

**APPENDIX G**  
**ENVIRONMENTAL MANAGEMENT PROGRAMME**



# **Draft Environmental Management Programme for the 132kV Power Line from the Existing Mbumbu Substation to the proposed Tsakani Substation**

Draft

Eskom Holdings SOC Ltd  
*DEA Ref: 14/12/16/3/3/1/1291*  
December 2014



## DOCUMENT DESCRIPTION

**Client:**

Eskom Holdings SOC Ltd

**Project Name:**

Environmental Management Programme for the 132 kV Power Line from the existing Mbumbu Substation to the proposed Tsakani Substation

**Royal HaskoningDHV Reference Number:**

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**Date:**

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**Location:**

Pretoria

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Signature

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## GLOSSARY OF TERMS

**Contractor:**

A person or company appointed by Eskom to carry out stipulated activities.

**Emergency:**

An undesired event that does result in a significant environmental impact and requires the notification of the relevant statutory body, such as a local authority.

**Environment:**

In terms of the National Environmental Management Act (NEMA) (No 107 of 1998), "environment" means the surroundings within which humans exist and that are made up of:

- i. the land, water and atmosphere of the earth;
- ii. micro-organisms, plant and animal life;
- iii. any part or combination of (i) of (ii) and the interrelationships among and between them; and the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

**Environmental Control Officer:**

An individual nominated through the Project Manager to be present on site to act on behalf of the Project Manager in matters concerning the implementation and day to day monitoring of the EMP. The Environmental Control Officer is assumed to be the regional Environmental Practitioner appointed by Eskom.

**Environmental Impact:**

A change to the environment, whether adverse or beneficial, wholly or partially, resulting from an organisation's activities, products or services.

**Environmental Management Programme:**

A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive impacts and limiting or preventing negative environmental impacts are implemented during the life cycle of a project. This EMP focuses on the construction phase, operation (maintenance) phase and decommissioning phase of the proposed project.

**General Waste:**

General waste means waste that does not pose an immediate hazard or threat to health or to the environment, and includes:

- a) domestic waste;
- b) building and demolition waste;
- c) business waste; and
- d) inert waste

**Hazardous waste:**

Hazardous waste means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste have a detrimental impact on health and the environment.

**Impact:**

A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

**Incident:**

An undesired event which may result in a significant environmental impact but can be managed through internal response.

**Mitigation:**

Measures designed to avoid, reduce or remedy adverse impacts.

**Riparian Zone/Area:**

The physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.

**Waste:**

Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 of the National Environmental Management: Waste Amendment Act (No 26 of 2014)



## ACRONYMS

BAR – Basic Assessment Report

DAFF – Department of Agriculture, Forestry and Fisheries

DEA – Department of Environmental Affairs

DWS – Department of Water and Sanitation

EAP – Environmental Assessment Practitioner

ECO – Environmental Control Officer

EIA – Environmental Impact Assessment

EMPr – Environmental Management Programme

I&AP – Interested and Affected Party

NEM: AQA – National Environmental Management – Air Quality Act (Act No. 39 of 2004)

NEM: WA – National Environmental Management – Waste Act (Act No. 59 of 2008)

NEMA – National Environmental Management Act (Act No. 107 of 1998)

NHRA – National Heritage Resources Act (Act No. 25 of 1999)

PPE – Personal Projective Equipment

SAHRA – South African Heritage Resources Agency



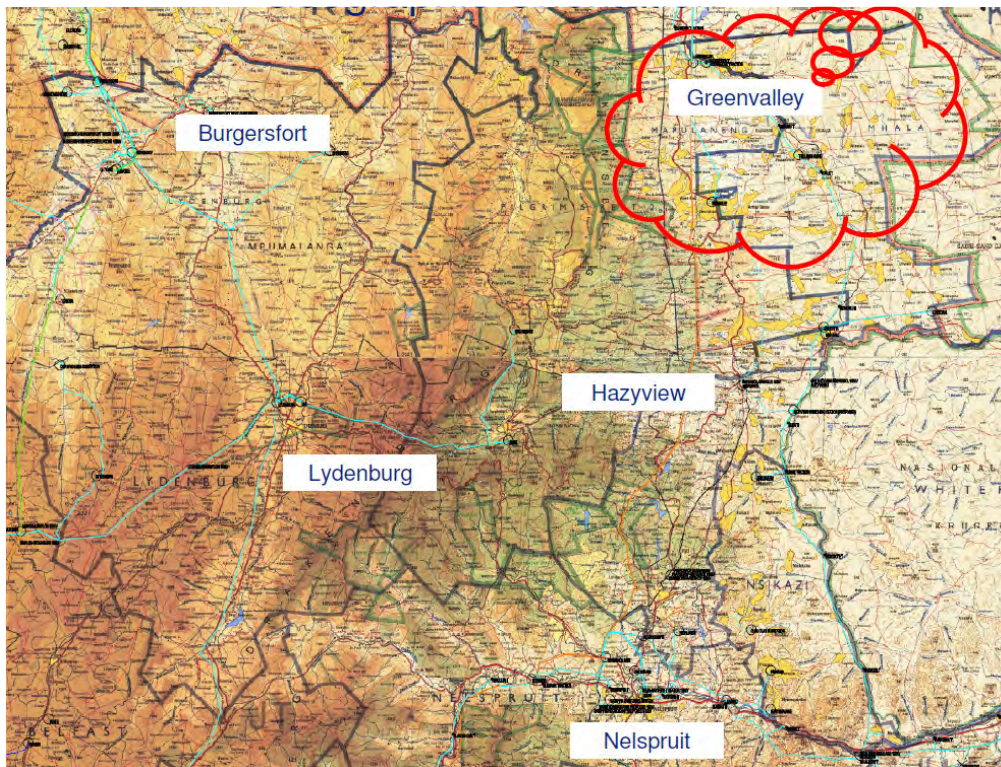
# 1 INTRODUCTION

Eskom Distribution proposes the establishment of a new 132 kV power line between the existing Mbumbu Substation to the proposed new Tsakani Substation. The new Tsakani Substation and power line are necessary to split the current overloaded feeders in the area as well as to provide sufficient capacity for new clients and improve the reliability of energy supply. The new Tsakani Substation furthermore helps with de-loading the currently overloaded infrastructures in the area and reduces the customer base per line thus, improving the system average interruption duration.

The entire proposed project is part of what is referred to by Eskom Distribution as the Green Valley Network (refer to Figure 1) which is located to the south east of Limpopo and the north east of Mpumalanga. This network is currently experiencing high electrification growth, natural growth of the existing load and network constraints in terms of overload under normal and emergency conditions.

The proposed construction of the Tsakani substation and 132KV power line was initiated in order to:

- Deload the Acornhoek substation (refer to Figure 2)
- Deload the Mbumbu Substation.
- Cater for load growth in the Acornhoek area which covers Tinswalo, Champagne, Marieskop and Timbavati.
- Provide network flexibility.
- Improve reliability of the network.



**Figure 1: Location of the Green Valley Network**

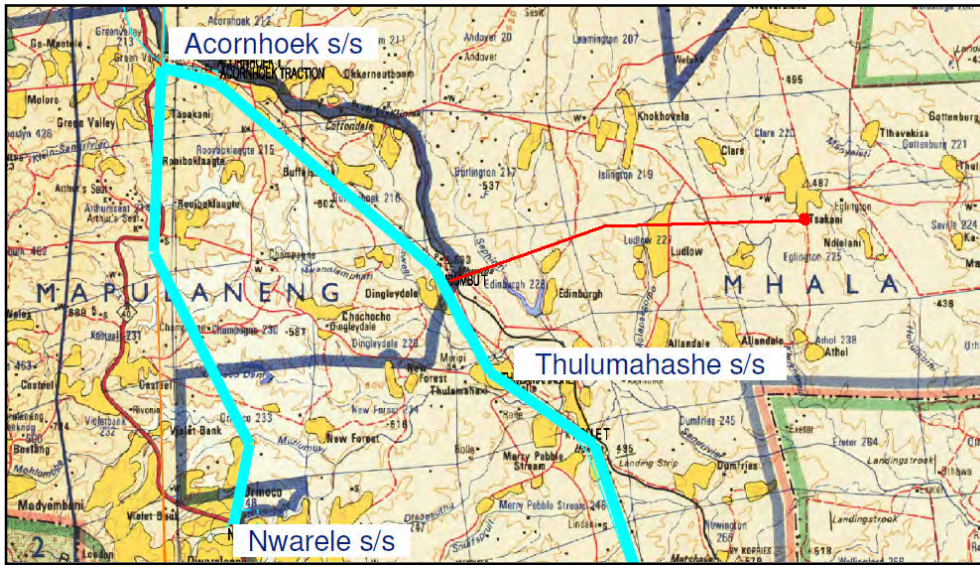


Figure 2: Zoomed in map of the Green Valley Network area (red line indicating a proposed power line connecting Mbumbu to Tsakani Substation)

The proposed project is located in Mpumalanga Province with the nearest small towns / settlements being Thulamahashe, Edinburgh, Ludlow, and Dingleydale. Nelspruit (Mbombela) is about 120 km from the site of the existing Mbumbu Substation. The proposed power line is located predominately within rural areas which are largely characterised by villages and open spaces. One main road provides general access to the proposed project, namely the R40. Access into the inner areas of the proposed project is by means of dirt roads.

## 1.1 Project Description

### 1.1.1 Power Line Alternatives

Two alternative power line alternatives are being considered for the project (refer to Figure 3 below):

- Alternative 1 Green route
- Alternative 3 Purple route

In the Environmental Authorisation Application three alternatives were proposed however upon site inspection it was noted that Alternative 2 would spanned two settlements which would have resulted in community relocation. Therefore only Alternative 1 and Alternative 3 were suitable for assessment.

### 1.1.2 Proposed Tsakani Substation

In addition, the new Tsakani Substation is proposed. An area of land approximately 150 m X 150 m (i.e. 1.5 ha) is required for the construction of the substation. Two site alternatives have been identified for the proposed Tsakani Substation as depicted in Figure 3. Both site alternatives for the proposed Tsakani Substation are located on a portion of land belonging to Msini and Amashangana Tribal Authorities. The nearest settlement is Hluvukani. The two site alternatives are situated on land which is dominated by degraded and transformed bushveld. An access road will be constructed from the gravel road off the D3930 to access the new substation.

### 1.1.3 Mbumbu Sustation Upgrade

It is proposed that the existing Mbumbu Substation be upgraded to a switching station. The existing site will be extended by 12 m on the southern side, 11.8 m on the western side and 14 m on the eastern side. Although the development footprint is increasing the output of the substation will not be increased.

In addition, a complete set of three Power Voltage Transformers (VT) and 4 x 132 kV Feeder Bays will be established at the substation. The existing 132 kV VTs will be repositioned to align with the proposed power line route. A standard control room will be built.

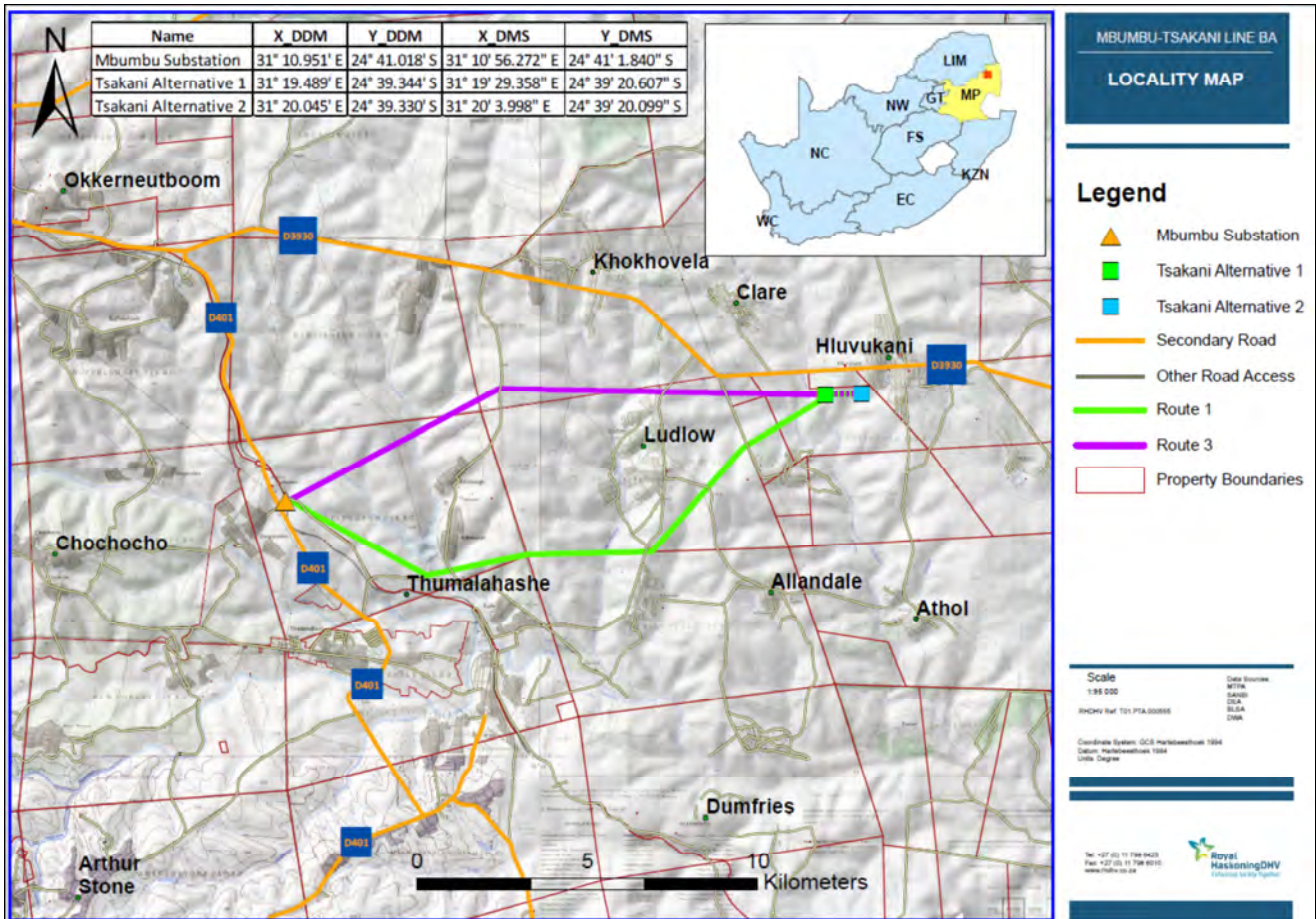


Figure 3: Proposed alternative alignments

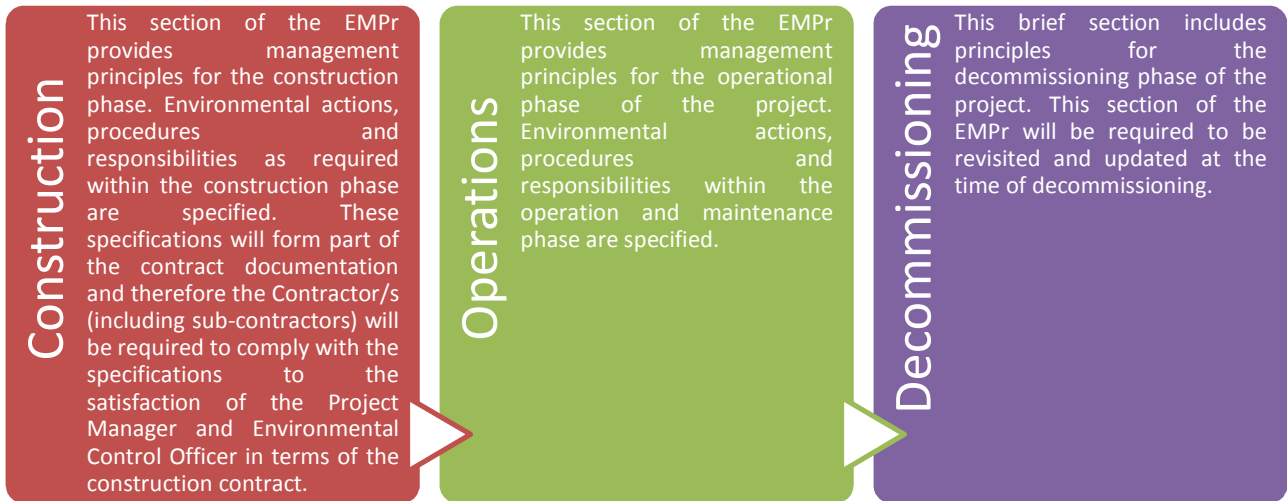
## 1.2 Applicable Documentation

The following documentation is applicable for the project, and should be read in conjunction with this EMP:

- Final Basic Assessment Report (BAR) for the proposed construction of the new 132 kV power line from the existing Mbumbu Substation to the proposed new Tsakani Substation.
- The Environmental Authorisation (once) issued by the Department of Environmental Affairs (DEA).

### 1.3 Structure of the EMPr

The EMPr provides mitigation and management measures for the following key phases of the project:



**Figure 4: Key phases of the project life-cycle**

A section on the Planning and Design phase impacts and mitigation measures is also included in this EMPr.

All relevant environmental legislation pertaining to the project from cradle to grave is listed in Section 2 below. The Contractor is required to comply with this legislation for all phases of the project. This list is intended to serve as a guideline only for the Contractor and is not exhaustive.

It should be noted that this EMPr is a dynamic document which should be updated as required on a continuous basis. This may be of particular importance once the final route alignment within the preferred corridor has been selected, as at this stage it may be possible to add more 'site specific' management measures. Any amendments made must be submitted to the Environmental Control Officer (ECO), the Project Manager and the Competent Authority (DEA) for approval prior to implementation.

### 1.4 Objectives of the EMPr

The EMPr has the following objectives:

- To outline functions and responsibilities of responsible persons;
- To state standards and guidelines, which are required to be achieved in terms of environmental legislation;
- To outline mitigation measures and environmental specifications, which are required to be implemented for all phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts; and
- To prevent long-term or permanent environmental degradation.

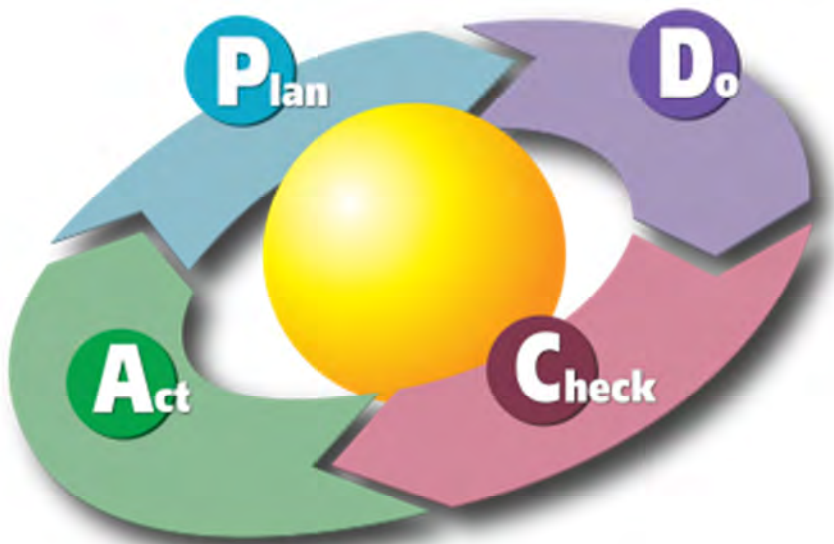
An independent ECO must be appointed (by the proponent: Eskom) before construction commences to ensure compliance with the EMPr. The EMPr will be considered an extension of the Conditions of Approval as set forth by the Department of Environmental Affairs (DEA). Non-compliance with the EMPr will constitute non-compliance with said Conditions.

The EMPr is binding document which all contractors operating on the site will adhere to.

It should be noted that in terms of the National Environmental Management Act (NEMA) No 107 of 1998 (Section 28) those responsible for environmental damage must pay the costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and / or environmental damage (The "polluter pays" principle) must be implemented.

## 1.5 The EMPr as a ‘Live’ Document

The approach adopted for this EMPr is derived from the Deming Cycle (Figure 5), a cycle of continuous improvement that entails the reiterative actions of plan, do, check, act, and critically to then return to the planning phase.



**Figure 5: Deming cycle of continuing improvement**

### **1.5.1 Plan**

Project-specific planning for the proposed project involves consideration of the legal triggers, the specifics of the proposed development, and the nature of the receiving environment. This provides a starting point for targeted environmental management objectives. Environmental performance indicators are then determined with measurable targets prescribed to monitor the environmental performance of the project. Achieving the targets depends on compliance with this EMPr and the legislative requirements that underpin it.

### **1.5.2 Do**

Throughout the development's life-span, the developer and operator will be required to develop and maintain a Quality Management System (QMS) – designed to ensure that best management practices are implemented in day-to-day management. Such a QMS should at least include the following information:

- Location and extent of associated infrastructure;
- Associated activities, such as the transportation of people and equipment;
- Resources and experience required (staffing);
- Materials and equipment to be used;
- Management actions;
- Human resources used;
- Construction-monitoring activities;
- Emergency / disaster incident and reaction procedures; and
- Rehabilitation procedures for the impacted environment.

### **1.5.3 Check**

A system of assessing monitoring results has been developed to check the environmental management performance. Continuous assessment facilitates proactive management of the environmental issues. Mitigation measures can then be successfully implemented on an ongoing basis to keep environmental indicators within

their target thresholds. Moreover, the assessment system also enables the assessment of the efficacy of the EMPr. Regular auditing of environmental performance is prescribed to prove and preserve accountability.

#### 1.5.4 Act

The assessments and monitoring of the results and findings of the regular audits must be documented within a reporting system. Precautionary mitigation measures and corrective actions will be prescribed and instructions will be given in order to implement these in the field. The findings of monitoring and auditing programmes can also be used to update the EMPr. Although the EMPr is a project-specific document, it is dynamic and should be updated regularly to address the changing circumstances of the scheme.

## 1.6 Details of the Environmental Assessment Practitioner

The particulars of the Environmental Assessment Practitioner (EAP) responsible for the compilation of this document are presented in Table 1 below:

**Table 1: Details of EAP**

Details	
<b>Consultant:</b>	Royal HaskoningDHV (formerly SSI Engineers and Environmental Consultants (Pty) Ltd)
<b>Contact Persons:</b>	Prashika Reddy and Nicole Botham
<b>Postal Address:</b>	PO Box 2530 Monument Park, 0105
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<b>Facsimile:</b>	012 367 5878
<b>E-mail:</b>	prashika.reddy@rhdhv.com / nicole.botham@rhdhv.com
<b>Expertise:</b>	Prashika Reddy is a Senior Environmental Scientist ( <i>Pr Sci Nat</i> 400133/10) with a BSc Honours in Geography. Ms Reddy has the necessary experience in various environmental fields including: environmental impact assessments, environmental management plans/programmes, public participation and environmental monitoring and auditing. Ms Reddy has extensive experience in compiling environmental reports (Screening, Scoping, EIA and <i>Status Quo</i> Reports). Ms Reddy is/has been part of numerous multi-faceted large-scale projects, including the establishment of linear developments (roads, and power lines); industrial plants; electricity generation plants and mining-related projects.  Nicole is an Environmental Consultant with six years experience in the mining sector, having undertaken work in Africa, Europe, Middle East, USA and Fiji. She has focussed on management plan preparation, mine decommissioning (closure) and audits of mine investments. Areas of expertise include: Scoping Reports, Environmental Impact Assessment (EIA), Environmental Management Reports, Environmental Audits, and Baseline Studies. Key project experience includes: Sol Plaatje Municipality, Trekkopje Mine, Tshipi è ntle Mine, Bon Accord Mine, Wonderfontein Mine, Manganese mine in Burkina Faso, Vatukoula Gold Mine, Northland Mine, Antimony Process Plant in Oman, and a Biofuels project in Mozambique.

## 2 ENVIRONMENTAL LEGISLATION, POLICIES AND GUIDELINES

All relevant environmental legislation pertaining to the project from cradle to grave is listed within Table 2 below. Eskom and the Contractor are required to comply with this legislation for all phases of the project. This list is intended to serve as a guideline only and is not exhaustive. Further, legislation is regularly amended or updated and as such some items may no longer be relevant, whilst others have been superseded. Additional aspects should be added once the Environmental Authorisation is obtained and amended as construction commences.

**Table 2: Relevant environmental legislation, guidelines and policies applicable to the project**

LEGISLATION	SECTIONS	RELATES TO
<b>National Environmental Management Act (Act No. 107 of 1998 [as amended])</b>	Section 2	Defines the strategic environmental management goals and objectives of the government. Applies throughout the Republic to the actions of all organs of state that may significantly affect the environment.
	Section 24	Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment.
	Section 28	The proponent has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care.
<b>EIA Regulations (2010) – Government Notice Regulation (GNR) 543 – 546</b>	GN 543 – Sections 22, 33, 54	Content of basic assessment report (Section 22), content of draft environmental management programmes (Section 33) and the public participation process (Section 54).
	GNR 544 – Listing Notice 1 and GN 922 – Amendment of Listing Notice 1	Activities requiring a Basic Assessment study to be undertaken.
	GNR 546 – Listing Notice 3	Activities in special geographical areas requiring a Basic Assessment study to be undertaken.
<b>National Environmental Management: Waste Act (Act No. 59 of 2008)</b>	Section 17	Every attempt must be made to reduce, recycle or re-use all waste before it is disposed off.
	Section 25	All waste (general and hazardous) generated during construction may only be disposed of at appropriately licensed waste disposal sites.
	Government Notice 921 (29 November 2013)	List of waste management activities that have or are likely to have a detrimental effect on the environment.
<b>National Water Act (Act No. 36 of 1998)</b>	Section 21	General principles for regulating water use.
<b>National Heritage Resources Act (Act No. 25 of 1999) and regulations</b>	Section 34	No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.
	Section 35	No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site.

**DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE CONSTRUCTION OF THE NEW 132kV POWER LINE BETWEEN THE EXISTING MBUMBU SUBSTATION AND THE PROPOSED TSAKANI SUBSTATION, MPUMALANGA**

LEGISLATION	SECTIONS	RELATES TO
	Section 36	No person may, without a permit issued by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority. "Grave" is widely defined in the Act to include the contents, headstone or other marker of such a place, and any other structure on or associated with such place.
<b>National Environmental Management: Air Quality Act (Act No. 39 of 2004)</b>	Section 32	Control of dust.
	Section 34	Control of noise.
	Section 35	Control of offensive odours.
<b>National Dust Control Regulations (GN R827 of November 2013)</b>		Control of dust.
<p><b><i>Conservation for Agricultural Resources Act (No 43 of 1983) and Regulations</i></b></p> <ul style="list-style-type: none"> <li>• <b>Control of Invasive Alien Vegetation (GN 1048)</b></li> </ul>		<p>Implementation of control measures for alien and invasive plant species. <i>Replaced by National Environmental Management Biodiversity Act (Act No. 10 of 2004) and regulations but listed here for completeness.</i></p> <p>It should be noted that a permit may be required for the removal of river bank vegetation and disturbance of the river bank itself for all river crossings under this act.</p>
<p><b>National Environmental Management Biodiversity Act (Act No. 10 of 2004) and regulations:</b></p> <ul style="list-style-type: none"> <li>• <b>Threatened or protected species (GN 388)</b></li> <li>• <b>Lists of species that are threatened or protected (GN 389)</b></li> <li>• <b>Alien and invasive species regulations (GNR 506)</b></li> <li>• <b>Publication of exempted alien species (GNR 509)</b></li> <li>• <b>Publication of National list of invasive species (GNR 507)</b></li> <li>• <b>Publication of prohibited alien species (GNR 508)</b></li> </ul>		<p>Provide for the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources.</p> <ul style="list-style-type: none"> <li>• Threatened or protected species.</li> <li>• Alien and invasive species management and control.</li> <li>• Exempted alien species.</li> <li>• National list of invasive species.</li> <li>• Prohibited alien species.</li> </ul>
<b>National Forests Act (Act No. 84 of 1998) and Regulations</b>	Section 7	No person may cut, disturb, damage or destroy any indigenous, living tree in a natural forest, except in terms of a licence issued under section 7(4) or section 23; or an exemption from the provisions of this subsection published by the Minister in the Gazette.



**DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE CONSTRUCTION OF THE NEW 132kV POWER LINE BETWEEN THE EXISTING MBUMBU SUBSTATION AND THE PROPOSED TSAKANI SUBSTATION, MPUMALANGA**

<b>LEGISLATION</b>	<b>SECTIONS</b>	<b>RELATES TO</b>
	Sections 12 – 16	These sections deal with protected trees, with the Minister having the power to declare a particular tree, a group of trees, a particular woodland, or trees belonging to a certain species, to be a protected tree, group of trees, woodland or species. In terms of section 15, no person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister.
<b>Occupational Health and Safety Act (No 85 of 1993)*</b>	Section 8	General duties of employers to their employees.
	Section 9	General duties of employers and self-employed persons to persons other than their employees.
<b>Hazardous Substances Act (Act No. 15 of 1973) and Regulations</b>		Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances.
<b>Mpumalanga Biodiversity Sector Plan (2013)</b>		
<b>Bushbuckridge Local Municipality IDP (2012 – 2016)</b>		
<b>Bushbuckridge Local Municipality SDF (2010)</b>		
<b>Ehlanzeni District Integrated Development Plan (2013/14 – 2015/16)</b>		
<b>Other Local Municipality Bylaws</b>		

## 3 MANAGEMENT AND MONITORING PROCEDURES

The EMPr has a long-term objective to ensure that:

- Environmental management conditions and requirements are implemented from the project inception;
- Precautions against damage and claims arising from damage are dealt with timeously; and
- The completion date of the contract is not delayed due to problems with landowners arising during the course of construction.

Eskom requires a commitment from the internal Project Manager and the Contractor on the following issues:

- To underwrite the Eskom Distribution Environmental Policy at all times.
- Ensure environmental conditions stipulated in the Environmental Authorisation are implemented.
- Immediately resolve problems and claims arising from damage to ensure a smooth flow of operations.
- To implement this EMPr for the benefit of all involved.
- To preserve the natural environment by limiting destructive actions on site.

### 3.1 Functions and Responsibilities

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager, ECO and Contractor for this project are as detailed below.

#### 3.1.1 Eskom Project Manager

The Eskom Project Manager is responsible for overall management of the project. The following tasks will fall within his / her responsibilities:

- Be fully conversant with the Basic Assessment for the project, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.
- Be familiar with the recommendations and mitigation measures of this EMPr, and enforce these measures.
- Ensure that all stipulations within the EMPr are communicated and adhered to the appointed Contractor(s).
- Monitor site activities on a daily basis for compliance.
- Conduct internal audits of the construction site against the EMPr.
- Confine construction site to the demarcated area.
- Rectify transgressions through the implementation of corrective action.

The Project Manager thus oversees the entire project, including both the construction team and the environmental oversight function to ensure compliance with the environmental decision reached by the authorities. Any of the tasks mentioned above may be delegated in writing.

#### 3.1.2 Environmental Control Officer

The Environmental Control Officer is responsible for the implementation of the EMPr during the construction phase as well as liaison and reporting to Eskom, Contractor, Landowners and Authorities. The following tasks will fall within his / her responsibilities:

- Be familiar with the recommendations and mitigation measures of this EMPr and the Environmental Authorisation.
- Conduct monitoring of the construction site according to the EMPr.
- Educate the construction team about the management measures of the EMPr.
- Liaise regularly with the construction team and the project manager.
- Recommend corrective action for any environmental non-compliance incidents on the construction site.
- Compile a regular report highlighting any non-compliance issues as well as good compliance with the EMPr.
- All negotiations for any reason shall be between the ECO, Eskom SoC Holdings Ltd, affected parties (landowners) and the Contractor.
- All agreements shall be recorded in writing and all parties shall co-sign the documentation. No verbal agreements shall be made.
- The affected parties shall always be kept informed about any changes to the construction programme should they be involved. If the ECO is not on site the Contractor should keep the affected parties informed. The

contact numbers of the Contractor and the ECO shall be made available to the affected parties. This will ensure open channels of communication and prompt response to queries and claims.

Further note, the ECO function is not limited to the construction phase alone, but is also an active role during the operational and later phases of the project.

### **3.1.3 Contractors and Service Providers**

All Contractors, including sub-contractors and staff (of both contractors and sub-contractors), and all service providers to the site are ultimately responsible:

- Complying with the environmental management specifications.
- Submitting Method Statements for approval by the ECO before any work is undertaken.
- Adhering to any instructions issued by the Project Manager on the advice of the ECO.
- Submitting a report at each site meeting which will document all incidents that have occurred during the period before the site meeting.
- Displaying the list of transgressions issued by the ECO in the site office.
- Maintaining a public complaints register.
- Arranging that all their employees and those of their subcontractors receive training before the commencement of construction in order that they are aware of the terms of reference of the EMPr.

Most landowners/surrounding landowners (landowners) will see the construction period as an interference with their daily activities. As such the potential for a negative attitude towards the whole construction process is high. Landowners are always apprehensive toward changes they have no control over as well as the presence of people from outside of their area. For the above reason, the ECO shall monitor activities on site on a daily basis and report to the Contractor and Eskom Project Manager.

As per the final responsibility, the necessary safety and health precautions shall be taken by the Contractor to safeguard the lives and property of the inhabitants and/or users thereof. The Contractor shall under no circumstances interfere with the property of landowners or nearby communities.

## **3.2 Environmental Awareness Plan**

It is important to ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and ongoing minimisation of environmental harm. To achieve effective environmental management, it is important that employees, contractors and sub-contractors are aware of their responsibilities in terms of the relevant environmental legislation and the contents of this EMPr.

The environmental awareness plan is aimed at:

- Promoting environmental awareness amongst all personnel on site;
- Informing personnel of all environmental procedures, policies and programmes applicable;
- Providing generic training on the implementation of environmental management specifications; and
- Providing job-specific environmental training in order to understand the key environmental features of the construction site and the surrounding environment.

The environmental awareness training programme will include:

- The induction of all construction and operation staff;
- Signing by all persons an acknowledgement of receiving and understanding the induction;
- Identification of environmental risks and job specific training on addressing these risks; and training on the implementation of emergency procedures (where necessary).

Topics covered by the Environmental Awareness Programme should include:

- What is meant by "Environment"?
- Why does the environment need to be protected and conserved?
- How can construction activities impact on the environment?
- What can be done to mitigate such impacts?
- Waste management.
- Health and Safety.

- Awareness of emergency and spills response provisions.
- Social responsibility during construction of the substation and loop-in lines e.g. being considerate to local residents.

Training can be done either in a written or verbal format but will be in an appropriate format for the receiving audience. The training must ensure that the contents and requirements of the EMPr are transferred to the audience. Where training has been done verbally, persons attending training must sign an attendance register (which must be properly filed). Training should be conducted monthly by the ECO and can also be dealt with weekly during the 'Toolbox Talks'.

### 3.3 Environmental Monitoring

A monitoring programme shall be in place, not only to ensure compliance with the EMPr through the contract/work instruction specifications, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that could result in significant environmental impacts for which corrective action is required. As part of the contract or work instruction, Eskom shall stipulate the period and frequency of monitoring required. The Project Manager shall ensure that the monitoring is carried out.

The ECO must be appointed to ensure compliance with the EMPr, and to carry out monitoring activities. The ECO will report to the Contractor should any non-compliance be evident or corrective action necessary. Only in severe cases of non-compliance, or repeated offences, will the ECO be required to report to the Project Manager.

### 3.4 Documentation and Reporting

The following documentation must be kept on site in order to record compliance with the EMPr:

- Record of complaints.
- Monitoring results.
- Non-conformance reports.
- Written corrective action instructions.
- Notification of emergencies and incidents.
- Environmental Authorisation.

## 4 ENVIRONMENTAL MANAGEMENT PROGRAMME: PLANNING AND DESIGN

Requirements for the planning and design phase include:

- The Contractor must adhere to all conditions of contract including the EMPr and environmental license conditions.
- Adequate planning of the construction programme to allow for disruptions due to rain and very wet conditions.
- All manmade as well as natural (vegetation) structures outside the boundary of the servitude shall be protected against damage at all times and any damage shall be rectified immediately.
- Proper documentation and record keeping of all complaints and actions taken.

**Table 3: Planning and design – General activities**

ASPECT & ASSOCIATED IMPACT	MITIGATION	RESPONSIBILITY
<p><b>Surface Water (including wetlands)</b></p> <ul style="list-style-type: none"> <li>• Damage and degradation of wetlands and surface water bodies.</li> </ul>	<p>1. When the route of the power line is being finalised in the pre-construction phase, it is recommended that proposed tower positions be subject to a walk down by a surface water specialist in order to confirm that no towers are to be placed within a surface water feature. A crucial aspect of this walk down will also be to assess whether planned access routes for construction vehicles would cross / traverse any surface water features (in particular seepage wetland features), and to highlight any no-go areas in this context. It is strongly recommended that this walk down be done in summer when the vegetation and hydrology of such features would be most prominent and recognisable.</p>	<p>Project Manager; ECO &amp; Surface Water Specialist</p>
<p><b>Flora</b></p> <ul style="list-style-type: none"> <li>• Design of transmission towers could result in protected trees being destroyed.</li> <li>• New access roads and haulage routes could impact on areas of high sensitivity (natural vegetation, protected tree species, riparian areas, areas of high slopes, rocky outcrops, etc.)</li> </ul>	<p>1. Conduct a pre-construction walk-down of the approved corridor in order to mark, geo-reference and fence off all protected tree species within the servitudes and development areas. Submit relevant applications for impacts on these individuals.</p> <p>2. Temporary access and haulage routes must be designed prior to construction commencing to ensure that the most preferable access and haulage routes for each tower site has been identified. Use should be made of existing roads as far as possible.</p>	<p>Project Manager, Ecologist &amp; ECO</p>
<p><b>Avifauna</b></p> <ul style="list-style-type: none"> <li>• Birds colliding with power line</li> </ul>	<p>1. An avifaunal walk through is recommended in order to confirm the high sensitivity areas to identify the exact spans of the power line to which the mitigation for bird collisions is required.</p>	<p>Project Manager, ECO &amp; Avifauna Specialist</p>

## 5 ENVIRONMENTAL MANAGEMENT PROGRAMME: CONSTRUCTION

### 5.1 Site Clearing

Site clearing must take place in a phased manner, as and when required. Areas which are not maintained after two months must not be cleared to reduce erosion risks. The area to be cleared must be visibly demarcated and this footprint strictly maintained. Spoil that is removed from the site must be moved to an approved spoil site or licensed landfill site.

### 5.2 Site Establishment

Site establishment shall take place in an orderly manner and all required amenities shall be installed at the camp site before the main workforce move onto site. The construction camp/lay down area shall have the necessary ablution facilities at the commencement of construction activities. The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed other than in supplied facilities.

The Contractor shall supply waste collection bins where such is not available and all solid waste collected shall be disposed of at a licensed landfill site. A certificate of disposal shall be obtained by the Contractor and kept on file. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regards to waste management. The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt on site.

### 5.3 Traffic and Access

**Table 4: Construction – Traffic and access**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Construction Traffic And Access</b></p> <ul style="list-style-type: none"> <li>• Compaction of soil.</li> <li>• Generation of dust.</li> <li>• Contamination of soil and groundwater.</li> </ul>	<p><b>Construction traffic</b></p> <ol style="list-style-type: none"> <li>1. Construction routes must be clearly defined.</li> <li>2. Access of all construction and material delivery vehicles should be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure.</li> <li>3. Wheel washing and damping down of un-surfaced roads must be implemented to reduce dust.</li> <li>4. Vehicles and equipment shall be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc.</li> <li>5. Servicing must be done off-site.</li> <li>6. Oil changes must take place on a concrete platform or on a drip tray.</li> <li>7. Soils compacted by construction shall be deep ripped to loosen compacted layers and re-graded to even running levels.</li> </ol> <p><b>Access</b></p> <ol style="list-style-type: none"> <li>1. No temporary roads or construction accesses must be constructed through any</li> </ol>	Weekly	Main Contractor & ECO

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<p>wetland or other surface water feature unless there is no other feasible option for access to stretches of the alignment.</p> <ol style="list-style-type: none"> <li>2. It is also strongly recommended that no permanent access roads / tracks along the servitude be constructed through any surface water feature. Rather existing track / road crossings of these surface water features should be used (even if they are a distance upstream or downstream of the crossing) and upgraded where necessary.</li> <li>3. No track / access road must be developed through any seepline wetland, even if the wetland is located away from the alignment.</li> <li>4. In the event of the need for a river crossing:               <ul style="list-style-type: none"> <li>• Should culverts be used as the structure for crossing a river or watercourse, culvert structures must be placed so that the base of the culvert is located at the current level of the current bed of the watercourse. No water must be impounded behind the culvert structure at a level lower than the base of the culvert during low flows. In addition the culvert must not create a step (drop in levels) between its base and the downstream watercourse that would hinder the movement of aquatic biota up the system.</li> <li>• Where channelled wetlands / watercourses crossed by the road / access track are associated with adjacent areas of wetland or riparian habitat which would be subject to periodic inundation by spate flows in the channel (caused by overtopping of the banks of the channel), the crossing structure must be extended to include this area of wetland / riparian habitat to the boundary of the wetland / riparian habitat.</li> <li>• All tracks / access roads that are developed must have formal stormwater measures included in the design so that no erosion develops on these tracks that could lead to the siltation of downslope surface water features.</li> </ul> </li> <li>5. Strategic positioning of entry and exit points must be established to ensure as little impact/ effect as possible on the traffic flow.</li> <li>6. The Contractor shall properly mark all access roads. Markers shall show the direction of travel as well as tower numbers to which the road leads.</li> <li>7. Roads not to be used shall be marked with a "NO ENTRY" sign.</li> <li>8. As access of livestock, and to a lesser degree, people into and through the servitude is associated with a number of potential indirect impacts, especially the development of erosion, measures must be taken to ensure that access into riparian zones along the servitude corridor be restricted.</li> <li>9. It is recommended that measures to physically block livestock from entering the riparian zone be put in place at the edge of the riparian corridor within the servitude; brushpacking of thorny vegetation that is felled as part of the clearing of the servitude can be used to create an effective barrier to livestock and is recommended. It is recommended that at least two rows of brushpacking be placed across the servitude at each end of the riparian zone.</li> <li>10. Unnecessary traversing of agricultural and natural open land is discouraged.</li> </ol>		

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<p><b>Road maintenance</b></p> <ol style="list-style-type: none"> <li>Contractors should ensure that access roads are maintained in good condition by attending to potholes, corrugations and stormwater damage as soon as these develop.</li> </ol> <p><b>General</b></p> <ol style="list-style-type: none"> <li>The Contractor shall meet safety requirements under all circumstances.</li> <li>All equipment transported shall be clearly labelled as to their potential hazards according to specifications. All the required safety labelling on the containers and trucks shall be in place.</li> <li>The Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken in the event of an accident.</li> <li>Where required, speed limits shall be indicated on the roads (30 km). All speed limits shall be strictly adhered to at all times.</li> </ol>		



## 5.4 Construction Camp

**Table 5: Construction – Establishment of construction camp**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Construction Camp</b></p> <ul style="list-style-type: none"> <li>Contamination of soil, groundwater and surface water.</li> <li>Compaction of soil.</li> <li>Fire.</li> <li>Loss of natural habitat.</li> <li>Impacts to employee health and safety.</li> </ul>	<p><b>Site of construction camp</b></p> <ol style="list-style-type: none"> <li>Choice of site for the contractor's camp requires the ECO's permission and must take into account location of local residents and / or ecologically sensitive areas, including flood zones and slip / unstable zones. A site plan must be submitted to the ECO and Project Manager for approval.</li> <li>The construction camp may not be situated within the 1:100 year flood line or on slopes greater than 1:3.</li> <li>If the Contractor chooses to locate the camp site on private land, he must get prior permission from both the project manager and the landowner.</li> <li>The size of the construction camp should be kept to minimum (especially where natural vegetation or grassland has to be cleared for its construction).</li> <li>Suitable control measures over the Contractor's yard, plant and material storage to mitigate any visual impact of the construction activity must be implemented.</li> <li>No development, or activity of any sort associated with camp, is allowed below the 1:100 year flood line of any drainage line.</li> </ol> <p><b>Storage of materials (including hazardous materials)</b></p> <ol style="list-style-type: none"> <li>Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general on site topography and water erosion potential of the soil. The site must be approved by the ECO.</li> <li>Only designated areas must be used for storage of construction materials, soil stockpiles, machinery and other equipment.</li> <li>Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent spillage into the ground and groundwater regime around the temporary storage area(s). Pollution prevention measures for storage of materials should include a bund wall high enough to contain at least 110% of any stored volume.</li> <li>Storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of stormwater from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources.</li> <li>Clear signage must be placed at all storage areas containing hazardous substances / materials.</li> <li>Fire prevention facilities must be present at all storage facilities.</li> <li>A Waste Disposal Contractor must be employed to remove waste oil. These wastes should only be disposed of at a licensed landfill sites designed to handle hazardous wastes. A disposal certificate must be obtained from the Waste Disposal Contractor.</li> <li>The Contractor must ensure that all construction employees are made aware of the health risks associated with any hazardous substances used and has been</li> </ol>	Weekly	Main Contractor & ECO

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<p>provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.</p> <p>9. All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site.</p> <p>10. Any spillage, which may occur, shall be investigated and immediate action must be taken. This must also be reported to the ECO and DEA, as well as local authorities if so required.</p> <p><b>Drainage at the construction camp</b></p> <p>1. Run-off from the camp site must not discharge into neighbours' properties or into adjacent wetlands, rivers or streams.</p> <p>2. The Contractor must attend to drainage at the camp site to avoid standing water and / or sheet erosion.</p> <p><b>General</b></p> <p>1. The construction camp must be kept clear of litter at all times.</p> <p>2. No open fires are allowed within the construction camp and no wood from surrounding vegetation may be used to create a fire.</p> <p><b>End of construction</b></p> <p>1. Once construction has been completed on site and all excess material has been removed, the storage area shall be rehabilitated. If the area was badly damaged, re-seeding shall be done.</p> <p>2. The construction camp shall be rehabilitated to its pre-construction state. Any spilled concrete shall be removed and soil compacted during construction shall be ripped, levelled and re-vegetated.</p>		

## 5.5 Soils

**Table 6: Construction – Soils**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBLE
<p><b>Soils</b></p> <ul style="list-style-type: none"> <li>• Pollution of topsoil and subsoils.</li> <li>• Mixing of topsoil and subsoils.</li> <li>• Soil erosion.</li> </ul>	<p><b>Topsoil</b></p> <p>1. The Contractor and ECO should, prior to the commencement of earthworks determine the average depth of topsoil.</p> <p>2. The full depth of topsoil should be stripped from areas affected by construction and related activities prior to the commencement of major earthworks. This should include the building footprints, working areas and storage areas.</p> <p>3. Care must be taken not to mix topsoil and subsoil during stripping.</p> <p>4. Removed polluted topsoil should be transported to a licensed landfill site.</p> <p>5. Remove and store topsoil separately in areas where excavation/degradation</p>	Monthly	Main Contractor & ECO

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBLE
	<p>takes place. Topsoil should be used for rehabilitation purposes in order to facilitate re-growth of species that occur naturally in the area.</p> <p><b>Soil stripping</b></p> <ol style="list-style-type: none"> <li>1. No soil stripping must take place on areas within the site that the Contractor does not require for construction works or areas of retained vegetation.</li> <li>2. Subsoil and overburden should, in all construction and lay down areas, be stockpiled separately to be returned for backfilling in the correct soil horizon order.</li> <li>3. Construction vehicles must only be allowed to utilise existing tracks or pre-planned access routes.</li> </ol> <p><b>Erosion</b></p> <ol style="list-style-type: none"> <li>1. Limit construction, maintenance and inspection activities to dry periods in order to curb occurrence/ augmentation of erosion in areas of existing erosion.</li> <li>2. No vehicles should be allowed to cross rivers or streams in any area other than an approved crossing, taking care to prevent any impact (particularly erosion) in a surrounding habitat.</li> <li>3. Disturbed areas of natural vegetation as well as cut and fills must be rehabilitated immediately to prevent soil erosion.</li> </ol> <p><b>Stockpiles</b></p> <ol style="list-style-type: none"> <li>1. Stockpiles should not be situated such that they obstruct natural water pathways and drainage channels.</li> <li>2. Stockpiles should not exceed 2 m in height</li> <li>3. If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or cloth. Stockpiles may further be protected by the construction of berms or low brick walls around their bases.</li> <li>4. Stockpiles should be kept clear of weeds and alien vegetation by regular weeding.</li> <li>5. Where contamination of soil is expected, analysis must be done prior to disposal of excess soil to determine the appropriate disposal route.</li> </ol> <p><b>Concrete mixing (if required)</b></p> <ol style="list-style-type: none"> <li>1. Concrete mixing must only take place within designated areas.</li> <li>2. Ready mixed concrete must be utilised where possible.</li> <li>3. No vehicles transporting concrete to the site may be washed on site.</li> <li>4. If a batching plant is necessary, run-off should be managed effectively to avoid contamination of other areas of the site. Untreated run-off from the batch plant must not be allowed to get into the stormwater system or any rivers, streams, wetlands or existing erosion channels / dongas.</li> </ol> <p><b>Earthworks</b></p> <ol style="list-style-type: none"> <li>1. Soils compacted during the construction of the power line should be deeply</li> </ol>		

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBLE
	ripped to loosened compacted layers and re-graded to even running levels. Topsoil should be re-spread over landscaped areas.		

## 5.6 Groundwater

**Table 7: Construction – Groundwater Pollution**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Sanitation facilities, hazardous materials, wastewater, construction activities.</b></p> <ul style="list-style-type: none"> <li>Contamination of groundwater.</li> </ul>	<p><b>Sanitation</b></p> <ol style="list-style-type: none"> <li>Adequate sanitary facilities and ablutions must be provided for construction workers.</li> <li>The facilities must be regularly serviced and emptied to reduce the risk of groundwater pollution.</li> <li>Sewage water must not flow freely or stagnate on the soil surface.</li> </ol> <p><b>Hazardous materials</b></p> <ol style="list-style-type: none"> <li>Use and or storage of materials, fuels and chemicals which could potentially leak into the groundwater must be controlled.</li> <li>All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces.</li> <li>Any hazardous substances must be stored at least 20 m from any of the water bodies on site.</li> <li>The ECO should be responsible for ensuring that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of preventing unauthorised entry.</li> <li>Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp shall be collected and removed from the site for appropriate disposal at a licensed commercial facility.</li> </ol> <p><b>Cement mixing (if required)</b></p> <ol style="list-style-type: none"> <li>Cement contaminated water must not enter the water system as this disturbs the natural acidity of the soil and affects plant growth.</li> </ol> <p><b>Water resources</b></p> <ol style="list-style-type: none"> <li>Site staff shall not be permitted to use any other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction or related activities.</li> <li>Municipal water (or another source approved by the ECO) should instead be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, concrete mixing, compacting, etc.</li> </ol>	Weekly	Main Contractor & ECO

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<ol style="list-style-type: none"> <li>3. The Department of Water and Sanitation (DWS), and the ECO as well as other Emergency contact numbers provided by the Municipality should be contacted in order to deal with spillages and contamination of aquatic environments.</li> <li>4. Wastewater should be directed into the proper systems.</li> </ol>		

## 5.7 Hydrology and Stormwater

**Table 8: Construction – Hydrology and stormwater**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Construction of power line and substation</b></p> <ul style="list-style-type: none"> <li>• Contamination of surface water resources.</li> <li>• Damage and alternation to surface water drainage lines.</li> <li>• Siltation of stormwater drains and surface water drainage lines.</li> </ul>	<ol style="list-style-type: none"> <li>1. No towers must be placed within the boundaries of any wetland or within the riparian zone of any watercourse.</li> <li>2. The clearing of riparian vegetation has been identified to be a potentially significant cause of localised impact on watercourses and rivers, thus clearing of riparian vegetation should be limited as far as possible. Clearing / felling of woody vegetation should be limited to trees / shrubs above the maximum permitted clearance height, and the understory should not be cleared.</li> <li>3. The clearing of woody vegetation from most riparian zones in the study area would fall under the definition of “altering the bed, banks, course or characteristics of a watercourse” under GN 1199 as any change affecting the resource quality within the riparian habitat is included as part of this activity. As assessed in the Wetlands Report, the clearing of vegetation from the riparian corridors of most of the larger rivers would constitute a change (lowering) of resource quality. The proponent should seek the instruction of the Department of Water and Sanitation (DWS) in this regard in order to determine whether a General Authorisation process would need to be undertaken.</li> <li>4. It is critical that only the centreline be cleared of woody vegetation higher than 1 m above ground level, and not the entire width of the servitude in riparian areas.</li> <li>5. All wetlands, rivers and watercourses and their associated riparian zones should be treated as highly sensitive areas, and be strictly maintained as ‘no-go’ areas, except in the case of construction activities such as stringing of the lines and clearing of vegetation. No lay down areas should be placed within riparian corridors as delineated in the Wetlands Report, and no construction right of ways should be created through or across watercourses (other than where existing roads / accesses cross watercourses).</li> <li>6. Stringing of the lines across wetlands and watercourses must be completed manually without the use of heavy machinery entering the wetland or riparian corridor that would adversely affect the surface water feature.</li> <li>7. Where surface water is encountered within rivers or watercourses, this should not be utilised for abstraction, or washing of equipment, etc., in order to minimise the risk of pollution of the water by construction activities. All</li> </ol>	Weekly	Main Contractor & ECO

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<p>abstraction of water from any surface water feature must be authorised as prescribed by the National Water Act, No 36 of 1998 and be subject to the provisions of any water use licence or general authorisation.</p> <ol style="list-style-type: none"> <li>8. Although it is recognised that implementing full stormwater control measures on a construction site (i.e. a dynamic situation) is difficult, measures must be taken to ensure that stormwater is controlled as far as possible and that all silt and other foreign materials are prevented from entering any surface water feature located adjacent to or crossed by the construction servitude during the construction phase.</li> <li>9. Stormwater containing silt must be prevented from entering any wetland or river, through the use of retarding features such as berms or silt fences</li> <li>10. No drains / ditches of any form must be constructed into wetlands as a temporary measure to divert stormwater from the construction servitude.</li> <li>11. Earth, stone and rubble must be properly disposed of so as not to obstruct natural water path ways over the site. (i.e. these materials must not be placed in stormwater channels, drainage lines or rivers).</li> <li>12. There should be a periodic checking of the site's drainage system to ensure that the water flow is unobstructed.</li> <li>13. No cement batching areas or storage areas for hazardous materials must be located within 100 m of the boundary of any surface water feature.</li> <li>14. In the event of a spill of potential pollutants that would be at risk of entering a nearby surface water feature, the spill must be fully remediated and all pollutants removed from the road servitude. Should pollutants enter a surface water feature, full remediation of the polluted area within the surface water feature must be undertaken.</li> <li>15. As access of livestock, and to a lesser degree, people into and through the servitude is associated with a number of potential indirect impacts, especially the development of erosion, measures must be taken to ensure that access into riparian zones along the servitude corridor be restricted.</li> <li>16. It is recommended that measures to physically block livestock from entering the riparian zone be put in place at the edge of the riparian corridor within the servitude; brushpacking of thorny vegetation that is felled as part of the clearing of the servitude can be used to create an effective barrier to livestock and is recommended. It is recommended that at least two rows of brushpacking be placed across the servitude at each end of the riparian zone.</li> <li>17. In parts of the servitude with steep slopes on the edge, and outside of the riparian zone, measures must be taken to ensure that no erosion develops after the centreline and servitude clearing are undertaken. Where necessary, low earthen berms to prevent the flow of water down the slope can be constructed, or brushpacking can be used to prevent the development of erosion through overland flow in the form of rilling and subsequent gullying.</li> <li>18. The potential encroachment of alien invasive plant species into the cleared servitude has been identified as one of the key potential impacts associated with the power line on riparian areas. It is thus critical that operational procedures for the management of the servitude and removal and prevention of proliferation of</li> </ol>		

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	alien invasive vegetation be strictly enforced. This should be undertaken at an interval of at least 6 months. Although the removal and management of riparian vegetation is most important within the riparian zone, it is also very important that parts of the servitude adjacent to the servitude (outside of riparian zones) also be subject to similar measures as without this the servitudes outside of the riparian zones would become 'springboards' for proliferation into the riparian area.		

## 5.8 Wetlands

**Table 9: Construction – Wetlands**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Construction of power line and substation</b></p> <ul style="list-style-type: none"> <li>The clearing and excavation of wetland vegetation at the tower location.</li> <li>The potential clearing and compaction of wetland vegetation and soil for the construction of temporary accesses / haulage roads for the heavy construction vehicles transporting the constructing the tower structures.</li> <li>Contamination of wetlands.</li> </ul>	<ol style="list-style-type: none"> <li>No towers must be placed within the boundaries of any wetland or within the riparian zone of any watercourse.</li> <li>The clearing of riparian vegetation has been identified to be a potentially significant cause of localised impact on watercourses and rivers, thus clearing of riparian vegetation should be limited as far as possible. Clearing / felling of woody vegetation should be limited to trees / shrubs above the maximum permitted clearance height, and the understory should not be cleared.</li> <li>It is critical that only the centreline be cleared of woody vegetation higher than 1 m above ground level, and not the entire width of the servitude in riparian areas.</li> <li>All wetlands, rivers and watercourses and their associated riparian zones should be treated as highly sensitive areas, and be strictly maintained as 'no-go' areas, except in the case of construction activities such as stringing of the lines and clearing of vegetation. No lay down areas should be placed within riparian corridors as delineated in the Wetland Report, and no construction right of ways should be created through or across watercourses (other than where existing roads / accesses cross watercourses).</li> <li>The requirement of GN1199 that any General Authorisation would not apply to developments within a 500 m radius from the boundary of any wetland would arguably apply in this case as the alignment(s) are located within 500 m of a number of wetlands. The proponent should seek the instruction of the Department of Water and Sanitation in this regard to determine whether a full Water Use Licence Application is required to be undertaken.</li> <li>Stringing of the lines across wetlands and watercourses must be completed manually without the use of heavy machinery entering the wetland or riparian corridor that would adversely affect the surface water feature.</li> <li>No cement batching areas or storage areas for hazardous materials must be located within 100 m of the boundary of any surface water feature.</li> <li>In the event of a spill of potential pollutants that would be at risk of entering a</li> </ol>	Weekly	Main Contractor & ECO

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<p>nearby surface water feature, the spill must be fully remediated and all pollutants removed from the road servitude. Should pollutants enter a surface water feature, full remediation of the polluted area within the surface water feature must be undertaken.</p> <p>9. Stormwater containing silt must be prevented from entering any wetland or river, through the use of retarding features such as berms or silt fences.</p> <p>10. No drains / ditches of any form must be constructed into wetlands as a temporary measure to divert stormwater from the construction servitude.</p> <p>11. As access of livestock, and to a lesser degree, people into and through the servitude is associated with a number of potential indirect impacts, especially the development of erosion, measures must be taken to ensure that access into riparian zones along the servitude corridor be restricted.</p> <p>12. It is recommended that measures to physically block livestock from entering the riparian zone be put in place at the edge of the riparian corridor within the servitude; brushpacking of thorny vegetation that is felled as part of the clearing of the servitude can be used to create an effective barrier to livestock and is recommended. It is recommended that at least two rows of brushpacking be placed across the servitude at each end of the riparian zone.</p> <p>13. In parts of the servitude with steep slopes on the edge, and outside of the riparian zone, measures must be taken to ensure that no erosion develops after the centreline and servitude clearing are undertaken. Where necessary, low earthen berms to prevent the flow of water down the slope can be constructed, or brushpacking can be used to prevent the development of erosion through overland flow in the form of rilling and subsequent gullying.</p> <p>14. The potential encroachment of alien invasive plant species into the cleared servitude has been identified as one of the key potential impacts associated with the power line on riparian areas. It is thus critical that operational procedures for the management of the servitude and removal and prevention of proliferation of alien invasive vegetation be strictly enforced. This should be undertaken at an interval of at least 6 months. Although the removal and management of riparian vegetation is most important within the riparian zone, it is also very important that parts of the servitude adjacent to the servitude (outside of riparian zones) also be subject to similar measures as without this the servitudes outside of the riparian zones would become 'springboards' for proliferation into the riparian area.</p>		



## 5.9 Air Quality

Table 10: Construction – Air quality

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Vehicle activities, preparation of substation site and transmission tower areas, and removal of construction equipment</b></p> <ul style="list-style-type: none"> <li>• Air pollution.</li> <li>• Dust generation.</li> <li>• Odour generation.</li> <li>• Fire.</li> </ul>	<p><b>Dust control</b></p> <ol style="list-style-type: none"> <li>1. Frequent and effective dust-suppression is advised, particularly along dirt roads. Dust must be suppressed on the construction site during dry periods by the regular application of water. Water used for this purpose must be used in quantities that will not result in the generation of run-off.</li> <li>2. Retention of vegetation where possible will reduce dust travel.</li> <li>3. Excavations and other clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas.</li> <li>4. The Contractor shall be responsible for dust control on site to ensure no nuisance is caused to the landowner or neighbouring communities.</li> <li>5. A speed limit for construction vehicles of 30 km/h must not be exceeded on dirty roads (if any).</li> <li>6. Any complaints or claims emanating from the lack of dust control shall be attended to immediately by the Contractor.</li> </ol> <p><b>Odour control</b></p> <ol style="list-style-type: none"> <li>1. Regular servicing of vehicles in order to limit gaseous emissions (to be done off-site).</li> <li>2. Regular servicing of on site ablutions to avoid potential odours.</li> <li>3. Allocated cooking areas must be provided.</li> <li>4. The Contractor must make alternative arrangements (other than fires) for cooking and / or heating requirements. LP gas cookers may be used provided that all safety regulations are followed.</li> </ol> <p><b>Rehabilitation</b></p> <ol style="list-style-type: none"> <li>1. The Contractor should rehabilitate concurrently and commence rehabilitation of exposed soil surfaces as soon as practical after completion of earthworks.</li> </ol> <p><b>Fire prevention</b></p> <ol style="list-style-type: none"> <li>1. The Contractor must ensure that any grass left in a natural state during the construction of the substation should be cut in order to prevent veld fires, especially during the dry months.</li> <li>2. No open fires shall be allowed on site under any circumstance. All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires.</li> <li>3. The Contractor shall have operational fire-fighting equipment available on site at all times. The level of fire fighting equipment must be assessed and evaluated thorough a typical risk assessment process. It may be required to increase the</li> </ol>	<p>Daily</p>	<p>Main Contractor &amp; ECO</p>

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	level of fire protection, especially during the winter months.		

## 5.10 Noise

**Table 11: Construction – Noise**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Construction activities (excavating and site clearing); construction vehicles; and construction staff</b></p> <ul style="list-style-type: none"> <li>Increase in noise levels.</li> </ul>	<ol style="list-style-type: none"> <li>Surrounding communities and adjacent landowners are to be notified in advance of noisy construction activities.</li> <li>The construction phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of residential areas in close proximity to the development.</li> <li>Construction site yards, workshops, and other noisy fixed facilities should be located well away from noise sensitive areas. Once the proposed final layouts are made available by the Contractor(s), the sites must be evaluated in detail and specific measures designed into the system.</li> <li>Truck traffic should be routed away from noise sensitive areas, where possible.</li> <li>Noise levels must be kept within acceptable limits.</li> <li>Noisy operations should be combined so that they occur where possible at the same time.</li> <li>With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the Contractor and ECO should liaise with local residents on how best to minimise impact, and the local population should be kept informed of the nature and duration of intended activities.</li> <li>As construction workers operate in a very noisy environment, it must be ensured that their working conditions comply with the requirements of the Occupational Health and Safety Act (Act No 85 of 1993). Where necessary ear protection gear should be worn.</li> <li>Noisy activities to take place during allocated construction hours only as per NEM: Air Quality Act (No 39 of 2004), Section 34 – Control of Noise.</li> <li>Noise from labourers must be controlled.</li> <li>The Contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance. Where possible labour shall be transported to and from the site by the Contractor or his sub-contractors by the Contractor's own transport.</li> <li>Noise suppression measures must be applied to all construction equipment. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site.</li> </ol>	Daily	Main Contractor & ECO

## 5.11 Flora and Fauna

**Table 12: Construction – Flora and fauna**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Construction of substation, power line and access road</b></p> <ul style="list-style-type: none"> <li>• Loss of protected tree species.</li> <li>• Loss of faunal habitats.</li> <li>• Destruction of threatened fauna.</li> <li>• Interference with fauna.</li> </ul>	<p><b>Protected tree species</b></p> <ol style="list-style-type: none"> <li>1. Protected tree species or plants must not be removed unless they are interfering with a structure.</li> <li>2. Should impacts on protected tree individuals be unavoidable, obtain necessary and required approval per application for damage/ removal/ cutting/ pruning of protected tree species from Department of Agriculture, Forestry and Fisheries, as per National Forests Act (Act No. 84 of 1998) under Government Notice GN 1012 of 2004 and GN 767 of 2005.</li> <li>3. The alignment of towers and the power line should be adjusted to prevent the destruction of remaining large (&gt;4 m) indigenous tree species including the three protected tree species (<i>Pterocarpus angloensis</i> – Wild teak, <i>Philenoptera violacea</i> – Apple-Leaf and <i>Sclerocarya birrea</i> – Marula).</li> <li>4. Marking should be done by means of semi-permanent (removable) marker tape.</li> <li>5. Cutting/ pruning/ damaging of any protected tree species must not be allowed under any circumstances without proper approval.</li> </ol> <p><b>Vegetation clearance</b></p> <ol style="list-style-type: none"> <li>1. Removal of vegetation / plants shall be avoided until such time as soil stripping is required and similarly exposed surfaces must be re-vegetated or stabilised as soon as is practically possible.</li> <li>2. Only an 8 m strip may be cleared flush with the ground to allow vehicular passage during construction. No scalping shall be allowed on any part of the servitude road unless absolutely necessary.</li> <li>3. Vegetation clearing on transmission tower sites must be kept to a minimum.</li> <li>4. Big trees with large root systems shall be cut manually and removed, as the use of a bulldozer will cause major damage to the soil when the root systems are removed. Stumps shall be treated with herbicide.</li> <li>5. Smaller vegetation can be flattened with a machine, but the blade should be kept above ground level to prevent scalping.</li> <li>6. Any vegetation cleared on transmission tower sites shall be removed or flattened and not be pushed to form an embankment around the tower.</li> <li>7. No vegetation clearing in the form of de-stumping, scalping or uprooting shall be allowed on river- and stream banks (riparian zone). Vegetation shall only be cut to allow for the passage of the pilot-cables and headboard.</li> <li>8. Trees and vegetation not interfering with the statutory clearance to the conductors can be left under the line.</li> <li>9. With permission of the landowner, the total servitude under the power line and up to 5 m outside the outer phases should be cleared.</li> <li>10. All remaining Aloes (<i>Aloe greatheadii</i>), bulbous plants (geophytes) should be</li> </ol>	<p>Weakly</p>	<p>Main Contractor, ECO &amp; Ecologist (if required)</p>

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<p>replanted if unearthed during the construction phase of the project.</p> <p>11. Disturbance of vegetation must be limited to areas of construction.</p> <p>12. Where herbicides are used to clear vegetation, specimen-specific chemicals should be applied to individual plants only. General spraying should be prohibited. The use of herbicides shall only be allowed after a proper investigation into the necessity, the type to be used, the long-term effects and the effectiveness of the agent. The application of herbicides shall be under the direct supervision of a qualified technician. All surplus herbicide shall be disposed of in accordance with the supplier's specifications.</p> <p>13. All declared aliens must be identified and managed in accordance with the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983), namely</p> <ul style="list-style-type: none"> <li>• Uprooting, felling or cutting.</li> <li>• Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer;</li> <li>• The application of control measures regarding the utilisation and protection of veld in terms of regulation 9 of the Act;</li> <li>• The application of control measures regarding livestock reduction or removal of animals in terms of regulations 10 and 11 of the Act;</li> <li>• Any other method or strategy that may be applicable and that is specified by the executive officer by means of a directive.</li> </ul> <p>14. All alien vegetation in the total servitude and densifiers creating a fire hazard shall be cleared and treated with herbicides.</p> <p>15. All alien invasive plant should be removed from the substation site to prevent further invasion.</p> <p>16. All alien vegetation should be eradicated over a five-year period.</p> <p>17. According to the Conservation of Agricultural Resource Act (No. 43 of 1983) as amended, the person applying herbicide must be adequately qualified and certified as well as registered with the appropriate authority to apply herbicides.</p> <p>18. Monitoring the potential spread of declared weeds and invasive alien vegetation to neighbouring land and protecting the agricultural resources and soil conservation works are regulated by the Conservation of Agricultural Resources Act, No. 43 of 1983 and the NEM: Biodiversity Act, No 10 of 2004 and should be addressed on a continual basis.</p> <p>19. The establishment and re-growth of alien vegetation must be controlled after the removal of grass.</p> <p>20. The Contractor must have the necessary knowledge to be able to identify protected species as well as species not interfering with the operation of the line due to their height and growth rate.</p> <p>21. The Contractor must also be able to identify declared weeds and alien species that can be totally eradicated.</p> <p>22. The Contractor must be in possession of a valid herbicide applicators licence.</p> <p>23. The Eskom Standard for Bush Clearing (Appendix B) should be adhered to.</p> <p>24. The removal or picking of any protected or unprotected plants shall not be</p>		

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<p>permitted and no horticultural specimens (even within the demarcated working area) shall be removed, damaged or tampered with unless agreed to by the ECO.</p> <p>25. The removal of all economically valuable trees or vegetation shall be negotiated with the Landowner before such vegetation is removed.</p> <p><b>Faunal habitats</b></p> <ol style="list-style-type: none"> <li>1. No dumping of any materials in undeveloped open areas and neighbouring properties should be allowed.</li> <li>2. Disturbance of vegetation cover as well as rocky outcrops, logs, stumps, termite mounds within sensitive areas should be limited.</li> <li>3. All temporary stockpile areas including litter and dumped material and rubble must be removed on completion of construction.</li> </ol> <p><b>Re-vegetation</b></p> <ol style="list-style-type: none"> <li>1. Disturbed areas of natural vegetation as well as cut and fills must be rehabilitated immediately to prevent soil erosion.</li> <li>2. Re-seeding shall be done on disturbed areas as directed by the ECO.</li> </ol> <p><b>Threatened fauna</b></p> <ol style="list-style-type: none"> <li>1. The Developer and Contractor as well as the ECO should be made aware of the possible presence of certain threatened animal species (Southern African Python) prior to the commencement of construction activities. In the event that any of the species are discovered relevant conservation authorities should be informed and activities surrounding the site suspended until further investigations have been conducted.</li> <li>2. Access to the power line servitude must be restricted. Access to the power line servitude should ideally be fenced off and gated along the main access roads.</li> <li>3. Prior to construction and vegetation clearance a suitably qualified Zoologist/Botanist or Ecologist should closely examine the proposed construction areas (substation, transmission towers and power lines) for the presence of any animal burrows (including spiders and scorpions), rocky outcrops, logs, stumps and other debris and relocate any affected animals to appropriate habitat away from the power line or substation.</li> <li>4. Contract employees must be educated about the value of wild animals and the importance of their conservation.</li> <li>5. Activities in the surrounding open undeveloped areas (especially open bushveld) must be strictly regulated and managed.</li> </ol> <p><b>Dangerous fauna</b></p> <ol style="list-style-type: none"> <li>1. During the construction phase care must be taken not to destroy any trap-door or baboon spider burrows.</li> <li>2. Prior to excavations a thorough inspection of the cleared areas must be undertaken to determine the presences of any baboon spider burrows, loosely</li> </ol>		

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	<p>embedded rocks or stumps in the proposed cleared areas.</p> <ol style="list-style-type: none"> <li>Safety precaution measure must be implemented especially during the vegetation clearance phase which could result in encounters with several venomous snake species.</li> <li>Care should be taken when removing stumps, logs or rock material. Standard precautions or safety measures includes wearing sturdy leather boots and gloves in the field and close inspection of sleeping areas and bedding, clothes, shoes etc. for any scorpions.</li> </ol> <p><b>Human presence</b></p> <ol style="list-style-type: none"> <li>Movement of workers must be limited to areas under construction and access to the undeveloped areas, especially the surrounding open areas must be strictly regulated (“no-go” areas during construction activities).</li> </ol> <p><b>Disturbance to livestock</b></p> <ol style="list-style-type: none"> <li>Construction activities must be planned carefully so as not to interfere with the calving and lambing season for most animal species.</li> <li>The Contractor shall under no circumstances interfere with livestock without the landowner being present. This includes the moving of livestock where they interfere with construction activities.</li> <li>Should the Contractor’s workforce obtain any livestock for eating purposes, they must be in possession of a written note from the landowner.</li> <li>Speed limits must be restricted especially on farm roads (30 km/hr) preventing unnecessary road fatalities of surrounding livestock.</li> </ol> <p><b>Access Road</b></p> <ol style="list-style-type: none"> <li>Limit construction, maintenance and inspection activities to dry periods in order to curb occurrence/ augmentation of erosion in areas that might be conducive to soil erosion.</li> <li>Demarcate construction areas in order to control movement of personnel, vehicles and provide boundaries for construction sites in order to limit spread of impacts.</li> <li>Disturbance of vegetation must be limited only to areas of construction.</li> <li>Limit construction, maintenance and inspection activities to dry periods when Red Data species of the area are most likely to be absent or hibernating, limiting potential impacts to a large extent.</li> </ol> <p><b>Fire</b></p> <ol style="list-style-type: none"> <li>Use of branches of trees and shrubs for fire making purposes is strictly prohibited.</li> <li>No open fires shall be allowed on site under any circumstance. The Contractor shall have fire-fighting equipment available on all vehicles working on site, especially during the winter months.</li> </ol>		

## 5.12 Avifauna

**Table 13: Construction – Avifauna**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Construction of power lines</b></p> <ul style="list-style-type: none"> <li>Disturbance of birds, impact on Red Data and other avifaunal species.</li> <li>Destruction or alteration of bird habitat, Impact on Red Data and other species.</li> </ul>	<ol style="list-style-type: none"> <li>Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff.</li> <li>If any of the “Focal Species” identified in the avifaunal report are observed to be roosting and/or breeding in the vicinity, an avifaunal specialist is to be contacted for further instruction.</li> </ol>	Weekly	ECO

## 5.13 Waste Management

**Table 14: Construction – Waste management**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Construction of construction camp, power line and substation</b></p> <ul style="list-style-type: none"> <li>Generation of waste during construction includes: general construction rubble, hazardous waste (used oil, cement and concrete etc.).</li> <li>Contamination of soil, groundwater and surface water.</li> </ul>	<p><b>Construction rubble</b></p> <ol style="list-style-type: none"> <li>Where possible, construction waste on transmission tower sites and the substation must be reused or recycled.</li> <li>Disposal of waste must be in accordance with relevant legislative requirements.</li> <li>Construction rubble shall be disposed of at the nearest registered landfill site that has been approved by the relevant Municipality.</li> </ol> <p><b>Litter management</b></p> <ol style="list-style-type: none"> <li>Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site of the substation.</li> <li>A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the substation construction site as well as along the power line route.</li> <li>If possible and feasible, all waste generated must be separated into glass, plastic, paper, metal and wood and recycled. An Independent Contractor can be appointed to conduct this recycling.</li> <li>Littering by the employees of the Contractor shall not be allowed under any circumstances. The ECO shall monitor the neatness of the work sites as well as the construction camp.</li> <li>Skip waste containers should be maintained. These should be kept covered and arrangements made for them to be collected regularly from the site by the local council.</li> <li>All waste must be removed from the substation and transported to a landfill site</li> </ol>	Weekly	Main Contractor & ECO

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<p>as approved by the relevant Municipality.</p> <ol style="list-style-type: none"> <li>7. Waste disposal certificates providing disposal at each construction site shall be provided to the ECO's inspection.</li> <li>8. The Contractor must familiarise themselves with the definitions of waste and the handling, storage and transport of waste as prescribed in the applicable environmental legislation.</li> <li>9. Burning of waste will not be permitted.</li> </ol> <p><b>Hazardous waste</b></p> <ol style="list-style-type: none"> <li>1. All waste hazardous materials must either be stored in a bunded or lined area or as otherwise advised by the ECO, and then disposed of at a licensed landfill site by a reputable third party waste Contractor. Hazardous waste may not be stored in excess of a 90 calendar day period.</li> <li>2. Contaminants to be stored safely to avoid spillage.</li> <li>3. Machinery must be properly maintained to keep oil leaks in check.</li> <li>4. Labelled containers must be provided to store used oils, as well as hazardous waste containers for oily rags, oil filters etc. and must be disposed of at a suitable approved register dumpsite.</li> </ol> <p><b>Sanitation</b></p> <ol style="list-style-type: none"> <li>1. The Contractor shall install mobile chemical toilets on the substation site and along the power line route.</li> <li>2. No indiscriminate sanitary activities shall be allowed.</li> <li>3. Ablution facilities shall be within 100 m from workplaces but not closer than 50 m from any natural water bodies or boreholes. There should be enough toilets available to accommodate the workforce. Male and females must be accommodated separately where possible.</li> <li>4. Toilets should be no closer than 100 m or above the 1:100 year flood line from any natural or manmade water bodies or drainage lines or alternatively located in a place approved of by the ECO.</li> <li>5. Potable water must be provided for all construction staff.</li> </ol> <p><b>Remedial actions</b></p> <ol style="list-style-type: none"> <li>1. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site.</li> <li>2. Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site.</li> <li>3. The ECO must determine the precise method of treatment of polluted soil. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil.</li> <li>4. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent materials.</li> <li>5. If necessary, oil absorbent sheets or pads must be attached to leaky machinery</li> </ol>		



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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<p>or infrastructure.</p> <ol style="list-style-type: none"> <li>Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use.</li> <li>Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal.</li> </ol>		

## 5.14 Health and Safety

**Table 15: Construction – Health and safety**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Construction of power lines and substation</b></p> <ul style="list-style-type: none"> <li>Safety of workers and the public exposed to construction activity hazards.</li> </ul>	<p><b>Worker safety</b></p> <ol style="list-style-type: none"> <li>Implementation of safety measures, work procedures and first aid must be implemented on the substation site.</li> <li>A health and safety plan in terms of the Occupational Health and Safety Act (Act No. 85 of 1993) must be drawn up to ensure worker safety.</li> <li>Workers should be thoroughly trained in using potentially dangerous equipment.</li> <li>The Contractor must ensure that all equipment is maintained in a safe operating condition.</li> <li>A safety officer must be appointed.</li> <li>A record of health and safety incidents must be kept on the substation site.</li> <li>Any health and safety incidents must be reported to the Project Manager immediately.</li> <li>First aid facilities must be available at all times.</li> <li>Workers have the right to refuse work in unsafe conditions.</li> <li>A record shall be kept of drugs administered or precautions taken and the time and dates when this was done. This can then be used as evidence in court should any claims be instituted against Eskom or Contractor.</li> <li>The Contractor must ensure that all construction workers are well educated about HIV/ AIDS and the risks surrounding this disease.</li> <li>Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers.</li> </ol> <p><b>Worker facilities</b></p> <ol style="list-style-type: none"> <li>Eating areas should be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness.</li> </ol> <p><b>Protective gear</b></p> <ol style="list-style-type: none"> <li>Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all</li> </ol>	Daily	Eskom Corporate, Main Contractor & ECO

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<p>times and other PPE worn where necessary i.e. dust masks, ear plugs etc.</p> <p>2. No person is to enter the substation site without the necessary PPE.</p> <p><b>Site safety</b></p> <ol style="list-style-type: none"> <li>1. The construction camp must remain fenced for the entire construction period.</li> <li>2. Potentially hazardous areas such as trenches are to be demarcated and clearly marked.</li> <li>3. Adequate warning signs of hazardous working areas.</li> <li>4. Excavations must be clearly demarcated.</li> <li>5. Emergency numbers for local police and fire department etc. must be placed in a prominent area.</li> <li>6. Fire fighting equipment must be placed in prominent positions across the site where it is easily accessible. This includes fire extinguishers, a fire blanket as well as a water tank.</li> <li>7. Suitable conspicuous warning signs in English and all other applicable languages must be placed at all entrances to the site.</li> <li>8. All speed limits must be adhered to.</li> </ol> <p><b>Hazardous material storage</b></p> <ol style="list-style-type: none"> <li>1. Staff that will be handling hazardous materials must be trained to do so.</li> <li>2. Any hazardous materials (apart from fuel) must be stored within a lockable store with a sealed floor.</li> <li>3. Storage areas containing hazardous substances / materials must be clearly sign-posted.</li> <li>4. For transformer oil containers which may be required to be temporary stored on the substation site for a period of not more than 21-calendar days, the following is proposed: <ul style="list-style-type: none"> <li>• Oil dam and drainage system be built before the installations of transformers on site;</li> <li>• Drip-trays be placed underneath the nozzles to contain any leakage that may occur;</li> <li>• Impermeable plastics be placed underneath the tank / containers instead of building a bund-wall;</li> <li>• Drip-trays and containers be checked daily and should there be any leakage captured in drip-trays, that must be emptied into the already built oil drainage system linked to the oil dam; and</li> <li>• Adherence to Eskom's Oil Spill Clean-up and Rehabilitation Standard (Appendix C) and those prescribed by other statutory requirements will be maintained and adhered to at all times. The bund walls for the transformer oil containers must be in place before the installation of these containers.</li> </ul> </li> <li>5. The provisions of the Hazardous Chemical Substances Regulations promulgated in terms of the Occupational Health and Safety Act 85 of 1993 and the SABS Code of Practice must be adhered to. This applies to solvents and</li> </ol>		

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<p>other chemicals possibly used in the construction time.</p> <p><b>Procedure in the event of a petrochemical spill</b></p> <ol style="list-style-type: none"> <li>1. The individual responsible for or who discovers the petrochemical spill must report the incident to the Project Manager, ECO or Contractor.</li> <li>2. The problem must be assessed and the necessary actions required will be undertaken.</li> <li>3. The immediate response must be to contain the spill.</li> <li>4. The source of the spill must be identified, controlled, treated or removed.</li> </ol> <p><b>Fire management</b></p> <ol style="list-style-type: none"> <li>1. Fire fighting equipment should be present on site at all times as per Occupational Health and Safety Act 85 of 1993.</li> <li>2. All construction staff must be trained in fire hazard control and fire fighting techniques.</li> <li>3. All flammable substances must be stored in dry areas which do not pose an ignition risk to the said substances.</li> <li>4. No open fires will be allowed on site.</li> </ol>		

## 5.15 Security

**Table 16: Construction – security**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Authorised access to constructions areas and private land surrounding the sites</b></p> <ul style="list-style-type: none"> <li>• Theft.</li> <li>• Health and safety impacts to person's accessing the substation and power line construction sites.</li> </ul>	<ol style="list-style-type: none"> <li>1. Access to the construction site should be strictly controlled by a security company.</li> <li>2. 24 hour security should be present on the substation site.</li> <li>3. No person shall enter the site unless authorised to do so by the Contractor, Project Manager and ECO.</li> <li>4. If any fencing interferes with the construction process, such fencing shall be deviated until construction is completed. The deviation of fences shall be negotiated and agreed with the landowner in writing.</li> <li>5. Trespassing on private / commercial properties adjoining the site is forbidden.</li> <li>6. Secure the site in order to reduce the opportunity for criminal activity in the locality of the construction site.</li> </ol>	Weekly	Main Contractor & ECO

## 5.16 Social Environment

**Table 17: Construction – Social environment**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Construction of power line and substation</b></p> <ul style="list-style-type: none"> <li>Social impacts of construction activities will have on the site and surrounding areas.</li> </ul>	<ol style="list-style-type: none"> <li>All contact with the affected parties shall be courteous at all times. The rights of the affected parties shall be respected at all times.</li> <li>A complaints register should be kept on the substation site. Details of complaints should be incorporated into the audits as part of the monitoring process. This register is to be tabled during monthly site meetings.</li> <li>No interruptions other than those negotiated shall be allowed to any essential services.</li> <li>Damage to infrastructure shall not be tolerated and any damage shall be rectified immediately by the Contractor. A record of all damage and remedial actions shall be kept on site.</li> </ol> <p><b>Electricity supply and economic growth</b></p> <ol style="list-style-type: none"> <li>Consult with Bushbuckridge Local Municipality on their requirements in terms of capacity required and timeframes.</li> </ol> <p><b>Attitude formation against the project</b></p> <ol style="list-style-type: none"> <li>If required, a communication forum should be established with neighbouring residents during the construction period. This forum can meet once a month to discuss any issues and progress on the construction of the substation.</li> <li>Employment opportunities should first be offered to the local community if the skills are available within the community.</li> <li>Eskom or its appointed Contractor(s) should deliver on their undertakings with the community in terms of employment creation, etc. (tangible benefits to the community).</li> <li>The undertakings in the EMPr should also be implemented effectively and with due diligence.</li> </ol> <p><b>Integration with local community</b></p> <ol style="list-style-type: none"> <li>A Code of conduct should be established for construction workers in their dealings with the local community. Creating of awareness on both sides (community and outsiders) is crucial for the success of the project.</li> <li>Potential conflict situations can be reduced beforehand using a transparent recruitment process, i.e. where labourers would be sourced from the local community.</li> <li>A labour desk should be implemented where the local community members could register. A rotary system could be used for unskilled labour to ensure that all job seekers have an equal opportunity to employment.</li> <li>Potential conflict situations within the construction village itself can be managed by means of weekly forum meetings. During these meetings residents should have the opportunity to raise any problems experienced and make suggestions</li> </ol>	<p>Weekly</p>	<p>MC &amp; ECO &amp; Project Manager</p>

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	in terms of their living space. Where feasible, these problems and suggestions should be addressed as soon as possible to ensure a conflict-free environment.		

## 5.17 Cultural and Heritage Artefacts

**Table 18: Construction – Cultural and heritage artefacts**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Construction of power line and substation</b></p> <ul style="list-style-type: none"> <li>• Unearth cultural heritage resources or graves.</li> <li>• Discovery of artefacts.</li> <li>• Destruction of cultural heritage sites.</li> </ul>	<ol style="list-style-type: none"> <li>1. If during construction any cultural heritage resources or graves are unearthed, all work has to be stopped until the site has been inspected and mitigated by a cultural heritage practitioner.</li> <li>2. Any discovered artefacts shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits shall be obtained from the South African Heritage Resources.</li> <li>3. Any finds must be reported to the nearest National Monuments office to comply with the National Heritage Resources Act (Act No 25 of 1999).</li> <li>4. Local museums as well as the South African Heritage Resource Agency (SAHRA) should be informed if any artefacts are uncovered in the affected area.</li> <li>5. The Contractor must ensure that his workforce is aware of the necessity of reporting any possible historical or archaeological finds to the ECO so that appropriate action can be taken.</li> <li>6. Any mitigation measures applied by an archaeologist, in the sense of excavation and documentation, should be published in order to bring this information into the public domain.</li> </ol>	Monthly	Main Contractor, ECO & Heritage Specialist (if required)

## 5.18 Visual

**Table 19: Construction – Visual**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBLE PERSON(S)
<p><b>Construction of power line and substation</b></p> <ul style="list-style-type: none"> <li>• Site (Servitude) clearing and removal of vegetation could partially alter the landscape as viewed from the surrounds of the site,</li> </ul>	<ol style="list-style-type: none"> <li>1. Vegetation clearing within the servitude and within the construction right of way should be limited to parts of the servitude and should be limited to vegetation (i.e. woody vegetation of a certain height) which needs to be cleared / felled for line clearance and / or fire prevention reasons. The natural woodland vegetation in the area typically provides a very effective screening function, even for large structures such as power line towers. The unnecessary clearing of this vegetation would partially negate this screening function. The clearing of the entire servitude of all woody vegetation can create a very prominent 'band'</li> </ol>	Weekly	Main Contractor & ECO

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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBLE PERSON(S)
<p>with the emergence of an exposed strip of bare soil.</p> <ul style="list-style-type: none"> <li>• Construction equipment such as cranes could be visually intrusive, albeit for a short time period.</li> </ul>	<p>within the landscape, especially when viewed from certain angles (where the viewer is able to look along the servitude) that would create a clear and distinct differentiation between the linear servitude and the surrounding woodland (especially in terms of line, colour and texture within the view).</p> <ol style="list-style-type: none"> <li>2. New access roads along the servitude should not be created unnecessarily, but rather existing access tracks / foot-cattle paths should be upgraded to provide access to the servitude. This will prevent the creation of new access roads that could create a clearly visible visual contrast in the landscape in the manner discussed above.</li> <li>3. The monopole tower type should be used for the development of this power line as it is associated with a lesser visibility factor than other (lattice-based) tower types.</li> <li>4. Permanent lighting at the substation should be limited to security lighting (if required). All lighting at the substation should be inward and downward facing, in order to not create unnecessary light spill.</li> <li>5. Clearing of trees and other vegetation should be limited to the substation footprint in retain the partial screening function of vegetation in the intervening area between the substation and the edge of the nearby settlement.</li> </ol>		

## 6 ENVIRONMENTAL MANAGEMENT PROGRAMME: OPERATIONAL

**Table 20: Operational – Impacts associated with access roads, and operational power line and substation**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Operational power line and substation</b></p> <ul style="list-style-type: none"> <li>Clearing of riparian vegetation will impact the riparian corridor.</li> <li>Risk of encroachment of alien invasive vegetation into the riparian zone. The risk will be even greater should operational management of the servitude not be properly undertaken.</li> <li>Operational risk of the development to wetlands relating to access into / through wetlands for line monitoring purposes.</li> </ul>	<ol style="list-style-type: none"> <li>Operational clearing of vegetation within the servitude must be limited to vegetation above the minimum clearance zone within the centreline, and indigenous shrubs should be allowed to remain should these not pose a fire risk.</li> <li>It is critical that all alien invasive vegetation management in the servitude be undertaken at regular intervals (at least every 6 months) for the operational life of the power line servitude. This must not just be undertaken for riparian areas but for servitudes in adjacent areas. As part of this management all alien invasive vegetation within the servitude must be removed.</li> <li>Operational line access procedures must ensure that there is no vehicular access into wetlands, unless in an emergency situation.</li> <li>If an emergency maintenance situation arises that requires access into wetlands to be required, access into the wetland must be carefully controlled, and all relevant Eskom environmental procedures must be followed. Any damage to the wetland must be fully rehabilitated.</li> </ol>	Weekly	Project Manager
<p><b>Operational power line</b></p> <ul style="list-style-type: none"> <li>Collisions with overhead power lines - collisions with the proposed line of certain large flying bird species is a possibility.</li> <li>Possible bird electrocution, impact on Red Data and other species.</li> </ul>	<ol style="list-style-type: none"> <li>A “Bird Friendly” monopole structure, with a bird perch (as per standard Eskom guidelines) should be used for the tower structures.</li> <li>For the purple route alternative - Mark the identified sections of line with anti-collision marking devices on the earth wire to increase the visibility of the line and reduce likelihood of collisions as indicated in the Avifaunal Report. Marking devices should be space 10 m apart. The sections of the line that pose a concern and require marking should be finalised in a site “walkthrough” by an avifauna specialist once the final route is decided and the transmission towers are pegged.</li> </ol>	Monthly	Project Manager
<p><b>Operational activities at the substation</b></p> <ul style="list-style-type: none"> <li>Waste generation during the operation phase will have a negative impact on the environment, if not controlled adequately. Waste includes: general waste or hazardous waste</li> </ul>	<ol style="list-style-type: none"> <li>Where possible, construction waste on site must be reused or recycled.</li> <li>Disposal of waste must be in accordance with relevant legislative requirements.</li> <li>The Contractor must familiarise themselves with the definitions of waste and the handling, storage and transport of it as prescribed in the applicable environmental legislation.</li> <li>Burning of waste material will not be permitted.</li> </ol>	Weekly	Project Manager

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<b>ASPECT &amp; ASSOCIATED IMPACTS</b>	<b>ENVIRONMENTAL MEASURES AND CONTROLS</b>	<b>MONITORING FREQUENCY</b>	<b>RESPONSIBILITY</b>
(used oil etc.).			
<b>Operational power line</b> <ul style="list-style-type: none"> <li>• Electromagnetic Fields.</li> </ul>	1. In general, it is not recommended for humans to live under power lines due to the effects of Electromagnetic Field (EMF). However, the radiation decreases with an increase in distance from the source. The EMFs are insignificant on the servitude border.	Monitoring in the initiation phase of operation	Project Manager
<b>Operational power line and substation</b> <ul style="list-style-type: none"> <li>• There is the potential risk of electrocution (people and livestock) if access to the site is not controlled.</li> </ul>	1. Safety and security issues should be addressed as a priority by Eskom. It is recommended that the landowners and affected community members be contacted in advance to ensure that they are forewarned of the construction and maintenance activities planned in the area. 2. In addition, the local community must be educated about the dangers of high voltage electricity.	Monthly	Project Manager
<b>Operational power line</b> <ul style="list-style-type: none"> <li>• By virtue of their size (height), power line towers and lines could be visually intrusive. However only limited areas of permanent human habitation would be exposed to high or very high degree of visual exposure.</li> <li>• Lighting at the substation could cause unnecessary light spill.</li> </ul>	1. Limiting of operational vegetation clearing along the servitude to woody vegetation higher than maximum clearance height. 2. Lighting to only be switched on when operationally required. 3. All lighting to be inward facing to prevent light spill.	Monitoring in the initiation phase of operation	Project Manager



## 7 ENVIRONMENTAL MANAGEMENT PROGRAMME: DECOMMISSIONING AND CLOSURE

**Table 21: Decommissioning and Closure – Impacts associated with the decommissioning of the power line and substation components**

ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
<p><b>Decommissioning and closure of power line and substation</b></p> <ul style="list-style-type: none"> <li>• Compaction of soil.</li> <li>• Generation of waste.</li> <li>• Rubble generation.</li> <li>• Contamination of water courses.</li> <li>• Erosion.</li> </ul>	<ol style="list-style-type: none"> <li>1. Decommissioning to be guided by Eskom guidelines for construction / decommissioning.</li> <li>2. Decommissioning to be monitored by an ECO according to the stipulations of the EMPr.</li> <li>3. After decommissioning of the power line, management of alien invasive vegetation should continue for a period.</li> </ol> <p><b>Removal of equipment</b></p> <ol style="list-style-type: none"> <li>1. All structures comprising the construction camp are to be removed from site.</li> <li>2. The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc, and these shall be cleaned up.</li> <li>3. All hardened surfaces within the construction camp area should be ripped, all imported materials removed, and the area shall be top soiled and regressed.</li> </ol> <p><b>Temporary services</b></p> <ol style="list-style-type: none"> <li>1. The Contractor must arrange the cancellation of all temporary services.</li> <li>2. A copy of all waste disposal certificates from waste disposal service providers are to be presented to the Project Manager.</li> <li>3. Temporary roads must be closed and access across these, blocked.</li> <li>4. No temporary accesses to be constructed through any surface water feature and no machinery to enter any wetland unless authorised by the ECO as part of a decommissioning activity.</li> <li>5. All areas where temporary services were installed are to be rehabilitated to the satisfaction of the Project Manager.</li> </ol> <p><b>Associated infrastructure</b></p> <ol style="list-style-type: none"> <li>1. Surfaces are to be checked for waste products from activities such as concreting and cleared in a manner approved by the ECO.</li> <li>2. All surfaces hardened due to construction activities are to be ripped and imported material thereon removed.</li> <li>3. All rubble is to be removed from the site to an approved disposal site as approved by the ECO. Burying of rubble on site is prohibited.</li> <li>4. The site is to be cleared of all litter.</li> <li>5. The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials.</li> <li>6. Fences, barriers and demarcations associated with the construction phase are to be removed from the site.</li> </ol>	<p>Weekly</p>	<p>Main Contractor, Project Manager &amp; ECO</p>









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ASPECT & ASSOCIATED IMPACTS	ENVIRONMENTAL MEASURES AND CONTROLS	MONITORING FREQUENCY	RESPONSIBILITY
	<p>7. All residual stockpiles must be removed to spoil or spread on site as directed by the ECO.</p> <p>8. All leftover building materials must be returned to the depot or removed from the site.</p> <p>9. The Contractor must repair any damage that the construction works has caused to neighbouring properties, specifically, but not limited to, damage caused by poor storm water management.</p> <p><b>Waste disposal</b></p> <p>1. Disposal of waste must be in accordance with relevant legislative requirements.</p> <p>2. Waste must be disposed of in the appropriate manner at a licensed disposal site.</p> <p><b>Erosion</b></p> <p>1. Rehabilitation of areas affected by construction activities should ideally commence at the start of the raining season (November).</p> <p>2. Recommended rehabilitation is in the form of active re-vegetation of affected areas, including areas where surface disturbances resulted from construction.</p> <p>3. All partially constructed areas should be completed and prepared for final rehabilitation and re-vegetation;</p> <p>4. All areas where topsoil was removed or placing of monopoles should be landscaped in order to reflect surrounding conditions.</p> <p>5. Erosion monitoring and control should be conducted. This should be in the form of inspections subsequent to rains. Topsoil should be replaced in all areas that were eroded. It is critical that adequate topsoil remains in construction areas, implying that topsoil might need to be supplemented in some areas until such time that a layer of vegetation has stabilised the soil.</p>		

**APPENDIX A:  
LOCALITY MAP**

LOCALITY MAP

Legend

-  Mbumbu Substation
-  Tsakani Alternative 1
-  Tsakani Alternative 2
-  Secondary Road
-  Other Road Access
-  Route 1
-  Route 3
-  Property Boundaries

Scale

1:95 000

RHDHV Ref: T01.PTA.000555

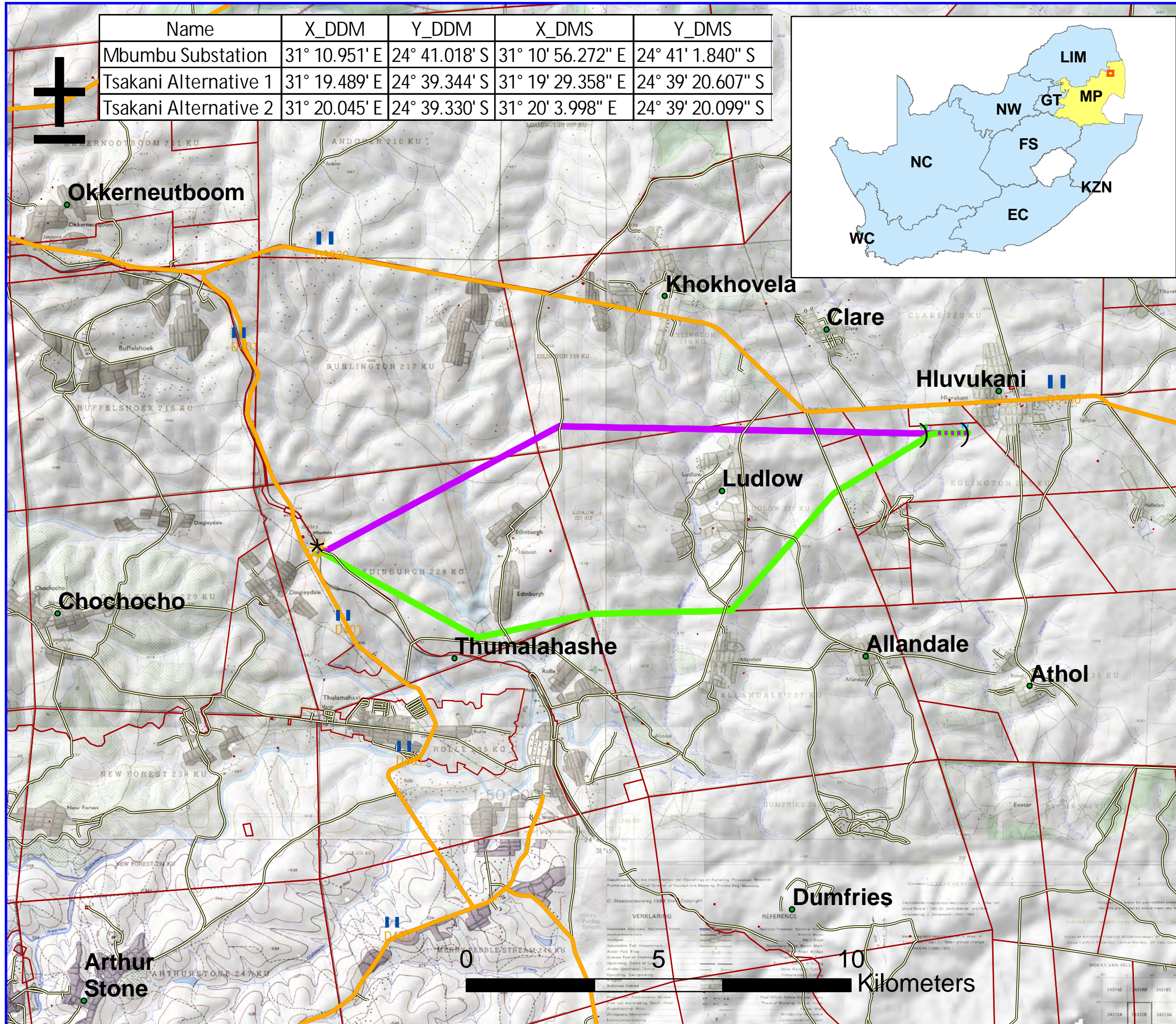
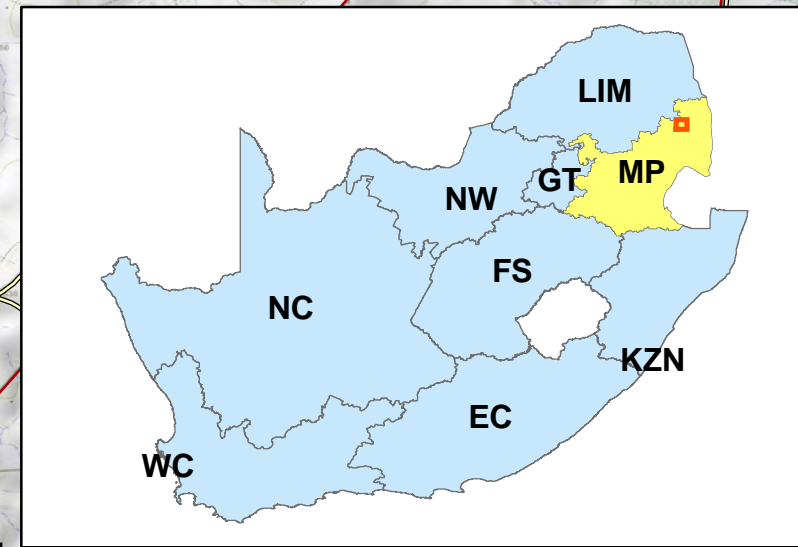
Data Sources:  
MTPA  
SANBI  
DEA  
BLSA  
DWA

Coordinate System: GCS Hartebeesthoek 1994  
Datum: Hartebeesthoek 1994  
Units: Degree

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Name	X_DDM	Y_DDM	X_DMS	Y_DMS
Mbumbu Substation	31° 10.951' E	24° 41.018' S	31° 10' 56.272" E	24° 41' 1.840" S
Tsakani Alternative 1	31° 19.489' E	24° 39.344' S	31° 19' 29.358" E	24° 39' 20.607" S
Tsakani Alternative 2	31° 20.045' E	24° 39.330' S	31° 20' 3.998" E	24° 39' 20.099" S



**APPENDIX B:**  
**ESKOM STANDARD FOR BUSHCLEARING**

**Table D1:** Minimum standards to be used for vegetation clearing for the construction of a new 132 kV Sub-transmission line

Item	Standard	Follow up
Centre line of the proposed Sub-transmission line	Clear to a maximum (depending on tower type and voltage) of an 8 m wide strip of all vegetation along the centre line. Vegetation to be cut within 100 mm of the ground. Treat stumps with herbicide.	Re-growth shall be cut within 100 mm of the ground and treated with herbicide, as necessary.
Inaccessible valleys (trace line)	Clear a 1 m strip for access by foot only, for the pulling of a pilot wire by hand.	Vegetation not to be disturbed after initial clearing – vegetation to be allowed to re-grow.
Access / service roads	Clear a maximum (depending on tower type) 5 m wide strip for vehicle access within the maximum 8 m width, including de-stumping / cutting stumps to ground level, treating with a herbicide and re-compaction of soil.	Re-growth to be cut at ground level and treated with herbicide as necessary.
Proposed tower position and proposed support / stay wire position	Clear all vegetation within proposed tower position and within a maximum (depending on tower type) radius of 5 m around the position, including de-stumping / cutting stumps to ground level, treating with a herbicide and re-compaction of soil. Allow controlled agricultural practices, where feasible.	Re-growth to be cut at ground level and treated with herbicide as necessary.
Indigenous vegetation within servitude area (outside of maximum 8 m strip)	Area outside of the maximum 8 m strip and within the servitude area, selective trimming or cutting down of those identified plants posing a threat to the integrity of the proposed Sub-transmission line.	Selective trimming
Alien species within servitude area (outside of maximum 8 m strip)	Area outside of the maximum 8 m strip and within the servitude area, remove all vegetation within servitude area and treat with appropriate herbicide.	Cut and treat with appropriate herbicide.

**APPENDIX C:**  
**OIL SPILL CLEAN-UP AND REHABILITATION STANDARD**



**STANDARD**

**TITLE: OIL SPILL CLEAN-UP AND REHABILITATION**

REFERENCE                      REV  
**ESKASABT0                      0**  
DATE: **NOVEMBER 2000**  
PAGE    1    OF    11  
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COMPILED BY

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Executive Director (Transmission)**

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## Foreword

This standard has been compiled to set a uniform standard addressing oil spill emergencies and long term action following the need identification by Eskom's Corporate Environmental Affairs Department. The standard addresses the containment and the remediation issues surrounding an oil spill. It also gives a risk rating and response reaction guideline. The standard was compiled following various discussions with staff involved in oil spills as well as response teams from various organizations

NOTE All comments for revising and updating this document must be directed to the Environmental Liaison Committee (ELC), who will in turn liaise with the Technology Standardization Manager.

Queries concerning this standard may be directed to the compilers, Ms A Lombard at Technology Services International (TSI), Rosherville or Mr M Hunter at Distribution, Megawatt Park.

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## Introduction

Insulating oil and other related hydrocarbon and synthetic compounds pose a serious pollution problem when released into the environment. Not only do these compounds pose a fire hazard, but with one litre of oil having the potential to contaminate in excess of a million litres of water, it needs to be handled with care. Oil can rapidly penetrate certain soil types, which may lead to extensive soil contamination as well as ground water and surface water contamination. The Water Act 36 of 1998, states that "hydrocarbons should not touch the soil or water and if they do, they shall be removed immediately".

## 1 Scope

### 1.1 Purpose

The purpose of this standard is to communicate a standard policy and response action following an oil spill on a site. It includes a rating system to enable a risk assessment that will assist with the reporting and especially the level of reporting of an oil spill.

This standard is applicable to any oil handling site and oil containing equipment, which includes distribution, transmission, generation sites as well as all contractors working on Eskom sites. It is of particular importance for employees in oil storage areas, maintenance teams and contractors to be familiar with the contents of this standard.

### 1.2 Applicability

This standard is applicable to all Eskom employees and contractors who in the event of their daily activities come across an oil spill.

## 2 Normative references

The following documents contain provisions that, through reference in the text, constitute requirements of this standard. At the time of publication, the editions indicated were valid. All standards and specifications are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents listed below. Information on currently valid national and international standards and specifications can be obtained from the Information Centre and Corporate Technology Standardization Division at Megawatt Park.

Erickson, MD:1993, *Remediation of PCB Spills*. Lewis publishers, Tokyo.

Waste-tech:1999, *National spill response service*.

MRO Product Management:1999, *Inland oil spill contingency plans*.

Eskom:1999, *NIOSC Insulating Oil Manual*.

ESKADABG8:Rev.0, Directive on oil spill clean-up and rehabilitation.

## 3 Definitions and abbreviations

### 3.1 Definitions

**3.1.1 clean-up:** The action of remediation, this may include soil excavation, bio-remediation, solvent soil wash, landfarming or electrochemical treatment.

**3.1.2 containment:** The prevention of the spreading of the oil spill.

**3.1.3 drip:** Where continuous dripping is taking place and can result in pooling of the oil.

**3.1.4 explosion:** A situation, which occurred due to the rupture of electrical equipment as a result of an electrical fault.

**3.1.5 leak:** A continuous dripping that will result in pooling of oil that will require corrective action as the electrical equipment will have to be topped-up.

**3.1.6 off-site:** A site, road or property not belonging to Eskom.

**3.1.7 on-site:** Any Eskom site (including any Eskom leased site).

**3.1.8 remediation:** A method of clean-up that will ensure a minimum hydrocarbon or synthetic oil presence of 1000 ppm or (0,1 %) above the background level.

**3.1.9 Responsible Person:** The person appointed by the relevant line manager, who will take responsibility during remedial action following a spill. This might be the environmental co-ordinator or the relevant site manager.

**3.1.10 spill:** Any amount of oil present out off its "normal" container – where normal refers to a transformer or a drum etc.

**3.1.11 weep:** Where no free running oil is visible, but the area is damp with oil. It will be an area where dust is accumulating but no effective loss of oil is evident.

## 3.2 Abbreviations

**3.2.1 NIOSC:** National Insulating Oil Steering Committee

**3.2.2 PCB:** polychlorinated biphenyls

**3.2.3 ppm:** parts per million

**3.2.4 TSI:** Technology Services International

**3.2.5 UTO:** used transformer oil

## 4 Requirements

### 4.1 General

An oil spill may be defined as being any amount of oil no longer present in its normal container or equipment. The Water Act, 1998 (Act 36 of 1998) states that "hydrocarbons should not touch the soil or water and if they do, shall be removed immediately". Oil spills can be categorized as being small or large, historic, weep, seep, drip, leaks on Eskom or neighbouring sites or major catastrophic events. However, the immediate prevention and clean-up is considered to be essential in all of the above.

### 4.2 Assessment of the spillage

Assessment of the oil spill will need considerable judgement to perform. Evaluating the cause, extent and ultimate corrective action can be done using the table given in annex A. The assessment shall include the following factors:

- a) identifying the source of the spill;
- b) the age of the spill;
- c) life-threatening conditions;
- d) weather conditions;
- e) properties affected (Eskom, neighbours, National roads);
- f) traffic implications;

- g) threat to any water bodies;
- h) PCB presence;
- j) soil types; and
- k) public relations threat.

### **4.3 Securing of sites**

Where necessary, secure the site and contain the spill to avoid further pollution, determine the spill boundaries, prevent unauthorized access to the spill site and, where required, notify all parties involved. The securing can include barricades, ropes, plastic taping or covers, or any other appropriate measures in order to prevent access or spread of the contamination.

### **4.4 Spill on an Eskom site**

#### **4.4.1 Limit the spillage**

The need for immediate corrective action to limit the spillage cannot be overemphasised as this will minimize the environmental damage and reduce remediation costs. This can involve actions such as:

- a) closing a valve;
- b) repairing the leak with rags, plugs or other appropriate material;
- c) repositioning the container so that the leaking area is at the highest level or lifting a fallen drum/container;
- d) placing a leaking container or equipment into a collecting tray or bund area; and
- e) collecting the spilt oil in a container located underneath the leak or channelling the leak into a container.

#### **4.4.2 Containing the spillage**

The containment of a spillage will involve an action that will either prevent or stop a spill from spreading. It is vital to prevent any oil spill from entering waterbodies such as drains, stormwater systems, dams or rivers. Containment of the oil near the source will minimize pollution and will enable easy clean-up and/or remediation. This shall be done using one or more of the following:

- a) soil barriers;
- b) sand bags;
- c) bund walls; and
- d) absorbent materials.

#### **4.4.3 Removal of oil**

The free oil (puddles) shall be captured and put into a suitable container such as a drum or tanker for proper disposal as soon as possible.

This oil shall not re-enter the Eskom insulating oil pool for regeneration and re-use in electrical equipment.

#### 4.4.4 Final clean-up/remediation

After removal of excess oil, saw dust, suitable absorbents or solvents shall be used to complete the clean-up of the spill. This might include the removal of leaking equipment, cleaning of pavements, removing contaminated soil and vegetation, as well as disposing of clean-up equipment. The absorbing material shall be bagged and disposed of at a class HH registered site.

PCB material shall be incinerated, encapsulated or de-chlorinated following consultation with NIOSC who will advise on the most viable option.

#### 4.4.5 Bio-remediation/Landfarming

Bio-remediation/landfarming are based on the principle of stimulating the relevant microbes in order to break down the hydrocarbon molecules present in an oil spill. Landfarming will entail treatment of the soil away from the affected area, whereas bio-remediation will be done in-situ. Generally these processes may need stimulation or human intervention and are normally performed after the initial remediation phase to ensure total remediation of the site. These processes will need to be completed by bio-remediation /landfarming specialists in accordance with Eskom's approved supplier/contractor list.

#### 4.5 Spill on a non-Eskom site

This shall be considered as a major spill greater than 25 points on the assessment scale in annex A and shall be treated as such.

#### 4.6 Recommended spill kit

To allow for a rapid response and clean-up to an oil spill, it is mandatory for all Eskom sites and vehicles handling oil to have access to a recommended basic spill kit. The vehicle kit shall be a smaller version of the site spill clean-up kit, that meets the basic requirements for the volume of oil transported. This shall be used in the event of a spill that is less than 12 points as assessed using the table in annex A.

Adequate and relevant training shall be given to all staff, maintenance teams and contractors working with oil on an Eskom site. This shall involve the actions to be taken following an oil spill as well as the use of the recommended oil spill kit.

The recommended oil spill kit shall contain the following:

- a) 2 pairs of latex or neoprene gloves;
- b) 20 heavy duty disposable bags (rubbish bags);
- c) 1 shovel;
- d) 1 hard bristle broom;
- e) 5 absorbent pads;
- f) 3 bags of absorbent material (cellulosic or other efficient material); and
- g) 1 pair of plastic goggles.

If a station or site is close to surface water, oil absorbing material for removal and containment of oil on water shall form part of the standard kit.

#### 4.7 Remediation contractors

Because of the emergency situation surrounding an oil spill clean-up, and to avoid bureaucratic delays in

established on an “as and when required” basis with approved and relevant hazardous or emergency response teams. This will involve the availability of such a team, and agreement on relevant costs if an unforeseen event occurs.

#### **4.8 Testing**

Samples for both hydrocarbon and PCB content or other synthetic oil level evaluation shall be taken and submitted to TSI or approved laboratories for analysis. This shall form part of the evaluation of the oil spill assessment as well as the remediation procedure and prior to final payment, to ensure compliance with the relevant legislation.

#### **4.9 Oil storage**

To limit any potential oil spill, it is recommended that all sites where insulating oil is stored are accredited in terms of Eskom’s NIOSC manual. For all other oils, the relevant Eskom standards shall be adhered to.

UTO removed from equipment shall be promptly salvaged and returned to the closest, authorized regeneration facility after its removal from the equipment.

#### **4.10 Reporting**

All oil spills shall be assessed using the standard formats in annexes A and B. The completed forms shall be copied to the environmental co-ordinator who shall ensure that all appropriate reporting is carried out in accordance with the latest legislation.

#### **4.11 Training**

The Environmental co-ordinators responsible for the site shall ensure that appropriate training is given in the use of the spill equipment, reporting and emergency response procedures.

#### **4.12 Preventive measures**

Prevention remains better than cure and for this reason each spill shall be evaluated and analysed and appropriate preventive measures adopted. Any oil site design or facility shall be evaluated using relevant tools such as the Electrical Power Research Institute (EPRI) Mineral Oil Spill Evaluation System (MOSES) MP software that is available to the Eskom line groups.

**Annex A**

(normative)

**Model oil spill assessment table**

Using your judgement and the facts available, allocate the relevant points (1, 3 or 5) to each of the following and add them together. The cumulative score will dictate the appropriate corrective action.

Condition	1	2	5
<b>Source of the spill</b>	<b>Weep</b>	<b>Drip/Leak</b>	<b>Explosion/Incident</b>
Age of spill	Historic	Happened recently - spill still moist	Happened within last 24 h
Threat to any waterbody	No threat	Threat with rain	Access to waterway
Containment	Leak is minor – can be controlled, contained and plugged with oil spill kit	Leak is moderate – cannot be successfully managed with spill kit.	Leak is serious, containment is impossible
Life threatening Conditions	Not at all	Moderate (Environmental or health risk only)	Serious (Explosion, fire, health and major environmental)
Weather conditions	Good weather and will last until spill is cleared	Moderate, but may change suddenly to weather conditions which will hamper containment	Raining
Properties affected	None	On-site (Only Eskom's property is affected)	Off-site (Eskom's neighbouring properties and public roads) <b>≈25 points</b>
Public relations threat	Small	Medium	Large
Soil types	Clay or compacted ground	Loose or loam soil	Sandy soil and Gravel
Traffic implications	Not on any road	Public road	Road closed
PCB presence*	None	Less than 50 ppm in the oil	Over 50 ppm in the oil will automatically get <b>≈25 points</b>
<b>Total score</b> <input type="text"/>	<b>Sub total</b>	<b>Sub total</b>	<b>Sub total</b>

Signature \_\_\_\_\_ Name \_\_\_\_\_ Date \_\_\_\_\_ Site \_\_\_\_\_

**Annex A**  
(concluded)

<b>Minor spill</b> <b>£ 12 points</b>	<b>Moderate spill</b> <b>13 – 24 points</b>	<b>Major spill</b> <b>≈ 25 points</b>
Clean-up must be performed and a report issued to the relevant Environmental co-ordinator	Contain and call in the assistance of the Environmental co-ordinator	Contain, call on Environmental co-ordinator who will assess the situation and if needed call upon an emergency response team

\*If the PCB levels of the oil are not known through prior testing, the spill shall be treated as a PCB spill, until such time that analysis proves otherwise.



**Annex B**

(normative)

**Model oil spill feedback form**

Please attach additional notes if necessary or if the space supplied is not sufficient

1	Give a short description of the oil spill incident.	
2	Give a short description on the following: -What was done immediately after the spill was discovered? -Could it be contained and how? -Was an emergency team involved and was it a contracted team? -Was free oil evident, how was this removed and what happened to this oil? -Has final remediation begun and what is being done? -Were PCB test results available and during which phase was this established?	
3	Which role did you fulfill within the process?	
4	How many litres of oil were involved?	
5	How big was the area that was polluted?	
6	Did any water pollution occur in the following areas? -trap dam -river -dam (water supply) -streams -underground	
7	How would you describe the incident – major or minor?	
8	Were there any other hazards or issues that needed attention?	
9	What were the weather conditions? -wind -temperature -precipitation, for example, rain or fog	
10	What were the causes - please explain? -human -technical -physical -organizational	
11	What was affected? -installation - describe -establishment -off-site local -off site regional	
12	How many people were affected? -staff -locals Describe the possible risks.	

**Annex B**  
(concluded)

13	What were the ecological effects? -pollution/contamination/damage -residential area -common wild fauna/flora -water catchment areas -land -marine or other fresh water	
14	What were the material losses (in Rands)? -material (costs to Eskom) -response -clean-up -restoration	
15	Was any community life disrupted?	
16	Was any utility such as electricity, sewage or water interrupted?	
17	Was there significant public concern?	
18	Who was notified within Eskom?	
19	Who was notified outside of Eskom?	
20	What lessons were learnt from this? -measures to prevent recurrence -measures to mitigate consequences -useful references	
21	Did you experience a lack of: -guidance -expertise -standards -directives -reference material -Eskom assistance -Outside assistance	
22	Any recommendations	
23	Any other comments	

Name \_\_\_\_\_ Signature \_\_\_\_\_

Date \_\_\_\_\_ Site \_\_\_\_\_