	2	2	8	**Low**
			Mitigation measures: • Skilled contractors must be utilised for specialised tasks. • Unskilled labour must be trained relevantly including environmental training. • Fire safety measures must be included in the design of the facility. Fire safety equipment must be provided on site during construction. • First aid kits must be available on site as well as an incident records file. • Safety gear including hard hats and safety shoes must be provided and worn at all times while on site. • Emergency numbers must be clearly visible on site. • Contractor staff are prohibited from trespassing over the site boundaries. • Interaction with objecting parties at the site must be well documented. A complaints register must be readily available on site. Interaction with external parties must be courteous. • Although the Contractor is responsible for ensuring that the environmental awareness training of staff members is put in place, it must be the direct responsibility of the appointed ECO to carry out the training. Each staff member is to sign a register confirming their attendance at this training. This register must be included in the site Environmental file. These mitigation measures are predicted to reduce impacts from occurring regularly to occurring very seldomly. The severity will also reduce to being potentially harmful.						
Construction	Fabrication for the construction of metal frames for the batteries to sit on.	Direct	**Without**	2	2	2	2	8	**Low**
			With	2	1	1	1	5	**Low**
			Mitigation measures: • Welding with propane torches is required and propane must be stored in gas tanks on site within a designated area. In terms of frequency and severity, these mitigation measures ensure that the impacts remain as low as possible.						
Operational	Safety of Employees	Indirect	**Without**	2	2	2	1	7	**Low**

			With	2	2	2	1	7	**Low**
			Mitigation measures: • No unauthorized access is permitted. • Service managers and supervisors inspecting the site must be PPE. With correct implementation of these mitigation measure, the frequency can be reduced from a regular occurrence to a highly unlikely event. While severity will be reduced from slightly harmful to potentially harmful.						

Table 13.13: Impacts to Heritage Resources

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	Impact to items of Heritage Significance - During construction, items of historical significance may be stumbled upon.	Direct	**Without**	2	3	2	2	9	**Low**
			With	2	1	1	1	5	**Low**
			Mitigation measures: • The KwaZulu-Natal Amafa and Research Institute must be contacted if any heritage objects are identified during earth-moving activities and all development must cease until further notice. • No structures older than sixty years or parts thereof are allowed to be demolished altered or extended without a permit from the KwaZulu-Natal and Amafa Research Institute. • Under no circumstances must any heritage material be destroyed or removed from site unless under direction of the KwaZulu-Natal and Amafa Research Institute and a heritage specialist. • If any remains be found on site that is potentially human remains, the South African Police Service (SAPS) must also be contacted. No SAPS official must disturb or exhume such remains, without the necessary permission from the KwaZulu-Natal and Amafa Research Institute. • No activities are allowed within 50m of a site, which contains rock art. • Sources of all natural materials (including topsoil, sands, natural gravels, crushed stone, asphalt, etc.) must be obtained in a sustainable manner and in compliance with the heritage legislation. In terms of frequency and severity, these mitigation measures ensure that the impacts remain as low as possible especially due to the fact that the site is already disturbed.						

Table 13.14: Socio Economic Impacts

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Construction	Socio Economic Impacts – Job creation and possible economic benefit to construction material suppliers in the area.	Direct	**Without**	2	2	2	2	8	**Low**
			With	2	1	1	1	5	**Low**
			Mitigation measures: • Local community members must be employed where possible • Strict penalties must be built into tenders to deal with issues such as petty crime, fence cutting, trespassing etc. In terms of frequency and severity, these mitigation measures ensure that the impacts remain as low as possible.						

Table 13.15: Decommissioning Impacts

Phase	Potential Impact	Impact Type	Mitigation	Frequency	Severity	Duration	Spatial Scope	Impact Score	Significance
Operational	Impact of waste from the decommissioning of the battery once the life span of the battery has been reached.	Direct	**Without**	2	2	2	2	8	**Low**
			With	2	1	1	1	5	**Low**
			Mitigation measures: • The supplier will be responsible to recycle any hazardous waste emanating from the technology operation, maintenance and finally replacement of the battery. • If the batteries cannot be recycled, the batteries must be disposed of at a registered waste disposal facility. In terms of frequency and severity, these mitigation measures ensure that the impacts remain as low as possible.						

12.3. Significance of Impacts

Construction Phase:

The duration of the construction phase is approximately 12 months. The proposed construction phase for the entire development is anticipated to be a year (approximately 12 months), given the scope of the project the construction phase is relatively short. A shorter construction phase will act as a mitigation measure in itself as it will reduce exposure of the environment to direct and indirect construction activities. Based on the outcome of the impact assessment matrix noted in Section 12 above, the overall significance of the impacts with mitigation measures for the construction phase, is noted to be **LOW/MEDIUM** i.e. the impact is reasonable but requires mitigation to reduce potential impacts to the environment.

Operational Phase:

Based on the outcome of the impact assessment matrix noted in Section 12 above, the overall significance of the impacts with mitigation measures for the operational phase, is noted to be **LOW/MEDIUM** i.e. the impact is reasonable but requires mitigation to reduce potential impacts to the environment.

12.4. Wetland Risk Assessment

Potential impacts associated with the construction phase are related to soil erosion emanating from the site as well as a pollution potential. There will be no impact to the Voyizana River identified within 500m of the site as the system is hydrologically isolated from the site. Stormwater runoff from the site cannot enter into the Voyizana River due to the anthropogenic impoundments. The risk assessment does not have a category to allow for no impact, therefore, the impact scores are displayed as low impact.

Refer to the wetland risk assessment on page 26 of the wetland report (Appendix E of this BAR).

12.5. Biodiversity Impact Assessment

The purpose of this phase of the study was to identify and assess the significance of the potential impacts and to provide a description of the mitigation required to limit the perceived impacts on the natural environment. Potential impacts of the proposed activity on the environment were assessed in terms a formalised method, whereby a typical risk assessment process was undertaken in order to determine the significance of the potential impacts without and with the application of mitigation/management measures. The confidence rating is provided in terms of impacts Without Mitigation Measures (WOMM) and With Mitigation Measures (WMM). The detailed methodology can be reviewed in the Biodiversity Assessment Report included under Appendix E. This section will highlight key impacts identified as part of the biodiversity report.

Table 13.16: Loss of Indigenous Vegetation and Diversity

	Extent	Duration	Magnitude	Likelihood	Significance	Confidence
Construction Phase						
WOMM	Site only (1)	Temporary (1)	Low (4)	Definite (5)	**Low to Moderate (20)**	High
WMM	Site only (1)	Temporary (1)	Minor (2)	Definite (5)	**Low to Moderate (35)**	High

Sources of Impact

- Construction activities resulting in both the destruction, removal and compaction of soils.
- Construction workers and personnel.
- Vehicle and heavy machinery activities.
- Creation of a construction camp.

Environmental Impacts

- Loss of indigenous vegetation through construction activities (direct and indirect).
- Altered soil processes through the removal and/or compaction of soils. This can result in a decline in water infiltration and an increase in surface water run-off.
- Decline in adjacent habitat quality and possible edge effects. These include a decrease in basal cover, an increase in erosion potential and spread of invasive alien vegetation.

Table 13.17: Spread of Invasive Alien Vegetation

	Extent	Duration	Magnitude	Likelihood	Significance	Confidence
Construction Phase						
WOMM	Local (2)	Temporary (1)	Moderate (6)	Highly Probable (4)	**Low to Moderate (36)**	High
WMM	Site only (1)	Temporary (1)	Low (4)	Probable (3)	**Low (18)**	Moderate-High
Operational Phase						
WOMM	Local (2)	Long Term (4)	Moderate (6)	Probable (3)	**Low Moderate (36)**	High
WMM	Site only (1)	Long term (4)	Low (4)	Unlikely (2)	**Low (18)**	Moderate-High

Sources of Impact

- Existing invasive alien species within the project area act as source of reproductive material as well as the seed banks present within the soils.
- Disturbance of vegetation and topsoil during construction facilitate the establishment of these pioneer species.
- Transport of reproductive materials of invasive species by machinery or construction personnel outside of the project area.

Environmental Impacts

- Possible spread and establishment of invasive species into the adjacent more intact Zululand Lowveld community.
- Increased displacement of remaining vegetation by alien invasive species.

Table 13.18: Loss of Faunal Species and Disturbance

	Extent	Duration	Magnitude	Likelihood	Significance	Confidence
Construction Phase						
WOMM	Site only (1)	Temporary (1)	Moderate (6)	Definite (5)	**Moderate (40)**	High
WMM	Site only (1)	Temporary (1)	Low (4)	Definite (5)	**Low to Moderate (30)**	High

Sources of Impact

- All construction activities pertaining to the clearing of vegetation.
- An increase in construction workers, personnel and vehicle activity and associated noise pollution.
- Potential need for the use of artificial lighting.

Environmental Impacts

- Inadvertent burial or mortalities (fossorial species) by construction machinery and mortalities through vegetation clearing.
- Elevated human presence and associated noise and light pollution.

13. ENVIRONMENTAL IMPACT STATEMENT

According to the wetland assessment, no wetland systems were delineated within the substation site or within 500m of the site. The Voyizana River and associated riparian zone are hydrologically isolated from the substation site. Any stormwater runoff will be intercepted by numerous anthropogenic impoundments and cannot enter the Voyizana River. The potential impacts that are associated with the construction phase are related to soil erosion emanating from the site as well as a pollution potential. It must be noted that there will be no impact on the Voyizana River. The specialist recommends that the proposed development go ahead.

According to the biodiversity assessment, impacts are likely associated with the degradation of habitats within the development footprint. However, as represented in this assessment large portions of habitats within the project area have already experienced a high degree of transformation. Due to these factors and the low ecological sensitivity of the site, the specialist is of the opinion that the proposed development proceeds.

According to the heritage specialist, an exemption application is applicable. The proposed development of the BESS will take place within an existing substation site which indicates that the area is already disturbed by the constructed and operational substation. Google earth images back dated to 2012 indicate that the land has been significantly transformed over the years. The specialist recommends that the exemption application be accepted and granted.

Through this Basic Assessment, it had been concluded that the proposed development is not expected to have any significant, adverse or lasting impacts on the environment. During the construction phase, the project can be expected to have low negative impacts on various environmental attributes with proper mitigation measures implemented. Similarly, the project can be expected to have a positive impact on the regional and local socio-economy during the construction phase. This will be as a result of the creation of jobs as well as procurement opportunities from local suppliers in the area. Benefits of the project outweigh the potential negative environmental and social impacts, which can be mitigated to within acceptable levels. Based on the outcomes of the risk assessments conducted as part of the BAR, coupled with the recommendations made by the specialists, the overall negative impact of the project is of Low - Medium significance, which can be reduced to Low significance through the implementation of simple, effective mitigation measures.

The EMPr must be adhered to and will ensure that any negative impacts however minimal are not magnified. During the post construction phase of the project, the contractors must ensure that all hazardous materials are removed from the site and that rehabilitation of land is undertaken according to the requirements of the EMPr.

14. IMPACT MANAGEMENT MEASURES FROM SPECIALIST STUDIES

14.1. Geotechnical Investigation

14.1.1. Excavation Requirements

The terrain is gently sloping and therefore cut to soil excavations will be required in the upper 0 – 0.5m layer. It is anticipated that excavations from ground level to 1m below, will require soft excavation and below 1m to 2.4m will require soft to intermediate excavations.

14.1.2. General Terrace Layer Works

The terrace layer work material must be compacted in layers not exceeding 200mm.

14.1.3. Access Road Assessment Findings

The condition of access road to the substation is good. However, small areas will require ripping, filling with G4 material and recompacting. Area to be considered will be at one side of turning area (off R66) and at the access gate respectively.

14.1.4. Surface Drains

No water table encountered during investigations, however they maybe a rise in water levels during rainy season in some areas of the site as of indicated in the test SP1 when we experience refusal. Proper drainage system will be required to divert downwards surface water (from the mountain), away from the substation.

14.1.5. Foundations

According to the Eskom Classification, the DCP's tests recorded on site indicate that the in-situ soils maybe defined as rock for number of blows between 6-14/100mm and > or = 9 for cohesive soils respectively. This is however not the case for SP test results, where dry loose to medium soils, and which can be moulded once moistened on material below 0.5m, which overall indicates presence of clay. This effect must be taken into account when designing for foundation as clay soils has a potential to heave. It is therefore recommended that soils type 3 foundations to be used below this depth.

14.2. Wetland Impact Assessment

The Voyizana River identified within 500m of the site is hydrologically isolated from the site. Stormwater runoff from the site cannot enter into the Voyizana River. The only impact therefore to consider is the infiltration of water into the soil profile at the substation site. Should stormwater from the site be contaminated it will quickly infiltrate through the structureless soil profile associated with the area. Best practice methods are recommended by the specialist for the construction and operational phases of the development:

- The utilisation of attenuation measures during construction. These will aid in limiting the washing away of exposed soils from the substation site. These include but are not limited to the use of sandbags, hessian sheets, silt fences, retention or replacement of vegetation and geotextiles such as soil cells.
- Do not allow surface water or storm water to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place.

- Vegetation clearing must be undertaken only in the areas to be developed and must not extend outside of the substation site.
- When soil is excavated for the cables, the topsoil and subsoil must be separated. In the event of infilling, replacement of subsoil must precede the topsoil replacement, and all material must be well compacted.
- All waste generated during construction must be disposed of as per an Environmental Management Programme (EMPr) and washing of containers, wheelbarrows, spades, picks or any other equipment that has been contaminated with cement or chemicals must occur in a controlled environment.
- No release of any substance i.e. cements, oil, or any other substance that could be toxic to fauna and flora within the site.
- Spillages of fuels, oils and other potentially harmful chemicals must be contained and cleaned up immediately. Contaminants must be properly drained and disposed of using proper solid/hazardous waste facilities (never to be disposed of within the natural environment). Any contaminated soil must be removed, and the affected area rehabilitated immediately.
- Areas which have been disturbed will be quickly colonised by invasive alien species. Alien invasive control must be incorporated into the Environmental Management Programme.
- Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge. This requirement is in fulfilment of the terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004). Areas which have been disturbed will be quickly colonised by invasive alien plant species.

14.3. Biodiversity Assessment

Recommendations presented are in most instances incorporated into planning conditions but are implemented to varying degrees. Follow-up monitoring and assessment of the mitigation with sufficient scientific rigor is often lacking to effectively determine whether the mitigation measures prescribed have been successful. The mitigation measures presented by the biodiversity specialist (Ecologist) must be fully implemented and monitored to determine their success/failure.

14.3.1. General

- Disturbed areas must be rehabilitated as soon as the construction is completed, and indigenous species planted around the facility. Indigenous species recommended include ***Vachellia tortilis, Spirostachys africana, Combretum apiculatum, Euclea divinorum, Coddia rudis*** and appropriate indigenous grass species. These grass species will assist in stabilising the soil and reducing available niche for invasive alien species.
- Nationally protected ***Adansonia digitata*** appears to be on the edge of the development footprint. It is recommended that this individual is not impacted. Should impacts be unavoidable due to the project, a licence must be granted by the relevant authorities.
- Implementation of an invasive alien management plan and removal of invasive species. It is important that construction activities do not result in these species spreading into adjacent more intact Zululand Lowveld.
- Incorporation of other specialist studies and associated recommendations must be taken into consideration.

14.3.2. Loss of indigenous vegetation and diversity

- All construction activities must be carried out according to the generally accepted environmental best practice and the spatial footprint must be kept to a minimum.
- Indigenous vegetation outside of the project area must not be disturbed.
- Retain as much natural vegetation as possible, removing it immediately ahead of construction activities.

- Efforts should be put in place to retain the nationally protected ***Adansonia digitata***. Should this tree be impacted by the project, a licence must be granted by the relevant authorities.
- Erosion control measures must be put in place during the construction phase in areas prone to erosion. These include slopes, trenches and areas of exposed soils.
- Construction camps, off-loading areas and the like must be set up in areas of low ecological sensitivity (already disturbed habitats).
- Prevent spillage of hydrocarbons, possible construction materials and other pollutants, contain and treat any spillages according to the relevant EMPr.
- Litter, building and foreign materials must be disposed of in demarcated rubbish bins or skips.
- Once the construction phase has been completed, disturbed areas must be rehabilitated immediately and all waste materials, equipment must be removed.
- Indigenous landscaping must form part of the development. Areas that have been rehabilitated must be monitored to ensure the success of this component.

14.3.3. Spread of invasive alien vegetation

- The implementation of an invasive alien management plan in terms of the National Environmental Management: Biodiversity Act must be incorporated into the environmental management programme. This plan should take into consideration:
    - Type and density of IAPs on site
    - Control methods to be implemented i.e. Hand pulling, ring-barking, foliar spraying etc.
    - Post removal follow up and rehabilitation
    - Monitoring to determine success/failure
- Construction equipment must be cleaned on a regular basis.
- It is imperative that soils which are colonised by invasive alien vegetation are not used during the re-vegetation of rehabilitated areas. This is due to the existing seed bed within the soil which will facilitate the re-establishment of these species.
- Ensure that both the temporal and spatial project footprint is kept to a minimum. This can be achieved through the effective demarcation of the project footprint (including construction camps).
- There is a risk of spreading ***P. hysterophorus*** by the movement of vehicles, machinery and construction activities. Effective treatment (Goodall et al., 2010) for the control of ***P. hysterophorus*** include:
    - Early detection and rapid response.
    - Wash down vehicles and machinery in the same area to allow easy follow-up control of any seeds that may germinate.
    - Manual control comprising of hoeing and hand pulling as well as treat isolated patches immediately with herbicides. Techniques and herbicides to be used must be approved by Ezemvelo KZN Wildlife and SANBI Invasive Species Programme.

14.3.4. Loss of faunal species and disturbance

- No wild animals may under any circumstance be handled, removed or be interfered with by construction workers or any personnel. This includes KwaZulu-Natal Hinged-backed Tortoise ***(Kinixys natalensis)*** and Leopard Tortoise **(*Stigmochelys pardalis*).**
- Should any Tortoise be noted on site during the construction phase it must be relocated outside of the development area into a suitable location (eastern Critical CBA). This must be done by a suitably qualified ECO ensuring minimal stress to the individual.

- The implementation of an environmental awareness programme for all construction personnel.
- Should artificial lighting be required, these must be faced towards the R66 (western portion of the substation site) and not directly into the eastern Critical Biodiversity Area. Consultation will also be required into the selection of the type of lighting to be utilised.
- The hunting or collection of fauna is prohibited.
- Any faunal species located on the site during the construction phase, that are unable to evade construction (e.g. fossorial species), must be moved to a suitable location with optimal habitat. This should be undertaken by a suitable qualified ecologist/faunal specialist.
- Any termite mound which must be destroyed should be carefully excavated by a suitably qualified herpetologist with a hand and pick. Any fauna found inside must be relocated to a safe location away from the construction area.

14.4. Heritage Impact Assessment

If exemption from undertaking a Phase 1 HIA is granted, then the following conditions must be met by the Applicant:

- For any chance heritage finds, all work must cease in the area affected and the Contractor must immediately inform the Project Manager. The provincial heritage agency, the KwaZulu-Natal Amafa and Research Institute (hereafter referred to as the Institute) must also be informed.
- A heritage specialist must be called to site to assess the significance of the find.
- Permits must be obtained from the Institute if heritage resources are to be removed, destroyed or altered.
- Only once the heritage specialist gives the go-ahead can work in the area of the find re-commence.
- Under no circumstances may heritage material be destroyed or removed from site unless under direction of a heritage specialist.
- Should recent remains be found on site that could potentially be human remains, then the South African Police Service should also be contacted. No SAPS official may remove remains until the correct permit/s have been obtained.
- In terms of chance fossil finds, the following must be adhered to:
    - When excavation takes place for the construction of the BESS facility, any rocks disturbed during this process should be inspected by the environmental officer or designated person. Any fossiliferous material (trace fossils, plants, insects, bone, and coal) should be put aside in a suitably protected place.
    - Photographs of possible fossils should be sent to a palaeontologist for preliminary assessment.
    - If there are concerns regarding any fossil finds, then a palaeontologist must visit the site to inspect the selected material and check dumps where necessary.
    - Fossil plants or vertebrates that are deemed to be of good quality scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a permit must be obtained from the Institute. Annual reports must be submitted to the Institute as required by the relevant permits.

15. CONDITIONS OF AUTHORISATION

In terms of Monitoring and Auditing, the following are recommended to ensure protection of the environment during construction:

- The Battery Energy Storage System (BESS) is a new and developing technology especially in the context of South Africa, therefore there are some areas that still have limitations and uncertainties.
- A Basic Assessment process has been undertaken with the assurance from the Applicant will not exceed 500m^3 of dangerous goods.
- An ECO must monitor the construction site and activities on a monthly basis for the duration of the construction phases.
- An ECO must document the findings and submit a monthly report to the Competent Authority (CA).
- The Project Manager and Contractor are responsible for the implementation of the EMPr and protection of the environment for the duration of the construction period.
- An ECO must monitor the facility on a bimonthly basis for the operational phase, for a period of 12 months following completion of construction to ensure that rehabilitation has been successful.
- An ongoing Alien Invasive Management Plan must be compiled and implemented prior to construction activities.
- A horticultural specialist must be appointed to identify and relocate sensitive plant species prior to any site works.
- A Rehabilitation Plan must be compiled as per the Ezemvelo KZN Wildlife Biodiversity Guideline.
- Once the final technology alternative is selected, a detailed fire management and protection plan must be compiled and submitted to DEA for consideration prior to undertaking any construction activities.

16. ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

The proposed plans and designs of the BESS project have been completed and are included in this BAR as Appendix C. However, these still require approval and Environmental Authorisation from the Competent Authority; the Department of Environmental Affairs.

16.1. Wetland Assessment

It is difficult to apply pure scientific methods within a natural environment without limitations or assumptions. The following apply to this study:

- The findings, results, observations, conclusions and recommendations provided in this report are based on the author's best scientific and professional knowledge as well as available information regarding the perceived impacts on the water resources.
- In order to obtain definitive data regarding the biodiversity, hydrology and functioning of rivers and wetlands, studies should ideally be conducted over a number of seasons and over a number of years. This study took place during a single site visit conducted on 05 September 2019.

16.2. Biodiversity Assessment

It is difficult to apply pure scientific methods within a natural environment without limitations or assumptions. During the present study, the following limitations were experienced:

- The findings, results, observations, conclusions and recommendations provided in this report are based on the author's best scientific and professional knowledge. The author, however, accepts no liability for any actions, claims, demands,

losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, and by the use of the information contained in this document.

- The current assessment focuses on a defined project area (as defined by 1World Consultants) and vegetation communities outside this area were not assessed.
- Modelled biodiversity databases have accuracy limitations and as a result, must be groundtruthed for verification.
- In order to obtain a comprehensive understanding of the dynamics and diversity of the biota on a site, including species of conservation concern, studies should include investigations through the different seasons of the year coupled with extensive sampling of the area. The current study relied on information gained during a single season site survey, desktop information for the area, as well as professional judgment and experience.
- Due to the cryptic nature of smaller herbs and geophtyes and their preference to flower only when conditions are optimal, it is likely that some species may have been overlooked during the investigation.
- A hand-held Garmin eTrex 30x was used to delineate the vegetation communities and record protected species and this has an accuracy of 3-6m.

17. RECOMMENDATIONS OF THE EAP

The information contained in this report and the documentation attached hereto, in the view of the EAP, was sufficient for the Public Participation Process (PPP). Should the Competent Authority request additional studies to be conducted, this shall be conducted and obtained to assist the Competent Authority in making an informed decision. The EMPr, which includes recommended conditions and mitigation measures that should be considered for inclusion in any authorisation that may be granted by the competent authority in respect of the application, is provided.

It is noted that the proposed technology would not pose significant negative environmental or social impacts. Potential adverse environmental impacts were identified and are accompanied with corresponding mitigation measures. Implementing renewable technology would directly contribute to the reduction in strain on the grid especially during peak hours as well as reduction of fossil fuels. Keeping the above-mentioned points in mind, it is the opinion of the EAP that DEA grant an EA that covers all possible scenarios.

Refer to Appendix F for a full Environmental Management Program. The EMPr must be read in conjunction with the BAR.

18. TIMEFRAMES

An environmental authorisation valid for five (05) years is requested. Construction may commence at any time within this 5-year period.

19. UNDERTAKING UNDER OATH OR AFFIRMATION BY THE EAP

(i) 1World Consultants (Pty) Ltd hereby confirms that the information provided in this Basic Assessment Report is correct at the time of the compilation and distribution for review. Input from specialists was utilised in the compilation of the Report.

(ii) 1World Consultants (Pty) Ltd confirms that all comments received from Stakeholder and I&APs have been included in this report. It is to be noted that in terms of the EIA Regulations (2017), GNR 326 43(2), all State Departments that administer a law relating to a matter affecting the environment, specific to the Application, must submit comments within 30 days to the EAP. Should no comment be received within the 30-day comment period, it will be assumed that the relevant State Department has no comment to provide.

(iii) All information from the specialist studies have been included in this Basic Assessment Report. Recommendations from the specialists have been included in the EMPr.

(iv) All information and comments received in response to this Basic Assessment Report will be summarised and responded to in a final version of the Report, which will be submitted to DEA for consideration in terms of issuing Environmental Authorisation.

For 1World Consultants (Pty) Ltd:

Fatima Peer B.Sc. (Hons) Pr. Sci. Nat.
SENIOR ENVIRONMEN TAL ASSESSMENT PRACTITIONER

N.B. An original signed EAP Declaration has been downloaded from the Departmental website and can be reviewed under Appendix B.

APPENDICES

The following appendices must be attached as appropriate:

Appendix	Description of Contents
A	Minutes of the pre-application meeting DEA Environmental Screening Report Desktop Screening Report
B	1World Consultants - Company Profile 1World Consultants - Company Experience EAP Team – Declaration and CV's Specialist Team – Declaration and CV's
C	Acknowledgement of Receipt of Environmental Authorisation Conceptual Design of BESS Letter Detailing Listed Activities
D	I&AP distribution list Background Information Document Newspaper Advertisements Site Notice Boards Comments and Responses Report on BID Comments and Responses Report on DBAR Proof of Distribution of DBAR and Comment Requested
E	Geotechnical Report Wetland Impact Assessment Biodiversity Assessment Heritage Exemption Application
F	Environmental Management Programme

Appendix A

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Minutes of the Pre-Application Meeting

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Environmental Screening Reports

Appendix B

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1World Consultants Company Profile

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1World Consultants Company Experience

EAP Team – Declaration and CV's

Specialist Team – Declaration and CV's

Appendix C

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Acknowledgement Receipt of Environmental Authorisation

Conceptual Design of BESS

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Correspondence Detailing Listed Activities

Appendix D

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I&AP Distribution List

Environmental & Engineering Consultants
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Background Information Document

Environmental & Engineering Consultants
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Newspaper Advertisements

Site Notice Boards

Environmental & Engineering Consultants
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Comments and Responses Report on BID

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Comments and Responses Report on DBAR

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Proof of Circulation of DBAR

Appendix E

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Geotechnical Report

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Wetland Impact Assessment

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Biodiversity Assessment

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Heritage Exemption Application

Appendix F

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Environmental Management Programme