Proposed Etna – Trade Route 88kV Powerline and Switching Station, Johannesburg, Gauteng Province

General wetland rehabilitation- and monitoring plan to mitigate the construction and operational related impacts

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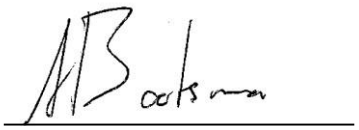
Declaration of Independence

I, **Antoinette Bootsma**, in my capacity as a specialist consultant, hereby declare that I -

- Act as an independent consultant;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- As a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member; and
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional judgement.



2016.04.20

Antoinette Bootsma (PrSciNat) Date

Ecologist/Botanist

SACNASP Reg. No. 400222-09

Indemnity

This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken. The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information at the time of study. Therefore, the author reserves the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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1 INTRODUCTION

Limosella Consulting was appointed by Nsovo Consulting to undertake a wetland and/or riparian delineation and functional assessment to inform the Environmental Authorization process for the proposed Etna – Trade Route 88kV Powerline and Switching Station, Johannesburg, Gauteng Province. The extent of the project entails construction of a 88kV powerline (built at 132kV specification) that will connect existing Etna, Lehae and the Trade - Route substation which is under construction.

1.1 Assumptions and limitations

- This document is based on information as received by Nsovo Environmental Consulting, as well as a site visit (19th of October 2016).
- The document takes into account the likely impacts that can arise during construction activities during construction of a 88kV powerline, as well as impacts that could arise as a result of the completed construction and operation. However, some unique impacts may arise that must be recorded during monitoring and appropriate corrective actions taken.
- Engineering drawings and the specification of rehabilitation structures falls outside of the scope of this general rehabilitation plan.
- This rehabilitation plan does not include specific reference to fauna and flora.
- This report understands that construction includes that of the actual pylon structure, as well as the stringing of the conductors and that the time lapse between these two phases of construction depends on the contactor's work plan.
- The specialist cannot be held accountable if a water use license is not granted.

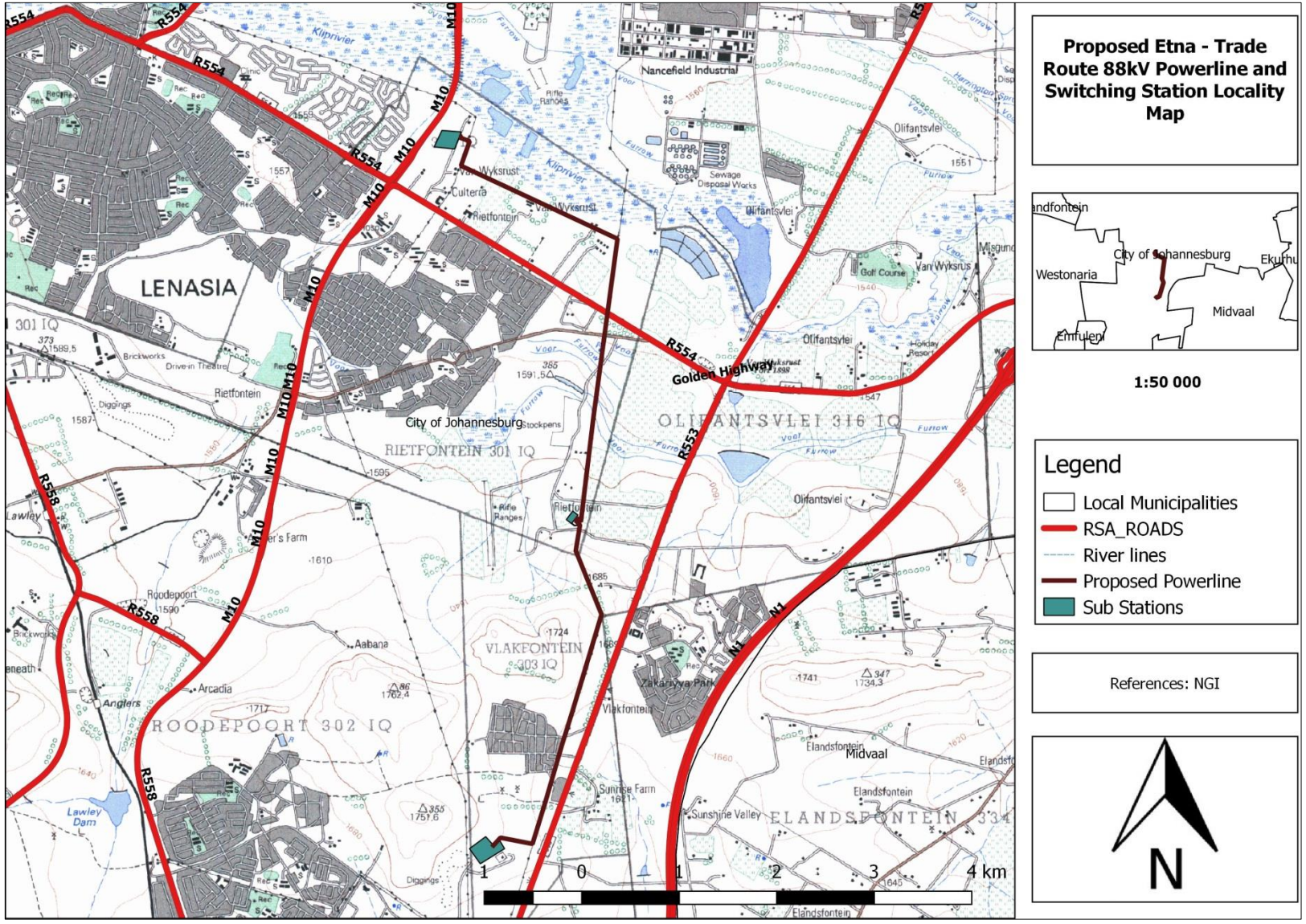

Figure 1: Locality Map

1.2 Objective and aims

This wetland rehabilitation and monitoring plan is specific to the construction of a new 88kv powerline. As the current degraded state of the watercourses is a symptom of the lack of management of the hydrology in the catchment, the rehabilitation efforts that form part of the proposed construction, are unlikely to improve the PES or EIS of the watercourses that could be impacted on. However, this document aims to limit localised impacts relating to the construction and to prevent further degradation of the watercourses in the catchment.

The overall objective is to return the environment in and around the construction footprint to a state as close to the state prior to construction and to limit or negate any construction associated impacts by:

- Ensuring the footprint of the impact on the watercourses or wetland is as small as possible;
- Providing guidance on rehabilitation of areas that may be temporarily disturbed during construction and operation;
- Reducing the likelihood of erosion and subsequent sedimentation during construction and operation; and
- Recommending monitoring and corrective actions in order to mitigate negative impacts as soon as they become apparent.

2 METHODOLOGY

In order to realize the objective of the rehabilitation plan, it is necessary to limit the impact as much as possible to reduce the need for costly rehabilitation and corrective action. Therefore, mitigation should already start in the planning phase in order to direct the proposed activities to have the least impact possible, reducing follow-up rehabilitation and corrective actions. Therefore, this rehabilitation document comprises of three plans (Table 1):

1. Mitigation Plan: to focus pre-construction planning and activities on limiting the possible impacts that can arise during construction.
2. Rehabilitation Plan: aimed at rehabilitating the areas temporarily disturbed by the construction.
3. Monitoring Plan: aimed at monitoring the success of rehabilitation as well as recording any impacts that may arise during the operational phase of the powerline line, for which corrective action is needed.

Table 1: Plans in relation to the relevant project phases

Plan	Project Phases
1. Mitigation plan	• Pre-construction planning and activities. • Construction: 88kv powerline.
2. Rehabilitation plan	• Construction: 88kv powerline.
3. Monitoring and corrective action	• 88kv powerline. • Operation.

3 DESCRIPTION OF ENVIRONMENT AND WATERCOURSES AFFECTED

3.1 Background

A total of three wetlands were recorded on the study site (Figure 2). All of these wetlands were classified as channelled valley bottom wetlands except for a non-perennial system (drainage lines) in the middle of the site. More wetlands not included in the assessment are located within the surrounding area. Another channelled valley bottom wetland not affected by the proposed alignment is located to the east of the R553. Two small artificial depressions one just south of the Trade Route substation (under construction) and one just to the south of the existing Etna substation (created by sand mining) are also located within the surrounding area.

Both the channelled valley bottom and non-perennial drainage lines have been impacted. These impacts are summarised in the table below:

Table 2: Summary of wetland aspects including functional assessment scores

Nr	Affected Watercourse	Approximate central coordinates	Recorded Impacts	PES/EC Score	EIS/QHI Score
1	**Channelled valley bottom**	26°19'17.69"S and 27°53'3.45"E	The increased hardened surfaces in the local catchment of the wetland and associated storm water together with extensive continues input of sewage due to leaking pipes and dysfunctional treatment plants resulted in increased flow-peaks and associated canalisation in the wetland areas. The hydrology of the wetland was altered over the years and erosion is evident.	**PES: D**	**B - High**
2	**Non-perennial Area**	26°21'35.24"S and 27°52'58.49"E	Erosion caused by excavations in the local catchment, trampling and burning practises.	**EC: B/C**	**QHI: C**
3	**Channelled valley bottom**	26°22'41.53"S and 27°53'15.17"E	The wetland is transformed due to residential and informal settlement development. Other impacts include pollution and increased storm water.	**PES: E**	**C - Moderate**

The study area is located within Quaternary Catchments A22A and C22H and is in the eighth water management area, the Upper Vaal. In this water management area, the major rivers include the Vaal-, Wilge, Suikerbosrant and Klip River.

The proposed powerline alignment does not traverse any major rivers but rather the wetland areas associated with the Klip River and/or tributaries that drain into the Klip River and Rietspruit.

The important factors relevant to the project are summarised in the table below:

Table 3: Summary of important relevant information

	Quaternary Catchment and WMA areas	Important Rivers possibly affected	Buffers
	A22A, C22H Upper Vaal (WMA)	Wetland areas associated with the Klip River and/or tributaries that drain into the Klip River and Rietspruit.	**30 m for all the wetlands/riparian areas**
Does the specialist support the development?	Yes, electrical infrastructure in the study area is in dire need of upgrading. However it should be done in a manner that does not further alter wetland areas and their catchments. The proposed alignment traverses important and ecological support areas and care should be taken to limit impacts in these areas to a minimum.		
Major concerns	• Changing the quantity and fluctuation properties of the watercourse • Changing the amount of sediment entering water resource and associated change in turbidity (increasing or decreasing the amount) • Alteration of water quality – increasing the amounts of nutrients (phosphate, nitrite, nitrate) • Alteration of water quality – toxic contaminants (including toxic metal ions (e.g. copper, lead, zinc) and hydrocarbons • Changing the physical structure within a water resource (habitat) • Erosion in the Klip River and downstream wetlands		
Recommendations	Powerline infrastructure should be excluded from the wetland areas as far as possible. However, linear developments such as the proposed powerline are rarely able to avoid crossing any watercourses whatsoever. Where alternatives have been investigated and watercourse crossings have been shown to be necessary it is important that appropriate mitigation measures are put into place and carefully monitored to ensure minimal impact to regional hydrology.		
CBA and other Important areas	The proposed alignment traverses important and ecological support areas. The northern section of the proposed powerline alignment traverse the Klipriver Highveld Grassland ecosystem which is critically endangered (NEMBA, 2011).		

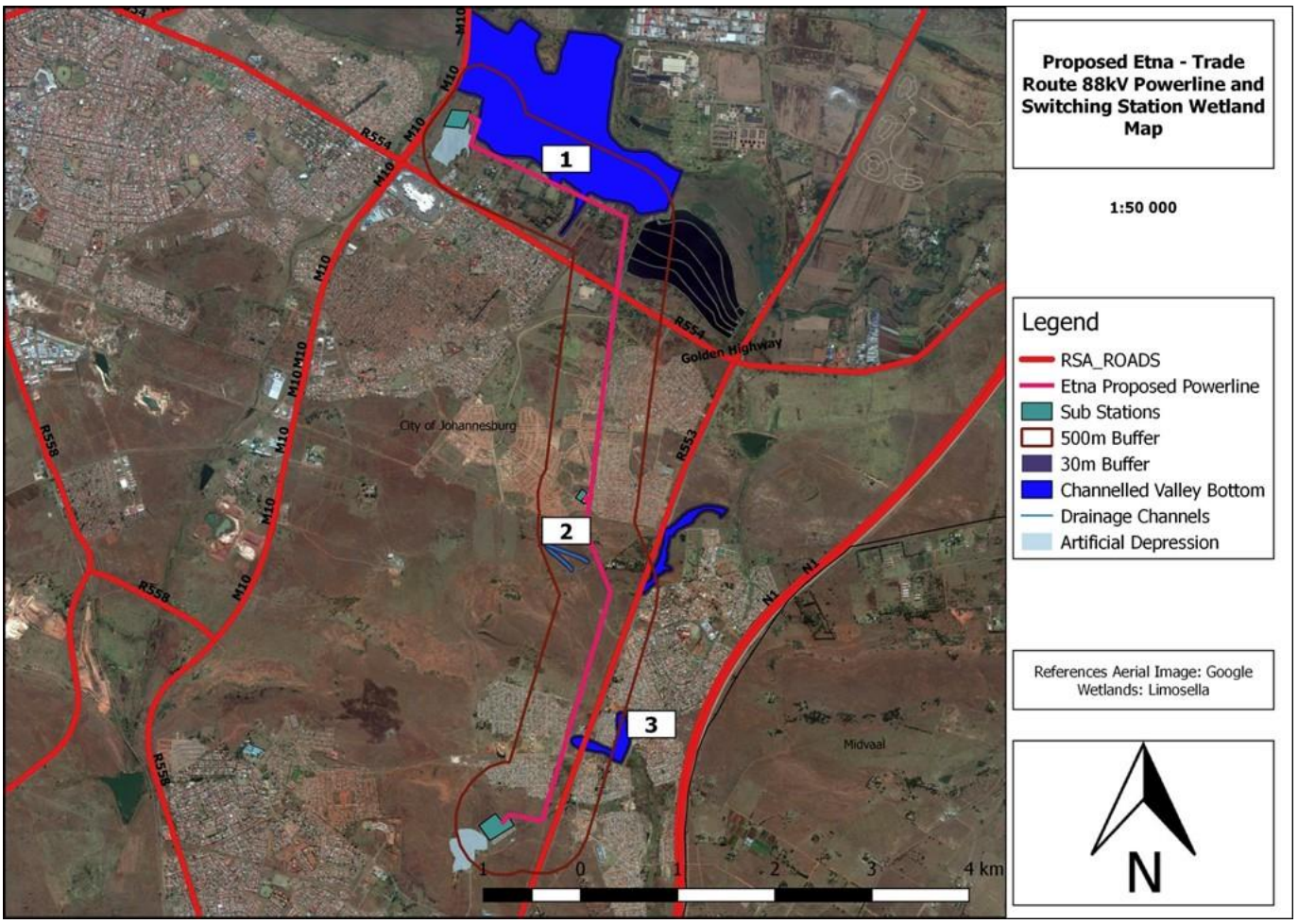

Figure 2: Wetland/Riparian areas associated with the substation and powerline.

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4 EXPECTED IMPACTS

4.1 Construction of the 88kv powerline

Only pylons within or in close proximity to the delineated watercourses are likely to impact on the
Likely impacts include:

Clearing/removal of natural vegetation: Excavation around the tower leg to prepare for cleaning and repair will result in clearing of vegetation in this area. Plants that grow in wetlands and on riverbanks are vital for preventing erosion. They play a role in the purification of water, reducing the severity of floods and regulating water, especially during droughts. The moment the vegetation is destroyed, these valuable functions disappear. In addition, vegetation around watercourses, especially upslope, holds soil in place and slows down water runoff during rainy events. Vegetation along wetlands contributes to increased surface roughness which contributes to a decrease in sedimentation, erosion and a loss of topsoil.

Compaction of soils: Compaction and trampling could inhibit seed germination, reduce water infiltration, inhibit root establishment, and result in bare soil exposure. In particular, soil compaction can lead to an increase in runoff during rainy events, which in drainage lines and slopes could result in erosion.

Sedimentation of wetlands: Vegetation clearing and related activities in rainy conditions could result in sediments being mobilised and entering the wetland. This is not expected to be a big risk, particularly if construction occurs in the dry season. However, sedimentation of wetlands can smother vegetation and decrease the oxygen concentration of water. If sedimentation is allowed to continue, wetlands will lose their function and likely become invaded by alien invasive plant species.

Invasion by alien invasive vegetation: Excavation around the tower leg to prepare for cleaning and repair will result in clearing of vegetation in this area. This provides an opportunity for alien and invasive species to become established. The seeds of alien invasive species that occur on and in the vicinity of the towers could spread into the disturbed soils. A number of alien invasive plant species was observed in the watercourses and should ideally be destroyed to prevent them spreading during construction.

5 MITIGATION PLAN:

On site mitigation can limit the impact of construction activities and reduce the need for expensive rehabilitation and the need for corrective action. In addition, sedimentation is very difficult and sometimes impossible to rehabilitate without further impacting on watercourses. Therefore, sedimentation should be prevented through mitigation. Table 4 lists the mitigation measures that should be implemented during the construction activities in order to limit the need for rehabilitation.

Table 4: Mitigation plan

Project Phase	Mitigation Objective	Mitigation to Limit Impact and Size of the Area to be Rehabilitated
Pre-construction planning	Position pylons to fall outside wetlands or their buffer zones as far as possible	• Plan tower positions should be placed in such a way as to minimise impact on watercourses • Plan access roads so as to avoid watercourse crossings • Position of crew camps should be located outside of wetlands or their 500m buffer • No vehicles and access of persons should be allowed through any wetland, except where approved by the relevant authority
	Preventing spread of alien invasive	• Alien invasive species that were identified in the development footprint should be removed prior to project related soil disturbances. This will prevent seed spreading into disturbed soils • Manual removal methods are preferred to chemical control
	Limit the construction footprint and related impacts	• Only use access roads and paths designated during the planning phase • Only cross watercourses at designated points where necessary • Limit the removal of indigenous vegetation around the construction footprint • Limit compaction by not working in wet conditions, limiting vehicular access • Watercourse boundaries and buffers must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete • Contractors should refrain from impacting areas beyond the demarcated construction area

Construction phases	Prevention of pollution	• Contractors responsible for construction in close vicinity to wetland areas must sign a declaration stating that they will adhere to all stipulations of the Environmental Management Plan relating to wetlands as well as measures as set out by this report • The contractors must provide and maintain a method statement for "cement and concrete batching". The method statement must provide information on proposed location, storage, washing & disposal of cement, packaging, tools and plant storage • Cement should only be mixed within mixing trays. Washing and cleaning of equipment should also be done within a bermed area, in order to trap any cement or plaster and avoid excessive soil erosion. These sites must be rehabilitated prior to commencing the operational phase • The mixing of concrete should only be done at specifically selected sites on mortar boards or similar structures to contain run-off into drainage lines, streams and natural vegetation • Materials such as fuel, oil, paint, herbicide and insecticides must be sealed and stored in bermed areas or under lock and key, as appropriate, in well-ventilated areas • These substances must be confined to specific and secured areas within the contractor's camp, and in a way that does not pose a danger of pollution even during times of high rainfall • Storage of materials as described above may not be within the 1:100 floodline, watercourses or associated buffer

Project Phase	Mitigation Objective	Mitigation to Limit Impact and Size of the Area to be Rehabilitated
Construction phases		areas • In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water Affairs (DWA) must be informed immediately and corrective action taken • All equipment should be parked overnight and/or fuelled at least 500 meters from a watercourse • Drip trays (minimum of 10cm deep) must be placed under all vehicles that stand for more than 24 hours. Vehicles suspected of leaking must not be left unattended, drip trays must be utilised. • Drip trays must be utilised during repairs and maintenance of all machinery. The depth of the drip tray must be determined considering the total amount / volume of oil in the vehicle. The drip tray must be able to contain the volume of oil in the vehicle. • Provision of adequate sanitation facilities located outside of the wetland/riparian area or its associated buffer zone • Remove all construction equipment and material on completion of construction • No water should be abstracted from any river / wetland • Run-off from the camp site must not discharge into neighbours' properties or into adjacent wetlands, rivers or streams • Management of on-site water use and prevent stormwater or contaminated water directly entering the watercourse • Management of point discharges
	Prevent/limit sedimentation	• Contractors responsible for construction in close vicinity to wetland areas must sign a declaration stating that they will adhere to all stipulations of the Environmental Management Plan relating to wetlands as well as measures as set out by this report • The contractor shall ensure that excessive quantities of sand, silt and silt-laden water do not enter watercourses. Appropriate measures, e.g. erection of silt traps, or drainage retention areas to prevent silt and sand entering drainage or watercourses must be taken • Sediment barriers should be installed immediately after initial disturbance of the watercourse or adjacent upland • Where wetlands are adjacent to the construction areas and these areas slopes toward the wetland, install sediment barriers along the edge of the construction areas as necessary to prevent sediment flow into the wetland(s) • Sediment barriers must be properly maintained throughout construction and reinstalled as necessary until replaced by permanent erosion controls or restoration of adjacent upland areas is complete • It is important that topsoil should be conserved in areas where bedrock is shallow to avoid sedimentation

Project Phase	Mitigation Objective	Mitigation to Limit Impact and Size of the Area to be Rehabilitated
		• No development, or activity of any sort associated with camp, is allowed below the 1:100 year flood line of any water system • Excavated soils may not be placed within wetland buffer zones and stockpiled soils may not exceed 3m in height
	Preventing spread of alien invasive	• Construction equipment must be cleaned prior to site access. This will prevent alien invasive seed from other sites to spread into disturbed soils • Alien invasive species that were identified in the construction footprint should be removed prior to construction related soil disturbances. This will prevent seed spreading into disturbed soils • Manual removal methods are preferred to chemical control

6 REHABILITATION PLAN

Rehabilitation in this document refers to the reinstatement of the temporarily disturbed areas affected by the construction or due to construction related activities, to a state that resemble the conditions prior to the disturbances. It therefore does not address the rehabilitation of the watercourses situated along the proposed powerline route from for example a management category D to a C (Kleynhans, 1996 & Kleynhans, 1999). In order to improve the management category, the current impacts due to mining, cultivation and grazing should be address and these fall outside the scope of this document and are not part of Eskom's mandate.

Table 5 list the rehabilitation measures that should be undertaken post construction as well as corrective action when monitoring has established that the listed impacts are taking place

Table 5: Rehabilitation plan

Impacts	Rehabilitation	Time frame
Removal of vegetation Areas where vegetation has been removed or destroyed should be kept to a minimum. Disturbance of slopes, for example by the removal of vegetation, may result in slope instability and erosion by rain and surface runoff.	• Stripping of vegetation for construction must be restricted to the tower footprint to reduce the risk of erosion during times of precipitation • Where possible, remove vegetation as sods that can be replanted as part of the rehabilitation of vegetation around the pylon footprint. Store sods in already cleared areas and water at least once week • Where soils are removed, the topsoil and subsoil must be stockpiled separately in low heaps (Topsoil are deemed to be the top layer of soil containing organic material, nutrients and plant grass seed. For this reason it is an extremely valuable resource for the rehabilitation and vegetation of disturbed areas) • After construction, compacted areas should be ripped and topsoil replaced from the areas where it was removed. Areas around the pylon footprint can be re-vegetated using the sods that were removed prior to construction. The sods should be placed level, or slightly deeper than surrounding vegetation, on ripped soils. Against slopes, the sods should be pegged to ensure that it does not wash away before the roots establish • All sloped areas must be re-vegetated by either using removed sods or by seeding with a grass mixture containing species naturally occurring in the area. Sloped areas where vegetation has been removed or destroyed should be replanted immediately after completion of construction to avoid erosion • Badly damaged areas and areas where grazing commonly takes place, should be fenced in to allow for rehabilitation to take place without further impacting on the areas • Areas where minimal disturbances took place, can be ripped and allowed to naturally re-vegetate (take note that this excludes sloped areas) • If natural re-vegetation is unsuccessful, corrective action should be taken and includes seeding and planting by an appropriate specialist as stipulated in the EMP • All rehabilitated areas must be monitored for the presence of exotic and alien plant species.	• Immediately after construction • At any time during operational phase of the power line, when maintenance activities might have destroyed natural vegetation • As and when monitoring indicate degradation of vegetation in the servitude

Impacts	Rehabilitation	Time frame
	• Should the presence of exotic/alien plant species be observed it should be removed appropriately • All disturbed areas will requiring rehabilitation must be mulched to encourage vegetation re-growth. Mulch used must be free from alien seed. These areas must be cordoned off so that vehicles or construction personnel cannot gain access to these areas • Badly damaged areas and areas where grazing, water collection or washing commonly takes place (e.g. in proximity to informal settlements), should be fenced in to allow for rehabilitation to take place without further impacting on the areas. Once rehabilitation was observed to be successful during monitoring, the fenced may be removed (at least two years). The reason for fencing must be communicated to the community using the areas and the fence should be monitored regularly	

Erosion
Erosion and sedimentation is likely to occur where vegetation has been cleared and where excavated material is stored in close proximity to a watercourse. Disturbance of steep slopes by the removal of vegetation may result in slope instability and erosion by rain and surface run-off.
	• The contractor shall be responsible for rehabilitating all eroded areas in such a way that the erosion potential is minimised after construction has been completed
	• All slopes that are disturbed during construction should be stabilised immediately to prevent erosion
	• Re-vegetation should be done immediately after construction, especially in sloped areas
	• Disturbances on site should be kept to a minimum to reduce the loss of material by erosion
	• Disturbed areas that require rehabilitation should be mulched to encourage vegetation re-growth.
	• Stockpiled soil should be protected from erosion due to water runoff
	• Near vertical slopes of 1(V):1(H) or 1(V):2(H) must be stabilised using hard structures, preferably with a natural look, and with facilities allowing for plant growth. The EO / ECO will specify a solution in terms of the most appropriate approved method and technology. One or more of the following methods may be required:
	  • Retaining walls (loffel or otherwise) (DWAF 2005)
	  • Stone pitching.
	  • Gabions.
	  • Shotcrete.
		• During and immediately after rconstruction
		• As and when monitoring indicate erosion is taking place

Impacts	Rehabilitation	Time frame

	• Protect the slopes of all river diversions. One or more of the following methods may be used, as specified by the EO / ECO: (DWAF, 2005)
	  • Sandbags.
	  • Reno mattresses.
	  • Plastic liners and / or coarse rock (undersize rip-rap)
	• Protect all areas susceptible to erosion and ensure that there is no undue soil erosion results from activities within work areas
	• Where access cannot be avoided into sensitive areas, the amount of vehicle and personnel traffic should be kept to a minimum and should make use of only one route
	• Where all preventative measures have failed and erosion persists soft and hard rehabilitation options, such as eco-logs or weirs, should be considered in conjunction with an engineer and wetland specialist
	• Erosion control of all banks must take place so as to reduce erosion and sedimentation into river channels or wetland areas.	

Mobilisation of pollutants The mobilisation of sediments, excavations, removal and disturbances to vegetation, mobilisation of sulphur, hydrocarbon and pyrite compounds could have various negative impacts on wetlands and their associated functionality.	• In case of emergencies or unforeseen events (e.g. spillage of chemicals), the problem must be remediated immediately and any spillage into any watercourses be reported to the Department of Water Affairs. In addition, the soil must be stabilised (import additional topsoil if necessary) and re-vegetated as soon as possible. Re-vegetation should include seeds from the adjacent grassland and any rescued protected plants and/or plants of conservation concern that might have been impacted upon by the emergency / unforeseen event. • Remove all project-related material used to support equipment on completion of construction	• Immediately after construction • At any time during operational phase of the power line, when maintenance activities might have resulted in pollution
Spread of Alien Invasive Species	• All alien seedlings and saplings must be removed as they become evident for the duration of construction	• During and after construction

Impacts	Rehabilitation	Time frame
	• Manual / mechanical removal is preferred to chemical control • All construction vehicles and equipment, as well as construction material should be free of plant material. Equipment and vehicles should be thoroughly cleaned other prior to access on to the construction site.	
Sedimentation	• Sedimentation should be prevented though sufficient mitigation • If structures are used on sensitive sloped areas it is important that sediment does not pass through these structures e.g. gabions should be lined • Should sedimentation be observed to accumulate and smother vegetation, a wetland specialist should be consulted to find a suitable solution for the specific wetland and its species composition.	• During and after construction

7 MONITORING PLAN

Monitoring refers to the repetitive and continued observation, measurement and evaluation of environmental criteria to follow changes over a period of time and to assess the efficiency of control measures. The monitoring plan aims to establish whether rehabilitation was successful, whether maintenance or related activities have impacts and whether the constructed pylons have detrimental impacts on the watercourses after construction (Table 6). Three monitoring frequencies are recommended:

Once-off Monitoring:

1. Monitoring during and after construction: Rehabilitation should take place immediately after construction prior to rehabilitation.

Routine Monitoring:

2. Seasonal monitoring: rehabilitation success, as well as signs of erosion, sedimentation and the presence of alien vegetation should be monitored during the summer months: once at the start and once at the end of the rainy season.

3. Annual monitoring: routine monitoring of the rehabilitated sites should be done annually.

Problems such as failed re-vegetation and erosion should be remediated as soon as it is recorded in the monitoring process. Corrective action should be taken and can include the re-initiation of rehabilitation in severe cases or by correction of the problem (e.g. mend broken fences). If problems arise due to the constructed transmission line that was not pre-empted in this plan, an engineer and wetland specialist should be consulted as soon as possible. It is recommended that fixed point photography is used to monitor vegetation and soil stability. This involves taking pictures of the areas monitored from the same point during each monitoring event. The images can be compared and serves as a record of the success of rehabilitation or the failure thereof.

Table 6: Monitoring plan: construction

Variables	Methods	Monitoring Frequency	Indicator	Corrective Action
Vegetation cover	• On-site inspection • Monitor species cover abundance and ensure that natural species cover increase(compare to vegetation study results prior to construction) • Fixed point photography	• After construction • Seasonal for the first year and after heavy rainfall • Thereafter annually	• Spreading and distribution of dominant plant species in specified wet zones • Wetland re-vegetation shall be considered successful if the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent wetland areas that were not disturbed by construction	• If natural re-vegetation does not occur replanting of indigenous plants should be done at sites of concern • Prevent livestock from entering rehabilitated areas • If re-vegetation is not successful at the end of 2 years, develop and implement (in consultation with a professional wetland ecologist) a remedial re-vegetation plan to actively re-vegetate the wetland. Continue re-vegetation efforts until wetland re-vegetation is successful • If wetland rehabilitation is successful at the end of 3 years, report on the status of the vegetation (e.g. using photographic record) and only monitor annually or if maintenance activities might have disturbed the area again • Where protected plant species are dying or no recruitment of seedlings are apparent, consult the local authority or a specialist
Plant species composition	• Fixed transect to determine the species composition	• Seasonal for the first year and after heavy rainfall • Thereafter annually	• Presence/absence of species in specified wet areas.	• If natural re-vegetation does not occur replanting of indigenous plants should be done at sites of concern. • If exotic plants have colonised the area the exotic plants should be removed.

Variables	Methods	Monitoring Frequency	Indicator	Corrective Action
Erosion	• On-site inspection • Fixed point photography • Compare to adjacent land	• After construction • Seasonal for the first year and after heavy rainfall • Thereafter annually.	• Areas where vegetation cover is limited or nil and where soil has started to erode • Bare soil patches or ditches (see Photograph 1)	• Should erosion occur, soft options such as hay bales, eco-logs and replanting should be considered, if erosion is too great a rehabilitation method should be discussed with an engineer and wetland specialist
Sedimentation	• As determined by ECO • Visual observations and site inspections • Fixed point photography	• After construction • Seasonal for the first year and after heavy rainfall • Thereafter annually	• Excess sediment in wetlands and rivers	• Cause of sedimentation should be identified and dealt with appropriately • Should sedimentation be observed to accumulate and smother vegetation, a wetland specialist should be consulted to find a suitable solution for the specific wetland / river and its plant species composition.
Alien Invasive Plant Species	• Monitor the emergence of alien invasive plant species in or around rehabilitated areas • On-site inspection • Fixed point photography	• After construction • Seasonal for the first year and after heavy rainfall • Thereafter annually	• Establishment of alien invasive plant species in rehabilitated areas or in watercourses	• Remove emergent invasive vegetation from the rehabilitated footprint as soon as it becomes apparent • Manual labour is preferred above chemical or manual removal. • Do not use herbicides or pesticides in or within 200 meters of wetland areas

8 REFERENCES

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