PROPOSED RE-ALIGNMENT OF THE AUTHORISED POWER LINE AND WATERCOURSE CROSSINGS FOR THE LOERIESFONTEIN 2 WIND ENERGY FACILITY, NORTHERN CAPE PROVINCE

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)
DEA REFERENCE NUMBER: 14/12/16/3/3/1/1118

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PROJECT DETAILS

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DEFINITIONS AND TERMINOLOGY

Alien species: A species that is not indigenous to the area or out of its natural distribution range.

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Assessment: The process or collecting, organising, analysing, interpreting and communicating information which is relevant.

Biological diversity: The variables among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes they belong to.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing'

alternative also provides the baseline against which the impacts of other alternatives should be compared.

Drainage line: A drainage line is a lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial and riparian vegetation may or may not be present.

Ecosystem: A dynamic system of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

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

Environmental assessment practitioner: An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management plan/ programme: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: 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 (Van der Linde and Feris, 2010;pg 185).

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800

Indirect impacts: Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

National integrated resource plan: Commissioned by NERSA in response to the National Energy Policy's objective relating to affordable energy services, in order to provide a long-term, cost-effective resource plan for meeting electricity demand, which is consistent with reliable electricity supply and environmental, social, and economic policies.

Perennial and non-perennial: Perennial systems contain flowing or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contain flows for short periods, such as a few hours or days in the case of drainage lines.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Riparian: the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Waste: Any substance, whether or not that substance can be reduced re-used, recycled and recovered; that is surplus, unwanted, rejected, discarded, abandoned or disposed of which the generator has no further use for the purposes of production. Any product which must be treated and disposed of, that is identified as waste by the minister of Environmental affairs (by notice in the Gazette) and includes waste generated by the mining, medical or other sectors, but: A by-product is not considered waste, and portion of waste, once re-used,

recycled and recovered, ceases to be waste (Van der Linde and Feris, 2010; pg 186).

Wetland: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin et al., 1979).

Water course: as per the National Water Act means -
(a) a river or spring;
(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows; and
(d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks

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APPENDICES

PROJECT DETAILS *CHAPTER 1*

South Africa Mainstream Renewable Power Loeriesfontein 2 (Pty) Ltd obtained environmental authorisation from the National Department of Environmental Affairs (DEA) for the proposed Loeriesfontein 2 Wind Energy Facility on a site near Loeriesfontein in July 2013 (DEA reference: 12/12/20/2321/3/1A & 12/12/20/2321/1). The project has also received preferred bidder status under Round 3 of the Department of Energy's (DoE) Renewable Energy Independent Power Producers (IPP) Procurement Programme. The environmental authorisation for the Loeriesfontein 2 wind energy facility for a 140MW wind energy facility included a power line linking the project to the existing Helios Substation. However, the alignment of the power line needs to be changed due to technical requirements. In addition, the environmental authorisations did not include the activities associated with impacting on or development within 32 metres of watercourses. However, through detailed planning, it has been determined that the access roads will encroach onto drainage lines within the development site and some infrastructure will be located within these drainage lines.

The re-alignment of the power line and drainage lines that will be impacted on due to watercourse crossings are proposed on Portions 1 and 2 of Farm Aan De Karree Doorn Pan 213 and the remaining portion of Farm Sous 226, which are located approximately 50 km north of Loeriesfontein in the Northern Cape. Refer to Figure 1.1.

A new application for environmental authorisation was accepted by DEA (DEA reference number: 14/12/16/3/3/1/1118) and pertains to the following infrastructure that triggers a basic assessment process and which is associated with the Loeriesfontein 2 Wind Energy Facility:

» The re-alignment of the authorised 132 kV power line
» Access roads and infrastructure (three culverts) which will impact on water courses (and be developed within 32 metres from a water course)

The re-alignment of the power line and water crossings that will be impacted on due to construction of culverts are proposed on Portions 1 and 2 of Farm Aan De Karree Doorn Pan 213 and the remaining portion of Farm Sous 226, which are located approximately 50 km north of Loeriesfontein in the Northern Cape Province. Refer to Figure 1 for a locality map for the power line. Refer to Figure 1.2 and 1.3 for the locations for the three culverts.

This EMPr is applicable to all South Africa Mainstream Renewable Power Loeriesfontein 2 employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the Loeriesfontein 2 wind energy facility, including the power line and watercourse crossings. The document will be adhered to, updated as relevant throughout the project life cycle. As these activities fall within the approved Loeriesfontein 2 wind energy facility site, this EMPr should be read in conjunction with the EMPr for the Loeriesfontein Wind Energy Facility (approved by the DEA in July 2013).

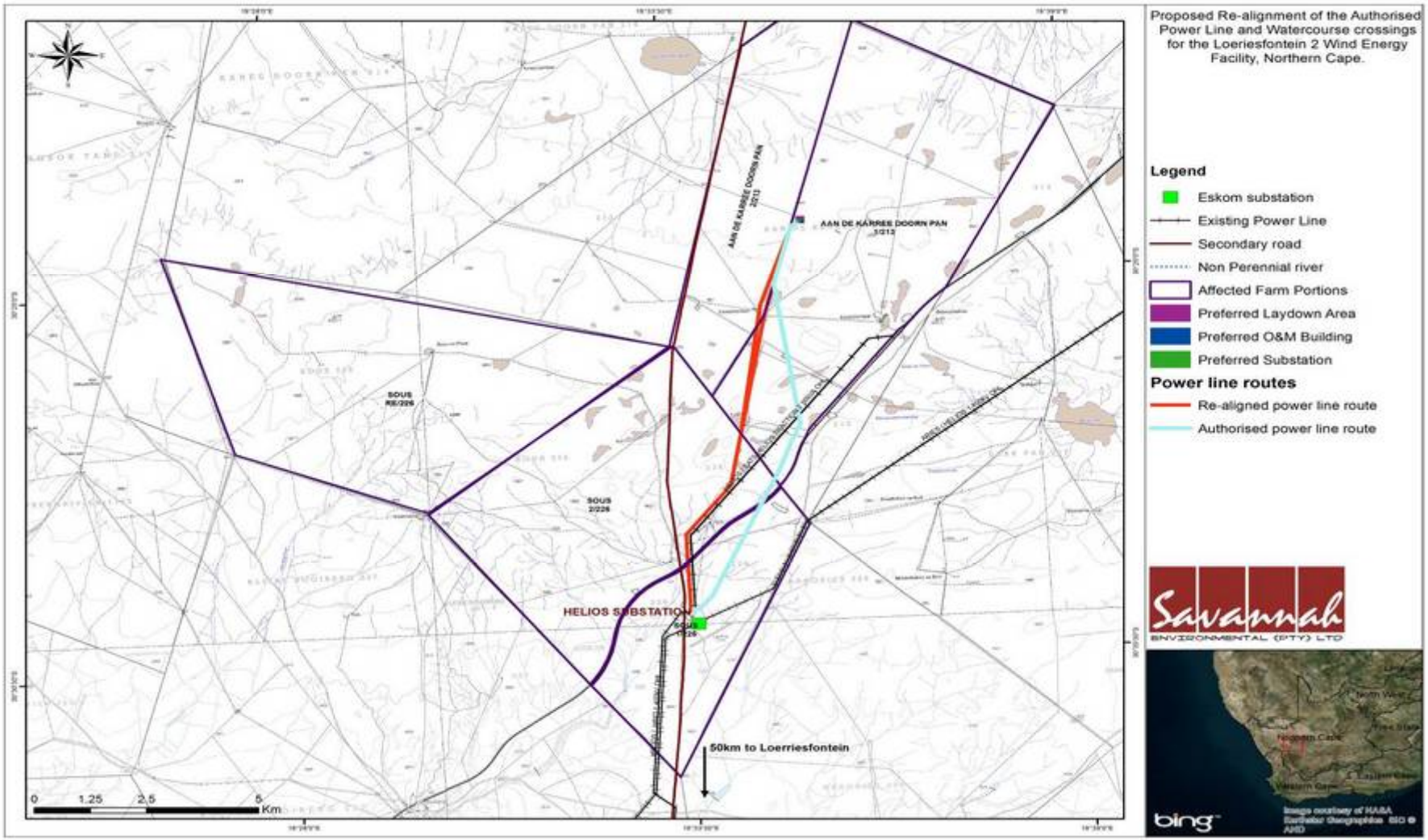

Figure 1.1: Site layout plan for the proposed re-alignment of the authorised power line for the Loeriesfontein 2 Wind Energy Facility

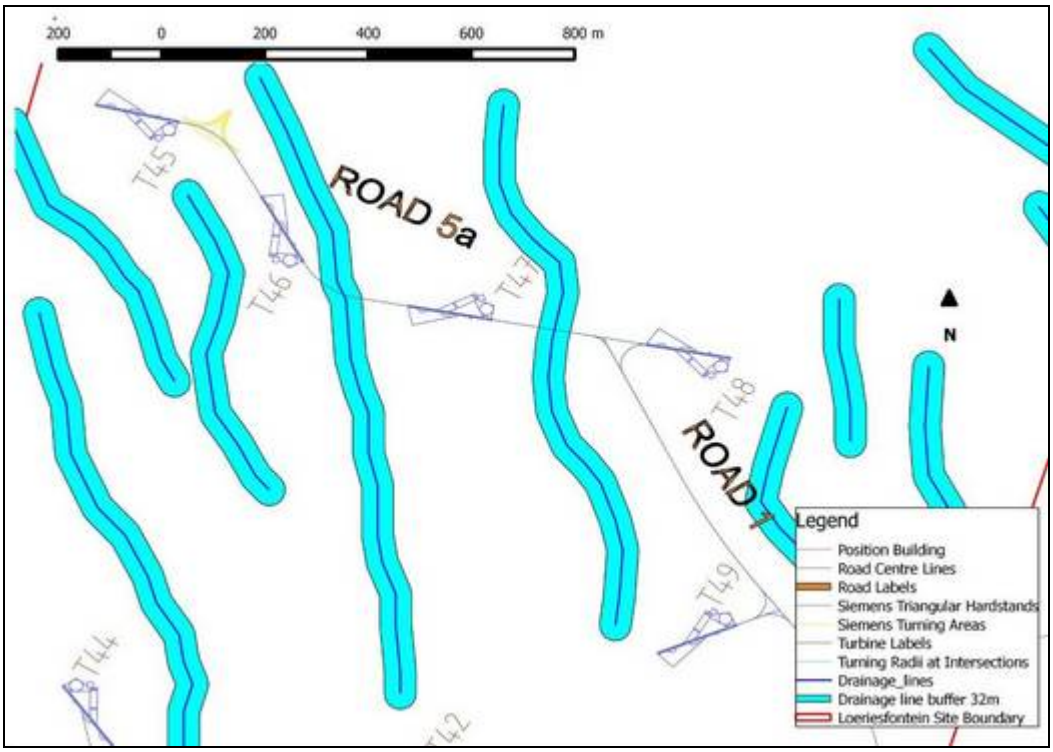

Figure 1.2: A zoomed in map of Road 5a and the associated watercourses (drainage lines)

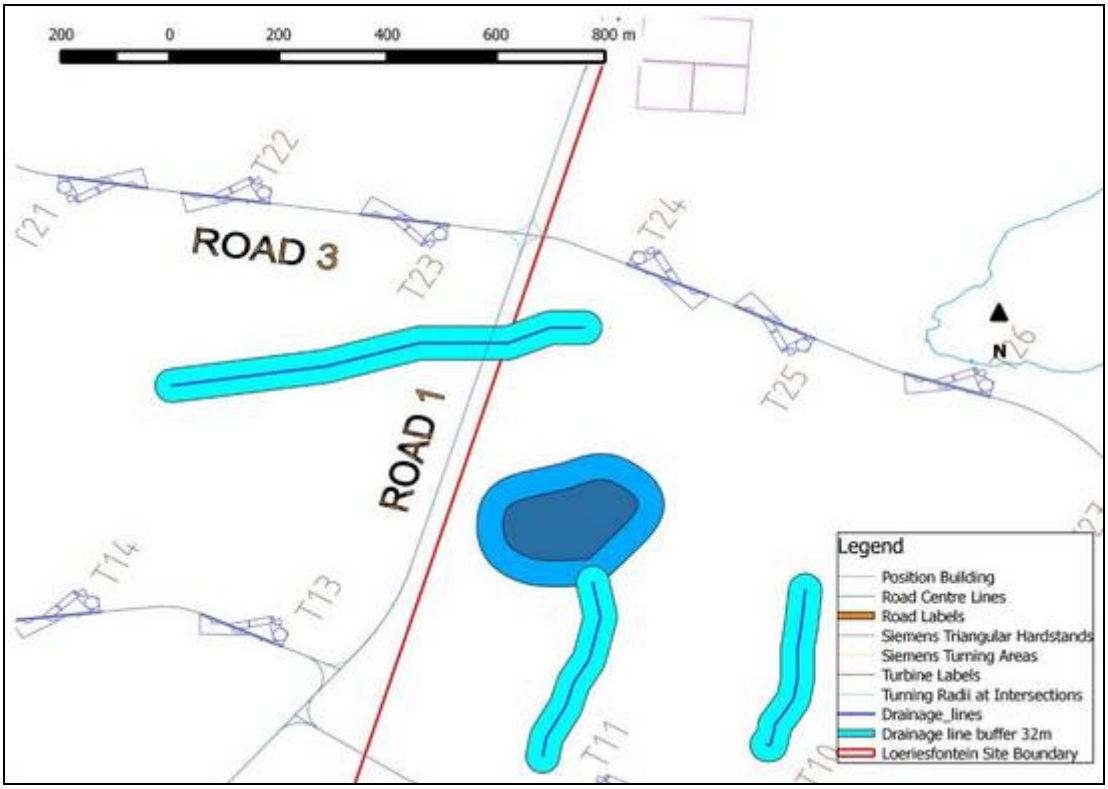

Figure 1.3: A zoomed in map of Road 1 and the associated watercourses (drainage lines)

1.1. Potential impacts

Potential impacts that could occur from the proposed power line and (as per the conclusion of the Basic Assessment report) include:

» **Ecology:** Due to the small footprint of the power line, (tower footprints within 31 metre servitude and an 11km power line) with its limited access road and linear nature, many of the impacts on flora and fauna will be reduced with effective management of the site as well as through the implementation of rehabilitation after construction. The impact on ecology is expected to be of **low significance** due to the limited footprint of the development. For the plant species of special concern, it is recommended that these species are identified within the development footprint and rescued before construction commences.

» **Avifauna:** The proposed site has very low avifaunal species richness. However, Ludwig's Bustard was observed on site. The proposed power line will possibly affect populations of this species in terms of collision and electrocution mortality risk, unless commitment is made to mitigating these effects. The length of the power line is however relatively short and the overall impact resulting from collisions is likely to be low. Therefore, if no mitigation is implemented, the impacts on birds as a result of the 132kV power line may have a **High to moderate** significance. With the implementation of mitigation measures, this impact can be reduced to one of **low to moderate significance.** Responsible implementation of the required mitigation measures should therefore reduce impacts to sustainable levels.

» **Heritage:** Few significant heritage resources were located on the proposed power line route. The primary heritage resources were the two old farm houses and their associated cultural landscapes, a graveyard and a small number of archaeological sites. The latter are generally located on hilltops with only very rare and highly weathered artefacts found on the plains. It should be feasible to avoid direct impacts to all identified heritage resources and any significant archaeological sites that cannot be avoided could be easily mitigated. The landscape impacts around the Kareedoornpan house are unavoidable due to other constraints, but this impact is only deemed to be of **medium** local significance. There are therefore no fatal flaws associated with the proposed power line.

» **Visual**: It is not expected that the proposed re-alignment of the power line will significantly alter the significance of the visual impacts associated with the Loeriesfontein 2 wind energy facility as the power line will be contained within the footprint of this facility. Visual impacts of the power line will be of a **low significance**.

» **Social:** the proposed power line will have a positive impact through the creation of employment and transfer of skills to the local people. Negative impacts of the power line will be limited.
» **Cumulative impacts:** the cumulative impacts on ecology, heritage, avifauna and social will be low considering the existing infrastructure and the proposed infrastructure (i.e. wind turbines, substation and power lines as part of the Loeriesfontein 2 wind energy facility) in the area.

Potential impacts that could occur from the proposed culverts and (as per the conclusion of the Basic Assessment report) include:

» **Ecology:** Some loss of vegetation is an inevitable consequence of the culverts during construction as excavation has to take place. However, no protected species or species of special concern (flora and fauna) were observed within the wetlands/aquatic areas during site visits. The significance of the impact of the culverts and access roads on water courses will be **low** if mitigation measures are put in place.
» **Aquatic**: the overall impacts on watercourses have significantly been reduced due to the final layout of the Loeriesfontein 2 wind energy facility. The only impacts remaining will be due to the construction of culverts for the support of two new roads and the upgrading of an access road. These culverts will be constructed within perennial drainage line. No protected species or species of special concern were observed within the drainage lines. The significance of the impacts assessed for the aquatic systems after mitigation is considered to be **low**
» **Soil:** Construction activities associated with the culverts create disturbance which may result in erosion and subsequently habitat degradation. There will however only be three culverts constructed on site. Given the small extent of the culvert construction, the significance of the impact is therefore **medium** to **low**. During the operational phase, the culverts are expected to provide a benefit as they will facilitate the flow of the water in the drainage lines under the road, thereby reducing the potential for erosion in these areas.
» **Visual**: The culverts are part of a supporting structure for the wind energy facility. The culverts themselves are not expected to cause visual impacts or alter the sense of place in the area.
» **Social:** the culverts will not have major positive or negative social impacts.
» **Cumulative impacts:** the cumulative impacts on water crossings will be low considering the existing infrastructure and the proposed infrastructure (i.e. wind turbines, substation and power lines) in the area.

An environmental sensitivity map is shown in Figure 1.4 which shows areas of high, medium and low environmental sensitivity for the power line route.

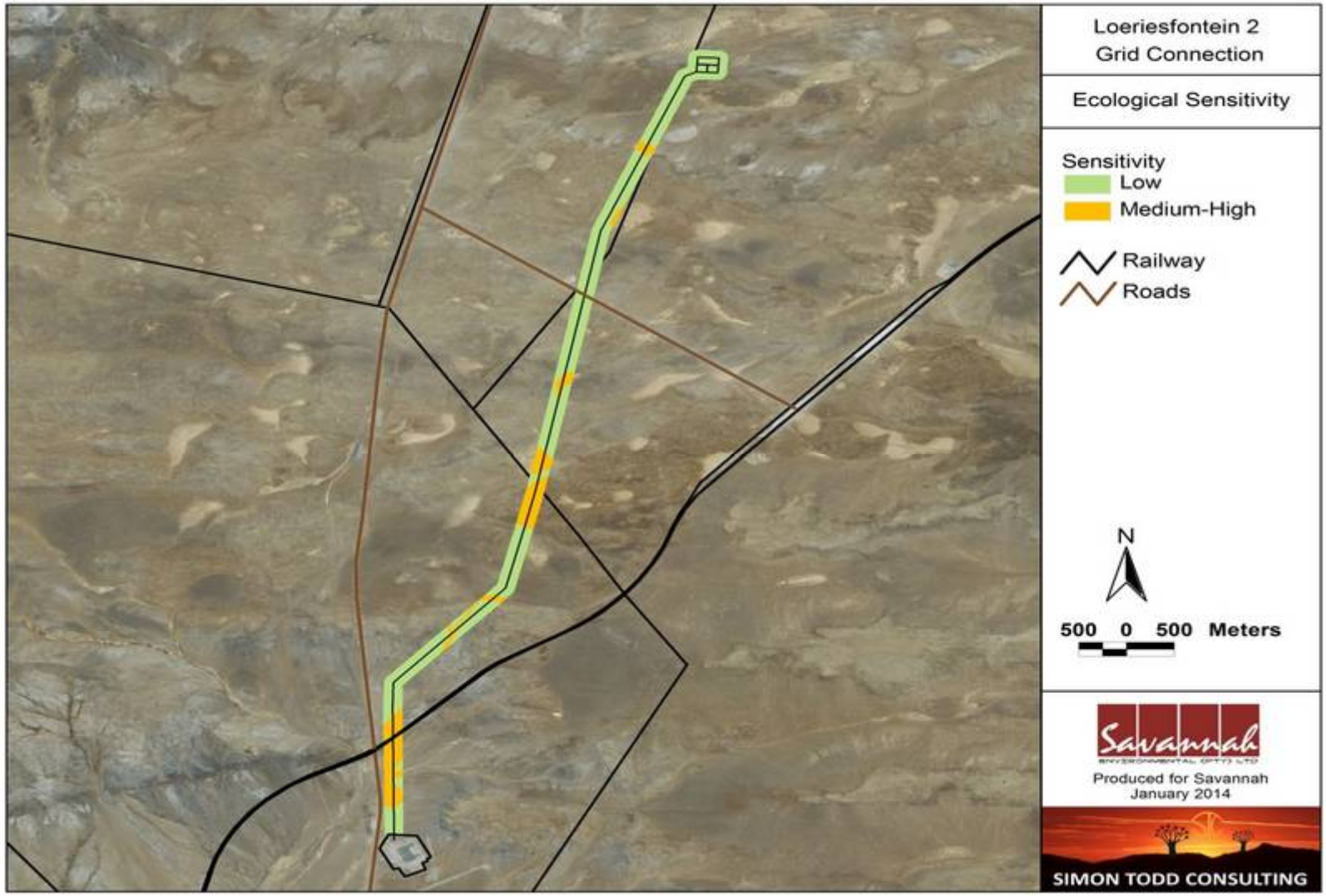

Figure 1.4: Ecological Sensitivity map for the power line corridor for the Loeriesfontein 2 Wind Energy Facility

1.2. Activities and Components associated with the Proposed Power line and culverts

The main activities/components associated with the proposed power line are detailed in the tables which follow.

POWER LINE COMPONENT:

The power line will be approximately 11km in length and have a servitude of 36m in width.

Construction activities and components associated with the proposed power line

Power lines are constructed in the following simplified sequence:

Step 1: Survey the area
Step 2: Final design and placement of the infrastructure
Step 3: Issuing of tenders, and award of contract to construction companies
Step 4: Vegetation clearance and construction of access roads (where required)
Step 5: Construction of foundations
Step 6: Assembly and erection of infrastructure on site
Step 7: Stringing of conductors
Step 8: Rehabilitation of disturbed area and protection of erosion sensitive areas
Step 9: Testing and commissioning
Step 10: Continued maintenance

Operation Phase

The proposed power line will require routine maintenance work throughout the operational period. The site will be accessed using the access roads established during the construction phase.

Decommissioning Phase

The power line is expected to have a lifespan of more than 20 years (with maintenance) and the infrastructure would only be decommissioned once it has reached the end of its economic life or is no longer required. The power line would be completely decommissioned and removed from site. The following decommissioning activities are expected to be undertaken:

a) Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate the required equipment and the mobilisation of decommissioning equipment.

b) Disassemble Components

The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

c) Rehabilitation

Disturbed areas (where infrastructure has been removed) will be rehabilitated, if required, depending on the future land-use of the facility.

CULVERTS COMPONENT:

The three culverts required for the access roads which cross water courses are described below.

Structure Description	Existing or new structure	Perennial, non-perennial drainage line or wetland	Structure type
New road and cable along crossing 1	New	Perennial drainage line	Culvert
New road and cable along crossing 2	New	Perennial drainage line	Culvert
Road upgrade along crossing 7	Upgrade of existing road; new culvert	Perennial drainage line	Culvert

The culverts will typically be constructed as follows:

Step 1: Identify local drainage systems
Step 2: Implement controls against loss of silt
Step 3: Excavate trenches
Step 4: Inspect excavated faces of trenches
Step 3: Prepare culvert base
Step 4: Lower pipe culvert to base
Step 5: Apply jointing material at the joints
Step 6: Seal joints to prevent the ingress of soil
Step 7: Commence with back filling

Table 1.1: Activities associated with the construction of a power line and watercourse crossings

Activity	Description
Pre-construction surveys	Prior to initiating construction, a number of detailed surveys will be required including, but not limited to: » *Geotechnical survey* – the geology and topography of the study area will be confirmed. The geotechnical study will look at flood potential, foundation conditions, potential for excavations, and the availability of natural construction materials. This study will serve to inform the type of foundations required to be built and the extent of earthworks and compaction required in the establishment of any internal access roads. » *Site survey* – this will be required to finalise the design layout of the power line and watercourse crossings. The finalisation will need to be confirmed in line with the Environmental Authorisation issued for the power line and watercourse crossings.
Establishment of access roads	» Access to the site and Helios substation will be upgraded. Existing roads on the farm portion will be used and upgraded where necessary (little to no clearing will be required). » Access track construction (if required) would normally comprise of compacted rock-fill with a layer of higher quality surfacing stone on top. The strength and durability properties of the rock strata at the proposed site are not known at this stage; this will need to be assessed via a geotechnical study to be conducted by the project proponent. » 3 perennial drainage lines will be impacted upon by the upgrade and construction of roads for the wind energy facility. A water use license has been applied for in this regard
Undertake site preparation and establish construction camp	» Site preparation activities will include clearance of vegetation at the proposed power line towers and watercourse crossings site, temporary lay down area and construction camp. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.
Transport of components and equipment to site	» The components for the proposed power line and watercourse crossings will be transported to site, in sections, by road. The typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, and compaction equipment etc.) as well as components required for the establishment of the power line and watercourse crossings.
Establishment of Laydown Areas on Site	» Laydown and storage areas will be required for the typical construction equipment which will be required on site, and within the development footprint.

Activity	Description
Undertake site rehabilitation	» Once construction is complete and all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the power line, any access points to the site that are not required during the operational phase must be closed and prepared for rehabilitation.

Operation and Maintenance Phase:

The proposed power line is part of the supporting infrastructure for the Loeroesfontein 2 wind energy facility. During the life-span of the wind energy facility, on-going maintenance will be performed and inspections are undertaken. It is anticipated that during this time security, maintenance, supervision and monitoring teams will be required on site. The proposed power line will be operated by Eskom and will require routine maintenance work throughout its lifespan. The site will be accessed using the access roads established during the construction phase.

Activity	Description
Site operation and maintenance	» Security, maintenance, and control room staff will be required on site. » The access to the site and the internal access roads will be maintained during the operational phase. » Maintenance activities associated with the power line include inspections, replacing transformers/cables/ oils etc.

Decommissioning Phase

The infrastructure associated with the power line and the watercourse crossings would only be decommissioned in the event that the Loeriesfontein 2 wind energy facility was decommissioned and the roads and power line were no longer required by the community or landowner. The infrastructure which will be utilised for the Loeriesfontein 2 wind energy facility is expected to have a lifespan of 20 to 30 years (with maintenance). The decommissioning activities of the wind turbines and all associated infrastructure would need to comply with the legislation relevant at the time.

PURPOSE AND OBJECTIVES OF THE EMPR CHAPTER 2

An Environmental Management Programme (EMPr) is defined as "an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts associated with the planning, construction, operation and decommissioning of a project are avoided or mitigated, and that the positive benefits of the projects are enhanced."[1] The objective of this EMPr is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMPr is to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation. An effective EMPr is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (i.e. site clearing and site establishment), during the construction activities themselves (i.e. erosion, noise, dust, and visual impacts), during site rehabilitation (i.e. soil stabilisation, re-vegetation), during operation and during decommissioning (i.e. similar to construction phase activities).

This EMPr has been compiled in accordance with Section 33 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

This EMPr has the following objectives:

» Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction and rehabilitation, operation, and decommissioning phases of the project in order to manage and

[1] Provincial Government Western Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

minimise the extent of potential environmental impacts associated with the power line and watercourse crossings.

» Ensure that all the phases of the project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
» Identify entities responsible for the implementation of the measures and outline functions and responsibilities.
» Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
» Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the EIA process.

The management and mitigation measures identified within the Environmental Basic Assessment (BA) process are systematically addressed in this EMPr, and ensure the minimisation of adverse environmental impacts to an acceptable level.

South Africa Mainstream Renewable Power Loeriesfontein 2 (Pty) Ltd must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr and through its integration into the contract documentation. Since this EMPr is part of the EIA process, it is important that this document be read in conjunction with the Basic Assessment Report compiled for this project. This will contextualise the EMPr and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the environmental authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

To achieve effective environmental management, it is important that Contractors are aware of their responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Contractors obligations in this regard include the following:

» Ensuring that employees have a basic understanding of the key environmental features of the construction site and the surrounding environment.
» Ensuring that a copy of the EMPr is readily available on-site, and that all site staff are aware of the location and have access to the document. Employees must be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the facility.
» Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an appropriate Environmental Awareness Training course. The course must provide the site staff with an appreciation of the project's environmental requirements, the EMPr specifications, and how they are to be implemented.
» Basic training in the identification of archaeological sites/objects, and protected or Red List flora and fauna that may be encountered on the site.
» Awareness of any other environmental matters, which are deemed to be necessary by the ECO.

This EMPr shall be binding on all the parties involved in the construction and operational phases of the project, and shall be enforceable at all levels of contract and operational management within the project.

STRUCTURE OF THIS EMPR CHAPTER 3

The first two chapters provide background to the EMPr and the proposed project, while the chapters which follow consider the following:

» Key legislation applicable to the development;
» Planning and design activities;
» Construction activities;
» Operation activities; and
» Decommissioning activities.

These chapters set out the procedures necessary for the construction of the proposed power line and watercourse crossings to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The EMPr has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions, monitoring requirements and performance indicators. A specific EMPr table has been established for each environmental objective. The information provided within the EMPr table for each objective is outlined below.

OBJECTIVE: Description of the objective, which is necessary to meet the overall goals; which take into account the findings of the EIA specialist studies

Project Component/s	» List of project components affecting the objective.
Potential Impact	» Description of potential environmental impact if objective is not met.
Activity/Risk Source	» Description of activities which could affect achieving objective.
Mitigation: Target/Objective	» Description of the target and/or desired outcomes of mitigation.

Mitigation: Action/Control	Responsibility	Timeframe
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures?	Periods for implementation.

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the EMPr.
Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

The objectives and EMPr tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

» Planned activities change;
» Modification to or addition to environmental objectives and targets;
» Relevant legal or other requirements are changed or introduced; or
» Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

Any changes made must be approved by DEA prior to implementation thereof.

3.1. Project Team for Compilation of the EMPr

This EMPr was compiled by:

» *Ravisha Ajodhapersadh* – holds an Honours Bachelor of Science degree in Environmental Management and has 7 years experience in environmental management and EIAs. She is currently involved in conducting EIA's for renewable energy and other projects across the country.
» *Geraldine Mogashane* holds a National Diploma in Environmental Management. She has 7 months of experience consulting in the environmental field. Her key focus is on environmental impact assessments, public participation, environmental management plans and programmes.
» *Jo-Anne Thomas - Jo-Anne Thomas (registered EAP on this application)* is a registered Professional Natural Scientist and holds a Master of Science degree. She has 16 years' experience consulting in the environmental field with a. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently involved in undertaking siting

processes as well as EIAs for several renewable energy projects across the country

The Savannah Environmental team have extensive knowledge and experience in EIAs and environmental management, having been involved in EIA processes over the past fourteen years. They have managed and drafted EMPs for other electricity transmission and distribution projects throughout South Africa, including major Eskom transmission lines.

ROLES AND RESPONSIBILITIES FOR IMPLEMENTATION OF THE EMPR DURING CONSTRUCTION AND OPERATION CHAPTER 4

Note that the roles and responsibilities adopted for the Loeriesfontein 2 wind energy facility will apply to the power line and culverts, however a potential outline of roles and responsibilities are provided below.

4.1. Roles and Responsibilities for the Construction Phase

As the Proponent, South Africa Mainstream Renewable Power Loeriesfontein 2 (Pty) Ltd must ensure that the implementation of the power line and culverts complies with the requirements of any and all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMPr, and the implementation of the EMPr through its integration into the contract documentation. South Africa Mainstream Renewable Power Loeriesfontein 2 (Pty) Ltd will retain various key roles and responsibilities during the construction of the power line, culverts and larger wind energy facility. These are outlined below. Formal responsibilities are necessary to ensure that key procedures are executed.

Specific responsibilities of the Owner's Representatives; Environmental Control Officer and EPC Contractor for the construction phase of this project are as detailed below.

The **Owner's Representative (i.e. General Manager and/or Site Manager)** will:

» Ensure of all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
» Ensure that South Africa Mainstream Renewable Power Loeriesfontein 2 (Pty) Ltd and its Contractor(s) are made aware of all stipulations within the EMPr.
» Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
» Be knowledgeable with the contents of all relevant licences and permits.
» Be conversant with the Environmental Impact Assessment for the project, the EMPr, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.

The **Owner's Engineer (i.e. Project Manager and/or Site manager)** will:

» Be knowledgeable with the contents of the Environmental Impact Assessment.
» Be knowledgeable with the contents and conditions of the Environmental Authorisation.
» Be knowledgeable with the contents of the Environmental Management Programme.
» Be knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
» Have overall responsibility of the EMPr and its implementation.
» Conduct audits to ensure compliance to the EMPr.
» Ensure there is communication with the Owner's Representative, the Environmental Control Officer and relevant discipline Engineers on matters concerning the environment.
» Be knowledgeable with the contents of all relevant licences and permits.
» Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
» Confine activities to the demarcated construction site.

An independent[2] **Environmental Control Officer (ECO)** must be appointed by the project proponent prior to the commencement of any authorised activities and will be responsible for monitoring, reviewing and verifying compliance by the Contractor with the environmental specifications of the EMPr and the conditions of the Environmental Authorisation Accordingly, the ECO will:

» Be fully knowledgeable with the contents with the Environmental Impact Assessment.
» Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
» Be fully knowledgeable with the contents with the Environmental Management Programme.
» Be fully knowledgeable of all the licences and permits issued to the site.
» Be fully knowledgeable of the content of the water use licence and the authorisation granted from the department of forestry and fisheries.
» Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
» Ensure that the contents of this document are communicated to the Contractor site staff and that the Owner's Representative and Contractor are constantly made aware of the contents through discussion.

- Ensure that the compliance of the EMPr, EA and the legislation is monitored through regular and comprehensive inspection of the site and surrounding areas.
- Ensure that if the EMPr, EA and/or the legislation conditions, regulations or specifications are not followed then appropriate measures are undertaken to address any non-compliances (for example an ECO may cease construction or an activity to prevent a non-compliance from continuing).
- Implement monitoring and verification to ensure that environmental impacts are kept to a minimum, as far as possible.
- Ensure that activities on site comply with all relevant environmental legislation.
- Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMPr, in line with the South African Labour laws and EPC contractors policies. This process includes: a verbal warning / written warning / removal from site.
- Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- Ensure that the compilation of progress reports for submission to the Owner's Representative, with input from the Owner's Representative, takes place on a regular basis, including a final post-construction audit.
- Ensure that there is communication with the Owner's Representative regarding the monitoring of the site.
- Ensure that any non-compliance or remedial measures that need to be applied are reported.
- Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
- The ECO must maintain the following on-site:
    - a site diary
    - copies of all reports submitted to DEA
    - a schedule of current site activities including the monitoring of such activities

As a general mitigation strategy, the Environmental Control Officer (ECO) should be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, facilitate environmental induction with construction staff and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). However, in the absence of the ECO there should be a designated environmental officer present to deal with any environmental issues that may arise such as fuel or oil spills. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

Contractors and Service Providers (i.e. EPC Contractor plus all service providers): All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

» Ensuring adherence to the environmental management specifications.
» Ensuring that Method Statements are submitted to the Owner's Representative for approval before any work is undertaken. Any lack of adherence to this will be considered as non-compliance to the specifications of the EMPr.
» Ensuring that any instructions issued by the Owner's Representative on the advice of the ECO are adhered to.
» Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
» Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO.
» Ensuring that a register of all public complaints is maintained.
» Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations).

Contractor's Environmental Officer: The EPC Contractor's Environmental Officer (EO) is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the EO must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Owner's Engineer and Contractor.

The Contractor's EO should:
» Be well versed in environmental matters.
» Understand the relevant environmental legislation and processes.
» Understand the hierarchy of Environmental Compliance Reporting, and the implications of Non-Compliance.
» Know the background of the project and understand the implementation programme.
» Be able to resolve conflicts and make recommendations on-site in terms of compliance.
» Keep accurate and detailed records of all EMPr-related activities on site.

Roles and responsibilities should be confirmed at the commencement of the construction phase. This section of the EMPr should be updated to reflect any changes in this regard.

4.2. Roles and Responsibilities for the Operation Phase of the Power Line and Culverts

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the South Africa Mainstream Renewable Power Loeriesfontein 2 (Pty) Ltd / Eskom's Operations Manager, and Environmental Manager for the operation phase of this project are detailed below.

The **Facility Manager** will:

» Ensure that adequate resources (human, financial, technology) are made available and appropriately managed for the successful implementation of the operational EMPr.
» Conduct annual basis reviews of the EMPr to evaluate its effectiveness.
» Take appropriate action as a result of findings and recommendations in management reviews and audits.
» Provide forums to communicate matters regarding environmental management.

The **Environmental Manager** will:

» Develop and Implement an Environmental Management System (EMS) for the wind energy facility and associated infrastructure.
» Manage and report on the facility's environmental performance.
» Maintain a register of all known environmental impacts and manage the monitoring thereof.
» Conduct internal environmental audits and co-ordinate external environmental audits.
» Liaise with statutory bodies such as the National and Provincial Department of Environmental Affairs (DEA) on environmental performance and other issues.
» Conduct environmental training and awareness for the employees who operate and maintain the wind energy facility.
» Compile environmental policies and procedures.
» Liaise with interested and affected parties on environmental issues of common concern.
» Track and control the lodging of any complaints regarding environmental matters.

KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT CHAPTER 5

The following legislation and guidelines have informed the scope and content of this EMPr Report:

- National Environmental Management Act (Act No 107 of 1998).
- EIA Regulations, published under Chapter 5 of the NEMA (GNR R545, GNR 546 in Government Gazette 33306 of 18 June 2010).
- Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010).
  - Public Participation in the EIA Process (DEA, 2010).
  - Integrated Environmental Management Information Series (published by DEA)
- International guidelines, including the Equator Principles.

Several other Acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the EIA Report. A review of legislative requirements applicable to the proposed project is provided in Table 5.1.

Table 5.1: Relevant legislative and permitting requirements applicable to the proposed power line and watercourse crossings

Title of the Legislation /Policy/Guideline	Application to the project	Relevant Authority	Compliance requirements
National Environmental Management Act (Act No 107 of 1998)	EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation. In terms of GNR 544 of June 2010, a Basic Assessment process is required to be undertaken for the proposed project	National Department of Environmental Affairs – lead authority. Provincial Environmental Department - commenting authorit.	The final draft of the report will be sent to Northern Cape Department of Environment and Nature Conservation as
National Environmental Management Act (Act No 107 of 1998)	In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised. In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect	Department of Environmental Affairs (as regulator of NEMA).	While no permitting or licensing requirements arise directly, the holistic consideration of the potential impacts of the proposed project has found application in the BA process. The implementation of mitigation measures are included as part of the Draft EMPr and will continue to

Title of the Legislation /Policy/Guideline	Application to the project	Relevant Authority	Compliance requirements
	of a variety of impacts.		apply throughout the life cycle of the project
National Environmental Management: Waste Act (Act No 59 of 2008)	The purpose of this Act is to reform the law regulating waste management in order to protect health and the environment by providing for the licensing and control of waste management activities. To set standards for waste management on the project.	Provincial Environmental Authorities – general waste. National DEA – hazardous waste	Waste handling storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of this Act as detailed in the EMPr for the Illaga CSP facility
National Water Act (Act No 36 of 1998)	In terms of Section 19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing or recurring. In terms of Section 21, a water use license is required for certain identified activities. The impacting on watercourses as is proposed for this project is listed as such an activity and therefore a Water use License will be required to be obtained.	National Department of Water Affairs (as regulator of NWA) Northern Cape DENC	A general permit of licence is required from this legislation for the river and watercourse crossings. Water use licence has been applied for.
National Heritage Resources Act (Act No 25 of 1999)	Section 38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including » the construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length;	South African Heritage Resources Agency (SAHRA)	A permit may be required should heritage sites be unearthed on site during the construction phase

Title of the Legislation /Policy/Guideline	Application to the project	Relevant Authority	Compliance requirements
	» any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent. The relevant Heritage Resources Authority must be notified of developments such as linear developments (such as roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 m^2; or the re-zoning of a site exceeding 10 000 m^2 in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature and extent of the proposed development must be provided. Standalone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of Section 38. In such cases only those components not addressed by the EIA should be covered by the heritage component. An HIA was undertaken for the site as part of the EIA completed for the CSP energy facility.		
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	In terms of Section 57, the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable and protected species in GNR 151 in Government	National Department of Environmental Affairs	As the applicant will not carry out any restricted activity in terms of S57, no permit is required to be obtained in this

Title of the Legislation /Policy/Guideline	Application to the project	Relevant Authority	Compliance requirements
	Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. In terms of GNR 152 of 23 February 2007: Regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA phase of the project to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements at an early stage of the EIA phase. the developer has a responsibility for: » The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations). » Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity. » Limit further loss of biodiversity and conserve endangered ecosystems.		regard A permit would be required for the protected plant species found on site to be disturbed or destroyed by the proposed development

Title of the Legislation /Policy/Guideline	Application to the project	Relevant Authority	Compliance requirements
Conservation of Agricultural Resources Act (Act No 43 of 1983)	Regulation 15 of GNR1048 provides for the declaration of weeds and invader plants, and these are set out in Table 3 of GNR1048. Declared Weeds and Invaders in South Africa are categorised according to one of the following categories: » Category 1 plants: are prohibited and must be controlled. » Category 2 plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread. » Category 3 plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourses and wetlands. These regulations provide that Category 1, 2 and 3 plants must not occur on land and that such plants must be controlled by the methods set out in Regulation 15E.	Department of Agriculture	While no permitting or licensing requirements arise from this legislation, this Act will find application during the BA and will continue to apply throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented. t
National Veld and Forest Fire Act (Act 101 of 1998)	In terms of Section 12 the applicant would be obliged to prepare and maintain firebreaks to ensure that should a veld fire occur on the property, that it does not spread to adjoining land.	Department of Agriculture, Forestry and Fisheries	While no permitting or licensing requirements arise from this legislation, this act will find application during operation of the project in terms of fire prevention and

Title of the Legislation /Policy/Guideline	Application to the project	Relevant Authority	Compliance requirements
	In terms of section 12 the applicant must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. In terms of section 17, the applicant must have such equipment, protective clothing and trained personnel for extinguishing fires.		management. It should be noted that due to the aridity and sensitivity nature of the Northern Province area, burning of firebreaks is not recommended but rather mechanical preparation.
National Forestry Act	In terms of S5(1) no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated". GN 1042 provides a list of protected tree species	Department of Agriculture, Forestry and Fisheries	A permit would need to be obtained for any protected trees that are affected, although none are likely to occur on site
National Environmental management : Air Quality Act (Act 39 of 2004)	S18, S19 and S20 of the Act allow certain areas to be declared and managed as "priority areas" Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards The Act provides that an air quality officer may require any person to submit an atmospheric	Department of Environmental Affairs Northern Cape DENC	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction phase of the project.

Title of the Legislation /Policy/Guideline	Application to the project	Relevant Authority	Compliance requirements
	impact report if there is reasonable suspicion that the person has failed to comply with the Act No permitting or license arises from this legislation. The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the act.		
National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	» In terms of the Biodiversity Act, the developer has a responsibility for: * The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations). * The application of appropriate environmental management tools to ensure integrated environmental management of activities. * Limit further loss of biodiversity and conserve endangered ecosystems. » In terms of S57, a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 4. In this regard the Minister of Environmental Affairs has published a list of critically endangered, endangered,	National Department of environmental Affairs	As the applicant will not carry on any restricted activity in terms of S57, no permit is required to be obtained in this regard.

Title of the Legislation /Policy/Guideline	Application to the project	Relevant Authority	Compliance requirements
	vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. » In terms of S75, (1) The control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs. (2) Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment. (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating, or re-establishing itself in any manner. » In terms of GNR 152 of 23 February 2007: regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA Phase to incorporate the legal provisions as well as the regulations associated with listed threatened		

Title of the Legislation /Policy/Guideline	Application to the project	Relevant Authority	Compliance requirements
	and protected species (GNR 152) into specialist reports in order to identify permitting requirements. » In terms of GNR 1477 of 2009: Draft National List of Threatened Ecosystems published under S52(1)(a) of the Act provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2011). GNR1187 Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List published under S56(1)of the Act.		
Provincial Legislation			
Northern Cape Nature Conservation Act, Act No. 9 of 2009	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such	Northern Cape DENC	Permitting or licensing requirements may arise from this legislation for the proposed activities to be undertaken for the proposed project

Title of the Legislation /Policy/Guideline	Application to the project	Relevant Authority	Compliance requirements
	a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. The Act provides lists of protected species for the Province..		

MANAGEMENT PROGRAMME: PRE-CONSTRUCTION CHAPTER 6

Overall Goal: undertake the pre-construction activities (planning and design phase) in a way that:

» Ensures that the design of the power line and watercourse crossings responds to the identified environmental constraints and opportunities.
» Ensures that pre-construction activities are undertaken in accordance with all relevant legislative requirements
» Ensures that adequate regard has been taken of any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
» Ensures that the best environmental options are selected for the linear components, including the access roads.
» Enables the construction activities to be undertaken without significant disruption to other land uses and activities in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

6.1. Objectives

OBJECTIVE: Ensure the power line and watercourse crossings design responds to identified environmental constraints and opportunities

In order to minimise impacts associated with the construction and operation of the power line and watercourse crossings, the following is required to be undertaken during the final design phase:

» Geotechnical survey – this will investigate flood potential, foundation conditions, potential for excavations, and the availability of natural construction materials. This study will serve to inform the type of foundations required to be constructed for the power line and watercourse crossings, and the extent of earthworks and compaction required in the establishment of the internal access roads.
» A storm-water management plan – this will detail how storm-water runoff (i.e. over engineered hard surfaces) can be managed to reduce velocities and volumes of water that could lead to erosion and potential sedimentation of drainage systems.

The implementation of the EMPr within this area will minimise and/or mitigate impacts on the environment, specifically on the ecology of the project area.

Project Component/s	» Power line. » Watercourse crossings.
Potential Impact	» Design fails to respond optimally to the environmental consideration.
Activities/Risk Sources	» Positioning of all the facilities components. » Construction of the power line » Access road upgrade
Mitigation: Target/Objective	» The design of the power line and watercourse crossings responds to the identified environmental constraints and opportunities. » Site sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	Responsibility	Timeframe
The terms of this EMPr and the Environmental Authorisation (once issued) must be included in all tender documentation and Contractors contracts	Mainstream	Tender process
Where water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (small footprint). This has been proposed by the design team in the prepared design crossings and includes energy dissipation structures such as gabions and reno mattresses.	Mainstream	Design
Undertake a geotechnical pre-construction survey.	Geotechnical specialist	Design
Ecological survey for the final development area should be surveyed for species suitable for search and rescue, which should be translocated prior to the commencement of construction.	Mainstream	Design
Obtain any additional environmental permits required (e.g. permit to impact on protected plant species, water use license to cross drainage lines).	Mainstream	Project planning
Consider and incorporate design level mitigation measures recommended by the specialists as detailed within the Basic Assessment Report and relevant appendices.	Mainstream	Design review
External access point and internal access road to be	Mainstream	Design

Mitigation: Action/Control	Responsibility	Timeframe
carefully planned to maximise road user safety.		
Compile a comprehensive storm water management plan for hard surfaces as part of the final design of the project	Mainstream	Design
Include stormwater management systems along the roads that would reduce flow velocities. Stormwater and any runoff generated by the hard surfaces should be discharged into retention swales or areas with rock rip-rap. These energy dissipation structures should be placed in manner that flows are managed prior to being discharged back into the natural systems, thus not only preventing erosion, but would support the maintenance of natural base flows within these systems, i.e. hydrological regime (water quantity and quality) is maintained	Mainstream	Design
The culvert crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing systems	Mainstream	Design
Bird Diverters are required for the power line	Mainstream	Planning
Bird-friendly power line tower design to be utilised	Mainstream	Design
Identify the exact power line spans requiring marking to reduce the potential for collision.	Developer and ornithologist	Planning
Line to avoid areas with high bird densities or areas which attract birds.	Developer and ornithologist	Planning

Performance Indicator	» The design meets the objectives and does not degrade the environment. » Design and layouts respond to the mitigation measures and recommendations in the Basic Assessment Report.
Monitoring	» Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction.

OBJECTIVE: Minimise storm water runoff (guideline for stormwater management plan)

Management of storm water will be required during the construction and operational phases of the watercourse crossing and power line. A detailed storm water management plan is required to be compiled as part of the final design to ensure compliance with applicable regulations and to prevent off-site migration of

contaminated storm water or increased soil erosion. The section below provides a guideline for the management of storm water on site and will need to be supplemented with the relevant method statements during the construction and operation phases of the power line.

Project Component/s	» Storm water management components. » Any hard engineered surfaces (i.e. access roads).
Potential Impact	» Poor storm water management and alteration of the hydrological regime (i.e. drainage lines).
Activities/Risk Sources	» Construction of the power line and access roads (i.e. placement of hard engineered surfaces).
Mitigation: Target/Objective	» Appropriate management of storm water to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
A Method Statement for the management of storm water which also considers the recommendations below is to be submitted to the ECO prior to the commencement of construction. This Method Statement must be approved by the Site Manager/ Site Engineer prior to implementation.	Mainstream	Pre-construction
Reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system through increased sedimentation.	Mainstream	Planning and design
Appropriately plan hard-engineered bank erosion protection structures (if required).	Mainstream	Planning and design
Ensure suitable handling of storm water within the site (i.e. trapping sediments and reduce flow velocities) through appropriate design of the watercourse crossings.	Mainstream	Construction and operation
Design measures for storm water management needed to allow for surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows.	Mainstream	Planning and design

Performance Indicator	» Appropriate storm water management measures included within the power line and watercourse crossings design. » Sound water quality and quantity management during construction and operation.
Monitoring	» Devise a suitable surface water quality monitoring plan for implementation during construction and operation.

OBJECTIVE: Search and Rescue of All Translocatable Indigenous Plants

Prior to any earthworks (including road construction) within areas of natural vegetation, a plant Search and Rescue program should be developed and implemented. Principles for the Search and Rescue program are included in **Appendix E.** The section below provides a guideline for the Search & Rescue Plan on site and will need to be supplemented with the relevant methodology depending on the final placement of infrastructure.

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Substantially increased loss of natural vegetation at construction phase and waste of on-site plant resources, and lack of locally sourced material for rehabilitation of disturbed areas.
Activities/Risk Sources	» Construction related loss and damage to remaining natural vegetation as a result of heavy machinery, etc.
Mitigation: Target/Objective	» Rescue, maintenance and subsequent replanting of vegetation in development footprints within any areas of natural vegetation on site

Mitigation: Action/Control	Responsibility	Timeframe
Search and Rescue (S&R) of certain translocatable, selected succulents, shrubs and bulbs occurring in long term & permanent, hard surface development footprints (i.e. all buildings, new roads and tracks, laydown areas, and panel positions) should take place. development footprints must be surveyed and pegged out as soon as possible, and then a local horticulturist with Search and Rescue experience should be appointed to undertake the S&R. Rescued species should be bagged (and cuttings taken where appropriate) and kept in the horticulturist's or a designated on-site nursery. These plants should be appropriately maintained (through watering, etc.) at this nursery to ensure viability to reuse in rehabilitation. The plants should be returned to site once all construction is completed and rehabilitation of disturbed areas is required. As far as possible, replanting should only occur in spring or early summer (August to November), once the first rains have fallen, in order to facilitate establishment. If not possible,	Contractor Specialist	Prior to construction

Mitigation: Action/Control	Responsibility	Timeframe
replanted plants should be maintained on the site (through watering, etc.) until re-established.		
Plants that can be considered for rescue are all bulbs and succulents, and certain shrubs.	Contractor	Prior to construction

Performance Indicator	» Horticulturist to submit list of target species to botanist for approval. » Rescue of material. » Replanting in rehabilitation areas to cover 40% of these areas within 3 months of replanting.
Monitoring	» ECO to monitor Search and Rescue. » Horticulturist to liaise with botanist. » Botanist to review rehabilitation success after 3 months of replanting of rehabilitation areas.

OBJECTIVE: To ensure effective communication mechanisms

On-going communication with affected and surrounding landowners is important to maintain during the construction and operational phases of the. Any issues and concerns raised should be addressed as far as possible in as short a timeframe as possible.

Project component/s	» Power line » Watercourse crossings
Potential Impact	» Impacts on affected and surrounding landowners and land uses
Activity/risk source	» Activities associated with construction of the power line and watercourse crossings » Activities associated with power line operation
Mitigation: Target/Objective	» Effective communication with affected and surrounding landowners » Addressing of any issues and concerns raised as far as possible in as short a timeframe as possible

Mitigation: Action/control	Responsibility	Timeframe
Implement a grievance mechanism procedure for the public (as outlined in **Appendix A**) to be implemented during both the construction and operational phases of the power line. This procedure should include details of the contact person who will be receiving issues raised by	Mainstream	Pre-construction (construction procedure) Pre-operation (operation procedure)

Mitigation: Action/control	Responsibility	Timeframe
interested and affected parties, and the process that will be followed to address issues.		
Liaison with landowners is to be undertaken prior to the commencement of construction in order to provide sufficient time for them to plan agricultural activities.	Mainstream	Pre-construction

Performance Indicator	» Effective communication procedures in place.
Monitoring	» An incident reporting system should be used to record non-conformances to the EMPr.

MANAGEMENT PROGRAMME: CONSTRUCTION CHAPTER 6

Overall Goal: Undertake the construction phase in a way that:

» Ensures that construction activities are appropriately managed in respect of environmental aspects and impacts.
» Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, traffic and road use, and effects on local residents.
» Minimises the impact on the indigenous natural vegetation, and habitats of ecological value.
» Minimises impacts on fauna (including birds) in the study area.
» Minimises the impact on heritage sites should they be uncovered.

6.1 Objectives

In order to meet the overall goal for construction, the following objectives, actions, and monitoring requirements have been identified.

OBJECTIVE: Minimise impacts related to inappropriate site establishment

Project Component/s	» Power line infrastructure. » Access roads. » Watercourse crossings.
Potential Impact	» Hazards to landowners and public. » Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located. » Loss of threatened plant species.
Activities/Risk Sources	» Open excavations. » Movement of construction vehicles in the area and on-site.
Mitigation: Target/Objective	» To secure the site against unauthorised entry. » To protect members of the public/landowners/residents. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint.

Mitigation: Action/Control	Responsibility	Timeframe
Secure site, working areas and excavations in an appropriate manner.	Contractor	Site establishment, and duration

Mitigation: Action/Control	Responsibility	Timeframe
		of construction
Where necessary control access, fence, and secure area.	Contractor	Site establishment, and duration of construction
Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access routes.	Contractor	Site establishment, and duration of construction
Fence and secure contractor's equipment camp.	Contractor	Site establishment
The construction camp used to house equipment must be located in a disturbed area and must be screened off as far as practical during the entire construction phase.	Contractor	Erection: during site establishment Maintenance: for duration of Contract
Establish appropriately bunded areas for storage of hazardous materials (i.e. fuel to be required during construction).	Contractor	Site establishment
All unattended open excavations shall be adequately demarcated and/or fenced.	Contractor	Site establishment, and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site.	Contractor	Site establishment, and duration of construction
Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including drainage lines.	Contractor	Site establishment, and duration of construction
Supply adequate waste collection bins at site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling.	Contractor	Site establishment, and duration of construction

Performance Indicator	» Site is secure and there is no unauthorised entry. » No members of the public/ landowners injured. » Appropriate and adequate waste management and sanitation facilities provided at construction site.
Monitoring	» An incident reporting system will be used to record non-

	conformances to the EMPr. » ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances will be immediately reported to the site manager.

OBJECTIVE: Appropriate management of the construction site and construction workers

It is expected that low skilled and semi-skilled positions will be filled by locals living in and around the area. This will however be dependent on the skills availability in the area. Workers not living in the area, including those required for skilled positions will be transported to site on a daily basis and will not be housed on site.

Project Component/s	» Power line » Access roads » Watercourse crossings
Potential Impact	» Damage to indigenous natural vegetation and sensitive areas. » Damage to and/or loss of topsoil (i.e. pollution, compaction etc.). » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities. » Pollution/contamination of the environment.
Activities/Risk Sources	» Vegetation clearing and levelling of equipment storage area/s. » Access to and from the equipment storage area/s. » Ablution facilities. » Contractors not aware of the requirements of the EMPr, leading to unnecessary impacts on the surrounding environment.
Mitigation: Target/Objective	» Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
No vehicles to refuel within drainage lines/ riparian vegetation	Contractor	Construction
The location of this construction camp and lay down areas to be approved by the project ECO.	Contractor	Pre-construction
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Site establishment, and during

Mitigation: Action/Control	Responsibility	Timeframe
		construction
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	Contractor	Duration of Contract
Ensure waste storage facilities are maintained and emptied on a regular basis.	Contractor	Site establishment, and duration of construction
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.	Contractor	Duration of construction
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no ablution activities will be permitted outside the designated areas. These facilities must be regularly serviced by appropriate contractors. A minimum of one toilet shall be provided per 15 persons at each working area such as the Contractor's camp.	Contractor and sub-contractor/s	Duration of contract
Cooking and eating of meals must take place in a designated area. No fires are allowed on site. No firewood or kindling may be gathered from the site or surrounds.	Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	Contractor and sub-contractor/s	Duration of contract
No one other than the ECO or personnel authorised by the ECO may disturb flora or fauna outside of the demarcated construction area/s.	Contractor and sub-contractor/s	Duration of contract
Fire-fighting equipment and training must be provided before the construction phase commences.	Contractor and sub-contractor/s	Duration of contract
Draft and implement a Code of conduct for construction workers.	Contractor and sub-contractor/s	Pre-construction
Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained in the Code of Conduct, specifically consequences of stock theft and	Contractor and sub-contractor/s	Construction

Mitigation: Action/Control	Responsibility	Timeframe
trespassing on adjacent farms.		
No person under the age of 16 should be allowed on site except in a bus or similar vehicle for educational purposes under the supervision of the Site Manager or designated responsible person.	Contractor and sub-contractor/s	Construction

Performance Indicator	» The construction camps have avoided sensitive areas, as approved by the ECO. » Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement. » All areas are rehabilitated promptly after construction in an area is complete. » Excess vegetation clearing and levelling is not undertaken. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Code of Conduct drafted before commencement of construction phase.
Monitoring	» Regular audits of the construction camps and areas of construction on site by the ECO. » Proof of disposal of sewage at an appropriate licensed wastewater treatment works. » Proof of disposal of waste at an appropriate licensed waste disposal facility. » An incident reporting system should be used to record non-conformances to the EMPr. » Observation and supervision of Contractor practices throughout construction phase by the ECO. » Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE: Maximise local employment and business opportunities associated with the construction phase

The unemployment rate in the study area is quite high and there are therefore various individuals in the area in search of employment. Employment of locals and the involvement of local SMMEs would enhance the social benefits associated with the project, even if the opportunities are only temporary. The procurement of local goods could furthermore result in positive economic spin-offs.

Project Component/s	» Construction and establishment activities associated with the establishment of the power line including infrastructure.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/Risk Sources	» The employment of outside contractors to undertake the work and who make use of their own labour will reduce the employment and business opportunities for locals. Employment of local labour will maximise local employment opportunities.
Mitigation: Target/Objective	» Aim to employ a minimum of 80% of the low-skilled workers from the local area. This should also be made a requirement for all contractors. Also develop a database of local BEE service providers

Mitigation: Action/Control	Responsibility	Timeframe
Attempt to employ a majority of the low-skilled workers from the local area.	Mainstream	Employment and business policy document that sets out local employment targets to be in place before construction phase commences.
Where required, implement appropriate training and skills development programmes prior to the initiation of the construction phase to ensure that local employment target is met.	Mainstream	Pre-construction
Skills audit to be undertaken to determine training and skills development requirements.	Mainstream	Within 1-month of commencement of construction phase commences.
Develop a database of local BEE service providers and ensure that they are informed of tenders and job opportunities.	Mainstream	Pre-construction
Identify potential opportunities for local businesses.	Mainstream	Pre-construction

Performance Indicator	» Employment and business policy document that sets out local employment and targets completed before construction phase commences; » Majority of semi and unskilled labour locally sourced. » Database of potential local BEE services providers in place before construction phase commences. » Skills audit to determine need for training and skills

	development programme undertaken within 1 month of commencement of construction phase.
Monitoring	» Monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Minimise impacts related to traffic management and transportation of equipment and materials to site (Traffic Management and Transportation Plan)

The construction phase of the project will be the most significant in terms of generating traffic impacts; resulting from the transport of equipment and materials and construction crews to the site and the return of the vehicles after delivery of materials. Potential impacts associated with transportation and access relate to works within the site boundary and external works outside the site boundary. The components for the proposed power line and watercourse crossings will be transported to site by road. The section below provides a guideline for the Traffic Management and Transportation Plan on site and will need to be supplemented with the relevant final transport plan devised by the EPC partner during the final design phase of the power line.

Project Component/s	» Delivery of any component required within the construction phase.
Potential Impact	» Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals. » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted. » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.
Activities/Risk Sources	» Construction vehicle movement. » Speeding on local roads. » Degradation of local road conditions. » Site preparation and earthworks. » Foundations or plant equipment installation. » Transportation of ready-mix concrete from off-site batching plant to the site. » Mobile construction equipment movement on-site. » Power line construction activities.
Mitigation: Target/Objective	» Minimise impact of traffic associated with the construction of the power line on local traffic volume, existing infrastructure,

	property owners, animals, and road users. » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the power line and watercourse crossings construction » To ensure all vehicles are roadworthy and all materials/ equipment are transported appropriately and within any imposed permit/licence conditions

Mitigation: Action/Control	Responsibility	Timeframe
The contractor's plans, procedures and schedules, as well as the anticipated intrusion impacts should be clarified with affected parties prior to the commencement of construction activities on site.	Contractor	Pre-construction
Source general construction material and goods locally where available to limit transportation over long distances.	Mainstream and Contractor	Pre-construction and construction
Appropriate dust suppression techniques must be implemented to minimise dust from gravel roads.	Mainstream and Contractor	Construction
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-contractor to ensure that these are in good working order and not overloaded.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Contractor	Construction
A designated access to the proposed site must be created to ensure safe entry and exit.	Contractor	Pre-construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
The movement of all vehicles within the site must be on designated roadways.	Contractor	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards).	Contractor	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	Contractor	Duration of contract
All vehicles of the contractor travelling on public roads	Contractor	Duration of

Mitigation: Action/Control	Responsibility	Timeframe
must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.		contract
Appropriate signs must be placed along construction roads to identify speed limits, travel restrictions and other standard traffic control information. Signage must be maintained on an on-going basis and must be clearly visible to all road users.	Contractor	Duration of contract

Performance Indicator	» Vehicles keeping to the speed limits on all roads. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » No construction traffic related accidents are experienced. » Local road conditions and road surfaces are up to standard. » Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).
Monitoring	» Developer and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: To avoid and or minimise the potential impact of the activities during the construction on the safety of local communities and the potential loss of stock and damage to farm infrastructure

An inflow of workers could, as a worst case scenario and irrespective of the size of the workforce, pose some security risks. Criminals could also use the opportunity due to "outsiders" being in the area to undertake their criminal activities.

Project Component/s	» Construction and establishment activities associated with the establishment of the power line, including infrastructure etc.
Potential Impact	» Impact on safety of farmers and communities (increased crime etc.) and potential loss of livestock due to stock theft by construction workers and also damage to farm infrastructure, such as gates and fences.
Activities/Risk Sources	» The presence of construction workers on the site can pose a potential safety risk to local farmers and communities and may result in stock thefts. The activities of construction workers may also result in damage to farm infrastructure.
Mitigation:	» To avoid and or minimise the potential impact on local

Target/Objective	communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Inform all workers of the conditions contained in the Code of Conduct.	Mainstream	Pre-construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc.	Contractors	Construction phase

Performance Indicator	» Code of Conduct developed and approved prior to commencement of construction phase. » All construction workers made aware of Code of Conduct within first week of being employed. » Compensation claims settled within 1 month of claim being verified by Community MF.
Monitoring	» Mainstream and/or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase. .

OBJECTIVE: To avoid and or minimise the potential impact on current and future farming activities during the construction phase.

Project component/s	» Construction phase activities associated with the establishment of the power line and associated infrastructure.
Potential Impact	» The footprint of the power line corridor and associated infrastructure will result in a loss of land that will impact on farming activities on the site.
Activities/risk sources	» The footprint occupied by the power line and associated infrastructure.
Mitigation: Target/Objective	» To minimise the loss of land taken up by the power line and associated infrastructure and to enable farming activities to continue where possible, specifically grazing.

Mitigation: Action/control	Responsibility	Timeframe
Minimise the footprint of the power line and watercourse crossings and the associated infrastructure as far as possible.	Contractor and Mainstream	Pre-construction
Rehabilitate disturbed areas on completion of the construction phase.	Contractors	Construction

Performance Indicator	» Meeting/s held with farmers during construction phase. .
Monitoring	» ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: To avoid and or minimise the potential impacts of safety, noise and dust and damage to roads caused by construction vehicles during the construction phase

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the main and internal access roads.

Project Component/s	» Construction and establishment activities associated with the establishment of the power line, including infrastructure etc.
Potential Impact	» Heavy vehicles can generate noise and dust impacts. Movement of heavy vehicles can also damage roads.
Activities/Risk Sources	» The movement of heavy vehicles and their activities on the site can result in noise and dust impacts and damage roads.
Mitigation: Target/Objective	» To avoid and or minimise the potential noise and dust impacts associated with heavy vehicles, and minimise damage to roads.

Mitigation: Action/Control	Responsibility	Timeframe
Implement appropriate dust suppression measures for heavy vehicles and ensure that vehicles used to transport building materials are fitted with tarpaulins or covers.	Contractors	Duration of Construction
Ensure that all vehicles are road-worthy; drivers are qualified and are made aware of the potential noise, dust and safety issues.	Contractors	Duration of Construction
Ensure that drivers adhere to speed limits. Vehicles should be fitted with recorders to record when vehicles exceed the speed limit.	Contractors	Duration of Construction
Ensure that damage to roads is repaired before completion of construction phase.	Contractors	Duration of Construction

Performance Indicator	» Dust suppression measures implemented for all areas that require such measures during the construction phase. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.

	» Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
Monitoring	» ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Minimisation of development footprint and disturbance to topsoil

In order to minimise impacts on flora, fauna, and ecological processes, the development footprint should be limited to the smallest area possible.

Project Component/s	» Power line » Access roads. » Watercourse crossings
Potential Impact	» Impacts on natural vegetation. » Impacts on soil. » Loss of topsoil.
Activity/Risk Source	» Site preparation and earthworks. » Excavation of foundations. » Construction of site access road. » Site preparation (e.g. excavation and compaction). » Construction activities. » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	» To retain natural vegetation, where possible. » To minimise footprints of disturbance of vegetation/habitats. » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas. » Minimise spoil material.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing.	Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on flora and fauna and their habitats is restricted.	Contractor	Site establishment & duration of contract
Construction activities must be restricted to demarcated areas so that impact on flora and fauna is restricted.	Contractor	Site establishment & duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Any fill material required must be sourced from a commercial off-site suitable/permitted source, licensed quarry or borrow pit. Where possible, material from foundation excavations must be used as fill on-site.	Contractor	Duration of contract
Excavated topsoil must be stockpiled in designated areas separate from base material and covered until replaced during rehabilitation.	Contractor	Site establishment & duration of contract
Topsoil must not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occur.	Contractor	Site establishment Maintenance: for duration of contract
As far as possible, the maximum topsoil stockpile height must be limited as far as possible in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen.	Contractor	Duration of contract

Performance Indicator	» Minimal disturbance outside of designated work areas. » Minimise clearing of existing vegetation. » Topsoil appropriately stored.
Monitoring	» Observation of vegetation clearing and soil management activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE: Minimise the impacts on and loss of indigenous vegetation and faunal habitat

All development footprints within areas of natural vegetation (for roads and foundation area) should be surveyed and appropriately fenced off. Only once this has been done can any construction activity proceed. It should be made very clear to all contractors that there is to be no disturbance outside these demarcated areas, at least not without the permission of the ECO.

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Loss of indigenous natural vegetation due to construction activities, or poor behaviour on the part of the construction

	team.
Activity/Risk Source	» Vegetation clearing. » Introduction of alien invasive plant species » Construction of access roads. » Chemical contamination of the soil by vehicles and machinery. » Operation of construction camps. » Storage of materials required for construction.
Mitigation: Target/Objective	» Minimise footprints of disturbance of vegetation/habitats. » Minimise loss of indigenous vegetation. » Minimise loss of species of conservation concern.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing.	Contractor	Construction
Limit unnecessary impacts on surrounding natural vegetation, e.g. driving around in the veld, use access roads only.	Contractor	Construction
A site rehabilitation programme must be developed and implemented.	Contractor in consultation with Specialist	Duration of contract Pre-construction
Animals that cannot flee from the affected areas by themselves (e.g. tortoises, snakes, amphibians, small mammals) must be removed from the affected areas before the start of site clearing/construction and relocated to safe areas.	Specialist	Pre-construction
Affected individuals of protected species which cannot be avoided should be translocated to a safe area on the site prior to construction.	Contractor	Construction
Alien plant clearing where necessary.	Contractor	Construction
Erosion control measures should be implemented in areas where slopes have been disturbed.	Contractor	Construction
Re-vegetation of cleared areas or monitoring to ensure that recovery is taking place	Contractor	Construction
The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.	Contractor	Construction
Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. In particular, a formal road should not be constructed under the power lines, a simple track should be sufficient.	Contractor	Construction
No collection of plants or plant parts to be allowed by construction personnel. Provide environmental induction to all construction staff to ensure that they are aware of this and other environmental sensitivities	Contractor	Construction

Mitigation: Action/Control	Responsibility	Timeframe
at the site.		
No fuel wood collection should be allowed on-site.	Contractor	Construction
Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or another suitably qualified person/s.	Contractor	Construction
The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.	Contractor	Construction
All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.	Contractor	Construction

Performance Indicator	» Minimal disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation and faunal habitats. » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation.
Monitoring	» Observation of vegetation clearing activities by ECO throughout construction phase. » Monitoring of vegetation clearing activities in terms of permit conditions. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE: Limit direct and indirect terrestrial faunal impacts

Project component/s	Construction activities, operational activities and human presence
Potential Impact	Disturbance of faunal communities due to construction as well as poaching and hunting risk from construction staff.
Activity/risk source	Habitat transformation during construction; site fencing, presence of construction and operation personnel.
Mitigation: Target/Objective	Low faunal impact, during construction and operation.

Mitigation: Action/control	Responsibility	Timeframe
Environmental induction for all staff	Contractor	Construction & Operation

Mitigation: Action/control	Responsibility	Timeframe
ECO to monitor and enforce ban on hunting, collecting etc. of all plants and animals or their products.	ECO	Construction & Operation
Any fauna encountered during construction should be removed to safety by the ECO or other suitably qualified person,	Contractor	Construction & Operation

Performance Indicator	» Low number of incidents with fauna during construction » No removal of vegetation/plants during construction
Monitoring	» Monitoring for compliance during the construction phase. All incidents to be noted.

OBJECTIVE: Minimise the establishment and spread of alien invasive plants (Invasive Plant Management Plan) and manage indigenous invasive plants

On-going alien and invasive plant monitoring and removal should be undertaken on all areas of natural vegetation within the project lease area on an annual basis. The section below provides a guideline for the Invasive Plant Management Plan and should be implemented together with consideration of the principles contained in the Department of Water Affairs: Working for Water Programme (refer to **Appendix B**).

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species.
Activities/Risk Sources	» Construction, environmental management.
Mitigation: Target/Objective	» There is a target of no alien plants within project control area during the construction and operation phases, and no additional thickening of indigenous invasive shrubs.

Mitigation: Action/Control	Responsibility	Timeframe
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants.	Contractor	Construction and operation

Mitigation: Action/Control	Responsibility	Timeframe
» Remove all alien plants from areas adjacent to or on frequently traversed access routes to prevent dispersal of regenerative material onto site		
Establish an on-going monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act).	Contractor	Construction and operation
Immediately control any alien plants that become established using registered control methods.	Contractor	Construction and operation
DWA approved methodology should be employed for all invasive clearing operations. No bulldozing or removal by any machinery except chainsaws is allowed, as this disturbs the soil and creates ideal conditions for re-invasion. All stems must be cut as close to ground level as possible, using loppers or chainsaws (depending on size). No herbicide spraying should be undertaken anywhere, due to the extensive collateral damage. All cut branches should be stacked into a pyramid (cut end up) and left to dry – where rodents will eat the available seed under the pile, reducing seed germination. Should this method not be feasible due to volumes of biomass, all cut branches shall be shredded. Shredded material of cut branches that do not contain any seed or other regenerative material can be kept for rehabilitation. Annual follow ups are required in all areas that have been previously cleared. Small seedlings may be hand pulled.	Contractor	Construction and operation

Performance Indicator	» For each invasive or alien species: number of plants and aerial cover of plants within project area and immediate surroundings is significantly reduced and alien species are absent from site.
Monitoring	» On-going monitoring of area by ECO during construction. » Annual audit of project area and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area and used in optimising the control programme. » The environmental manager should be responsible for driving

	this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE: Minimise soil degradation and erosion (Erosion management Plan)

The soil on site may be impacted in terms of:

» Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere is of a concern in areas that are underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion).
» Uncontrolled run-off relating to the construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation along natural drainage lines or catchment areas.
» Degradation of the natural soil profile due to excavation, removal of topsoil, stockpiling, wetting, compaction, pollution and other construction activities may affect soil forming processes and associated agricultural potential.

Management of erosion will be required during the construction phase of the power line and watercourse crossings. An erosion management plan is required to ensure compliance with applicable regulations and to prevent increased soil erosion and sedimentation of the downstream environment. The section below provides a guideline for the management of erosion on site and will need to be supplemented with the principles for erosion management contained in the Erosion Management plan included in **Appendix C.**

Project Component/s	» Power line » Access roads. » Watercourse crossings
Potential Impact	» Soil degradation including erosion, dust and siltation. » Reduction in agricultural potential.
Activities/Risk Sources	» Earthworks & activity on site. » Rainfall and concentrated discharge causing water erosion of disturbed areas. » Wind - erosion of disturbed areas.
Mitigation: Target/Objective	» Minimise soil degradation (removal, excavation, mixing, wetting, compaction, pollution, etc.). » Minimise erosion. » Minimise sediment transport downstream (siltation). » Minimise dust pollution.

Mitigation: Action/Control	Responsibility	Timeframe
Identify areas of high erosion risk (drainage lines/watercourses, existing problem areas). Only special works to be undertaken in these areas to be authorised by ECO and Site Manager.	ECO/ER	At design stage.
Identify construction areas for general construction work and restrict construction activity to these areas.	Contractor	At design stage and during construction
Prevent unnecessary destructive activity within construction areas (prevent over-excavations and double handling)	Contractor	During construction
Access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary degradation of soil. Special attention to be given to roads that cross drainage lines and roads on steep slopes (to prevent unnecessary cutting and filling operations).	Contractor	At design stage and during construction
Dust control on construction site through wetting or covering of cleared areas.	Contractor	Daily during construction
Minimise removal of vegetation which aids soil stability.	Contractor	Continuously during construction
Rehabilitate disturbance areas as soon as an area is vacated.	Contractor	Continuously during and after construction
Soil conservation - stockpile topsoil for re-use in rehabilitation phase. Protect stockpile from erosion. Topsoil should be stockpiled for as short a period as possible to ensure survival of the soil seed bank and other soil-borne organisms.	Contractor	Continuously during construction
Erosion control measures- run-off control and attenuation on slopes (sand bags, logs), silt fences, stormwater channels and catch-pits, shade nets, soil binding, geofabrics, hydroseeding or mulching over cleared areas.	Contractor	Duration of contract
Control depth of excavations and stability of cut faces/sidewalls.	Contractor	Duration of contract

Performance Indicator	» Only authorised activity outside construction areas. » No activity in no-go areas. » Acceptable level of activity within construction areas, as determined by ECO. » Limited soil erosion attributable to construction activities

	around site. » Limited sedimentation along drainage lines as a result if construction activities. » No soil degradation.
Monitoring	» Immediate reporting of ineffective sediment control systems. » An incident reporting system will record non-conformances.

OBJECTIVE: Minimising the impact on heritage sites

Few significant heritage resources were located on the proposed power line route and at the watercourse crossing sites. The primary heritage resources were the two old farm houses and their associated cultural landscapes, the graveyard and a few archaeological sites. The latter are generally located on hilltops with only very rare and highly weathered artefacts found on the plains. It should be feasible to avoid direct impacts to all identified heritage resources and any significant archaeological sites that cannot be avoided could be easily mitigated. The landscape impacts around the Kareedoornpan house are unavoidable due to other constraints, but this impact is only deemed to be of medium local significance.

Project Component/s	» Power line » Service roads » Watercourse crossings
Potential Impact	» Destruction of heritage site
Activity/Risk Source	» Earth moving and vehicular activity on site
Mitigation: Target/Objective	» Heritage sites avoided and preserved during construction and operation or else successfully mitigated prior to construction

Mitigation: Action/control	Responsibility	Timeframe
Ensure that measure for dealing with unexpected heritage finds are known to the construction teams.	ECO	Pre-construction
Conduct archaeological mitigation for sites that cannot be avoided	Archaeologist	Pre-construction

In the event that heritage resources of high significance are found, they are likely to be of a nature that potential impacts could be mitigated by documentation and/or salvage following approval and permitting by the South African Heritage Resources Agency and, in the case of any built environment features, by Ngwao Boŝwa ya Kapa Bokone (the Northern Cape Heritage Authority).	Contractor, ECO	Duration of construction
If any human remains or any other concentrations of archaeological heritage material are exposed during construction, all work must cease and it must be reported immediately to the nearest museum/archaeologist or the Northern Cape Heritage Authority).	Contractor, ECO	Duration of construction
Should archaeological sites or graves be exposed during construction work, work in the area must be stopped and the find must immediately be reported to a suitably qualified heritage practitioner such that an investigation and evaluation of the finds can be made.	Contractor, ECO	Duration of construction
The identified burial grounds and graves may not be impacted by the proposed development. In order to ensure this, these sites must be clearly demarcated and cordoned off during the construction phase of the development	Contractor	Duration of construction
Should it not be possible to adhere to the above conditions, the applicant must consult with SAHRA regarding the reasons for non-compliance. In this instance, on SAHRA's advice, other mitigation strategies may have to be adopted which will require following a process for archaeological investigation in terms of Section 35 and for exhumation in terms of Section 36 of the NHRA (Act 25 of 1999).	Contractor	Duration of construction
Any direct impacts to the identified structures will require a permit from the Northern Cape Provincial Heritage Resources Authority (Mr Andrew Timothy, ratha.timothy@gmail.com)		

Mitigation: Action/control	Responsibility	Timeframe
Ensure that measure for dealing with unexpected heritage finds are known to the construction teams.	ECO	Pre-construction
Conduct archaeological mitigation for sites that cannot be avoided	Archaeologist	Pre-construction
In the event that heritage resources of high significance are found, they are likely to be of a nature that potential impacts could be mitigated by documentation and/or salvage following approval and permitting by the South African Heritage Resources Agency and, in the case of any built environment features, by Ngwao Boŝwa ya Kapa Bokone (the Northern Cape Heritage Authority).	Contractor, ECO	Duration of construction
If any human remains or any other concentrations of archaeological heritage material are exposed during construction, all work must cease and it must be reported immediately to the nearest museum/archaeologist or the Northern Cape Heritage Authority).	Contractor, ECO	Duration of construction
Should any evidence of archaeological sites or remains (such as remnants of stone-made structures indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, marine shell and charcoal/ash concentrations), unmarked human burials, fossils or other categories of heritage resources be found during the proposed activities, or in any future activities, SAHRA APM Unit (Jenna Lavin/Colette Scheermeyer 021 462 4502) must be alerted immediately, and a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance a Phase 2 rescue operation might be necessary	Contractor	Construction

Performance Indicator	» No destruction of heritage sites. » Successful and timeous reporting of unexpected finds should these occur on site
Monitoring	» Monitoring of excavations by ECO » Any newly discovered heritage resources should be promptly reported to the heritage authorities or project archaeologist » Any direct impacts to the identified structures will require a permit from the Northern Cape Provincial

	Heritage Resources Authority (Mr Andrew Timothy, ratha.timothy@gmail.com)

OBJECTIVE: Appropriate handling and management of waste

The main wastes expected to be generated by the construction of the power line will include general construction waste, hazardous waste (i.e. fuel and oil from the transformers), and liquid waste (including grey water and sewage)

In order to manage the wastes effectively, guidelines for the assessment, classification, and management of wastes, along with industry principles for minimising construction wastes must be implemented. A waste management plan is included as **Appendix D** of this EMPr.

Project Component/s	» Power line » Access roads. » Watercourse crossings
Potential Impact	» Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices.
Activity/Risk Source	» Packaging. » Other construction wastes. » Hydrocarbon use and storage. » Spoil material from excavation, earthworks, and site preparation.
Mitigation: Target/Objective	» To comply with waste management legislation. » To minimise production of waste. » To ensure appropriate waste storage and disposal. » To avoid environmental harm from waste disposal. » A waste manifests should be developed for the ablutions showing proof of disposal of sewage at appropriate water treatment works.

Mitigation: Action/Control	Responsibility	Timeframe
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas must be designated on-site for the	Contractor	Duration of

Mitigation: Action/Control	Responsibility	Timeframe
temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.		contract
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Uncontaminated waste will be removed at least weekly for disposal; other wastes will be removed for recycling/ disposal at an appropriate frequency.	Contractor	Duration of contract
Disposal of waste will be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Regularly serviced chemical toilets facilities will be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction
Dispose of all solid waste collected at an appropriately registered waste disposal site. Waste disposal shall be in accordance with all relevant legislation and under no circumstances may waste be burnt on site.	Contractor	Duration of construction
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management.	Contractor	Duration of construction

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.
Monitoring	» Observation and supervision of waste management practices throughout construction phase. » Waste collection will be monitored on a regular basis. » Waste documentation completed. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE: Appropriate handling and storage of chemicals, hazardous substances

The construction phase will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents, this may require an on-site batching plant.

Project Component/s	» Storage and handling of chemicals, hazardous substances i.e. oil dam for the cooling of transformers.
Potential Impact	» Release of contaminated water from contact with spilled chemicals. » Generation of contaminated wastes from used chemical containers.
Activity/Risk Source	» Vehicles associated with site preparation and earthworks. » Construction activities of area and linear infrastructure. » Hydrocarbon use and storage.
Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons.

Mitigation: Action/Control	Responsibility	Timeframe
Develop and implement an emergency preparedness plan during the construction phase.	Contractor	Pre-construction and implement for duration of Contract
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface. The bunded area must be provided with a tap-off system through which spillages and leakages that might occur will be removed without any spillage outside the bunded area.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
with.		
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	Contractor	Duration of contract
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction

Performance Indicator	» No chemical spills outside of designated storage areas. » No unattended water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping.
Monitoring	» Implement an effective monitoring system to detect any leakage or spillage of all hazardous substances. » Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register must be maintained, in which any complaints from the community will be logged. » An incident reporting system will be used to record non-conformances to the EMPr.

OBJECTIVE: To avoid and or minimise the potential risk of increased veld fires during the construction phase

The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

Project Component/s	» Construction and establishment activities associated with the establishment of power line including infrastructure etc.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences.
Activities/Risk Sources	» The presence of construction workers and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Ensure that open fires on the site for cooking or heating are not allowed except in designated areas.	Mainstream and contractors	Duration of construction
Provide adequate firefighting equipment onsite.	Mainstream and contractors	Duration of construction
Provide fire-fighting training to selected construction staff.	Contractors	Duration of construction
Compensate farmers / community members at full market related replacement cost for any losses, such as livestock, damage to infrastructure etc.	Contractors	Duration of construction
If in existence, join the local Fire Protection Agency	Mainstream	Pre-construction

Performance Indicator	» Conditions contained in the Construction EMPr. » Designated areas for fires identified on site at the outset of the construction phase. » Firefighting equipment and training provided before the construction phase commences. » Compensation claims settled within 1 month of claim being verified by Community MF. .
Monitoring	» Mainstream and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Limit damage to drainage lines

Construction within drainage lines has been minimised as far as possible. Where impacts are unavoidable, mitigation measures are required to minimise impacts on these systems

Project Component/s	» Watercourse crossings » Power line and associated access road
Potential Impact	» Damage to water course areas by any means that will result in hydrological changes (includes erosion, siltation, dust, direct removal of soil of vegetation, dumping of material within wetlands). The focus should be on the functioning of the watercourse as a natural system
Activities/Risk Sources	» Construction and operation of power line » Construction of access roads. » Construction of watercourse crossings

Mitigation: Target/Objective	» No damage to the delineated watercourses within project footprint (i.e. no-go area). » Minimise damage to watercourse areas where crossings are to be built or upgraded.

Mitigation: Action/Control	Responsibility	Timeframe
Rehabilitate any disturbed areas as soon as possible once construction is completed in an area.	Mainstream and contractors, ECO	Duration of construction
Control storm water and runoff water through the implementation of a storm water management plan for the site.	Contractors, ECO	Duration of construction
Obtain a permit as required in terms of the National Water Act from DWA to impact on any wetland or water resource.	Mainstream	Duration of construction

Performance Indicator	» No impacts on water quality, water quantity, riparian vegetation, natural status of watercourses
Monitoring	» Habitat loss in watercourses should be monitored before and after construction. » The presence and development of erosion features downstream of any construction through wetlands must be monitored. » The ECO should be responsible for driving this process. » An incident reporting system must be used to record non-conformances to the EMPr/IWWMP. » Public complaints register must be developed and maintained on site.

6.2 Detailing Method Statements

OBJECTIVE: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMPr will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications". The Method Statement must cover applicable details with regard to:

» Details of the responsible person/s
» Construction procedures;
» Materials and equipment to be used;
» Getting the equipment to and from site;
» How the equipment/material will be moved while on-site;
» How and where material will be stored;
» The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
» Timing and location of activities;
» Compliance/non-compliance with the Specifications; and
» Any other information deemed necessary by the Site Manager.

Method Statements must be compiled for all activities which affect any aspect of the environment and should be applied consistently to all activities. The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Site Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

The Contractor may not commence the activity covered by the Method Statement until it has been approved by the Site Manager, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

Failure to submit a method statement may result in suspension of the activity concerned until such time as a method statement has been submitted and approved. The ECO should monitor the construction activities to ensure that these are undertaken in accordance with the approved Method Statement.

6.3 Awareness and Competence: Construction Phase

OBJECTIVE: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractors obligations in this regard include the following:

» Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
» Ensuring that a copy of the EMPr is readily available on-site, and that all site staff are aware of the location and have access to the document.
» Employees will be familiar with the requirements of the EMPr and the environmental specifications as they apply to the construction of the power line.
» Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course.
» The course should be sufficient to provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
» Awareness of any other environmental matters, which are deemed necessary by the ECO.
» Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) are erected at prominent locations throughout the site.
» Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution.
» Records must be kept of those that have completed the relevant training.
» Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
» Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible, detailed below.

6.4.1 Environmental Awareness Training

Environmental Awareness Training must take the form of an on-site talk and demonstration by the ECO before the commencement of site establishment and construction on site. The education/awareness programme should be aimed at all levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the ECO on site.

6.4.2 Induction Training

Environmental induction training must be presented to all persons who are to work on the site – be it for short or long durations; Contractor's or Engineer's staff; administrative or site staff; sub-contractors or visitors to site.

This induction training should include discussing the developer's environmental policy and values, the function of the EMPr and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight overall do's and don'ts on site and clarify the repercussions of not complying with these. The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the SHE Officer on site.

6.4.3 Toolbox Talks

Toolbox talks should be held on a scheduled and regular basis (at least twice a month) where foremen, environmental and safety representatives of different components of the Works and sub-consultants hold talks relating to environmental practices and safety awareness on site. These talks should also include discussions on possible common incidents occurring on site and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

6.4 Monitoring Programme: Construction Phase

OBJECTIVE: To monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have

not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the Environmental Authorisation (once issued). The Project Manager will ensure that the monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to monitor the implementation of the specified environmental specifications, in order to:

» Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications.
» Ensure adequate and appropriate interventions to address non-compliance.
» Ensure adequate and appropriate interventions to address environmental degradation.
» Provide a mechanism for the lodging and resolution of public complaints.
» Ensure appropriate and adequate record keeping related to environmental compliance.

6.5.1. Non-Conformance Reports

All supervisory staff including Foremen, Resident Engineers, and the ECO must be provided the means to be able to submit non-conformance reports to the Site Manager. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor. Records of penalties imposed may be required by the relevant authority within 48 (forty eight) hours.

The non-conformance report will be updated on completion of the corrective measures indicated on the finding sheet. The report must indicate that the remediation measures have been implemented timeously and that the non-conformance can be closed-out to the satisfaction of the Site Manager and ECO.

6.5.2. Monitoring Reports

A monitoring report will be compiled by the ECO on a monthly basis and must be submitted to DEA for their records. This report should include details of the activities undertaken in the reporting period, any non-conformances or incidents recorded, corrective action required, and details of those non-conformances or incidents which have been closed out.

6.5.3. Final Audit Report

A final environmental audit report must be compiled by an independent auditor and be submitted to DEA upon completion of the construction and rehabilitation activities (within 30 days of completion of the construction phase (i.e.: within 30 days of site handover)) and within 30 days of completion of rehabilitation activities. This report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions and the requirements of the EMPr.

MANAGEMENT PROGRAMME: REHABILITATION CHAPTER 7

Overall Goal: Undertake the rehabilitation measures in a way that:

» Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed.

7.1. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

OBJECTIVE: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

Project Component/s	» Power line » Access roads » Watercourse crossings
Potential Impact	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
Activity/Risk Source	» Temporary construction areas. » Temporary access roads/tracks. » Other disturbed areas/footprints.
Mitigation: Target/Objective	» Ensure and encourage site rehabilitation of disturbed areas. » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.

Mitigation: Action/Control	Responsibility	Timeframe
All temporary facilities, equipment, and waste materials must be removed from site as soon as construction is completed..	Contractor	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been	Contractor	Following completion of

Mitigation: Action/Control	Responsibility	Timeframe
completed.		construction activities in an area
The area that previously housed the construction equipment camp is to be checked for spills of substances such as oil, paint, etc. and these should be cleaned up.	Contractor	Following completion of construction activities in an area
All hardened surfaces within the construction equipment camp area should be ripped, all imported materials removed, and the area shall be top soiled and re-vegetated.	Contractor	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked.	Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
A rehabilitation plan should be drawn up that specifies the rehabilitation process and should be approved by the ECO.	Contractor, Mainstream and ECO	Pre-construction
Where disturbed areas are not to be used during the operation of the proposed power line and watercourse crossings, these areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use of native/indigenous plant species removed from disturbance areas in the rehabilitation phase to be determined by a botanist, as applicable.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may need to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Mainstream in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive areas such as areas with steep slopes.	Mainstream in consultation with ECO and rehabilitation specialist (if required)	Post-rehabilitation

Mitigation: Action/Control	Responsibility	Timeframe
On-going alien plant monitoring and removal must be undertaken on all areas of natural vegetation on an annual basis.	Mainstream	Post-rehabilitation

Performance Indicator	» All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities. » Topsoil replaced on all areas and stabilised where practicable or required after construction and temporally utilised areas. » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites. » Completed site free of erosion and alien invasive plants.
Monitoring	» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented. » On-going alien plant monitoring and removal should be undertaken on an annual basis.

MANAGEMENT PROGRAMME: OPERATION CHAPTER 8

Overall Goal: To ensure that the operation of the power line and culverts for the watercourse crossings do not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the line in a way that:

» Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
» Enables the operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices, traffic and road use, and effects on local residents.

An environmental manager must ensure the implementation of the operational EMPr.

8.1. Objectives

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE: Minimise Impacts on Vegetation, Soils and Ecology & Avifauna

The soil on site may be impacted in terms of:

» Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere is of a concern across the entire site which is underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion).
» Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of drainage systems.
» Degradation of the natural soil profile due to pollution.
» Soil contamination due to use of hazardous substances such as transformer oils.

Management of erosion will be required during the operation phase of the power line and watercourse crossings. An erosion management plan is required to

ensure compliance with applicable regulations and to prevent increased soil erosion and sedimentation of the downstream environment. The section below provides a guideline for the management of erosion on site and will need to be supplemented with the principles for erosion management contained in the Erosion Management plan included in **Appendix C**.

Project Component/s	» Power line » Access roads » Culverts at Watercourse crossings
Potential Impact	» Soil degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	» Poor rehabilitation and/or re-vegetation of cleared areas. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity.
Mitigation: Target/Objective	» Ensure rehabilitation of disturbed areas is maintained. » Minimise soil degradation (i.e. wetting). » Minimise soil erosion and deposition of soil into drainage lines. » Ensure continued stability of embankments/excavations.

Mitigation: Action/Control	Responsibility	Timeframe
During the operational phase, monitor culverts to see if erosion issues arise and if any erosion control is required.	Mainstream	Operation
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	Mainstream	Operation
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (bags, logs), silt fences, storm water catch-pits, and shade nets).	Mainstream	Operation
Develop and implement an appropriate stormwater management plan for the operational phase of the power line and watercourse crossings	Mainstream	Operation
Site access should be controlled and only authorized staff and contractors should be allowed on-site.	Mainstream	Operation
Notice boards stating that fauna and flora may not be collected, harvested etc. should be placed at the entrances to the site.	Mainstream	Operation
Any maintenance activities should avoid listed plant species and strive to keep the footprint as low as possible.	Mainstream	Operation
No herbicides should be used and if vegetation	Mainstream	Operation

Mitigation: Action/Control	Responsibility	Timeframe
clearing needs to take place, this should be done by hand.		
The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.	Mainstream	Operation
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	Mainstream	Operation
Spill kits must be kept on-site	Mainstream	Operation
Regular monitoring for erosion post-construction to ensure that no erosion problems have developed as result of the past disturbance.	Mainstream	Operation
Regular monitoring must be undertaken for alien plant invasion, which is likely to occur in previously disturbed areas or in areas receiving runoff from the hardened surfaces of the infrastructure.	Mainstream	Operation
Any electrocution and collision events that occur should be recorded, including the species affected and the date. If repeated collisions occur within the same area, then further mitigation and avoidance measures may need to be implemented.	Mainstream	Operation

Performance Indicator	» Acceptable level of soil erosion around site, as determined by the site manager. » Acceptable level of increased siltation in drainage lines, as determined by the site manager.
Monitoring	» Inspections of site on a bi-annual basis. » Water management plan

OBJECTIVE: Protection of avifauna from collision and electrocution

During the operation, the threat of collision with the power line is the biggest potential threat to avifauna, particularly sensitive, collision prone species that may occur in the study area. The threat of electrocution while perching on the power line and associated infrastructure serves as a threat to certain sensitive species, depending on the power line structures implemented.

Project Component/s	» Power line.
Potential Impact	» Collision and electrocution events with the overhead power line.
Activities/Risk Sources	» Operation of the power line without appropriate mitigation measures.
Mitigation: Target/Objective	» Maintain a low number of collision, and electrocution events.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Fit power lines with bird flight diverters along their entire length, but particularly in areas where larger birds are likely to pass such as near drainage lines, dams or pans and hills.	Contractor	Construction
Insulate live components at support structures.	Contractor	Construction

Performance Indicator	» Minimal collision, or electrocution events.
Monitoring	» Observation of electrocution or collision events with the power line. » Monitor power line servitude for mortalities.

OBJECTIVE: Minimise dust and air emissions

During the operational phase, limited gaseous or particulate emissions are anticipated from exhaust emissions (i.e. from operational vehicles), and from the augmentation plant. Windy conditions and the movement of vehicles on site may lead to dust creation.

Project Component/s	» Hard engineered surfaces. » On-site vehicles.
Potential Impact	» Dust and particulates from vehicle movement to and on-site. » Release of minor amounts of air pollutants (for example NO_2, CO and SO_2) from vehicles and the augmentation plant.
Activities/Risk Sources	» Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation:	» To ensure emissions from all vehicles are minimised, where

Target/Objective	possible. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements.

Mitigation: Action/Control	Responsibility	Timeframe
Roads must be maintained to a manner that will ensure that nuisance to the community from dust is not visibly excessive.	Mainstream	Operation
Appropriate dust suppression must be applied to the roads as required to minimise/control airborne dust.	Mainstream	Duration of contract
Speed of vehicles must be restricted on site, as defined by the Environmental Manager.	Mainstream	Duration of contract
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Mainstream	Duration of contract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » Dust suppression measures implemented for where required. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.
Monitoring	» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMPr.

OBJECTIVE: Ensure the implementation of an appropriate fire management plan during the operation phase

The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

Project Component/s	» Operation and maintenance of the power line.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a risk to the power line and associated infrastructure.
Activities/Risk	» The presence of operation and maintenance personnel and

Sources	their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
If in existence, join the local Fire Protection Agency.	Mainstream	Operation
Provide adequate fire fighting equipment on site.	Mainstream	Operation
Provide fire-fighting training to selected operation and maintenance staff.	Mainstream	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	Mainstream	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	Mainstream	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	Mainstream	Operation
Contact details of emergency services should be prominently displayed on site.	Mainstream	Operation

Performance Indicator	» Fire fighting equipment and training provided before the operational phase commences. » Appropriate fire breaks in place and maintained.
Monitoring	» Mainstream must monitor indicators listed above to ensure that they have been met.

MANAGEMENT PROGRAMME: DECOMMISSIONING CHAPTER 9

The infrastructure associated with the power line and the watercourse crossings (culverts) would only be decommissioned in the event that the Loeriesfontein 2 Wind Energy Facility was decommissioned and the roads and power line were no longer required by the community. The infrastructure which will be utilised for the Loeriesfontein 2 wind energy facility is expected to have a lifespan of 20 to 30 years (with maintenance). The decommissioning activities of the wind turbines and all associated infrastructure would need to comply with the legislation relevant at the time.

Should the activity ever cease or become redundant, the applicant shall undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered at any relevant and competent authority at that time

FINALISATION OF THE EMPR CHAPTER 10

The EMPr is a dynamic document, which must be updated to include any additional specifications as and when required. It is considered critical that this draft EMPr be updated to include site-specific information and specifications following the final walk-through survey by specialists of the power line. This will ensure that the construction and operation activities are planned and implemented considering sensitive environmental features.

Appendix A:
Grievance Mechanism for Public Complaints and Issues

GRIEVANCE MECHANISM / PROCESS

AIM

The aim of the grievance mechanism is to ensure that grievances / concerns raised by local landowners and or communities are addressed in a manner that is:

- Fair and equitable;
- Open and transparent;
- Accountable and efficient.

It should be noted that the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. However, the aim should be to address grievances in a manner that does not require a potentially costly and time consuming legal process.

Proposed generic grievance process

- Local landowners, communities and authorities will be informed in writing by the proponent (the renewable energy company) of the grievance mechanism and the process by which grievances can be brought to the attention of the proponent.
- A company representative will be appointed as the contact person for grievances to be addressed to. The name and contact details of the contact person will be provided to local landowners, communities and authorities.
- Project related grievances relating to the construction, operational and or decommissioning phase must be addressed in writing to the contact person. The contact person should assist local landowners and or communities who may lack resources to submit/prepare written grievances.
- The grievance will be registered with the contact person who, within 2 working days of receipt of the grievance, will contact the Complainant to discuss the grievance and agree on suitable date and venue for a meeting. Unless otherwise agreed, the meeting will be held within 2 weeks of receipt of the grievance.
- The contact person will draft a letter to be sent to the Complainant acknowledging receipt of the grievance, the name and contact details of Complainant, the nature of the grievance, the date that the grievance was raised, and the date and venue for the meeting.
- Prior to the meeting being held the contact person will contact the Complainant to discuss and agree on who should attend the meeting. The people who will be required to attend the meeting will depend on the nature of the grievance. While the Complainant and or proponent are entitled to invite their legal representatives to attend the meeting/s, it should be made clear that to all the parties involved in the process that the grievance mechanism process is not a legal process. It is therefore recommended that the involvement of legal representatives be limited.
- The meeting will be chaired by the company representative appointed to address grievances. The proponent will provide a person to take minutes of and record the meeting/s. The costs associated with hiring venues will be covered by the proponent. The proponent will also cover travel costs incurred by the Complainant, specifically in the case of local, resource poor communities.
- Draft copies of the minutes will be made available to the Complainant and the proponent within 4 working days of the meeting being held. Unless otherwise agreed, comments on the Draft Minutes must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days of receipt of the draft minutes.

- In the event of the grievance being resolved to the satisfaction of all the parties concerned, the outcome will recorded and signed off by the relevant parties. The record should provide details of the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of a dispute between the Complainant and the proponent regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed. The record of the meeting/s will note that a dispute has arisen and that the grievance has not been resolved to the satisfaction of all the parties concerned;
- In the event that the parties agree to appoint a mediator, the proponent will be required to identify three (3) mediators and forward the names and CVs to the Complainant within 2 weeks of the dispute being declared. The Complainant, in consultation with the proponent, will identify the preferred mediator and agree on a date for the next meeting. The cost of the mediator will be borne by the proponent. The proponent will provide a person to take minutes of and record the meeting/s.
- In the event of the grievance, with the assistance of the mediator, being resolved to the satisfaction of all the parties concerned, the outcome will recorded and signed off by the relevant parties, including the mediator. The record should provide details on the date of the meeting/s, the names of the people that attended the meeting/s, the outcome of the meeting/s, and where relevant, the measures identified to address the grievance, the party responsible for implementing the required measures, and the agreed upon timeframes for the measures to be implemented.
- In the event of the dispute not being resolved, the mediator will prepare a draft report that summaries the nature of the grievance and the dispute. The report should include a recommendation by the mediator on the proposed way forward with regard to the addressing the grievance.
- The draft report will be made available to the Complainant and the proponent for comment before being finalised and signed by all parties. Unless otherwise agreed, comments on the draft report must be forwarded to the company representative appointed to manage the grievance mechanism within 4 working days.

The way forward will be informed by the recommendations of the mediator and the nature of the grievance. As indicated above, the grievance mechanism does not replace the right of an individual, community, group or organization to take legal action should they so wish. In the event of the grievance not being resolved to the satisfaction of Complainant and or the proponent, either party may be of the opinion that legal action may be the most appropriate option.

Appendix B:

Department of Water Affairs:
Working for Water Programme
Principles for Invasive Plant
Species

APPENDIX B

ALIEN INVASIVE PLANT MANAGEMENT PLAN

OVERALL OBJECTIVE

Manage alien and invasive plant species during the construction and operation of the power line and culverts, through the implementation of an alien invasive species management and control programme.

PROBLEM OUTLINE

Alien plants replace indigenous vegetation leading to severe loss of biodiversity and change in landscape function. Potential consequences include loss of biodiversity, loss of grazing resources, increased fire risk, increased erosion, loss of wetland function, impacts on drainage lines, increased water use etc.

In addition, the Conservation of Agricultural Resources Act (Act 43 of 1983), as amended in 2001, requires that land users clear *Declared Weeds* from their properties and prevent the spread of *Declared Invader Plants* on their properties. A list of declared weeds and invader plants is attached.

Table 3 of CARA (the Conservation of Agricultural Resources Act) lists all declared weeds and invader plants. Alien plants are divided into 3 categories based on their risk as an invader.

- Category 1 - These plants must be removed and controlled by all land users. They may no longer be planted or propagated and all trade in these species is prohibited.
- Category 2 – These plants pose a threat to the environment but nevertheless have commercial value. These species are only allowed to occur in demarcated areas and a land user must obtain a water use license as these plants consume large quantities of water.
- Category 3 – These plants have the potential of becoming invasive but are considered to have ornamental value. Existing plants do not have to be removed but no new plantings may occur and the plants may not be sold.

The following guide is a useful starting point for the identification of alien species:

Bromilow, C. 2010. *Problem Plants and Alien Weeds of South Africa*. Briza, Pretoria.

SPECIFIC MANAGEMENT OBJECTIVES:

- Ensure alien plants do not become dominant in parts or the whole landscape

- Initiate and implement a monitoring and eradication programme for alien and invasive species
- Control alien and invasive species dispersal & encroachment
- Promote the natural reestablishment and planting of indigenous species

VULNERABLE ECOSYSTEMS AND HABITATS

Certain habitats and environments are more vulnerable to alien plant invasion and are likely to bear the brunt of alien plant invasion problems at the site. In addition, construction activities and changes in water distribution at the site following construction are also likely to increase and alter the vulnerability of the site to alien plant invasion.

Areas at the site which are likely to require specific attention include the following

- Wetlands, drainage lines and other mesic areas
- Cleared and disturbed areas such as road verges, crane pads and construction footprints etc.
- Construction camps and lay-down areas which are cleared or are active for an extended period

Wetlands and drainage lines

There are a drainage lines at the site as well wetlands. Disturbance within these areas often results in alien plant invasion on account of the greater water and nutrient availability in this habitat. Although there are no turbines within such areas, numerous road crossings will be required. The disturbance footprint within such areas should be minimized and these areas should be checked for alien species more often than the surrounding landscape.

Cleared and disturbed areas

Cleared and disturbed areas are clearly vulnerable to invasion on account of the lack of existing plant cover to resist invasion as well as the disturbance which created during construction which promotes the germination and establishment of alien plant species.

Construction camps and laydown areas

Construction camps and lay down areas are either cleared of vegetation or prolonged activities in these areas result in negative impact on indigenous vegetation. In addition, repeated vehicle and human activity in these areas usually results in the import of alien plant seed on clothes, dirty vehicles or with construction machinery and materials.

GENERAL CLEARING & GUIDING PRINCIPLES

- Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area. Alien problems at the site should be identified during preconstruction surveys of the development footprint. This may occur simultaneously to other required searches

and surveys. The clearing plan should then form part of the preconstruction reporting requirements for the site.

- The plan should include a map showing the alien density & indicating dominant alien species in each area.
- Lighter infested areas should be cleared first to prevent the build-up of seed banks.
- Dense mature stands of woody species where present should be left for last, as they probably will not increase in density or pose a greater threat than they are at the moment.
- Collective management and planning with neighbours may be required as seeds of aliens are easily dispersed across boundaries by wind or water courses.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

CLEARING METHODS

- Different species require different clearing methods such as manual, chemical or biological or a combination of both.
- However care should be taken that the clearing method (s) used does not encourage further invasion. As such, regardless of the method (s) used, disturbance to the soil should be kept to a minimum. Fire is not a natural phenomenon at the site and fire should not be used as a clearing method or vegetation management approach at the site.
- The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the DWAF Working for Water Website. http://www.dwaf.gov.za/wfw/Control/

USE OF HERBICIDES FOR ALIEN CONTROL

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- Specific care must be taken to prevent contamination of any water bodies. This includes: due care in storage, application, cleaning of equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products used should have least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighboring vegetation.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

For all herbicide applications, the following guidelines should be followed:

Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.

ALIEN PLANT MANAGEMENT PLAN

CONSTRUCTION PHASE ACTIVITIES

The following management actions are aimed at reducing soil disturbance during the construction phase of the development, as well as reducing the likelihood that alien species will be brought onto site or otherwise encouraged.

Action	**Frequency**
The ECO is to provide permission prior to any vegetation being cleared for development.	Daily
Clearing of vegetation must be undertaken as the work front progresses – mass clearing is not allowed unless the entire cleared area is to be rehabilitated immediately.	Weekly
Should re-vegetation not possible immediately, the cleared areas must be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.	Weekly
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.	Weekly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site. Brush from cleared areas should be used as much as possible. Arid soils are usually very low in organic matter and the use of manure or other soil amendments is likely to encourage invasion.	Weekly
Clearing of vegetation should not be allowed within 50m of any wetland or pan, 80m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the ECO for specifically allowed construction activities in these areas.	Weekly
Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment.) Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	Weekly
Alien vegetation regrowth must be controlled throughout the entire site during the construction period.	Monthly
The alien plant removal and control method guidelines should adhere to best-practice for the species involved. Such information can be obtained from the DWAF Working for Water website.	Monthly
Clearing activities must be contained within the affected zones and may not	Daily

spill over into demarcated No Go areas.	
Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only.	Monthly
Drainage lines and other sensitive areas should remain demarcated with appropriate fencing or hazard tape while construction activities within the area are underway. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily

MONITORING – CONSTRUCTION PHASE

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indictor	Timeframe
Document alien species present at the site	List of alien species	Preconstruction
Document alien plant distribution	Alien plant distribution map	3 Monthly
Document & record alien control measures implemented	Record of clearing activities	3 Monthly
Review & evaluation of control success rate	Decline in documented alien abundance over time	Biannually

OPERATIONAL PHASE ACTIVITIES

The following management actions are aimed at reducing the abundance of alien species within the site and maintaining non-invaded areas clear of aliens.

Action	Frequency
Surveys for alien species should be conducted regularly. Every 3 months for the first two years after construction and biannually thereafter. All aliens identified should be cleared.	Every 3 months for 2 years and biannually thereafter
Re-vegetation with indigenous, locally occurring species should take place in areas where natural vegetation is slow to recover or where repeated invasion has taken place.	Biannually, but re-vegetation should take place at the start of the rainy season.
Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.	When necessary
No alien species should be cultivated on-site. If vegetation is	When necessary

required for esthetic purposes, then non-invasive, water-wise locally-occurring species should be used.	

MONITORING – OPERATIONAL PHASE

The following monitoring and evaluation actions should take place during the operational phase of the development.

Monitoring Action	**Indictor**	**Timeframe**
Document alien species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Quarterly
Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

DECOMMISSIONING PHASE ACTIVITIES

The following management actions are aimed at preventing the invasion, by alien plant species, of the re-vegetated areas created during the decommissioning phase. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to operation.

Action	**Frequency**
All damaged areas shall be rehabilitated if the infrastructure is removed and the facility is decommissioned.	Once off
All natural areas must be rehabilitated with species indigenous to the area. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction.	Once off, with annual follow up re-vegetation where required.
Maintain alien plant monitoring and removal programme for 3 years after rehabilitation.	Biannually

MONITORING – DECOMMISSIONING PHASE

The following monitoring and evaluation actions should take place during the decommissioning phase of the development.

Monitoring Action	Indictor	Timeframe
Monitor newly disturbed areas where infrastructure has been removed to detect and quantify any aliens that may become established for 3 years after decommissioning and rehabilitation.	Alien plant surveys and distribution map	Biannually until such time as the natural vegetation has recovered sufficiently to resist invasion.
Monitor re-vegetated areas to detect and quantify any aliens that may become established for 3 years after decommissioning and rehabilitation.	Alien plant surveys and distribution map	Biannually for 3 years
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Annually for 3 years

REFERENCES:

AGIS (2006) Weeds and Invasive Plants Atlas (www.agis.agric.za/wip)

Appendix C:
Principles for Erosion Management

PRINCIPLES FOR EROSION MANAGEMENT

1. Purpose

An Erosion Management Plan addresses the management and mitigation of significant impacts relating to soil erosion. The objective of the plan is to provide:

» A general framework for erosion management, which enables the contractor to identify areas where erosion can be accelerated from their action.
» An outline of general methods to monitor, manage and rehabilitate erosion in ensuring that all erosion caused by this development is addresses.

2. Legislation and Standards

Soil conservation pertaining to erosion has been a topic within legislation form the 1930's till today in South Africa. Internationally, standards have been set by the International Finance Corporation and the World Bank to address soil erosion in construction and decommissioning of areas. Therefore this document will ensure that the developer meets the South African legislative requirements with regards to monitoring, managing and rehabilitating soil erosion for the power line and culverts.

Relevant legislation:

» Conservation of Agricultural Resources Act No 43 of 1983
» Environmental Conservation Act No 73 of 1989
» National Forestry Act No 84 of 1998
» National Environmental Management Act No 107 of 1998
» The Department of Water Affairs and Forestry, February 2005. Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.

3. Areas with a high soil erodability potential

The following areas are generally associated with high soil erodibility potential:

» Any areas without vegetation cover
» Excavated areas
» Steep areas
» Areas where the soil has been degraded already
» Dispersive, duplexed soil areas
» Areas with fine grained soil material with a low porosity
» Areas which undergo overland flow of water.
» Areas close to water
» Irrigated areas
» Compacted areas

» Rivers
» Drainage lines
» And any areas where developments cause water flow to accelerate on a soil surface.
» Coarsely gravelly covered surfaces

4. Precautionary management activities to avoid erosion

In the assessment process the ECO and the contractor must assess all:
» Infrastructure and equipment placements and function to ensure that the infrastructure or equipment is not causing accelerating soil erosion on the site.
» Construction activities to ensure that no erosion indicators are forming as a result of the construction activities.

5. Monitoring

5.1. General Erosion

The ECO must assess the site for erosion indicators in the monitoring process, which include:

» Bare soil
» Desiccation cracks
» Terracettes
» Sheet erosion
» Rill erosion (small erosion features with the same properties and characteristics as gullies)
» Hammocking (Soil build-up)
» Pedestalling (Exposing plant roots)
» Erosion pavements
» Gullies
» Evidence of Dispersive soils

In the assessment process, the ECO and the contractor must assess all:

» Infrastructure and equipment placements and function to ensure that the infrastructure or equipment is not causing accelerated soil erosion on the site.
» Construction activities to ensure that no erosion indicators are forming as a result of the construction activities.

If any activities or placement of equipment cause pooling on the site, degrade the vegetation, result in removal of the surface or subsurface soil horizons, create compacted surfaces with steep gradients, or minimise runoff areas, the erosion potential on the site will increase.

If any erosion features are begin forming or are present as a result of the activities mentioned above the ECO must:

» Assess the situation.
» Take photographs of the soil degradation.
» Determine the cause of the soil erosion.
» Inform and show the relevant contractors the soil degradation.
» Inform the contractor that rehabilitation must take place and that the contractor is to implement a rehabilitation method statement and management plan.
» Monitor that the contractor is taking action to stop the erosion and assist them where needed.
» Report and monitor the progress of the rehabilitation weekly and recorded all the findings in a site diary.
» All actions with regards to the incidents must be reported on a monthly compliance report which will be submitted to the department.

The contractor/ developer (with the ECO's consultation) must:

» Select a system to treat the erosion
» Design the treatment system
» Implement the system
» Monitor the area to see if the system functions like it should, if the system fails, the method must be adapt or adjust to ensure the accelerated erosion is controlled.
» Monitoring must continue until the area has been stabilised

5.2. Stormwater Management

The ECO is responsible to monitor the site and the activities to ensure that no unnatural soil degradation is taking place.

The ECO must assess the site for erosion indicators such as:

» Bare soil
» Exposed plant roots, pedestalling
» Sheet erosion
» Rill erosion
» Hammocking
» Erosion pavements
» Terracettes
» Gullies

In the assessment process the ECO and the contractor must assess all:

» Disturbed watercourse areas by the development: roads, bridges, river crossings, cabling, permanent laydown areas, crane pads and any other remaining hard surfaces.
» Construction activity limited to specified areas. Stockpiles of aggregate and material will be positioned at least 50 m away from drainage lines and wetlands.

If any erosion features are present as a result of the activities mentioned above the ECO must:

» Assess the situation
» Take photographs of the soil degradation.
» Determine the cause of the erosion.
» Inform and show the relevant contractors the soil degradation.
» Inform the contractor that rehabilitation must take place and that the contractor is to implement a rehabilitation method statement and management plan.
» Monitor that the contractor is taking action to stop the erosion and assist them where needed.
» Monitor the rehabilitation weekly and record the findings in a site diary.
» All actions with regards to the incidents must be reported on in the monthly compliance monitoring report.

The contractor/ developer must (with the ECO's consultation):

» Select a system to treat the erosion
» Design the treatment system
» Implement the system
» Monitor the area to ensure that the erosion has been addressed adequately.
» Monitor the erosion until the area has been stabilised.

6. Rehabilitation

The following erosion control measures and rehabilitation specifications must be implemented to ensure that good environmental practice is conducted and environmental compliance is achieved.

6.1. General Erosion Management

In this section the equipment needed to remediate erosion, the precautionary measures which must be taken to avoid erosion and mitigation requirements for already degraded areas.

6.1.1. Equipment

The civil works contractor may use the following instruments to combat erosion when necessary:

» Reno mattresses
» Slope attenuation
» Hessian material
» Shade catch nets
» Gabion baskets
» Mulching Run-off control (increase the amounts of runoff areas to disperse the water)
» Silt fences
» Storm water channels and catch pits
» Shade / catch nets
» Soil bindings
» Geofabrics
» Hydroseeding and/or re-vegetating
» Mulching over cleared areas
» Stone packing
» Tilling (roughing the surface)

6.1.2. Methods to prevent accelerated erosion

The following practises should be considered and adhered to:

» Ensure steep slopes are stabilised.
» Ensure that steep slopes are not stripped of vegetation and left to dry out and become water repellent (which will case increased runoff and a decreased infiltration rate) increasing the erosion potential.
» Ensure that all water on site (rain water or water wastage from the construction process) does not result in any surface flow (increase velocity and capacity of water) as a result of the poor drainage systems.
» Ensure that pooling of water on site is avoided, as the site and the general area consists of dispersive soils, pooling will cause an increase of infiltration on one area, causing the subsurface to begin eroding.
» Ensure that heavy machinery does not compact those areas which are not intended to be compacted (i.e. areas intended to be managed), as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. where compaction does occur, the areas should be ripped.
» Ensure that compacted areas have adequate drainage systems to avoid pooling and surface flow.
» Prevent the concentration or flow of surface water or stormwater down cut or fill slopes, or along pipeline routes or roads, and ensure measures to prevent erosion are in place prior to construction.
» Ensure that stormwater and any runoff generated by hard surfaces should be discharged into retention swales or areas with rock rip-rap. These areas should be grassed with indigenous vegetation. These energy dissipation structures

should be placed in a manner that surface flows are managed prior to being discharged back into a natural watercourse to support the maintenance of natural base flows within the ecological systems and prevent erosion, i.e. hydrological regime (water quantity and quality) is maintained.

» Ensure siltation and sedimentation through the use of the erosion equipment mentioned structures.
» Ensure that all stormwater control features have soft engineered areas that attenuate flows, allowing for water to percolate into the local ground watertable in low quantities (to reduce runoff but prevent subsurface erosion).
» Minimise and restrict site clearing to areas required for construction purposes only and restrict disturbance to adjacent undisturbed natural vegetation.
» Ensure that vegetation clearing is conducted in parallel with the construction progress across the site to minimise erosion and/or run-off.
» Ensure that large tracts of bare soil which would cause dust pollution in high winds, or have high erosion susceptibility and increase sedimentation in the lower portions of the catchment are controlled through temporary surface covering.
» Ensure no diversion of water flows in catchment occurs.
» Ensure that dust control measures are implemented, but prevent over-wetting/ saturating the area (to cause pooling) and run-off (that may cause erosion and sedimentation).
» Watercourse (stream) crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing watercourses.

6.1.3. Mitigation for previously degraded areas

Previously degraded areas could pose a threat to construction activities in the area and must therefore be stabilised, then remediated and rehabilitated through:

» Protecting, stabilise and isolate the degraded areas to ensure no further damage is caused by erosion due to construction activities.
» Increase the drainage in the area but avoid pooling.
» Prevent increasing sedimentation in areas that have been chocked by soils from degraded areas.
» Once construction has been completed, a method statement must be drafted for the rehabilitation of the previously degraded areas, using equipment mentioned above and implemented.
» Stabilisation of steep slopes must be undertaken.
» Ensure that bare soil is covered and hydro seeded to reduce topsoil loss.

6.2. Methodologies

The following erosion control measures and rehabilitation specifications may be required to be implemented to ensure that good environmental practice is conducted and environmental compliance is achieved.

» Topsoil covered with a geotextile or hessian material and a grass seed mixture (see Rehabilitation Specifications).
» Logging or stepping following the contours of the slope, to reduce surface runoff.
» Earth or rock-pack cut-off berms.
» Packed branches to roughen the surface and promote infiltration.
» Benches (sand bags).
» Stabilisation of near vertical slopes (1:1 – 1:2), if created during construction, will be required to utilise hard structures that have a natural look. The following methods may be considered:
  - Gabions (preferred method with geotextile material).
  - Retaining walls.
  - Stone pitching.
» The slopes of all stream diversions must be protected. The following methods may be considered:
  - Reno mattresses (preferred method), ensure that the reno mattresses are buried deep into the subsurface, to avoid undercutting from the water.
  - Coarse rock (undersize rip-rap)
  - Sandbags.
  - Stone packing with geotextile
» Where feasible use rubber dams as stream diversions when establishing water course crossings. Although (and considering that these are non-perennial watercourses) the recommendation is to construct watercourse crossings during dry periods (or no flow periods), where possible.
» Any concentration of natural water flow caused by road works or hardstands areas will be treated as follows:
  - if water flow is sub-critical, nothing is required
  - if water flow is supercritical, the outlets will be provided with protection (either gabions or stone pitching – depending on the flows) to release water subcritical back into the watercourse at a low velocity.

6.3. Engineering Specifications

A detailed Stormwater Management Plan describing and illustrating the proposed stormwater control measures must be prepared by the Civil Engineers and this includes erosion control.

Requirements for project design:

» Erosion control measures to be implemented before and during the construction period, including the final stormwater control measures (post construction).
» The location, area/extent (m^2/ha) and specifications of all temporary and permanent water management structures or stabilisation methods.

» A resident Engineer to be responsible for ensuring implementation of the erosion control measures on site during the construction period.
» The Developer holds ultimate responsibility for remedial action in the event that the approved stormwater plan is not correctly or appropriately implemented and damage to the environment is caused.
» Concrete lined drains placed adjacent to road to transfer the water to the existing water courses.
» At the point where stormwater is discharged, energy dissipaters to be constructed to reduce the flow rate of run-off.
» All cut and fill banks will be seeded with an approved seed mix (as per the rehabilitation specifications) to ensure bank stabilisation and the elimination of potential erosion. Reno mattresses may be used to ensure that the area remains stable.

6.4. Rehabilitation Specifications

» Employ a Horticultural Landscape Contractor to fulfil the rehabilitation of disturbed areas post-construction.
» A detailed Rehabilitation Plan describing and illustrating the proposed rehabilitation activities on site must be prepared i.e. areas of top soiling, seeding and replanting of vegetation; species mix; requirements for fertilisation; seed sowing rates; watering etc. (i.e. bill of quantities).
» The following document should be consulted for further support with respect to information regarding rehabilitation, namely: The Department of Water Affairs and Forestry, February 2005. Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.
» These specifications may be modified by the Horticultural Landscape Contractor on consideration of site conditions.

6.5. Post- and during construction rehabilitation activities

» Correct and appropriate stockpile management of topsoil will be required during the construction phase.
» Rehabilitation of disturbed areas will be implemented as these areas become available for rehabilitation.
» Disturbed areas will include, for example: construction camp site, areas where underground cabling has been layed/buried, roadsides of new access roads.

7. Rehabilitation steps to mitigate the eroded areas

» Stockpiled topsoil must be spread over disturbed areas (150 – 200mm thick) just prior to planting/seeding.

» Rip and scarify along the contours of the newly spread topsoil prior to watering and seeding.
» Organic fertilizers or compost shall be used if site conditions require it and can be applied as part of hydro-seeding applications.
» Seed should be sown into weed-free topsoil that has been stockpiled (i.e. original topsoil from the site).
» Indigenous plants shall be used to rehabilitate disturbed areas.
» Applying the seed through hydromulching (hydro-seeding) is advantageous (or organic mulching after seeding).
» Watering is essential and rehabilitation should ideally occur during the wet season.
» The topsoil in the area is vulnerable to erosion therefore the hydro-seeded surfaces must be covered with a shade cloth material or natural fibre (hessian material) to reduce the loss of soil while the plants establish.

7.1. 'Watering' to avoid erosion

» Movement of livestock in newly rehabilitated areas must be restricted, where possible, while taking into consideration drinking areas/paths.
» Watering the rehabilitated areas should be undertaken in the wet/rainy season essential but if this is not possible, an initial watering period (supplemental irrigation) will be required to ensure plant establishment (germination and established growth).
» Generous watering during the first two weeks, or until the seeds have germinated, is required (unless adequate rainfall occurs) i.e. seed beds will need to be kept moist for germination to occur.
» For grass to establish (once germination has occurred), rainfall or irrigation is needed at regular intervals, ideally every few days and possibly every day if weather conditions require it.
» During dry periods, with no rainfall, 100 litres per m^2 (or 100mm of rain) over a month or more, may be necessary to establish plants capable of surviving dry weather (or otherwise specified by the Horticultural Landscape Contractor).

7.2. Seeding

The developer should make use of an appropriate mix of grass species for rehabilitation 9to be determined in consultation with a suitably qualified ecologist) and they must be mixed for sowing either in summer or in winter. Grass species application (Rutherford, 2006) is at the rate secified as kg/ha.

7.3. Steep slopes

» Areas that have a steep gradient and require seeding for rehabilitation purposes should be adequately protected against potential run-off erosion e.g. with coir geotextile netting or other appropriate methodology.

» Provision for wind should also be made on these slopes to ensure the fine grained soil is not removed.

7.4. Maintenance and duration

» Rehabilitation will occur during construction, as areas for plant rehabilitation become available.
» The rehabilitation period post construction is estimated to be over a period of 6 (minimum) to 12 months (maximum), or a time period specified by the Horticultural Landscape Contractor, particularly if planting of trees and shrubs occurs.
» The rehabilitation phase (including post seeding maintenance) should be at least 6 months (depending on time of seeding and rainfall) to ensure establishment of plants with a minimum 80% cover achieved (excluding alien plant species).
» If the plants have not established and the 80% is not achieved within the specified maintenance period, maintenance of these areas shall continue until at least 80% cover is achieved (excluding alien plant species).
» Additional seeding may be necessary to achieve 80% cover.
» Any plants that die during the maintenance period must be replaced.
» Succession of natural plant species should be encouraged.

8. Conclusion

The Erosion Management Plan is a document to assist the contractor, the Developer and the ECO with guidelines on how to manage erosion. The implementation of management measures is not only good practice to ensure minimisation of degradation, but also necessary to ensure comply with legislative requirements. This document forms part of the EMP, and is required to be considered and adhered to during the design, construction, operation and decommissioning phases of the project.

9. References

Department of Environmental Affairs. (1983). *Conservation of Agricultural Resources Act 43 of 1983.* Pretoria: Department of Environmental Affairs.

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Appendix D:

Waste Management Plan

APPENDIX D:

WASTE MANAGEMENT PLAN

Table of Contents

Introduction

Sound waste management is better achieved when an Integrated Waste Management System is implemented. This is more evident on sites or in areas where different parties and aspects are involved. Integrated Waste Management is better achieved when system is underlined by sound environmental principles. These principles derived from section 2 of the National Environmental Management Act (Act 107 of 1998). The following principles apply to waste management.

A **Precautionary approach** will be followed in the sense that harm to health and the environment is prevented when waste is generated, treated and disposed off. The developer as the generator of waste have to abide by the **Duty of Care** principle by ensuring that waste is disposed off in a manner that is environmentally sound and responsible. Management of waste must also follow an **Integrated and Holistic Approach** integrating health, safety and the environment in to the management approach and managing all aspects as a whole. By following the Best Practical Environmental Option one selects and implements the most sustainable management option in terms of the environment and the people surrounding it. The last principle that has to be considered in waste management is the **Polluter Pays** principle. This principle indicates that the costs for remediation and prevention of further pollution will fall on the responsible party.

Purpose of this document

A Waste Management Plan plays a key role in achieving sustainable waste management. This document is set to indicate the procedure that has to be followed during the handling, storage, transportation and disposal of waste that is generated from the activities on site.

Scope

The Waste Management Plan Procedure provides guidelines for waste management and applicable to employees, sub-contractors working on behalf of the developer for the development of the power line and culverts.

Waste Management Strategy

Waste will be managed according to the waste hierarchy as set in the National Environmental Management: Waste Act (Act 59 of 2008).The waste hierarchy dictates that the generation of waste should be avoided and minimised. If this is not possible the most desirable options will be reuse, recycle and recover waste. The last option will be disposal.

When waste is disposed it must be done in an environmentally safe manner and at a disposal site that is permitted and authorised to dispose of that waste. It is

the generators duty to ensure that such disposal sites have sound and responsible management practices.

Waste will be segregated at source to facilitate re-use, recycling, and recovery. Segregation of waste will be made possible by means of waste containers that are allocated and marked for different waste streams that are identified within the content of this document.

Emergency Procedures will be followed in the unforeseen event of a spill or if waste burns on site. (Emergency preparedness and Response Plan – XXX).

All employees will receive training on waste management issues by means of induction training and toolbox talks that will take place once per week. Littering on site is prohibited. No person is allowed to discard of any litter on site expect in bins provided for that purpose.

Waste generation

Daily operational activities will generate general waste, metal waste as well as hazardous waste on monthly basis. Figures of these wastes are not yet known and will vary within project cycles as there will be times of acceleration in activity and times decreased activity.

Sources of waste will include: empty containers, office paper, plastic water bottles, and food waste canteens, printer cartridges, and used vehicle oil from workshops

Legal Requirements

The following sources of South African Law have been identified and will form the basis for the developer to comply with environmental policies or Acts that apply to the Project, and the Project Manager should familiarize himself with, and have access to, the following pieces of legislation as a minimum:

- Constitution of South Africa (Act No. 108 of 1996);
- National Environmental Management Act (Act 107 of 1998);
- National Environmental: Waste Act (Act No. 59 of 2008);
- Hazardous Substances Act (Act No. 15 of 1973);
- Impacts and Aspects Register;
- Minimum Requirements for the Disposal of Waste by Landfill, Edition 3 (2005); and
- Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste, Edition 3 (2005).
- Environmental Authorisation for the power line and culverts (once issued)

Definations and Abbreviations

a. Defination of waste relevant to operations

Environment Surroundings within which human exists and that are made up of:

- The land, water and atmosphere of the earth;
- Micro- organisms, plant and animal life;

- Any part or combination of the above and the interrelationships among and between them; and
- The physical, chemical, aesthetic and cultural properties and conditions of foregoing that influence human health and well-being. (NEMA Act, Act No. 107 of 1998).

Waste means any substance, whether or not that substance can be reduced, re-used, recycled or recovered:

a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of;
b) which the generator has no further use of for the purposes of production;
c) that must be treated or disposed of; or
d) that is identified as a waste by the minister, by notice in the Gazette, but:
   i) a by-product is not considered waste; and
   ii) any portion of waste, once re-used, recycled and recovered, ceases waste.

Hazardous Means a source of or exposure to danger (NEMA, 1998)

Recovery Means the controlled extraction of a material or the retrieval of energy from waste to produce a product

Recycle a process where waste is reclaimed for further use, which process involves the separation of waste from a waste stream for further use and the processing of that separated material as a product or raw material.

Re-use to utilise articles from the waste stream again for a similar or different purpose without changing the form or properties of the articles

Container means a disposable or re-usable vessel in which waste is placed for the purposes of storing, accumulating, handling, transporting, treating or disposing of that waste, and includes bins, bin –liners and skips

Disposal Means the burial, deposit, discharge, abandoning, dumping, placing or release of any waste into air or any land.

Hazardous Waste Waste that has the potential to cause a negative threat/impact to humans and/or the environment. It includes, but is not limited to, batteries, neon lights, fluorescent lights, printer cartridges, oil, paint, paint containers, oil filters, IT equipment etc.

General waste Waste which does not pose an immediate hazard or threat to health or to the environment' and includes the following waste flows: domestic waste, construction and demolition waste, business waste, insert waste.

EMP Environmental Management Plan. A detailed plan of action prepared to ensure that recommendations for preventing the negative environmental Impacts and where possible improving

the environment are implemented during the life cycle of the project.

Abbreviations

ECO	Environmental Control Officer
EMP	Environmental Management Plan
WMP	Waste Management Plan
NEM: WA	National Environmental Management: Waste
(Act 59 of 2009)	
DWA	Department of Water Affairs
I&AP	Interested and Affected Parties/Person

General waste

a. Management of general waste

General waste will be segregated at source and place in the correct waste bins designated for each waste stream. General waste will not be stored on site for longer than 30 days and will be collected and emptied on a weekly basis by waste management company for disposal.

b. General waste stream

This is waste that does not pose an immediate threat to health or the environment. Most of these waste streams will be designated to be re-used, recycle and recovered.

i) Compactable General waste

This is any waste type that are small in size and that can be compacted

- General waste: waste that does not fall within the defined waste streams that will be disposed of in landfill. Domestic waste will be discarded in waste bins that are labelled "General Waste". Source of this waste will be kitchen, beverage cans, plastic waste and carteens.
- Waste papers: These are waste paper boxes that are unwanted. This waste will be discarded in waste bins labelled "Waste paper, Boxes"

ii) Un-compactable general waste

This is waste that is large in size that cannot be disposed of in normal waste bins or skip. Most of the waste types in this category can be recycled or re-used within the operations on a construction site or can be recycled in to the local community.

- Scrap metals: all metal or steel that is discarded or termed off-cuts will form the bulk of the scrap metal waste stream. These metals will be placed in waste bins labelled "Metal Waste"

c. Recycling Procedure

All scrap/metal waste generated will be collected and sent to the recycling facilities for recycling purpose. Used oil shall be collected by recycling companies where applicable.

Hazardous waste

a. Management of hazardous waste

Hazardous waste will be stored in a safe and responsible manner. Hazardous waste will not be stored on site for more than 30 days. This hazardous waste will be placed in a waste bin labelled 'Hazardous Waste" and will be collected and disposed of as Hazardous waste at approved landfill site. All hazardous waste types will be identifiable at all times. Incompatible waste type will be stored separately.

b. Hazardous waste types

- Hydrocarbon contaminated materials: such as soil due to spills and oil leaks;
- Used equipments/vehicles oils: from vehicles being serviced at workshop;
- Printing cartridges; and
- Chemical waste (such as used oil, paint, insecticide).

Waste bins

a. Waste bins conditions

The contractor/s to ensure that the waste bins used are suitable for the waste that is to be stored within. The waste bins will be in a good condition, not be corroded and may not permit leachate or be otherwise unfit for the safe storage of waste designated to that container. Bins will have mechanisms in place to prevent waste from becoming wind blow litter and it must be scavenger proof. Hazardous waste bins will be sealed to ensure that no spillages can occur. These bins will be also be labelled so as to identify type of waste, date of storage commencement and generator details.

b. Inspections of waste bins

Waste bins will be inspected on a daily basis to ensure that they remain in an acceptable condition for safe storage of waste. These inspections will be documented and records will be kept for future references.

c. Placement of waste bins

The bins will be placed in centralised locations in order to ensure that it is accessible to all employees. The waste bins will be emptied and the waste will be taken to the relevant designated areas (the central storage area or the waste transfer station) awaiting collection by waste removal companies.

Waste storage areas and collecion points

a. Specifications of waste storage areas

Waste will be managed in such a way as to prevent it from becoming a nuisance such as odor and to prevent the breeding of vermin and vectors. Management practices will ensure that no environmental harm is caused. All waste area will be clearly marked with signs to specify that waste is being stored in that area and to indicate what the nature of waste is. Storage areas will be fenced with access control to prevent unauthorised access.

i) General waste storage areas

Storage areas for general waste will be kept clean and neat, with a high level of housekeeping.

ii) Hazardous waste storage areas

Storage areas for hazardous waste will be having a roof to divert rain water from waste containers and must be fully bunded (110%) with pollution collection measurements in place in case of any spills or leakages. A high level of house keeping must be maintained in and around the storage. A file with (MSDS) documents and waste acceptance forms must be kept on site.

b. Requirements of collection points

Points from which waste is collected to be taken to the storage areas or the transfer stations will be clearly accessible for vehicles.

d. Waste removal schedule

Waste bins will be emptied on a regular basis. This will either be daily, weekly or when bins have reached their capacity. A call for service will be issued to the waste removal company when bins are full.

General rules

a. Records

All waste removal records will be maintained on site where it is accessible to all interested and affected parties. These records will include an updated list of the waste streams and volumes generated and disposed of, all collection certificates and disposal certificate and all material recycled or re-used and the volume thereof.

b. Review

Project Manager and Environmental Officer will review this Waste Management Plan.

c. Reporting

Waste disposal figures will be reported on a monthly basis to the the Team Aurora HSE and ECO.

Conclusion

Compliance and implementation of this procedure will ensure effective management of waste on site. The developer and their sub-contractors will comply with the requirements of the EMPr, the environmental authorisation and other legislative requirements that may have an impact on waste management in general.

Appendix E:

Principles for Plant Search & Rescue, Re-vegetation and Rehabilitation

METHODS FOR PLANT RESCUE AND HABITAT REHABILITATION

List of Abbreviations

CARA: Conservation of Agricultural Resources Act 43 of 1983
DEA: Department of Environmental Affairs
EA: Environmental Authorisation
ECO: Environmental Control Officer
EMPr: Environmental Management Programme
NEMA: National Environmental Management Act 107 of 1998
LFA: Landscape Functional Analysis (Tongway and Hindley 2004)
IAP: Invasive Alien Plant

List of Definitions:

Accelerated soil erosion: Soil erosion induced by human activities.

Acceptable cover: An acceptable cover shall mean that not less than 75% (in an area with rainfall above 400 mm per annum), or 40% (in regions receiving less than 400 mm rain per annum), of the area planted or hydroseeded shall be covered with grass and that there shall be no bare patches of more than 500 mm in maximum dimension.

Alien: originating from another country or continent and originally different environment, commonly used to describe plants that are not indigenous to South Africa and have become problematic (spreading rapidly, threatening existing biodiversity).

Allelopathic components: one or more biochemical compound produced by a plant and released through leaf litter or roots that suppresses the growth, survival, and reproduction of other surrounding vegetation.

Bare soil: Un-vegetated soil surface, unaltered by humans.

Compacted soil surface: A soil surface that has been hardened by an outside source, causing the soil to be more compacted than the surrounding area.

Container plants: Container plants include all vegetation which are bought or supplied in acceptable containers from nurseries or vegetation lifted out of their natural position and placed in containers.

Desirable end state: the future condition or target on which the rehabilitation is designed and that will serve later as a basis for rehabilitation success evaluation. This can be based on a reference site or modelled according to available information on historic vegetation.

Ecological rehabilitation: The process of assisting the recovery of a degraded or damaged ecosystem in a trajectory that renders the ecosystem fully functional, stable, and able to develop further, but not necessarily returning to the original historic state.

Ecological restoration: The process of assisting the recovery of an ecosystem that has been degraded damaged or destroyed, in a trajectory that ultimately returns the ecosystem to its natural successional stage.

Ecosystem: The combination of biota within a given area, together with a suitable environment that sustains the biota and the interactions between biota. It can have a spatial unit of any size, but shows some degree homogeneity as far as structure, function and species composition is concerned. Small-scale ecosystems typically link up to larger scale ecosystems and all contribute to the ecosystem function and services at the landscape-scale.

Environmental Management Plan: an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction and operation, and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced.

Establishment of grass: All procedures necessary to produce an acceptable cover of grass on an area.

Establishment Period: The Establishment Period is defined as the period beginning from the actual planting or placing of vegetation until three months thereafter, unless otherwise specified or unless grass cover is unacceptable or unless plants have not taken.

Extinction debt: is a concept that describes the future extinction of species due to events in the past. Extinction debt occurs because of time delays between impacts on a species, such as destruction of habitat or reduction of population size, and the species' ultimate disappearance.

Geophytic: resprouting during the growing season from an underground storage organ such as bulbs, corms, tubers or rhizomes, and dying back completely during unfavourable seasons.

Hydroseeding: To apply seed in a slurry with water (plus other materials to enhance growth) by means of a spraying device.

Indigenous: refers to a plant or animal that occurs naturally in the place in which it is currently found.

Invasive plant: a kind of plant which has under section 2 (3) of CARA been declared an invader plant, and includes the seed of such plant and any vegetative part of such plant which reproduces itself asexually.

Landscape: Consists of a mosaic of two or more ecosystems that exchange organisms, energy, water, and nutrients.

Nursery conditions: These are the necessary conditions to maintain healthy growth of rescued and/or container plants. This includes protection of such plants against wind, frost, direct sunlight, pests, rodents, diseases, and drought. It also includes the provision of suitable water, fertilizer and any other measures required to maintain the container plants.

Period of Maintaining: The Period of Maintaining is defined as the period following directly after the Establishment Period until the end of the Period

of Maintenance for the whole Contract as defined in the General Conditions of Contract, unless otherwise specified.

Revegetation: The process of establishing a vegetative cover on exposed soils, regardless of species composition or structure, as long as the species are non-invasive and their presence will not impede the gradual process of ecological rehabilitation or –restoration.

Soil Erosion: is a natural process whereby the ground level is lowered by wind or water action and may occur as a result of inter alia chemical processes and or physical transport on the land surface**.**

Scarifying: To roughen the surface of soil as a preparation for seeding or topsoil addition.

Trimming: To neatly round off the levels of existing or previously shaped earthworks to blend in with the levels of other earthworks, constructed works, or natural landforms.

Transformation: The conversion of an ecosystem to a different ecosystem or land use type.

Topsoil: uppermost layer of soil, in natural vegetation maximally 30 cm, in cultivated landscapes the total depth of cultivation, containing the layer with humus, seeds and nutrients. Topsoils that are applied to landscapes to be rehabilitated must be free of refuse, large roots and branches, stones, alien weeds and/or any other agents that would adversely affect the topsoils suitability for re-vegetation.

Weed: a plant that grows where it is not wanted, and can therefore be an indigenous or alien species. An unwanted plant growing in a garden is just called a weed, but the 198 listed IAPs are called “declared weeds and invaders”.

1. Purpose

The Plant Rescue and Revegetation Management Plan addresses the need to mitigate all impacts leading to disturbed vegetation, loss of species and/or agricultural potential, disturbed soil surfaces, and generally bare soils prone to erosion and further degradation on the proposed development site. The plan overlaps to some degree with the Storm Water and Erosion Management Plan, and for successful rehabilitation, it is imperative that this plan is at all times used in conjunction with other EMPrs mentioned.

The objective of the plan is therefore to provide:

» Protocols for the removal, temporary storage and replanting of plant species of conservation concern
» Protocols for the rehabilitation of vegetative cover across the project area
» Tools for planning the rehabilitation work and responding to unforeseen events
» Guidelines on implementation and post-implementation tasks
» Criteria for evaluating rehabilitation success
» A summary of items to be included in the rehabilitation budget to ensure that there is sufficient allocation of resources on the project budget so that the scale of EMP-related activities is consistent with the significance of project impacts

2. Scope

This document is a plant rescue, rehabilitation, and revegetation plan that provides a guideline to be applied by all contractors on the development site. This plan, as part of the project EMPr, is a legally binding document that must be implemented to fullfil the requirements of relevant legislation. However, the management plan is an evolving guideline that needs to be updated or adapted as progress is made with the rehabilitation and revegetation of the project area, and successes and failures of procedures identified.

The objective of rescuing plants, rehabilitation and revegetation on the project area is:

» Preventing the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.
» Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.
» Preserving or re-creating the structural integrity of natural plant communities.
» Actively aid the improvement of indigenous biodiversity according to a desirable end state according to a previously recorded reference state. This reference

state, if healthy, will be dynamic and able to recover after occasional disturbances without returning to a degraded state.

» Improving the ecosystem function of natural landscapes and their associated vegetation.

3. Legislation and Standards

Relevant legislation:

» Conservation of Agricultural Resources Act 43 of 1983
» Environmental Conservation Act 73 of 1989
» National Forestry Act 84 of 1998
» National Environmental Management Act 107 of 1998
» Northern Cape Nature Conservation Act (Act No. 9 of 2009)

4. Effect of clearing alien vegetation

Invasive and Alien Plants (IAPs) gradually displace and suppress indigenous and/or herbaceous vegetation as their stands become bigger and denser. In addition, they use more water, hence desiccate the soil more, and may alter chemical properties of the soil – partially through secondary compounds released from their litter, partially from compounds released from roots. These altered soils suppress the germination and establishment of herbaceous species, leading to bare soil underneath dense IAP canopies.

After clearing dense stands of invasive shrubs, soil surfaces are thus generally bare with topsoil exposed to erosion and often already somewhat capped and eroded.

5. Effect of removing individuals of species of conservation concern

Species of conservation concern are declining either due to overexploitation or because their range of occupancy is limited and further infringed on by development. Most plant populations require a certain minimum number of individuals within a population or metapopulation to allow for sufficient genetic transfer between individuals. This prevents genetic erosion and hence weakening of the ability of individuals to persist in their environments. Similarly, where the distance between metapopulations is significantly increased due to fragmentation and the resultant loss of some populations, populations may suffer genetic decline due to restricted movement of pollen. Pollinators or other species that depend on a particular plant species for a specific microhabitat or food source may be equally affected because of the reduction of available resources. Therefore the aim of plant rescue actions are always to maintain as many individuals of a plant population in as close proximity to the original habitat as possible to minimise loss of individuals and fragmentation of populations to prevent the creation of future extinction debts of the development.

6. General: Plant rescue and protection

Successful plant rescue can only be achieved if:

» Species can be removed from their original habitat with minimal damage to the plant, especially the roots.
» All plants removed are safely stored and treated according to their specific requirements prior to being transplanted again.
» They are relocated into a suitable habitat and protected from further damage and all disturbances to aid their re-establishment.
» Timing of planting activities is planned with the onset of the growing season.
» Steps are taken where necessary to aid the initial establishment of vegetation, including occasional watering.

6.1. Time of planting

» All planting shall be carried out as far as is practicable during the period most likely to produce beneficial results (i.e. during the peak growing season), but as soon as possible after completion of a section of earthworks.
» Drainage line rehabilitation preparation must be done during autumn, and planting of appropriate species in these areas should commence during early spring after the first rains.

7. General: IAP removal

Removal of invasive plants should at all time follow the specifications and guidelines of the Working for Water Programme (refer also to invasive plant management plan).

Information can be obtained from the relevant website:
http://www.dwaf.gov.za/wfw

Detailed information on clearing methods is available on the above websites “Alien Invasive Plants” menu (clearing methods, operational standards and species-specific treatment methods).

8. General: Rehabilitation and re-vegetation

Successful rehabilitation can only be achieved with:
» A long-term commitment
» Practical, adaptive management
» Viable goals of desired outcomes

Prior to vegetation rehabilitation, all stakeholders involved should be consulted to determine:

» What the rehabilitation is ultimately aiming for– rehabilitation of cropping/grazing lands or rehabilitation of indigenous vegetation, after soil erosion and storm water management is in place and IAPs have been cleared?
» A clear definition of incompatible and compatible vegetation on and in the immediate surroundings of the development must be defined and maintained as such. No tree or shrubs shall be allowed to grow to a height in excess of the horizontal distance of that tree or shrub from the nearest newly developed structure or to grow in such a manner as to endanger the development or its operation
» Who will take long-term ownership and hence responsibility for the rehabilitation and its subsequent monitoring and management? Continued monitoring of vegetation establishment and composition, as well as erosion detection will have to be coupled with continued follow-up maintenance of rehabilitation and erosion control from commencement of activity up to the decommissioning phase.

The ultimate objective for rehabilitation should focus on the stabilisation of soil erosion, retaining agricultural potential of transformed areas and /or the establishment of a dense and protective plant cover and the maintenance of habitats to enable vegetation to persist and flourish on rehabilitated areas indefinitely, ultimately relying only on environmental resources.

8.1. Map and create management areas

The entire project area must be mapped and divided into management areas indicating:

» Current land cover
  - Roads and residential
  - Areas with IAPs, subdivided further in sparse or dense infestations where applicable
  - Transformed areas
  - Untransformed indigenous vegetation

For every one of the management areas, the project proponent, in consultation with the land users, will have to decide what intervention will be necessary, desirable, and feasible to enable the development of the project and long-term sustainable maintenance of infrastructure. Thus for every management area there must be an operational outline on:

» what will happen there
» what needs to be mitigated – including storm water- and erosion management
» which management units need priority intervention/mitigation
» how will this mitigation / intervention be done (method statements) including schedule of work
» realistic and desirable end states including list of species that should be established to initiate rehabilitation after initial revegetation

» approximate timeframes
» monitoring protocol to evaluate success or failures of interventions
  - establish permanently marked transects and monitor with fixed-point photography
» who will be responsible for doing what
» how will different actions be integrated to achieve and maintain or improve the desirable end state of the environment of that management unit

Special attention will have to be given to drainage zones, as these not only have very active morphodynamics, but are also distributers of seeds – both indigenous and of IAPs. Thus clearing a downstream invasion of aliens to enable maintenance of the development will be futile if the upstream IAPs are not cleared or at least aggressively controlled.

8.2. Setting realistic rehabilitation goals

Rehabilitation efforts typically aim at improving ecosystem function that consists of a series of processes, which can in the end be evaluated against a desired outcome or reference state of the vegetation and environment.

Attainable goals of rehabilitation on the project area should be possible and viable for at least the following:

» Stabilisation of soils
» Stabilisation of riparian areas
» Storm water reduction through management and wetland integrity
» Clearing of IAPs
  - The degree to which IAPs can be cleared from the project area needs to be determined according to desirability, available project funding, personnel and project requirements
» Restoring and/or rehabilitating vegetative cover on non-transformed areas to obtain an acceptable vegetation cover that can be maintained or persists on its own indefinitely

8.3. Remove or ameliorate the cause of degradation

This will include:

» Physical rehabilitation of topsoil where it has been removed.
» Topsoil on areas that have not been cultivated are considered as the upper 20 - 30 cm only. These contain the most important nutrients, micro flora and –fauna essential for nutrient cycling processes. Topsoils are also an important source of seeds.
» Subsoils and overburden substrata lack the above elements and will first have to be used for physical rehabilitation of landscapes as and where necessary, and then overlain with topsoils

» Stabilisation of topsoils and prevention of erosion – refer to the Erosion management pan
» Removal of all invasive vegetation – refer to the Invasive Management Plan
    - Where it is desirable to use brush or logs of the cleared vegetation for soil stabilisation, such material must be free of regenerative material – e.g. seeds or root suckers

8.4. Initial revegetation

Immediately after clearing of vegetation, the soil surface must be inspected for signs of erosion and stabilised as soon as possible. After completion of construction, such erosion stabilisation should preferably be with a cover of vegetation. A dense initial grass or other perennial cover will be desirable. The appropriate seed mix should be determined in consultation with an ecologist familiar with the area. The aim of the first vegetation cover is to form a protective, relatively dense indigenous layer to slow runoff, increase moisture infiltration into the soil, and gradually change the soil nutrient status in order for it to be more favourable for other desirable indigenous vegetation to become established.

8.5. Plant Search and Rescue

Prior to construction, once all the areas where topsoil will be removed or areas will be transformed have been demarcated, the ECO and contractor will be responsible to remove all bulbous species from the topsoil, as well as succulents and small indigenous shrubs that can be transplanted. These are to be kept in a raised, protected position in a designated area until they can be replanted again as part of the rehabilitation process. Further details are listed in the operation standards.

8.6. Natural seed banks and improvement of plant structural and compositional diversity

It is expected that soil seed banks of indigenous vegetation will be present to initiate initial vegetation cover, but may not be sufficient to establish an acceptable cover of desirable species. After deciding which indigenous species should be re-introduced, seed should be ideally collected from site or an environmentally-matched site nearby.

Seed collection may be done throughout the year as seed ripens, but can also be restricted to summer, when a large amount of the perennial seed should have ripened. Seeds should be stored in paper or canvas bags dusted with insecticide, and sown at the onset of the rainy season.

Alternatively, slower-growing perennials may be raised from seed or cuttings in a nursery and then transplanted once established. It will be beneficial to investigate if community members would be able to create and maintain such a nursery, or if there are nurseries in the area, that raise indigenous flora from the area.

The final vegetation cover should resemble the original (non-encroached) vegetation composition and structure as far as practicable possible or permissible within each management unit.

For drainage areas:

» First restore drainage line morphology following the guidelines of the Erosion management plan – without that ecological recovery cannot be initiated
» Determine if natural seed sources may be present further upstream
» If such upstream seed sources are still present, rehabilitation of riparian vegetation after soil erosion management will most likely occur naturally, PROVIDED that follow-up monitoring of the establishment of vegetation is carried out, and all invasive species eradicated as they emerge. This can only be achieved with a long-term commitment (> 5 years minimum)
» Should no upstream seed resources be available, suitable species (as determined in consultation with an ecologist) should be sown or planted.

8.7. Monitoring and follow-up action

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of ecosystems affected by the development, and remedy these as soon as detected.

During the construction phase, the ECO and contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the project proponent will have to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that should be monitored:
» Composition and density of replanted vegetation, distinguishing between species introduced for initial revegetation only and species that are part of the pre-determined desirable end state
» Associated nature and stability of surface soils
  - It is recommended that permanent transects are marked and surveyed annually according to the LFA technique (Tongway and Hindley 2004), adapted to integrate both surface soil characteristics and the vegetation to be monitored
» Re-emergence of IAPs
  - If noted, remedial action must be taken immediately according to Working for Water specifications
» Nature and dynamics of riparian zones
  - Stability of riparian vegetation
  - Any form of bank erosion, slumping or undercutting

- Stability of channel form and width of streams – if this increases, it shows that vegetation on plains and/or riparian areas and upper drainage lines are not yet in a stable enough state to be fully functional in reducing excess runoff and the ecosystem overall is losing valuable resources

8.8. Timeframes and duration

» Rehabilitation will occur during construction, as areas for the re-application of topsoil and revegetation become available or where revegetation can be initiated after clearing of invasives or to stabilise erosion.
» The initial revegetation period post construction is estimated to be over a period of 6 (minimum) to 12 months (maximum), or a time period specified by the Horticultural Landscape Contractor, particularly if planting of trees and shrubs occurs.
» The rehabilitation phase (including post seeding maintenance) should be at least 12 months (depending on time of seeding and rainfall) to ensure establishment of an acceptable plant cover is achieved (excluding invasive plant species or weeds).
» If the plants have not established and the acceptable plant cover is not achieved within the specified maintenance period, maintenance of these areas shall continue until at acceptable plant cover is achieved (excluding alien plant species or weeds).
» Additional seeding or planting may be necessary to achieve acceptable plant cover. Hydroseeding may have to be considered as an option in this case.
» Any plants that die, during the maintenance period, shall be replaced by the Horticultural Landscape Contractor (at the Horticultural Landscape Contractor's cost if it was due to insufficient maintenance).
» Succession of natural plant species should be encouraged
» Monitoring of rehabilitation success and follow-up adaptive management, together with clearing of emerging invasives shall be carried on until the decommissioning phase has been completed.

9. Conclusion

The Plant Rescue and Revegetation Management Plan is a document to assist the contractor, the developer, and the ECO with guidelines on how to plan and implement the required work, and understand the concepts behind successful rehabilitation. This plan will have to be implemented in conjunction with erosion-, storm water- and IAP management plans. The exact details of the rehabilitation plan will depend on the determined extent of rehabilitation that will have to be undertaken, available funding, and desirable end state of the vegetation after rehabilitation.

10. References and further reading

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Tongway, D.J. and Hindley, N.L. (2004) Landscape Function Analysis: Procedures for Monitoring and Assessing Landscapes, CSIRO Sustainable Ecosystems, CANBERRA, AUSTRALIA.

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A. APPENDIX: RECOMMENDED OPERATIONAL STANDARDS

OBJECTIVE: Revegetate and Rehabilitate disturbed areas

The Contractor must take all reasonable measures to ensure that plant species of conservation concern are rescued and survive indefinitely. Landscaped topsoils as well as areas cleared of IAPs must be adequately rehabilitated and /or revegetated to ensure that the ecosystems affected by the development regain and/or retain their functionality indefinitely.

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of ecosystems affected by the development and remedy these as soon as detected.

Mitigation measures relating to the vegetative cover as part of a healthy ecosystem must be implemented in order to effectively limit and gradually reverse the impact on the environment. The focus of the mitigation measures laid out below relate to project-related disturbances. Where such disturbances are exacerbated by farming-related disturbances or vice versa, mitigation measures must be carried out in consultation with the land-user responsible.

Project component/s	Project components affecting the objective: » Turbines » Access roads and cabling between and to turbine units » Power line » Sealed surfaces (e.g. roofs, concrete surfaces, compacted road surfaces, paved roads / areas) » Substation » All other infrastructure
Potential Impact	» Loss of suitable substrate for a stable vegetation cover » De-stabilisation and/or alteration of substrate and hence degradation of vegetation cover, significant change in species composition or loss of agricultural potential » Loss of suitable habitat for flora and fauna » Leaky ecosystem due to loss of nutrients and moisture from the system, leading to a less resilient vegetation cover and loss of ecosystem function and -services » Degradation and/or loss of riparian areas and wetlands on and beyond the project boundaries » A loss of indigenous vegetation cover and possibly endangered species » Disturbance of fauna species
Activities/risk sources	» Rainfall and wind erosion of disturbed areas » Excavation, stockpiling and compaction of soil » Existing IAPs as well as clearing thereof » Concentrated discharge of water from construction activity or new

	infrastructure » Storm water run-off from sealed, altered or bare surfaces » Mobile construction equipment movement on site » Cabling and access roads construction activities » Power line construction activities » River/stream/drainage line road crossings » Roadside drainage ditches » Project related infrastructure » Premature abandonment of follow-up monitoring and adaptive management of rehabilitation
Mitigation: Target / Objective	» To minimise loss of plant species of conservation concern » To minimise unfavourable runoff conditions and loss of resources from the ecosystems » To minimise erosion of soil from site during and after construction » To minimise and mitigate unfavourable alteration to drainage lines, especially incision » To minimise damage to indigenous vegetation during and after construction » No accelerated overland flow related surface erosion as a result of project infrastructure » No reduction in the surface area or general nature and functionality of wetlands (drainage lines and other wetland areas) as a result of the establishment of infrastructure on the project areas and beyond its boundaries » A clear reduction of IAPs on the project area and replacement thereof by indigenous vegetation according to a pre-determined desirable end state

Mitigation: Action / control	**Responsibility**	**Timeframe**
Planning		
Classify the entire project area into management units according to current land cover and state of the environment and map accordingly	Developer / Contractor	Prior to construction
For each management unit » establish what interventions will be necessary relating to IAPs, soil erosion management, topsoil handling, landscape rehabilitation and revegetation » where rehabilitation and revegetation will be necessary, decide on the desired end state of vegetation for that management unit and create a list of species to be established on specific sites » outline the management of construction activities, including topsoils, excavated materials and felled biomass in a manner that will optimise the rehabilitation goals as fast and as effective as possible for that management unit	Developer / Contractor in collaboration with ECO and land-users	Prior to construction
Plant Rescue and indigenous plant materials		
All harvested plant materials shall be labelled with » Genus as minimum, species if known » Habitat from which materials were collected	ECO	Prior to construction

Mitigation: Action / control	Responsibility	Timeframe
Indigenous plant materials for re-vegetation: » All plant material shall be obtained from the search-and-rescue operation on the site prior to clearing or from local nurseries or reputable seed providers » Indigenous materials shall only be removed from their habitat with the necessary permits whenever applicable » Each plant removed shall be handled, packed and stored in a manner suitable for that species » Removed plants shall be protected from windburn or other damage during transportation » No plants or plants with exposed roots shall be subjected to excessive exposure to drying winds and sun, or subjected to water logging » All plants shall be kept free from plant diseases and pests and protected from rodents or other damaging agents » All indigenous plants that have been removed prior to clearing shall be returned to conditions resembling their original habitat as close as practically possible	Contractor in collaboration with ECO	Before, during and after construction
Seed stocks for rehabilitation » Seed can be used for cultivation of desirable species for revegetation » Seed shall be utilised for direct sowing or hydroseeding » Seed collected from the site must be dried and stored in a suitable facility under cool (7-10˚C), dry, insect free conditions until required for cultivation or seeding. Only viable, ripe seed shall be used » Seed harvested shall be insect- and pathogen free » Seed harvested shall not contain materials of any invasive species » Prior to clearing, seed should be collected from the site on a regular basis as species start to seed to maximise the amount of fully developed seed secured » From sites that will be cleared, 100% of all seeds available may be collected » From sites adjacent to the development, 25% of seeds can be collected for rehabilitation	Contractor and ECO	Before, during and after construction
Site-specific nursery » On-site nursery facilities shall be erected for the holding of rescued plant material and the propagation of appropriate species for re-vegetation » Where nursery facilities can only cater for rescued plants, a suitable (local) nursery shall be identified that will be willing to receive seeds collected and propagate the necessary species for later revegetation » Soil or other propagation media, were used, shall be weed- and pathogen free » Argentine ants shall be controlled at all times » The area where plants are stored shall be kept free of	Contractor, ECO to control	Prior to construction

Mitigation: Action / control	Responsibility	Timeframe
weeds » Plants stored in the designated area shall be protected from rodents, excessive sun and wind, and inspected regularly until being planted for pathogens and pests, and then treated accordingly » The nursery shall be adequately secured to prevent loss or theft of species		
Protected flora » Ensure that no indigenous protected flora is removed from its original habitat in the project area without legal documents from the relevant authorities	ECO	Before, during and after construction
Topsoil		
Avoid » Management units that will not be developed or selected elements – trees, rocky outcrops on site shall be maintained in situ and demarcated clearly to prevent any disturbance during construction » These units will be considered as NO-GO areas during construction	Contractor and ECO	Before, during and immediately after construction
Invasives » Remove all invasive shrubs as per the Working for Water specifications	Contractor, ECO to control	Before, during and after construction
Mulch » all trees felled shall be debranched and the logs used in controlling erosion from re-landscaped topsoils and/or adding surface roughness and organic matter to topsoils to be rehabilitated » all cut branches from trees, as well as all shrubs cleared from the construction site shall be shredded to mulch, either by a chipper or by hand to sticks no longer than 10 cm » preparation of mulch shall be done at source » mulched material shall be free of seed-bearing invasive plant material » the mulch shall be suitably stored – bagged if necessary - and will be used in rehabilitation and soil erosion management on the site » should additional mulch be used for rehabilitation, this should be obtained from invasive shrubs of areas not cleared » mulch shall be stored for as short a period as possible	Contractor, ECO to control	Before, during and immediately after construction
Storage of topsoil and subsoil: » topsoils constitute the upper 20 – 30 cm of soil only, lower layers of soil are regarded as subsoil » stockpiling of topsoils and subsoils shall only be done on previously transformed areas, and be kept at least 50 m from any remaining natural vegetation » care shall be taken during stockpiling to prevent the	Contractor, ECO to control	During and immediately after construction

Mitigation: Action / control	Responsibility	Timeframe
mixing of topsoil with subsoil and/or any other material » topsoils shall be stored in heaps no higher than 100 cm, and shall be re-applied as soon as possible » care shall be exercised during stockpiling of topsoils to prevent compaction thereof » topsoils shall be adequately protected from erosion by preventing concentration of surface water and scouring of slopes » erosion of topsoils has to be contained and repaired as soon as it occurs, before large scale erosion and loss of topsoil develops » any logs obtained during clearing operations can be used in continuous rows to curtail erosion where necessary. Geojute (geotextile) shall be used additionally if the logs are not sufficient to remedy any erosion – for details refer to the erosion management plan » where topsoils need to be stored longer than 6 months, such stockpiles shall be revegetated, even if this has to include re-seeding to achieve an acceptable cover of vegetation		
Boulders and rocks » where removed during clearing, should be stored separately and used in the rehabilitation program » boulders and rocks must be partially buried within the topsoil layer wherever practical to provide greater soil-holding stability and reduce water erosion » placement of rocks and boulders shall mimic the natural occurrence of rocks and boulders in the area	Contractor, ECO to control	During and after construction
Rehabilitation of surface		
Prior to the application of topsoil » subsoil shall be shaped and trimmed to blend in with the surrounding landscape or used for erosion mitigation measures » ground surface or shaped subsoil shall be ripped or scarified with a mechanical ripper or by hand to a depth of 15 – 20 cm, » compacted soil shall be ripped to a depth greater than 25 cm and the trimmed by hand to prevent re-compacting the soil » any rubbish, concrete remnants, steel remnants or other objects introduced to the site during the construction process shall be cleared before ripping, or shaping and trimming of any landscapes to be rehabilitated takes place » shaping will be to roughly round off cuts and fills and any other earthworks to stable forms, sympathetic to the natural surrounding landscapes	Contractor, ECO to control	During and after construction

Mitigation: Action / control	Responsibility	Timeframe
Application of topsoil » topsoils shall be spread evenly over the ripped or trimmed surface, if possible not deeper than the topsoil originally removed » the final prepared surface shall not be smooth but furrowed to follow the natural contours of the land » the final prepared surface shall be free of any pollution or any kind of contamination » care shall be taken to prevent the compaction of topsoil » where applicable, the final prepared surface will also contain scattered rocks and/or logs to mimic the natural condition of the original habitat or area and to aid in soil stabilisation and erosion control	Contractor, ECO to control	During and after construction
Soil stabilisation » mulch from brush shall be applied by hand to achieve a layer of uniform thickness » mulch shall be rotovated into the upper 10 cm layer of soil o this operation shall not be attempted if the wind strength is such as to remove the mulch before it can be incorporated into the topsoil » in very rocky areas a layer of mulch shall be applied prior to adding the topsoil » measures shall be taken to protect all areas susceptible to erosion by installing temporary and permanent drainage work as soon as possible o where natural water flow-paths can be identified, subsurface drains or suitable surface drains and chutes need to be installed » additional measures shall be taken to prevent surface water from being concentrated in streams and from scouring slopes, banks or other areas o if mulch is limited, available mulch, together with harvested seeds, should be concentrated in these hollows to promote rapid re-vegetation in them » runnels or erosion channels developing shall be back-filled and restored to a proper condition o such measures shall be effected immediately before erosion develops at a large scale » where erosion cannot be remedied with available mulch, logs or rocks, geojute shall be used to curtail erosion	Contractor, ECO to control	During and after construction
Borrow-pits » shall be shaped to have undulating, low-gradient slopes and surfaces that are rough and irregular, suitable for trapping sediments and facilitation of plant growth » upon completion of rehabilitation these reshaped and revegetated areas shall blend into the natural terrain	Contractor, ECO to control	After construction

Mitigation: Action / control	Responsibility	Timeframe
Revegetation		
Recreate a non-invasive, acceptable vegetation cover that will facilitate the establishment of desirable and/or indigenous species » revegetation of the final prepared area is expected to occur spontaneously to some degree where topsoils could be re-applied within 6 months » revegetation will be done according to an approved planting/landscaping plan according to the management units initially delineated and their respective desirable end states and permissible vegetation	Contractor, ECO to control	Successively during construction, as construction of individual components is completed, then followed up until desired end state is reached
Re-seeding » revegetation can be increased where necessary by hand- seeding indigenous species o previously collected and stored seeds shall be sown evenly over the designated areas, and be covered by means of rakes or other hand tools » re-seeding shall occur at the recommended time to take advantage of the growing season » in the absence of sufficient follow-up rains after seeds started germinating, watering of the new vegetation cover until it is established shall become necessary to avoid loss of this vegetative cover and the associated seedbank » where, after initial re-seeding, the no acceptable vegetation cover has established within 12 months, hydroseeding should be considered as an option for follow-up revegetation work » sowing rates of seeds used during hydro-seeding should be obtained from the relevant supplier and in accordance with the existing environment	Contractor, ECO to control	Successively during construction, as construction of individual components is completed, then followed up until desired end state is reached
Planting of species » species to be planted include all rescued species » the size of planting holes shall be sufficiently large to ensure that the entire root system is well covered with topsoil » soil around the roots of container plants shall not be disturbed » bulbous plants shall be planted in groups or as features in selected areas » before placement of larger plant specimens into prepared holes, the holes shall be watered if not sufficiently moist » during transplanting care shall be taken to limit or	Contractor, ECO to control	Successively during construction, as construction of individual components is completed, then followed up until desired end state is

Mitigation: Action/control	Responsibility	Timeframe
prevent damage to roots » plants should be watered immediately after transplanting to help bind soil particles to the roots (or soil-ball around rooted plants) and so facilitate the new growth and functioning of roots		reached
Traffic on revegetated areas » designated tracks shall be created for pedestrian of vehicle traffic where necessary » Disturbance of vegetation and topsoil must be kept to a practical minimum, no unauthorised off road driving will be allowed » All livestock shall be excluded from revegetated areas	Contractor	Before, during and after construction
Establishment » The establishment and new growth of revegetated and replanted species shall be closely monitored » Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created	Contractor	Successively during construction, as construction of individual components is completed, then followed up until desired end state is reached
Monitoring and follow-up treatments		
Monitor success of rehabilitation and revegetation and take remedial actions as needed according to the respective plan » Erosion shall be monitored at all times and measures taken as soon as detected » Where necessary, reseeding or replanting will have to be done if no acceptable plant cover has been created	ECO during construction, suitable designated person/institution after that	During and after construction, during operational and decommis-sioning phase
Weeding » It can be anticipated that invasive species and weeds will germinate on rehabilitated soils o These need to be hand-pulled before they are fully established and/or reaching a mature stage where they can regenerate o Where invasive shrubs re-grow, they will have to be eradicated according to the Working for Water specifications		

Performance Indicator	» No activity in identified no-go areas » Acceptable level of activity within disturbance areas, as

	determined by ECO » Natural configuration of habitats as part of ecosystems or cultivated land is retained or recreated, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist » The structural integrity and diversity of natural plant communities is recreated or maintained » Indigenous biodiversity continually improves according to the pre-determined desirable end state o This end state, if healthy, will be dynamic and able to recover by itself after occasional natural disturbances without returning to a degraded state » Ecosystem function of natural landscapes and their associated vegetation is improved or maintained
Monitoring	» Fortnightly inspections of the site by ECO during construction » An incident reporting system must record non-conformances to the EMPr. » Quarterly inspections and monitoring of the site by the ECO or personnel designated to the rehabilitation process until 80% of the desired plant species have become established o These inspections should be according to the monitoring protocol set out in the rehabilitation plan » Thereafter annual inspections according to the minimal monitoring protocol

B. APPENDIX: CHECKLIST OF ACTIONS FOR REHABILITATION PLANNING

Conceptual Planning	» Identify rehabilitation site locations and its boundaries » Identify ownership of rehabilitation program » Describe improvements that are anticipated following rehabilitation » Identify the kind of ecosystem to be rehabilitated at each site » Identify rehabilitation goals and desirable end state » Identify physical site conditions in need of repair » Identify stressors in need of regulation or re-initiation to maintain the integrity of the ecosystem, such as aliens, erosion, fire-regime » Identify the list and kinds of interventions of abiotic and biotic interventions that are and will be needed » Identify landscape restrictions and whether or not its integrity is dependent on a functioning ecosystem outside the project area » Determine project funding and sources » Identify labour sources and equipment needs » Identify biotic resource needs and sources, e.g. suitable topsoil, seeds » Identify any permit requirements or other legal issues » Determine project duration » Outline adaptable strategies for long-term protection and management
Preliminary Tasks	» Appoint a rehabilitation practitioner who is in charge of all the technical aspects of rehabilitation » Appoint a restoration team and train where necessary to ensure effective implementation » Prepare a budget to accommodate the completion of preliminary tasks » Document existing site conditions, also describing biota » Conduct pre-project monitoring as needed, including soil chemistry, that may affect the success of the rehabilitation program » Establish a reference site or past reference that represents the desired end state of the site » Gather information on key species to be re-introduced » Conduct investigations as needed to assess the effectiveness of restoration methods and strategies used in similar habitats up to date » Decide if rehabilitation goals are realistic or need modification » Prepare a list of objectives that need to be reached to achieve restoration goals » Ensure liaison with affected stakeholders, especially as far as rehabilitation goals are concerned » Investigate available accedes and infrastructure needed to facilitate implementation of rehabilitation
Implementation phase	» Describe the interventions that will be implemented to attain each set objective » Acknowledge potential for passive restoration where viable » Prepare performance standards and monitoring protocols to measure the attainment of each objective » Schedule tasks needed to fulfil each objective

	» Obtain equipment, supplies and biotic resources as needed » Prepare an appropriate budget
Implementation tasks	» Mark boundaries and work areas » Install permanent monitoring fixtures » Implement restoration tasks
Post-implementation tasks	» Protect the rehabilitation site against initial disturbance, including herbivores » Perform post-implementation maintenance, especially continued monitoring and eradication of emerging IAPs » Monitor site at least once per year, using the LFA technique, and identify needs for adaptive management
Evaluation	» Assess monitoring data to determine whether performance standards are met and rehabilitation objectives reached and maintained » Conduct an ecological evaluation of the newly completed rehabilitation

C. APPENDIX: TRANSPLANTING GUIDELINES FOR PLANTS WITH UNDERGROUND STORAGE ORGANS

Many of the plants in harsh environments have underground storage organs from which they resprout every year after sufficient rains, flower and then die back soon after fruiting and remain dormant, out of sight until the next growing season. All species of the families Amaryllidaceae, Iridaceae, Orchidaceae are protected provincially, nationally and/or internationally, as are many species of other monocot species.

Root system: underground storage organs are variable in size, but usually between 15 and 40 cm deep in the soil

Transplanting: success of transplanting is usually very high IF handled correctly

Rescue 101: Plants should be lifted and transplanted after flowering and fruiting, preferably as the leaves start to die back. For lifting, loosen the soil or wedge apart rocks working from a circle of about 20 cm away from the base of the plant, working inwards but not closer than about 5 cm of the plant with a sharp narrow object such as a koevoet. Once the soil is loosened, gently feel by hand where the bulb, corm, or other storage organ is, and wedge out by hand, taking care not to damage it. Remove loose soil, gently cleanse off most of remaining soil, or rinse off the storage organ. Group these according to species and label clearly, keep records of labels to include name if that is known, or a brief description or photo, also the average depth of the organs when they were removed, and the habitat they were removed from. Spread these plants so that the storage organ can dry completely, and then loosely pack into newspaper or paper bag and then store in a shaded, dry position for maximally 3 months. Transplant into soil that is as similar as possible to the original habitat, TAKING CARE that the growing point of the organ points to the top, else the plant will die. Make sure the storage organs are positioned according to the records kept about original depth of the storage organ.

Aftercare: Firm down soil around the base of the plant once it is in a new position. Allow plant to resprout naturally after sufficient rains, do not water. As these plants may not be visible for a while, clearly demarcate the area where these have been planted to avoid disturbing and potentially destroying them later on.

Appendix F:
Maps

Proposed Re-alignment of the Authorised Power Line and Watercourse crossings for the Loeriesfontein 2 Wind Energy Facility, Northern Cape.

19°28'0"E 19°33'30"E 19°39'0"E

30°25'0"S 30°30'30"S

AAN DE KAREE DOORN PAN 2/213

AAN DE KAREE DOORN PAN 1/213

KAREE DOORN PAN 214

BOK TAND 215

SOUS 226

SOUS RE/226

KLEINE ROOIBERG 227

NAROSIES 228

BRAK PAN 212

HELIOS SUBSTATION

SOUS 1/226

HELIOS TRACTION 2 50kVA OHL

HELIOS JUNO 1 400kV OHL

ARIES / HELIOS 1 400kV OHL

50km to Loerriesfontein

0 1.5 3 6 Km

Legend

- Eskom substation
- Existing Power Line
- Secondary road
- Non Perennial river
- Affected Farm Portions
- Preferred Laydown Area
- Preferred O&M Building
- Preferred Substation

Power line routes

- Re-aligned power line route
- Authorised power line route

Savannah ENVIRONMENTAL (PTY) LTD

Loeriesfontein 2
Grid Connection

Ecological Sensitivity

Sensitivity
Low
Medium-High

Railway
Roads

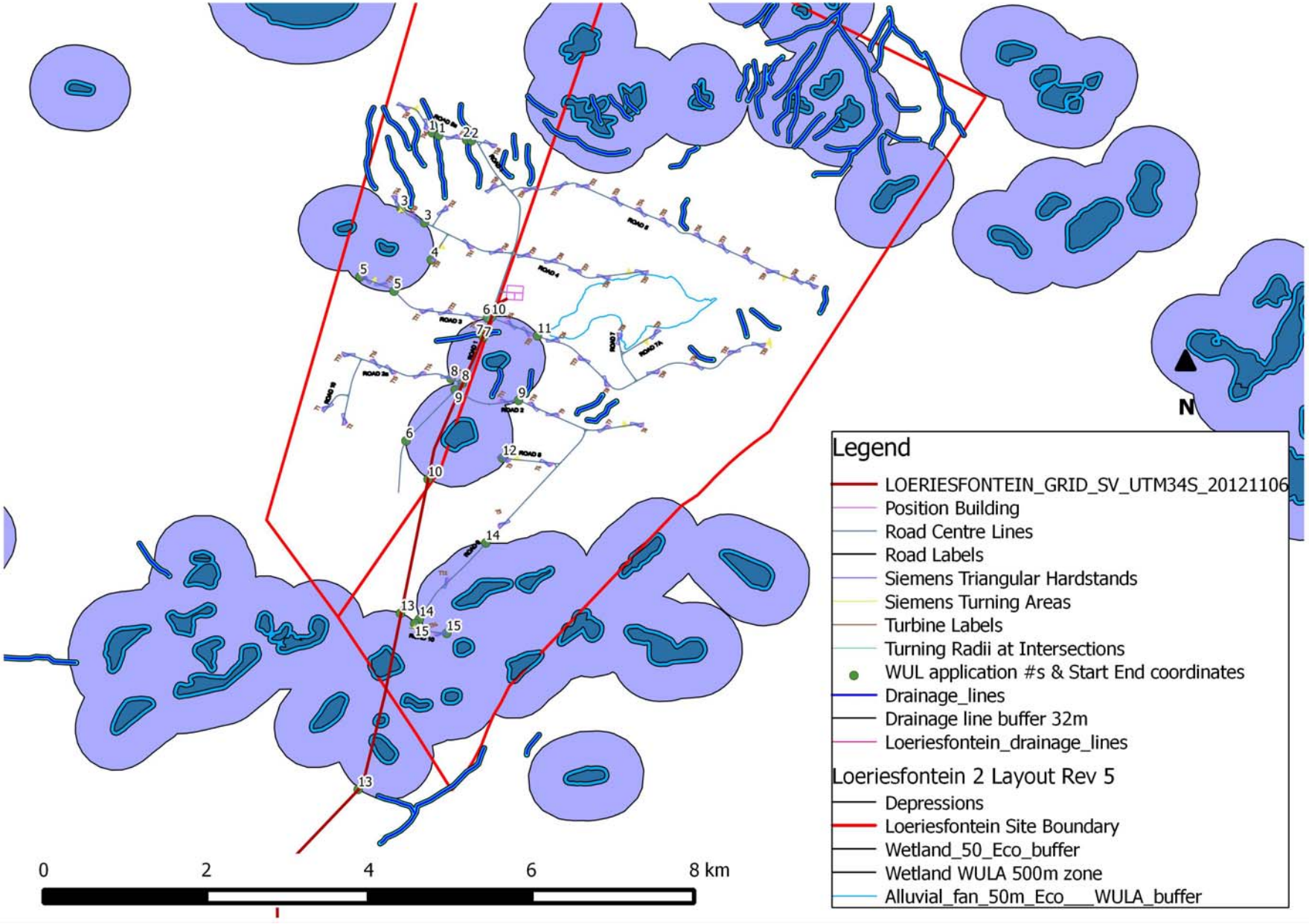
N

500 0 500 Meters

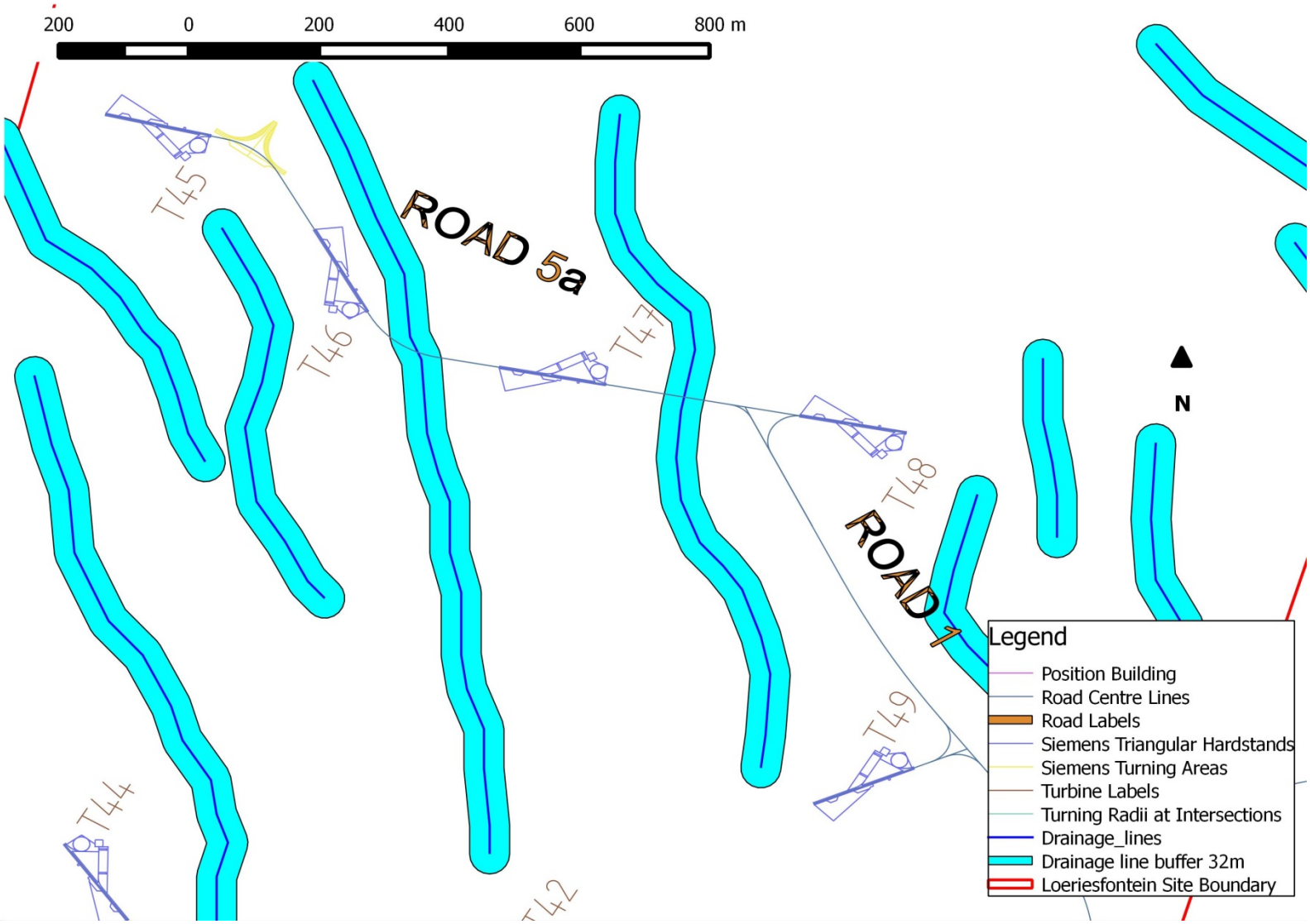
Savannah
ENVIRONMENTAL (PTY) LTD

Produced for Savannah
January 2014

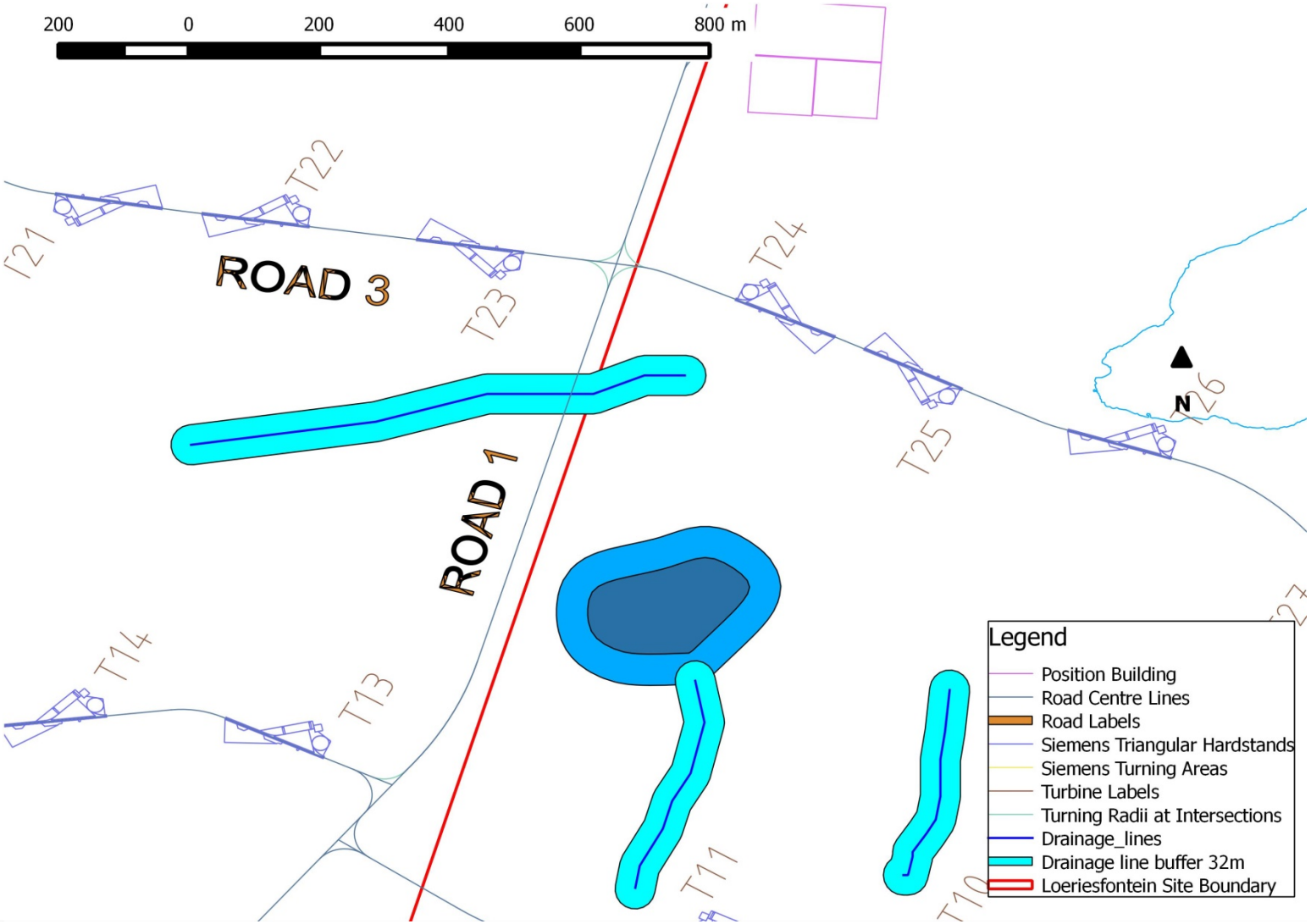
SIMON TODD CONSULTING



Environmental Sensitivity map showing water courses on the Loeriesfontein 2 Site



Sensitivity Map - Zoomed in map of the 2 new water course crossings 1 and 2 in the northern portion of the study area



Sensitivity Map - Zoomed in map of water course crossings 7