DEDISA-GRASSRIDGE 132 KV LINE

ENVIRONMENTAL MANAGEMENT PROGRAMME: CONSTRUCTION PHASE

Prepared by:	Prepared for:	Submission date:
Envirolution Consulting	Eskom Holdings SOC Limited	26 July 2013

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DEFINITIONS

Auditing:	A systematic and objective assessment of an organisation's activities and services conducted and documented on a periodic basis.
Biodiversity:	The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.
Catchment:	All the land area from mountaintop to seashore which is drained by a single river and its tributaries.
Cement laden water	Water containing cement or concrete arising from the Contractor's activities.
Contaminated water	Water contaminated by the Contractor's activities such as with hazardous substances, hydrocarbons, paints, solvents and runoff from plant, workshop or personnel wash areas but excludes water containing cement/ concrete or silt.
Environment:	Surroundings within which human beings exist and these comprise 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. The environment is a place where living, non-living and man-made features interact, and where life and diversity is sustained over time.
Evaporation:	The change by which any substance (such as water) is converted from a liquid state into and carried off in vapour.
Floodplain:	A flat expanse of land bordering a river channel, formed through sediment deposition and other alluvial processes, and often characterized by frequent flooding as a result of bank overspill from the river channel.
Groundwater:	Subsurface water in the zone in which permeable rocks, and often the overlying soil, are saturated under pressure equal to or greater than atmospheric.
Inland wetlands:	Fresh water (non-tidal) wetlands that can often be likened to a basin filled with soil which has an impervious layer that retains water.
Method Statement	Is a written submission by the Contractor to the Engineer in response to the Specifications or to a request by the Engineer, setting out the plant (construction equipment), materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Engineer when requesting the Method Statement. The Method Statement shall be in such detail that the Engineer 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 shall cover applicable details with regard to: • Construction procedures; • Materials and equipment to be used; • Getting the equipment to and from Site;

	• How the equipment/ materials will be moved while on Site; • How and where materials 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 Engineer.
Monitoring:	A systematic and objective observation of an organisation's activities and services conducted and reported on regularly.
Natural vegetation:	All existing vegetation species, indigenous or otherwise, of trees, shrubs, groundcover, grasses and all other plants found growing on the site.
Open water:	Permanently or seasonally flooded areas characterized by the absence (or low abundance) of emergent plants.
Overburden:	The soil overlying desirable material extracted during borrowing or quarrying.
Pan:	An inward draining flat bottomed depression lacking an outlet usually intermittently to seasonally flooded.
Pollution:	The result of the release into air, water or soil from any process or of any substance, which is capable of causing harm to man or other living organisms supported by the environment.
Potentially hazardous substance:	Is a substance, which, in the reasonable opinion of the Engineer, can have a deleterious effect on the environment. Hazardous Chemical Substances are defined in the Regulations for Hazardous Chemical Substances published in terms of the Occupational Health and Safety Act.
Reasonable:	Means, unless the context indicates otherwise, reasonable in the opinion of the Engineer, after he has consulted with Coega Development Corporation (CDC) Safety, Health & Environment Business Unit.
Silt laden water:	Means water containing sand and silt arising from the Contractor's activities and/or as a result of natural run-off.
Site (Construction Footprint):	This is the area in the possession of the Contractor for the construction of the Works. Where the area is not demarcated, it will include all adjacent areas, which are reasonably required for the activities for the Contractor, and approved for such use by the Engineer. This is also referred to as the Construction Footprint.
Solid waste:	Means all solid waste, including construction debris, chemical waste, excess cement/concrete, wrapping materials, timber, tins, cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).
Protected Plants:	Plant species officially listed on the Protected Plants List (each province has one), and which may not be removed or transported without a permit to do so from the relevant provincial authority.
Red Data Species:	Plant and animal species officially listed in the Red Data Lists as being rare, endangered or threatened.

Rehabilitation:	Making the land useful again after a disturbance. It involves the recovery of ecosystem functions and processes in a degraded habitat. Rehabilitation does not necessarily re-establish the pre-disturbance condition, but does involve establishing geological and hydrologically stable landscapes that support the natural ecosystem mosaic.
Riparian vegetation:	Vegetation occurring on the banks of a river or a stream (i.e. vegetation fringing a water body).
Runoff:	The total water yield from a catchment including surface and subsurface flow.
Topsoil:	The upper soil profile irrespective of the fertility appearance, structure, agriculture potential, fertility and composition of the soil, usually containing organic material and which is colour specific.
Transplanting	The removal of plant material and replanting the same plants in another designated position.
Veld:	Unimproved areas of natural vegetation.
Watercourse:	A geomorphological feature characterized by the presence of a streamflow channel, a floodplain and a transitional upland fringe seasonally or permanently conveying surface water.
Wetland:	A seasonally, temporarily or permanently wet area, often exhibiting a specific vegetation community.

ACRONYMS

CDC:	Coega Development Corporation
DEAT:	Department of Environmental Affairs and Tourism
DE:	Design Engineer
DWA:	Department of Water Affairs
EO:	Environmental Officer
ECO:	Environmental Control Officer
EIA:	Environmental Impact Assessment
EM:	Environmental Manager
EMP:	Environmental Management Plan
EMPr	Environmental Management Programme
EMS:	Environmental Management System
EO:	Environmental Officer
EP:	Environmental Planner
I&AP:	Interested and Affected Party
IDZ	Industrial Development Zone (Coega IDZ)
IEM:	Integrated Environmental Management
IEMF:	Integrated Environmental Management Framework
PM:	Project Manager
RoD:	Record of Decision
RE	Resident Engineer or the equivalent on site responsible for the management of contractors and their employees on site
SABS:	South African Bureau of Standards
SSC	Species of Special Concern
SHE:	Safety, Health and Environment (SHE Officer)
SE:	Site Engineer
SUP:	Sustainable Utilisation Plan

APPLICABLE LEGISLATION

Overarching Environmental Legislation:

- National Environmental Management Act (Act No. 107 of 1998)
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
- National Water Act (Act No. 36 of 1998)
- National Forest Act (Act No. 84 of 1998)
- National Heritage Resources Act (Act No. 25 of 1999)
- National Veld and Forest Fire Act (Act No. 101 of 1998)

Other legislation

- Constitution of the Republic of South Africa Act (Act No. 108 of 1996)
- Environment Conservation Act (Act No. 73 of 1989)
- Forest Act (Act 122 of 1984)
- Conservation of Agricultural Resources Act (Act 43 of 1983)
- Occupational Health And Safety Act (Act 85 Of 1993)
- Provincial and Local Government Ordinances and Bylaws
- Hazardous Substances Act (Act No. 15 of 1973)
- Soil Conservation Act (Act No. 76 of 1969)
- Atmospheric Pollution Prevention Act (Act 45 of 1965)
- Animals Protection Act (Act 71 of 1962)
- Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947)
- National Resources Development Act (Act No. 51 of 1947)
- Forest and Veld Conservation Act (Act No. 13 of 1941)
- Land Survey Act (Act No. 9 of 1921)

COEGA DEVELOPMENT CORPORATION
SUPPORTING DOCUMENTS AND SPECIFICATIONS

The following supporting specifications shall form part of the Contract Documents, and have been integrated into this EMP, where applicable to this project and are attached to this EMP for ease of reference:

(a) Standard Environmental Specification (SES)
(b) Standard Vegetation Specification (SVS).

The Standard Environmental Specifications for Construction were developed for the Coega Industrial Development Zone (IDZ) by the Coega Development Corporation (CDC).

The Standard Environmental Specification was developed in order to control and mitigate the environmental impacts of all construction activities within the Coega IDZ. The Standard Vegetation Specification for Construction covers the requirements for Site clearance, including the translocation of rare and endangered plant species (Species of Special Concern), planting for stabilisation and the clearing of alien vegetation in an environmentally sensitive manner. The Specification is applicable to all activities involving vegetation undertaken within the Coega IDZ.

The Coega Development Corporation's ''Compilation Document for Construction Environmental Management Plan: Preparation and Incorporation of Specifications into Tender and Contract Documentation'' should be utilized by the Engineer, Contractor or any team responsible for compiling the Contract Documentation (whether from the Coega Development Corporation or external) and should ensure that they have copies of, and are familiar with this compilation document, and the Guideline Document for the Engineer and Engineer's SHE Coordinator.

Refer to the Appendix for these documents.

EXECUTIVE SUMMARY

This document describes the various phases of a construction of the project and the specific deliverables, requirements and restrictions relevant for this phase.

The management actions, given as Performance Specifications are firstly described for the **Pre-construction** phase, in terms of planning requirements.

Secondly, Performance Specifications applicable to the **Construction** phase are detailed in terms of the various components of the Work Site:

- Site establishment
  - Demarcation of the site
  - Protection of vegetation and natural features
  - Protection of fauna
  - Protection of cultural historical aspects
  - Topsoil conservation
  - De-bushing and de-stumping
- Site infrastructure
  - Structures and accommodation
  - Contractors camp and lay-down areas
  - Nurseries
  - Access routes
- Site management
  - Rubble and waste rock
  - Solid waste
  - Liquid waste
  - Hazardous waste
  - Pollution control
  - Implements and equipment
  - Air quality
  - Noise control
  - Fire control
  - Health and Safety
- Stockpiles, storage and handling
  - Topsoil
  - Spoil
  - Vehicles and equipment
  - Fuel
  - Hazardous substances
- Erosion control
  - Surface water management
  - Erosion protection
- Control of alien plants

Thirdly the **Rehabilitation** of the Work Site is addressed, in which the Performance Specifications are detailed in terms of the following successive activities:

- Removal of structures and infrastructure
- Inert waste and rubble
- Hazardous waste and pollution control
- Final shaping
- Surface water management
- Topsoil replacement and soil amelioration

- Ripping and scarifying
- Planting
- Grassing
- Maintenance.

Although no species of special concern or wetland will be impacted on directly, specific attention is also drawn to the following legal aspects, which have been initiated:

- Protected plant and tree removal permits (PNCO and Forestry Act)
- Section 21 Water Use License due to construction within 500m of a wetland boundary

With regard to impacts on the birds the following must be adhered to:

- Retain the existing spiral bird flight diverters on the existing Grassridge-Dedisa and Poseidon-Dedisa 400kV power lines
- Install black and white Spiral “pigtail” Bird Flight Diverters on both earth wires in accordance with ESKOM Guidelines on:
    - Re-routed Portion of Grassridge-Dedisa 400kV Power Line (Towers DG8 to DG10)
    - Re-routed Portion of 220kV Power Line approaching Brak River Substation where it runs parallel to the existing Poseidon – Dedisa 400kV power line
    - New 400kV Power Line parallel to Towers DG4 to DG7 of the Grassridge-Dedisa power line
    - On earth wire of new 132kV Emergency Power Line from approximately parallel with Tower DG2 near Grassridge substation to near the Grassridge – Coega road

In conclusion the following general recommendations have been included by the specialists:

- Avoid and minimize clearing of vegetation, especially in Thicket vegetation and especially in the Coega Open Space system
- Use existing access tracks, avoid and minimize the requirement for additional access routes. Ensure everyone keeps to the approved access routes
- Activity is to remain within the demarcated construction areas
- No vegetation should be cleared between towers for access or stringing operations
- Best practice for the management of spoil, sub-soil and topsoil
- Appropriate rehabilitation to ensure 70% cover with indigenous vegetation with no bare areas exceeding 1m x 1m and no alien vegetation

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LIST OF FIGURES

The following figures are included in support of the performance specifications:

1. INTRODUCTION

1.1. PURPOSE AND SCOPE OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

This Construction Environmental Management Programme (EMPr) was compiled in response to the a condition of the authorization granted by the National Department of Environmental Affairs for the construction and operation of the Eskom Grassridge - Dedisa 400kV Transmission Line. The Transmission Line is located within the Coega Industrial Development Zone (IDZ), north-east of Port Elizabeth in the Eastern Cape. It is a guideline document that provides performance management measures that will assist in negating and mitigating potential environmental impacts arising from the construction of the Transmission Line.

The Construction EMPrwas developed to comply with regulations as set out by the National Department of Environmental Affairs (DEA) and the Provincial Department of Economic Development, Environmental Affairs and Tourism (DEDEAT). It incorporates provisions outlined within the Record of Decision (Ref: 12/12/20/781) for "The construction of the Proposed Coega Integration 400/132kV Substations and the 400 and 132 kV Transmission Lines in the Coega Industrial Development Zone (IDZ) near Port Elizabeth'' (Refer to the Appendix). *Note that this EMPr document only relates to the Eskom Grassridge - Dedisa 400kV Transmission Line, which is connected to these two existing substations.*

Conditions of the 2006 Record of Decision (ROD) include the submission of a site specific Construction Environmental Management Programme(EMPr) and an Operational EMPr to the Department of Environment Affairs for approval. A Construction EMPr was prepared in August 2007 for the construction of the first phase of the project (Diamond 2007; Eyethu Engineers 2007). Eskom appointed Envirolution Consulting to revise the Construction EMPr and to compile an Operational EMPr for the Eskom Grassridge - Dedisa 400kV Transmission Line.

The Construction Environmental Management Programme (EMPr) sets out general and specific Construction Environmental Specifications (requirements), which are applicable to the construction of the Grassridge - Dedisa 400kV Transmission Line between the established Dedisa and Grassridge Substations.

The Construction Environmental Management Programme (EMPr) objectives are:

- Ensure that the activities are undertaken in compliance with national, provincial and local environmental legislation.
- Ensure that construction activities are undertaken that do not significantly impact on the environment in accordance with these environmental specifications and that important biodiversity features (as identified in the specialist studies undertaken for this EMPr) are considered i.e. plant Species of Special Concern, wetlands, drainage areas, birds, fauna and heritage resources (although heritage resources were not exposed during the specialist assessment prior to the construction of the Transmission Line, the possibility of future discovery should not be discounted).
- Determine mitigation measures and methods for assessing the success or failure of each measure.

- Ensure that all concerns of key stakeholders, such as the Coega Development Corporation, are addressed.
- Provide a framework or starting point for environmental reporting into the operational phase.

Responsibility of the Construction Environmental Management Programme (EMPr)

Eskom Holdings SOC Ltd: Transmission Division, and any other contractors and sub-contractors, as well as staff, will be required to comply with and implement the specifications contained herein. The Construction EMPr and its provisions must form part of any contractual arrangements between Eskom Transmission, the Coega Development Corporation (CDC) and any Contractors. This also includes health and safety requirements for the IDZ

This Construction EMPr serves as a guideline for the management of activities within the Transmission Line's servitude and provides specifications that must be adhered to in order to reduce potential construction impacts on biodiversity. The Construction EMPr is a legally-binding document. Parties that do not comply with the specifications contained herein will be penalized (Refer Section 3). Refer to Section 5 (Monitoring and Auditing) for Roles and Responsibilities.

This CEMP has been compiled and structured to enable ease of use by parties involved in the construction of the powerline. As such the CEMP sets out:

- Conditions of the Record of Decision, stipulating conditions that are relevant to the various parties involved in the construction of the line.
- Roles and responsibilities of different parties in terms of the various aspects of powerline construction.
- Generic mitigation measures related to specific environmental parameters.
- Site-specific environmental sensitivities and landowner requirements related to individual pylon (tower) locations.

1.2. PROJECT DESCRIPTION AND LOCATION

The study area is within the Southern Grid and forms part of the Port Elizabeth customer load network (PE CLN). This area is defined as the 400/132kV interconnected network between Grassridge and Dedisa MTSs, including the 400/132kV transformation at each MTS.

Grassridge - Dedisa 132kV line is proposed to resolve the overload on the remaining Dedisa 1x500MVA transformer. The proposed installation of this line will improve the load sharing between Dedisa and Grassridge Main Transmission System Substations or MTSs. The installed N-1transformer capacity in the study area is 1500MVA (excluding the 2x360MVA 220/132kV Grassridge transformers), and the forecast load in the study area is approximately 1300MVA in 2014. Theoretically the load in the study area can be supplied from the existing transformers, provided adequate 132kV interconnection and closely matched source impedances for Grassridge and Dedisa MTS's.

The proposed solution is therefore the construction of the ±8km long Grassridge - Dedisa 132kV line, to increase load sharing of the transformers in the study area. The line would cross ±90m of rural land before entering the Coega IDZ (Industrial Development Zone). The section of land within the Coega IDZ between Grassridge

and Dedisa, is zoned Special Purposes 29 (Industrial or Commercial), and has an existing servitude between Grassridge and Dedisa.

The current assumption is that the line should be built as a 400kV line and operated at 132kV, as the existing servitude is limited to 6 lines and the towers need to be aligned with the existing 400kV lines.

The following constitutes the Eskom Grassridge and Dedisa Transmission Line, including re-routed Transmission Lines (Figures 2a & 2b):

- A 400kV Transmission Line within an existing transmission line corridor or servitude, parallel to and approximately 50m north of the existing Grassridge - Dedisa 400kV line, with the same 400kV free standing lattice tower designs as used on the existing two 400kV lines. Initially, the intention is to string 132kV conductors along the Transmission Line and to upgrade these to 400kV conductors at a later stage.
- A temporary 132kV transmission line for emergency loads between the Grassridge Sub-station and the new 400kV transmission line.
- A re-routed existing 400kV Grassridge-Dedisa transmission line between two existing towers (DG8 and DG10) to a new tower position (DG9N).
- A re-routed existing 220kV transmission line passing under the two existing 400kV transmission lines (near towers DG9N and PD9), travelling north of and parallel to the existing Poseidon-Dedisa 400kV powerline to the Brak River substation.
- A re-routed existing 22kV transmission line (near towers DG8 and DH9N), remaining south of the Grassridge-Dedisa 400kV powerline, before crossing under the Grassridge-Dedisa and new 400kV transmission lines, re-joining the original 22kV alignment.
- A re-routed existing Poseidon-Grassridge 400kV transmission line (between towers PD16 and GD 16) near the Dedisa substation.

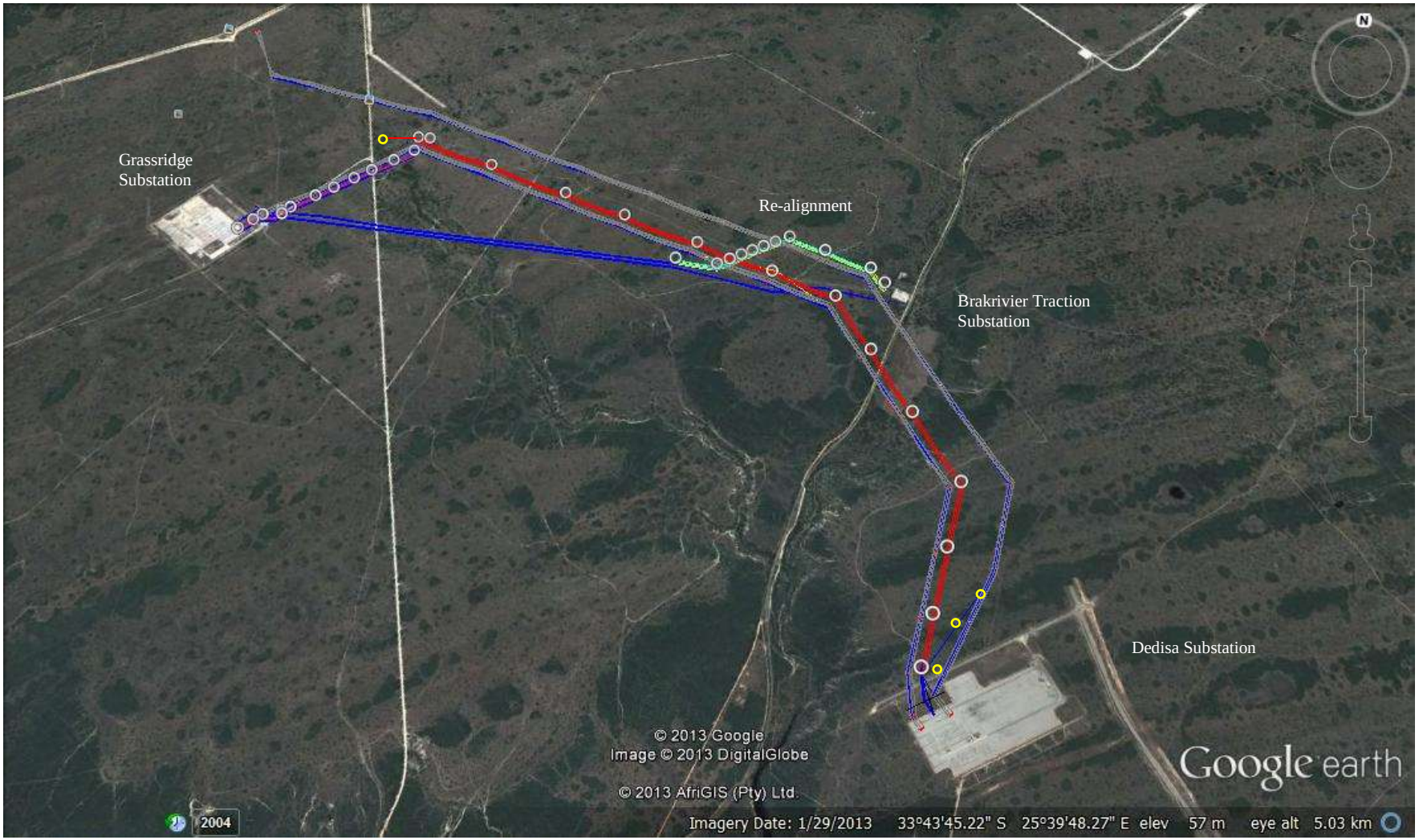


Figure 1:Locality Map indicating the position of the various towers described in this EMPr. Where: White circles = New Pylons (Towers) Red Line = New Transmission Line, Green Line = New re-alignment of Transmission Line and Blue and Grey Lines = Existing Transmission Lines

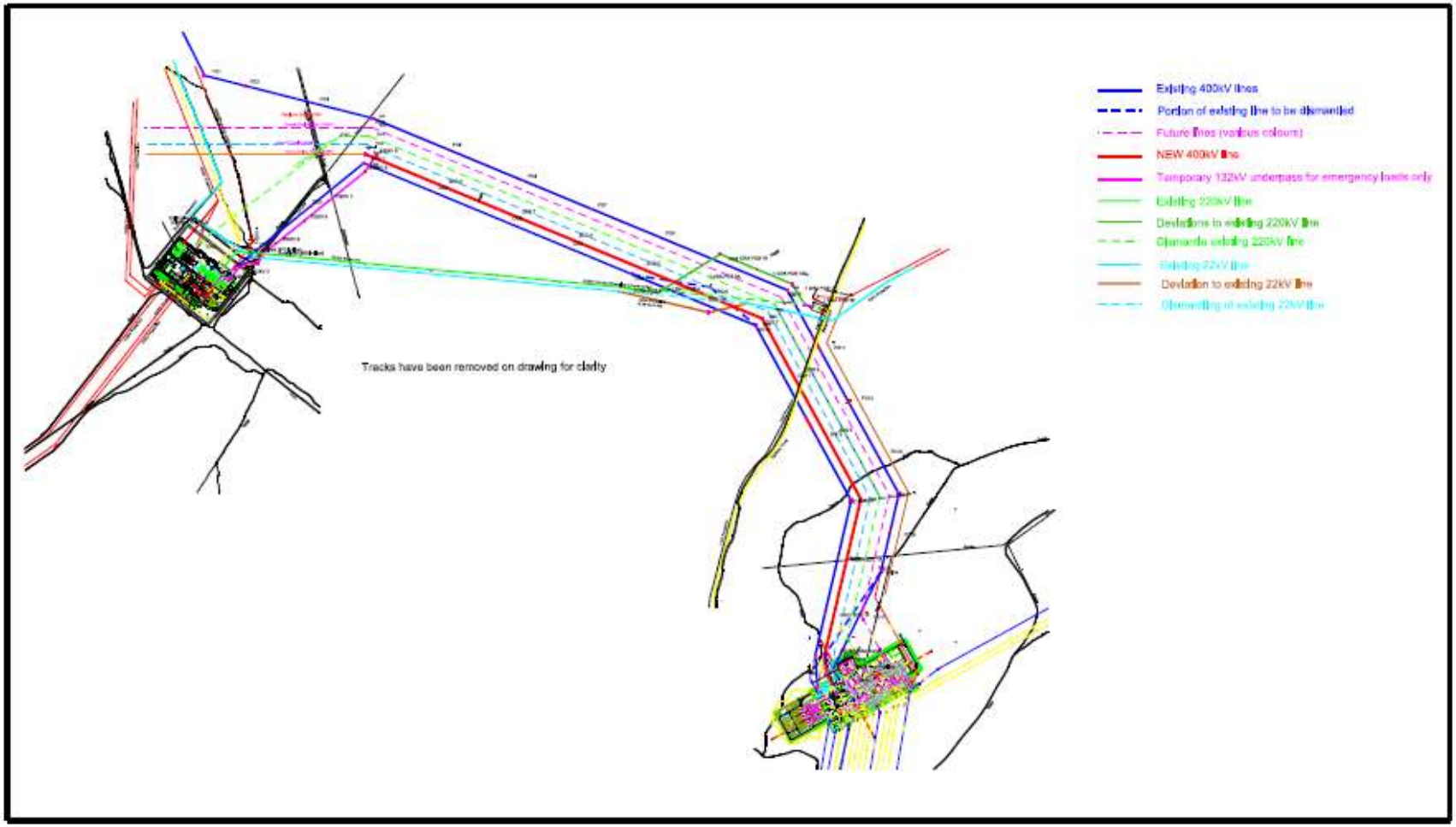


Figure 2a:Layout plan indicating current and future transmission lines within the Dedisa – Grassridge servitude.

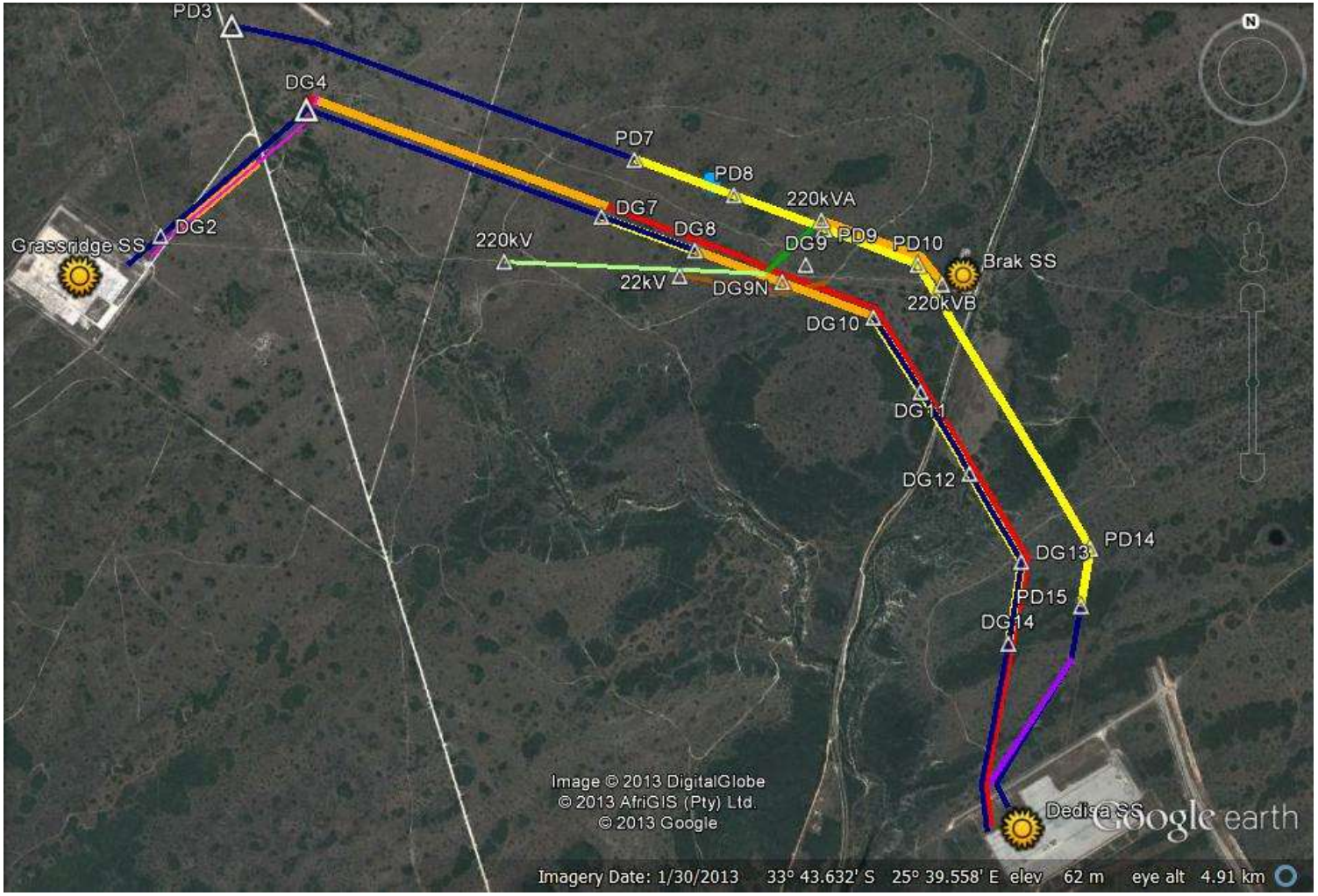


Figure 2b: Layout Map showing detailed re-routing.Spans of the 132kV, 400kV and 220kV power lines requiring Bird Flight Diverters (orange); New 132kV line (pink), 400kV line (red); 220kV line (green; 22kV line (brown).

1.3. CONSTRUCTION ACTIVITIES

The construction activities will take place in the following sequence, based on the information supplied in the 2007 EMP:

1. Tower pegging
2. Excavation of foundation
3. Foundation reinforcing steelwork
4. Concrete filling/foundation pouring
5. Delivery of steel to tower site
6. Assembly team/punch and paint
7. Erection of pylons (towers)
8. Stringing, sag and tension
9. Rehabilitation

This CEMP therefore deals with the following:

- Pylon erection:
    - Typical 518 (H, C or E) structures, Height of between 24 m and 33 m. The ground footprint of these structures is 9 m X 9 m.
    - Typical 132kV pole structures.
    - 220kV towers
- Foundations:Concrete foundations with dimensions of approximately (3m x 3m). Each tower will have 4 of these foundations at each leg.
- Construction footprint: 20 m X 20 m (400 m²) per tower location and per drum station.
- Access tracks: Existing and proposed (no new graded tracks but designated areas to drive along).
- Some vegetation removal, limited topsoil removal.
- Staff accommodation: Construction staff will be accommodatedwithin the dedicated Coega IDZ construction village.
- Construction camp (Contractors camp): Established at either the Dedisa or Grassridge substations.

The following equipment will be required to construct the Dedisa Grassridge Transmission Line

- Cranes
- Pylons
- Stringing tensioners
- Cable drums
- 12 ton truck

The construction of the Dedisa Grassridge Transmission Line will not require or comprise the following:

- A crusher plant
- A batching plant
- Blasting
- Borrow pits and test pits

The following comprise hazardous materials that may detrimentally impact on the natural environment during the construction phase:

- Ready mix cement
- Fuel and oil (i.e. leakage from cranes and 12 ton truck)
- Chemical and sewage from potable chemical toilets i.e. accidental leakage

The construction period will extend over a period of 1.5 years, from January 2014 – June 2015.

It should be noted the CDC / Coega IDZ have listed the construction of the Dedisa and Grassridge MTSs and the erection of the current towers as a Best Practice Operation and thus have recommended that the Stringing Operation again take place using helicopters. This will minimise the potential impact on the vegetation and Opens Space System within the IDZ, while reducing the need for bush clearing that should not take place within this area.

Figure 3 below illustrates the pylons that will be erected as part of the Transmission Line. The Construction Footprint is 400 m² (20 m X 20 m), whereas one foot (with sub-surface foundation) of each pylon base will be 9 m² (therefore 4 X 9 m² per pylon = 36 m²).

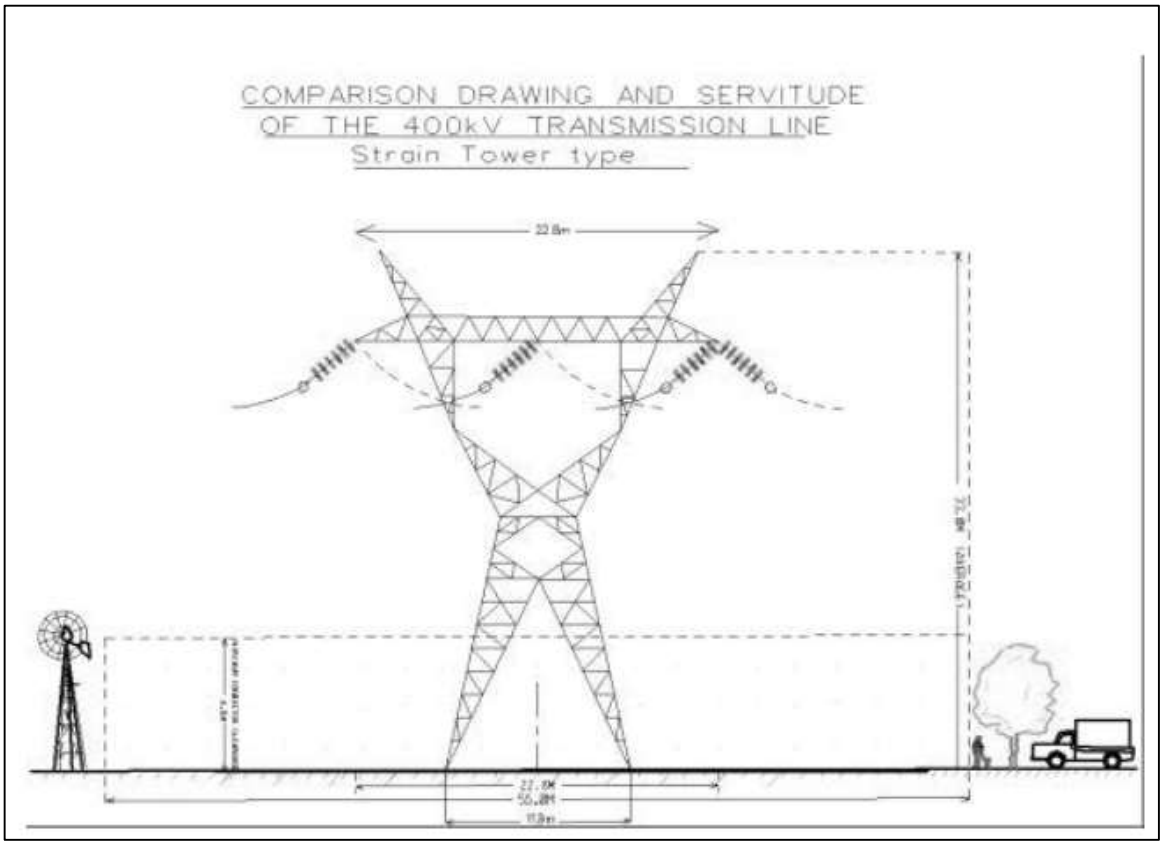


Figure 3: Typical 400 kV pylon structure that will be used for the 132 kV lines.

1.4. SPECIALIST ASSESSMENTS UNDERTAKEN FOR THE COMPILATION OF THE EMP

1.4.1. Vegetation Assessment

Based on a review of relevant conservation plans, and verified by field work, the following habitats have been identified within the study area (Figure 4):

- Sundays Valley Thicket
- Grassridge Bontveld
- Transformed and degraded vegetation

The vegetation units as per Nelson Mandela Bay Municipality CAP correspond to the Subtropical Thicket Ecosystem Programme (STEP) vegetation units, for which general floristic descriptions are provided in the STEP and NMBM CAP reports. Most of the flat areas within the study area tend to be underlain by calcrete, having Grassridge Bontveld as the dominant vegetation unit, with Sundays Valley Thicket along the drainage line slopes and the Brak River area (Stewart and Reeves, 2010).

Sundays Valley Thicket

The thicket tends to be limited to slopes around drainage lines, with some clumps scattered throughout the Bontveld habitat. Typical Sundays Valley Thicket elements are common and include: *Abutilon sonneratianum, Allophylus decipiens, Aloe africana, Aloe ferox, Aloe speciosa, Apodytes dimidiata, Aristida congesta, Asparagus spp., Azima tetracantha, Cotyledon orbiculata, Cotyledon campanulata, Cussonia thyrsiflora, Ehretia rigida, Euclea racemosa, Euclea undulata, Euphorbia grandidens, Euphorbia triangularis, Gasteria nitida, Gymnosporia capitata, Gymnosporia spp., Hippobromus pauciflorus, Jasminum angulare, Lauridia tetragona, Maeruacafra, Mystroxylonaethiopicum, Oleaeuropaeasubspafricana, Pappeacapensis, Pittosporum viridiflorum, Ptaeroxylon obliquum, Pterocelastrus tricuspidatus, Rhusincisa, Sansevieriahyacinthoides, Schotiaafravarafra, Scolopiazeyheri, Tarchonanthus camphoratus, Grewia occidentalis, Scutia myrtina* and *Sporobolus africana.*

- Thicket tends to be fragmented from existing roads, powerline and pipeline servitudes throughout the general IDZ, but only roads and powerlines fragment Zone 13 & 14.
- The thicket areas that will be impacted tend to be fragmented and occur in transformed areas within designated Open Space areas, the loss of which could affect ecological processes negligibly.
- Extensive on slopes surrounding the Brak River and associated drainage lines.

Figure 4: Vegetation types based on the NMBM Conservation Action Plan spatial data

Grassridge Bontveld

The vegetation of the above sites consists of Grassridge Bontveld, which is a mosaic vegetation consisting of small Sundays Valley Thicket clumps interspersed with a grassy matrix dominated by a mix of herbs, shrubs and grasses, where soil is shallow due to presence of subterranean calcrete. Grassridge Bontveld is the dominant vegetation type within the flat areas of site, consists of scattered exposed aeolionite (calcrete) outcrops, interspersed with a grassy-herb matrix in shallow soils underlain with subsurface calcrete and scattered thicket clumps of varying size, where deeper soils are present.

Where calcrete daylights (is exposed to the surface) to form a distinct outcrop, the typical grassy matrix is replaced by a succulent or forb vegetation. There is thus a high ecotonal ratio within the unit and associated high diversity due to the different habitats and associated flora. This unit is restricted to areas underlain by calcrete as well as exposed outcrops of limestone (Nanaga formation), with 'islands' of Valley Thicket present where deeper soils permit. The species present is a mix of Fynbos, Grassland and Succulent Karoo elements, often with *Acmadenia obtusata, Aloe ferox, Euryops ericifolius, Lobostemon trigonus, Muraltia squarrosa, Osteospermum imbricatum, Pentaschistis pallida, Rhus pyroides* and *Themeda triandra* prominent. Within the site three sub-communities can be differentiated. A distinct community associated with the exposed calcrete outcrops is present with an abundance of succulent species belonging to the Crassulaceae and Mesembryanthemaceae. Grasses tend to be scant in shallow soils. Between the exposed outcrops, soils (light in colour) become deeper and allow for grasses and shrubs to become more abundant with scattered thicket bushclumps varying in size

from less than $1m^2$ to a few square meters. Two distinct communities can be distinguished in areas where distinct outcrops are absent. These include a grassy community and a more shrub dominated community. Slopes tend to have deeper Nanaga formation soils (red in colour) which allow thicket to establish.

- Bontveld tends to be dominated by shrubby and grass species typical of the unit and tends to be largely intact.
- Bontveld in affected areas tends to be high in species diversity in comparison to other low diversity degraded Bontveld areas within the southern parts of the IDZ.

Transformed and degraded vegetation

The transformed areas in the site tend to have a low biodiversity (predominantly grasses and some herbs) often with a moderate to high density of alien species and are thus of limited conservation importance and most suited to be used for development. Typical grass species include *Digitaria sp., Pennisetum clandestinum, Stenotaphrum secundatum* and *Themeda triandra.* *P*rotected species were however noted within the disturbed areas, mostly common widespread species, which are conducive to relocation.

- The areas adjacent to the drainage lines are important in terms of drainage and the ecological corridor and buffer areas should be retained even if transformed.
- A few severely degraded (non-restorable) and transformed areas are present within the zone as well, but are only applicable to road and cable routing.

Plant Species of Special Concern (Threatened, Endemic and/or Protected)

Plant Species of Special Concern are Threatened, Endemic and/or Protected species. Plant Species of Special Concern were identified within the construction footprints of the proposed pylons (i.e. 20 m X 20 m area). The protection status of these plants is due to their respective listing in the Provincial Nature Conservation Ordinance (PNCO) of 1974, the National Forest Act (84 of 1998), the National Environmental Management: Biodiversity Act (10 of 2004), and/or by the red data listing (Threatened plants) of the International Union for Conservation of Nature (IUCN).

Protected Species of Special Concern will require permits from the relevant provincial departments, if any individual plants are to be removed, translocated or trimmed according to the relevant legislation, namely the National Forests Act (Department of Forestry and the Provincial Nature Conservation Ordinance (Provincial Department of Environmental Affairs – Permit Administration).

The plant Species of Special Concern included (Refer Table 1 and Figure 5 for location and importance):

1. *Aloe africana*
2. *Aloe striata*
3. *Aloe humilis*
4. *Bergeranthus scapiger*
5. *Crassula perfoliata*

6. *Euryops ericifolius*
7. *Ficinia truncate*
8. *Haemanthus coccineus*
9. *Carobrotusdeliciosus*
10. *Ruschia sp.*
11. *Corpuscularia lehmannii*
12. *Drosanthemum hispidum*
13. *Delosperma sp.*
14. *Sideroxylon inerme*

Table 1: List of plant Species of Special Concern that were recorded within the construction footprints of the proposed pylons sited along the proposed power line route. The detail for localities will be finalised as part of a separate permitting process.

Note the reader must read this in conjunction with the attached vegetation report which includes additional maps.

Species	Pylon location	Approximate GPS - pylon GPS recording (i.e. not plant specific).	Threatened, Endemic and/or Protected	Mitigation Measures
Aloe africana 	Adjacent to existing track leading to pylon 6, 7 (possible fringe), 11	7 = -33.722083 25.669793 11 = -33.7207 25.663108	All species of the genus Aloe except *Aloe ferox* are Protected by the Provincial Nature Conservation Ordinance.	Implement a rescue and translocation programme, as indicated in Section 3.1.2.
Aloe striata 	1, 4, 7,	3 = -33.73197 25.676459 4 = -33.721732 25.673631 7 = -33.722023 25.669987		
Aloe humilis	11	11 = -33.7207 25.663108		

				
Euryops ericifolius 	3, 11	3 = -33.73197 25.676459 11 = -33.7207 25.663108	Endangered	
Haemanthus coccineus 	3, 4	3 = -33.73197 25.676459 4 = -33.721732 25.673631	All species of Amaryllidaceae are Protected by the Provincial Nature Conservation Ordinance.	
Crassula perfoliata 	8	8 = -33.721233 25.669126	Protected by the Provincial Nature Conservation Ordinance.	
Ficinia truncate	11	11 = -33.7207 25.663108	Endemic species.	

				
Sideroxylon inerme 	3, 4, 6 (in Thicket clump adjacent to construction footprint), 7, 8, 9 (possibly outside of construction footprint), 10 (possibly outside of construction footprint), 11, 12, 13	3 = -33.73197 25.676459 4 = -33.721732 25.673631 6 = -33.720146 25.671851 7 = -33.722083 25.669793 8 = -33.72117 25.669044 9 = -33.721282 25.669005 10 = -33.721645 25.666504 11 = -33.7207 25.663108 12 = -33.720622 25.663033 13 = -33.720368 25.660684	Protected by the National Forest Act	Replace as many trees as those removed during construction. Refer to Section 3.1.2.
Mesembryanthemaceae plants				
Carobrotusdeliciosus 	4, Along access track to pylon 6	4 = -33.721732 25.673631 Along access track to pylon 6	All Mesembryanthemaceae species are Protected by the Provincial Nature Conservation Ordinance.	If possible, rescue and translocate the Mesembryanthemaceae species, as indicated in Section 3.1.2. Alternatively, plant cuttings or nursery plants to replace those species removed, as indicated in Section 3.1.2.
Ruschia sp.	3, **4**, 6, 7, **8, 9**, 10, 11, 12,	As per Milkwood above		

 	13, **14**			
Corpuscularia lehmannii 	3	3 = -33.73197 25.676459		
Drosanthemum hispidum 	15	15 = -33.720021 25.656682		
Delosperma sp.	15	15 = -33.720021 25.656682		

				
Bergeranthus scapiger 	11	11 = -33.7207 25.663108		

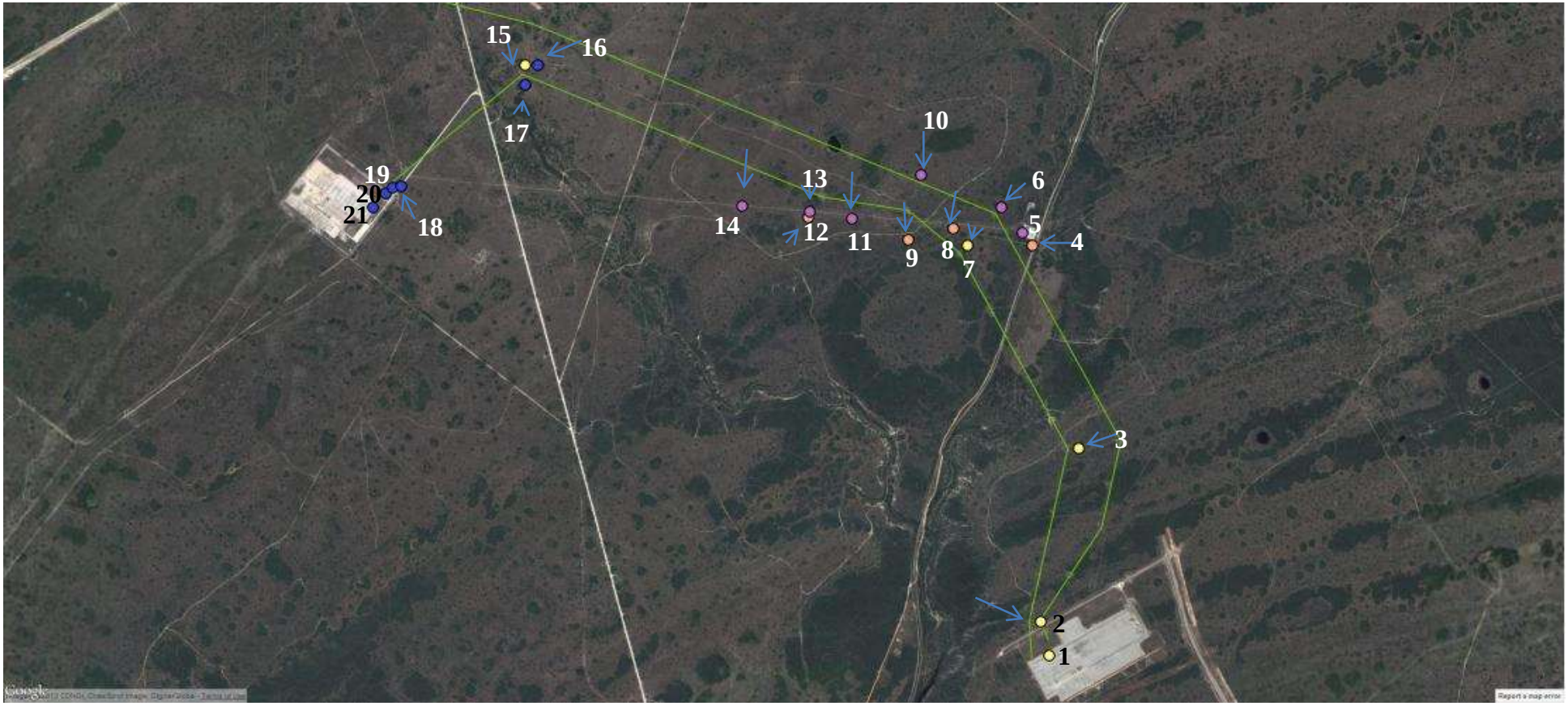


Figure 5. Surveyed pylons in which plant Species of Special Concern were identified. All pylon sites, including those pylons not indicated to the consultants at the time of the site visit, will need to be surveyed 3 weeks prior to construction proceeding to provide the botanical specialist (responsible for rescue and translocation) with the opportunity to advise the Contractor with regards to the removal of Species of Special Concern.

1.4.2. Aquatic Assessment

The study site is located approximately 28km north of the Port Elizabeth Central Business District, located near the Coega River. The Majority of the development falls within the Quaternary catchment M10C. The proposed development does not have any direct link to the Coega Estuary.

A detailed description of the surrounding topography, soils and land cover is contained in the vegetation and terrestrial fauna assessment contained in the EIA, but the site is covered mainly by Grassridge Bontveld and Sundays River Thicket vegetation types.

Several aquatic systems were observed on site with the relevant delineations shown in Figure 6. The observed waterbodies could be divided into two broad groups, namely watercourses (drainage lines) and Pans / Depressions (natural & modified).

For the purposes of this report, all the water bodies and wetland areas will therefore be assessed using the National Wetland Classification System, which does allow for categorisation of wetland areas within river channels and drainage lines.

Based on the National Wetland Classification System, level 1 to 6, these systems are typical of Inland Systems (Level 1), with no direct connection to the sea, within the South Eastern Coastal Belt Ecoregion (Level 2). All these riparian and wetland areas were found either on a plain or within valley floor landscape units (Level 3), corresponding to the depression (pan) and the un-channelled valley bottoms hydrogeomorphic units (Level 4). The study area drainage lines were associated with one main watercourses, which could be classified as headwater systems of the Coega River, with channel formation. Due to the position of the wetlands within very small catchment basins, surface water run-off volumes as limited and no permanent riparian (vegetation) zones were observed (Level 5).

The three observed pan or depressions are a landform with closed elevation contours that increase in depth from the perimeter to a central area of greatest depth, where water typically accumulates. Dominant water sources for these wetlands are precipitation, ground water discharge, interflow and (diffuse or concentrated) overland flow (SANBI, 2009).

Various provincial guidelines on buffers have been issued within the province. These are stated below so that the engineers and contractors are aware of these buffers during the planning phase. Associated stockpiles, lay down areas and construction camps should avoid these buffer areas.

Currently there is no accepted priority ranking system for wetlands. Until such a system is developed, it is recommended that a **50m buffer** be set for all wetlands. The Nelson Mandela Bay Municipality (NMBM) has recently produced a bioregional conservation plan, which does cover the study area. The plan calls for a buffer of 50m, for small closed wetland systems such as those found on the site. Similarly these policies have proposed in agreement with the water act, that no development should take place within 32m of any watercourse.

However due to the proposed locality of the pylons, no direct impacts are anticipated to occur within the aquatic environment (rivers and wetlands), assuming that only existing tracks are used.

A number of the pylons do fall within the 500m boundary from a wetland, and will thus require a Section 21 c and i Water Use license as per the National Water Act as shown in Figure 6.

The following documents (amongst others) will be needed for a Water Use License Application due to the watercourse crossings in the area, as well as the project being within 500m of a wetland area, as required by the Department of Water Affairs (DWA), noting that none of the drainage lines will be require diversion or alteration to their bed or banks:

- Application forms for Section 21 (c) and (i) use. Note that the current Section 21 (c) and (i) General Authorizations (GAs) do *not* apply to the use of water within a 500m radius from the boundary of a wetland. Should construction within these boundaries be considered, *licensing* and not registration will have to take place.

- Supporting documentation in terms of the activity and applicant

NOTE:

"At Level 4C of the NWCS, depressions (i.e. the primary HGM Unit captured at Level 4A) are categorised according to their outflow drainage. Depressions can be classified as 'exorheic' (i.e. outward-draining) or 'endorheic' (i.e. inward-draining) in terms of their surface outflow drainage, with the additional option to categorise depressions that occur as a primary HGM Unit in a valley floor setting or on a slope as 'dammed'. The reason that the surface drainage has been used as the basis for distinguishing between "exorheic" and "endorheic" depressions, as opposed to surface and/or subsurface drainage (which would be more technically correct), is that it is often not immediately apparent whether downstream subsurface drainage is present (especially on the basis of remote sources of information such as maps and aerial photography). At Level 4D, depressions can be further subdivided on the basis of their inflow drainage characteristics, into those 'with channelled inflow' and those 'without channelled inflow'. This is a very important distinction for management purposes because the water quality and other characteristics of "depressions with channelled inflow" will be directly related to that of the inflowing channels, which implies that management of these types of depressions will require management and monitoring of the inflowing channels" (from SANBI 2009)

Figure 6: Aquatic Map indicating the various streams and pans (wetlands) found within the study area. Also shown are the pylons that fall within 500m of a wetland boundary and will require a Water Use License Application

1.4.3. Avifaunal Assessment

Several potential impacts are related to the project and can be summarised as follows:

Destruction of bird habitats and populations: Birds can be displaced by this loss of habitat must find alternative suitable habitat, which may be less favourable, and there the displaced birds must compete for resources with the established population of birds of the same or other species, potentially to the detriment of both. The result is a reduction in the local population of most small birds. This can be of conservation concern if the vegetation types affected supports endemic or threatened species of birds, especially so if the plant community is rare in the wider environment. In contrast, some species, largely those which exploit disturbed habitat, may increase, e.g. game-birds which may forage and display along seldom-used gravel access roads (Douglas *et al.* 2011). These impacts may be locally intense and of a permanent nature.

Fragmentation of bird habitats and patterns of movement: Construction of infrastructure, including overhead powerlines, fencing and roads, could create isolated fragments of habitat. The impact of such fragmentation will vary from species to species, depending on the degree of mobility of the species and its tolerance of sub-optimal habitat types. Species with low tolerance of habitats other than their preferred habitat, become ecologically isolated within fragments and thereby become more vulnerable to local extinction, especially if the fragments are too small to support viable populations.

Collision with overhead transmission cables: The key issue is the outright death, or crippling and subsequent death, of birds as a result of collision with power cables. From a bird conservation perspective, the aim must be to minimise the number of birds placed at risk of collision, with particular attention given to species that are of conservation concern.

Most birds can fly and generally do so within 100 m of the ground. Electrical infrastructures – transmission lines with their support structures, can intrude on this air space. This leads to collisions which are, both globally and in southern Africa, the most direct and widespread impact of electrical infrastructure on birds (Bevanger 1998, van Rooyen& Ledger 1999, van Rooyen 2004, Rubolini*et al.* 2005, Drewitt& Langston 2006). Birds may collide with stay-wires (where they are used to support pylons) or with the conductors, but usually hit the earth wires which are generally the thinnest, least conspicuous, and highest-rigged component of electricity pylon configurations (Alonso *et al*. 1994).

There are a number of generic factors which often influence the risk of birds colliding with powerlines. These include: the agility and manoeuvrability of birds in flight; their age and experience; the sex of the birds; the degree to which birds fly by day or night; whether they fly in flocks; and, especially, the frequency with which their flights take them near powerlines

Electrocution on pylons: Electrocution of birds occurs mainly where birds perch, or nest, close to conductors on electricity pylons and a bird either touches two phase

conductors or a conductor and an earthed device simultaneously, and occurs especially when feathers are wet (Bevanger 1998). Conductors are usually spaced too far apart for small birds to touch two at a time and most birds electrocuted are those large birds (e.g., eagles, owls, storks and crows) which habitually perch or breed on pylons and which can easily span the distance between energized wires (Van Rooyen 2004). In a 10-year study, 96% of electrocuted birds were raptors and 66% of these were juveniles (Harness & Wilson 2001). Electrocutions are more prevalent in open habitats where alternative perches, trees or rocks, are rare (Kochert&Olendorff 1999).

Most electrocutions occur on lower voltage lines, where the air gaps between the conductors and potential perches for birds are relatively small. In higher voltage (>132 kV) configurations, the conductors and the lattice-work of the pylons are generally too far apart for even the largest birds to short-circuit the line. The problem of electrocution can be reduced by making design changes to the configuration of power poles to provide adequate spacing between phase conductors and ground wires. New towers should be specially designed and bird-friendly (APLIC 1994, Bevanger 1998, van Rooyen and Ledger 1999, Lehman *et al*. 2007).

The two habitat types occur within the study area, particularly Zone 13 & 14 are Grass Ridge Bontveld (also called Coega Bontveld) on higher ground and Sundays Valley Thicket in the small valleys (Stewart *et al*., 2004). Other habitat types nearby that influence the avifauna flying over the site are wetlands and farmland in the Sundays River valley that consists of grassland pasture and irrigated cultivated lands.

Though bird abundance and diversity is lower than in Sundays Valley Thicket, Bontveld habitat in the study area is important for some of the main threatened and priority bird species that may be impacted. These include Denham's Bustard, Secretarybird and Blue Crane, as well as several raptor species that often fly within the risk area.

Bird diversity and abundance is relatively high in the Sundays Valley Thicket vegetation. However, the bird community comprises mostly passerine and bush-dwelling species that tend to keep within the vegetation or fly low over the vegetation, below the risk area. The Knysna Woodpecker is one of the priority species that utilizes this habitat.

Wetlandsof consequence to birdsdo not occur within the site. However, the regionally important wetlands of Tankatara Saltpans are located 8 km east of the site, and Coega Saltpans 7.5 km to the south. The estuarine, saltpan and freshwater wetlands of the Swartkops Valley, 18 km southwest of the study area, are a Globally Important Bird Area (Barnes 1998). Many priority species are associated with these wetlands and although the site is not on a direct flyway between the wetlands, waterbird species can be expected to overfly the site on a regular basis.

Farmland, comprised primarily of un-irrigated grassland with a small area of irrigated pasture, is found at Tankatara next to the Sundays Estuary, 6 km east and northeast of Zone 13 & 14. Irrigated farmland (e.g. vegetables, citrus, lucerne) is found adjacent to the Sundays River, 11 km north and northeast of the site.

Priority species, namely Denham's Bustard, Secretarybird and Blue Crane, are found on the Tankatara grasslands and the latter two are known to regularly breed there.

These species are certain to move between the Bontveld in Zone 13 & 14 and the Tankatara Grassland. Species such as Hadeda Ibis and Egyptian Goose utilize the irrigated and un-irrigated farmlands and are also likely to overfly the study area.

Conservation areas:The small valley through Zone 13 & 14, down the Brak River valley to, and including portions of the Coega River valley, falls within the Coega Open Space Management Plan (OSMP). The OSMP area includes a large portion of the direct route to the Dedisa Sub-Station and has consequences for the route of the electrical infrastructure connecting the study area to the national grid. The Coega OSMP is an integral part of the NMBM Conservation Plan and local NMBM Bioregional Plan that is currently being finalized, and the area is classified as a Critical Biodiversity Area (to be managed for biodiversity conservation and to be incorporated into the protected area system) (SRK, 2010). The open space system continues up the valley to the northwest to link in with the Grassridge open space area as part of the Coega-Grassridge-Tregathlyn Corridor.

The management criteria for Coega OSMP areas are no development and no loss of natural habitat. Linear services crossing open space areas must keep to pre-planned servitudes and disturbance of natural habitat must be minimized.

The Swartkops Globally Important Bird Area, 18 km southwest of the study area has been discussed above. The nearby Alexandria Coastal Belt and Algoa Bay Island Globally Important Bird Areas (Barnes 1998) have little consequence for the study area as the marine species of special concern keep to the marine environment and generally will not overfly Zone 13 & 14.

The summary table below indicates the birds that have been observed within the region based on data provided by the CDC monitoring programme led by the author of this report section, indicating the various birds a risk.

Proposed Mitigation

This impact can be partially avoided, and substantially reduced. The recommended mitigations are:

- *Use bird diverters:*Even with approved routing of powerlines, there will always be some risk of bird death through collisions. This risk can be reduced by making the lines more visible to birds through the use of diverters. Bird collisions with powerlines can cause power outages and thus costs to the utility company. International experience has shown that bird collisions with powerlines can be reduced through the placing of bird diverters (including flappers, spirals, plastic balls etc.) on powerlines. These visual features cause birds to react to powerlines with diverters at a greater distance than they do to lines without diverters, and also increase their flight height to avoid powerlines (Morkill& Anderson 1991, Brown &Drewien 1995).Most markers can only be fitted during the initial erection of the lines. Fitted plastic balls deteriorate and disintegrate over time. Flappers and spirals have a longer lifespan and can be replaced because they are not clamped onto the line, but unfixed flappers get wind-drifted into bunches and so often leave sectors of line unmarked. Furthermore, none of the diverters currently fitted in South Africa are readily visible at night. The need is for diverters that: alert birds to lines during both day and, especially, night-time; can be fitted in place so that they do not drift along the line; and can be readily and cost effectively installed on, or removed from, existing lines.

Large birds that tend to perch on pylons are at risk of electrocution. This could include birds such as the Martial Eagles that occur in Zone 13 & 14. Fortunately, this risk can be avoided by means of appropriate pylon design.Electrocution of birds can be effectively eliminated by use of only those pylons approved by Eskom's Bird Research Committee.

Priority bird species likely to pass through the study area and non-priority species that may be at risk from collisions with infrastructure.

Indicated are conservation status, habitat preference, whether the species was observed within the study areaarea August/September 2011, likely frequency of flying over the site (several times per day (D+), daily (D), weekly (W) or monthly/several times per year (M)), assessed risk of local population decline resulting from collision or displacement (H-High, M-Medium or L-Low), and notes on local breeding and abundance and risk factors. Conservation status: **E** = endangered, **V** = vulnerable, **NT** = near-threatened, **P** = protected, **Ra** = raptor or owl, **B** = Listed in Appendix II of the Bonn Convention, **WA** = listed in Annexure 2 of the African-Eurasian Waterbird Agreement, RL = IUCN Red List; SA = South African Red Data Book (Barnes 2000), DEA = Threatened and Protected Species Regulations (DEAT 2007).

Common name	Scientific name	Conservation status	Habitat	Obs. on site	Over-fly area	Risk	Notes
Blue Crane	*Anthropoides paradiseus*	**V** (RL,SA); **E** (DEA); **WA**	bontveld; pasture	Y	W	H	Pair seen study area. 1 pair known to breed on adjacent farm. Max 2-3 pairs breed locally.
Secretarybird	*Sagittarius serpentarius*	**V** (RL); **NT** (SA); **Ra**	bontveld; pasture	Y	D	H	1-2 birds always feeding / flying around study area. Pair known to breed under the current 400Kv line adjacent the pan. Max 3-4 pairs breed locally.
Denham's Bustard	*Neotis denhami*	**V** (SA); **NT** (RL); **P** (DEA)	bontveld; pasture	Y	D+	H	3+ birds around study area (seen daily). Max 6 pairs likely to breed locally.
Martial Eagle	*Polemaetus bellicosus*	**V** (SA,DEA); **NT** (RL); **Ra**	bontveld; all	Y	D	H	Pair present & nest on 400kV tower. The only pair within 50+km.
Jackal Buzzard	*Buteo rufofuscus*	**Ra**	bontveld; thicket; pasture	Y	D	M	Pair in area. Max 5 pairs likely to breed locally.
Southern Pale Chanting Goshawk	*Melierax canorus*	**Ra**	bontveld; thicket; pasture	Y	D+	M	Pair courting within study area. Max 4 pairs likely to breed locally.
Black-shouldered Kite	*Elanus caeruleus*	**Ra**	bontveld; thicket; pasture	Y	D+	M	2 pairs within study area. Hunt at tower height. Fairly common.
Rock Kestrel	*Falco rupicolis*	**Ra**	bontveld; thicket; pasture	Y	D+	L	1 pair resident around study area. Hunt at tower height. Common.
Yellow-billed Kite	*Milvus [migrans] parasitus*	**Ra**	bontveld; pasture	Y	W	L	Summer migrant, uncommon.
Steppe Buzzard	*Buteo vulpinus*	**Ra**	bontveld; pasture		W	L	Summer migrant, common.
Lanner Falcon	*Falco biarmicus*	**NT** (SA); **B**; **Ra**	bontveld; pasture		W	L	Uncommon.
Peregrine Falcon	*Falco peregrinus*	**V** (DEA); **NT** (SA); **B**; **Ra**	bontveld; pasture		M	L	Uncommon.
Spotted Eagle-Owl	*Bubo africanus*	**Ra**	bontveld; thicket; pasture		W	L	Nocturnal. Uncommon.
Barn Owl	*Tyto alba*	**Ra**	bontveld; pasture		M	L	Nocturnal. Uncommon.
African Sacred Ibis	*Threskiornis aethiopicus*	**B**; **WA**	wetland; cultivated	Y	W	L	Breed on local wetlands. Flocks commute between feeding areas. Common.
South African Shelduck	*Tadorna cana*	**WA**	wetland	Y	D	L	Breed on local wetlands. Pairs commute between wetlands.

Common name	Scientific name	Conservation status	Habitat	Obs. on site	Over-fly area	Risk	Notes
							Common.
Egyptian Goose	*Alopochen aegyptiaca*	**WA**	wetland; cultivated	Y	D	L	Breed on local wetlands. Commute between feeding areas. Common.
Spur-winged Goose	*Plectropterus gambensis*	**WA**	wetland; cultivated	Y	W	L	Flocks commute between feeding areas. Uncommon.
Yellow-billed Duck	*Anas undulate*	**B**; **WA**	wetland	Y	D	L	Commute between wetlands. Breed. Common.
Black-winged Lapwing	*Vanellus melanopterus*	**NT** (SA); **WA**	bontveld	Y	M	L	Rare but have been observed in the area recently.
Crowned Lapwing	*Vanellus coronatus*	**WA**	bontveld; pasture	Y	D	L	Crepuscular / Nocturnal. Common.
African Spoonbill	*Platalea alba*	**B**; **WA**	wetland		W	L	Commute between wetlands. Uncommon.
White Stork	*Ciconiaciconia*	**B**; **WA**	pasture		M	L	Summer migrant. Uncommon.
Greater Flamingo	*Phoenicopterus ruber*	**B**; **WA**	wetland		M	L	Common on local saltpans. Migrate at night.
Lesser Flamingo	*Phoenicopterus minor*	**NT** (RL,SA); **B**; **WA**	wetland		M	L	Uncommon on local saltpans. Migrate at night.
African Marsh-Harrier	*Circus ranivorus*	**V** (SA); **P** (DEA); **Ra**	wetland		M	L	Uncommon.
Black Harrier	*Circus maurus*	**NT** (RL,SA); **Ra**	bontveld; pasture		M	L	Rare.
Black Sparrowhawk	*Accipiter melanoleucus*	**Ra**	thicket		M	L	Uncommon.
Cape Teal	*Anas capensis*	**B**; **WA**	wetland		M	L	Commute between saltpans. Breed. Common.
Cape Shoveler	*Anas smithii*	**B**	wetland		M	L	Commute between wetlands. Breed. Common.
Red-billed Teal	*Anas erythrorhyncha*	**B**; **WA**	wetland		M	L	Commute between wetlands. Breed. Uncommon.
White-breasted Cormorant	*Phalacrocorax lucidus*		wetland	Y	W	L	Commute between wetlands. Breed. Common.
Black-headed Heron	*Ardea melanocephala*	**WA**	pasture; cultivated	Y	W	L	Commute between feeding areas. Common.
Goliath Heron	*Ardea goliath*		wetland		M	L	May move between Swartkops & Sundays Rivers. Max 6 individuals.
Cattle Egret	*Bubulcus ibis*	**WA**	pasture; cultivated		W	L	Commute between roost & feeding areas. Common.
Grey Heron	*Ardea cinerea*	**WA**	wetland		M	L	Commute between wetlands. Common.
Knysna Woodpecker	*Campethera notata*	**NT** (RL,SA)	thicket		M	L	Usually flies Low. Uncommon.
Grey-headed Gull	*Larus cirrocephalus*	**WA**	wetland		M	L	Breeds on saltpans. Commutes between wetlands. Common.
Caspian Tern	*Sterna caspia*	**NT** (SA); **WA**; **B**	wetland		M	L	Breeds on saltpans. Commutes between wetlands. Uncommon.
Black-necked Grebe	*Podiceps nigricollis*	**WA**	wetland		M	L	May move between saltpans. Common.
Red-knobbed Coot	*Fulica cristata*	**WA**	wetland		M	L	Move between wetlands. Common.
Common Whimbrel	*Numenius phaeopus*	**WA**	wetland		M	L	May move between Swartkops, Sundays estuaries. Common.
Marsh Sandpiper	*Tringa stagnatilis*	**WA**	wetland		M	L	May move between saltpans. Uncommon.
Common Greenshank	*Tringa nebularia*	**WA**	wetland		M	L	May move between wetlands. Common.
Little Stint	*Calidris minuta*	**WA**	wetland		M	L	May move between saltpans. Common.
Curlew Sandpiper	*Calidris ferruginea*	**WA**	wetland		M	L	May move between saltpans. Common.
Ruff	*Philomachus pugnax*	**WA**	wetland		M	L	May move between saltpans. Common.

Common name	Scientific name	Conservation status	Habitat	Obs. on site	Over-fly area	Risk	Notes
Black-winged Stilt	*Himantopushimantopus*	**WA**	wetland		M	L	Move between wetlands. Common.
Pied Avocet	*Recurvirostra avosetta*	**B**; **WA**	wetland		M	L	May move between saltpans. Uncommon.
Grey Plover	*Pluvialis squatarola*	**WA**	wetland		M	L	May move between Swartkops, Sundays estuaries. Common.
Kittlitz's Plover	*Charadrius pecuarius*	**WA**	wetland		M	L	May move between wetlands. Common.
Three-banded Plover	*Charadrius tricollaris*	**WA**	wetland		M	L	Move between wetlands. Common.
Hadeda Ibis	*Bostrychia hagedash*		pasture; cultivated	Y	D	L	Flocks commute between roost & feeding areas at tower height. Common.
Spotted Thick-knee	*Burhinus capensis*		bontveld; thicket; pasture	Y	D+	L	Crepuscular / Nocturnal (collision risk). Common.
Fiery-necked Nightjar	*Caprimulgus pectoralis*		thicket	Y	D+	L	Nocturnal (collision risk). Common.
White-necked Raven	*Corvus albicollis*		all	Y	D	L	Pair resident near study area.
Cape Clapper Lark	*Mirafra apiata*		bontveld	Y	D+	L	Display flight at tower height.
Cape Crow	*Corvus capensis*		all	Y	D+	L	19 birds in often at tower height. Breed.
Pied Crow	*Corvus albus*		all	Y	D+	L	9 birds in often at tower height.
Pied Starling	*Spreo bicolor*		thicket; pasture	Y	D	L	Commute between roost & feeding areas at tower height. Common.
Speckled Pigeon	*Columba guinea*		pasture	Y	D	L	Commute between feeding areas at tower height. Common.
Cape Turtle-Dove	*Streptopelia capicola*		thicket	Y	D+	L	Sometimes fly at tower height. Common.

1.4.4. Heritage Assessment

The potential impact of the proposed pylons (towers) was assessed based on the following requirements:

Parts of sections 35(4), 36(3) and 38(1) (8) of the National Heritage Resources Act 25 of 1999 apply:

Archaeology, palaeontology and meteorites

35 (4) No person may, without a permit issued by the responsible heritage resources authority—

(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

Burial grounds and graves

36. (3) (a) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

Heritage resources management

38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorized as –

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

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

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

- *(i) exceeding 5000m^2 in extent, or*
- *(ii) involving three or more erven or subdivisions thereof; or*
- *(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
- *(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA, or a provincial resources authority;*

(d) the re-zoning of a site exceeding 10 000m^2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must as the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

It was found that the alignment based on the field indicators and information collected from past surveys within the region, that this project would not impact on any heritage aspects that are known to occur.

However, where development occurs within the or adjacent to the Coega IDZ the responsible ECOs should be alerted to the possibility of significant buried fossil heritage, for example by familiarizing themselves with the recent palaeontological report for the Coega IDZ (Almond 2010a). In this light all major bedrock excavations should be examined at intervals for fossil material by the ECOs. If any substantial fossil remains are found these should be safeguarded, preferably *in situ*. The Eastern Cape Provincial Heritage Resources Authority (ECPHRA) should be contacted as soon as possible. A qualified palaeontologist should be commissioned to record and sample the occurrence, and also to advise on any further mitigation actions or further studies needed.

To carry out monitoring and mitigation of areas of high palaeontological sensitivity, which would normally involve the judicious sampling of newly exposed fossil material together with pertinent geological data, the professional palaeontologist involved would need to apply beforehand for a palaeontological collection permit from the relevant heritage management authority. In this case this is the Eastern Cape Provincial Heritage Resources Authority, ECPHRA (Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; smokhanya@ecphra.org.za).

Fossil material collected must be recorded according to best academic practice and properly curated in an accredited fossil collection, such as the Albany Museum, Grahamstown.

2. PRE-CONSTRUCTION ENVIRONMENTAL PERFORMANCE SPECIFICATIONS

The Pre-Construction Phase refers to the period following final project planning and the tender phase, leading up to, but not including, the establishment on site by the appointed contractor.

2.1. GENERAL

Certain items, although of a pre-construction nature, are not necessarily the responsibility of the Contractor. Adherence thereto may be the responsibility of the Project Manager:

- Make provision for environmental issues on the Agenda for the Construction Site Meeting.
- Maintain professional conduct at all times, addressing all role players with respect and refrain from foul language and abuse.
- Understand the interaction and relationship of these flora in terms of the project as a whole (this includes remuneration agreements, meeting protocols etc.).
- Advise the local community, affected landowners and other Interested and Affected Parties of the construction schedule (i.e. the extent and duration of the construction Works) as soon as it is approved.
- Allow for information sessions and educational tours as required.
- Any disputes and complaints must immediately be brought to the attention of the EO / ECO for further address.
- Ensure that all construction related social issues are addressed. This may include the provision of recreational facilities, housing and access.

2.2. ENVIRONMENTAL SITE MANAGEMENT AND REHABILITATION PLAN

The specifications listed hereunder are preparation actions ahead of the Construction and Rehabilitation phases. Adherence thereto is the responsibility of the Contractor. These specifications are relevant for the entire period of the construction contract:

- Draw up and submit for approval an amended Environmental Site Management and Rehabilitation Plan, based on the Provisional DevelopmentPlan to be conducted by the appointed contractor based on the construction needs issued during the tender phase. This plan must show the final positions and extent of all permanent and temporary site structures and infrastructure, including:
    - Buildings and structures
    - Contractors' accommodation.
    - Contractors' camp and laydown areas.
    - Site offices.
    - Roads and access routes
    - Gates and fences.
    - Essential services (permanent and temporary water, electricity and sewage)
    - Substations
    - Rubble and waste rock storage and disposal sites.
    - Solid waste storage and disposal sites.
    - Site toilets and ablutions.

- Hazardous waste storage and disposal sites.
- Firebreaks.
- Topsoil stockpiles.
- Spoil areas.
- Sludge dams.
- Construction materials stores.
- Vehicle and equipment stores.
- Workshops.
- Wash bays.
- Fuel stores.
- Hazardous substance stores.
- Site weather stations.
- Features and plants to be conserved.

- Draw up and submit for approval a complete Construction Schedule. Take into account any limitations of the environment, including the seasonality of water bodies, growth and dormancy period of fauna and flora etc, although these biodiversity attributes should not be an issue for this project.
- Plan to make optimum use of the dry season for construction works. This should not be an issue with respect to impacting aquatic features, namely wetlands and non-perennial drainage features.
- Indicate that the rehabilitation will be **immediately executed**, per pylon.Ensure that the Construction Schedule and the amended Development Plan relate to one another.
- Inform the EO / ECO of any changes to the approved Construction Schedule as submitted.
- The construction schedule must allow for translocation of Species of Special Concern and rehabilitation of disturbed areas with indigenous grass species.
- Make provision for monitoring and auditing as specified. Ensure that the EO / ECO have access to the site at all times.
- Ensure that the relevant Environmental Awareness Courses (Chapter 6) are presented before the commencement of construction.
- Ensure that a Safety Officer (compulsory) and Environmental Control Officer are appointed before the commencement of construction.

2.3. APPOINTMENT OF THE ENGINEER'S SHE COORDINATOR

As per the CDC's ''Compilation Document for Construction Environmental Management Plan: Preparation and Incorporation of Specifications into Tender and Contract Documentation'':

- The Engineer or team overseeing the design and compilation of the **contract documentation** must appoint the "Engineer's SHE Coordinator" who's roles are detailed in the Guideline Document for the Engineer and Engineer's SHE Coordinator.
- This must be done as soon as the Engineer or team is appointed to work on any project in the IDZ as the Engineer's SHE Coordinator should be an integral part of the team doing the design and contract documentation for any such projects.
- The draft letter of appointment of the Engineer's SHE Coordinator by the Engineer must be completed by the Engineer and used to appoint the Engineer's SHE Coordinator.
- Should there be any changes that the Engineer would like to make to the letter that alters the role or responsibility of the Engineer's SHE Coordinator in any way this, is to be approved by the CDC SHE Business Unit.

3. CONSTRUCTION ENVIRONMENTAL PERFORMANCE SPECIFICATIONS

The Construction Phase refers to the period of the project during which the Transmission Line is erected, deemed to include site establishment and site Works.

3.1. SITE ESTABLISHMENT

3.1.1. Demarcation of the Works Site (Construction Footprint)

- The Works Site or Construction Footprint is considered to be:
    - (i) Access tracks required to reach each new proposed pylon.All existing access tracks must be utilised. Only a few pylons will require access where no such access tracks existand must be indicated on the development plan. In these instances, the access tracks will be established through continued movement of vehicles i.e. no grading will take place and asphalt construction, and
    - (ii) each pylon site, covering an area of 20 m X 20 m (400 m²).
    - (iii) equipment laydown areas, which should be sited within each pylon site, but possibly extending beyond the 400 m² pylon Construction Footprint.
- Identify and demarcate the extent of the site and associated Works Areas as indicated on the approved Development Plan[1] using danger tape with steel droppers (Figure 7).
- Maintain site demarcations in position until the cessation of construction works.
- All sensitive environments shall be avoided. Sensitive areas include wetlands and watercourse areas (non-perennial drainage lines). Construction activities and infrastructure will not be permitted within 50 m of a wetland or 32 m of a natural drainage area.
- No access shall be allowed in areas other than the Construction Footprint.
- Animal movement will not be restricted by the proposed powerline, as no impervious fencing will be established which will prevent movement through the area.
- Minimise the extent of the Works Site footprint (Construction Footprint) as much as is possible.
- Maintain the demarcation line, and ensure that no personnel or contraction materials move outside the designated site.
- Do not use the site for any other purpose other than for the proper carrying out of the Works under the Contract.
- Do not establish any site Works besides those specified and allowed for in the successful tender, unless specifically agreed upon with the EO / ECO.
- Do not establish any activities or operations that, in the opinion of the EO / ECO are likely to adversely affect the aesthetic quality of the environment.
- In the event that such activities and operations are deemed to be necessary, then ameliorative actions must be taken to reduce the adverse effects. Actions will be specified by the EO / ECO.
- Do not paint or mark any natural feature. Marking for surveying and other purposes must be done using pegs, beacons or rope and droppers.

[1]The ECO will be available to aid the Contractor with the demarcation of this area.

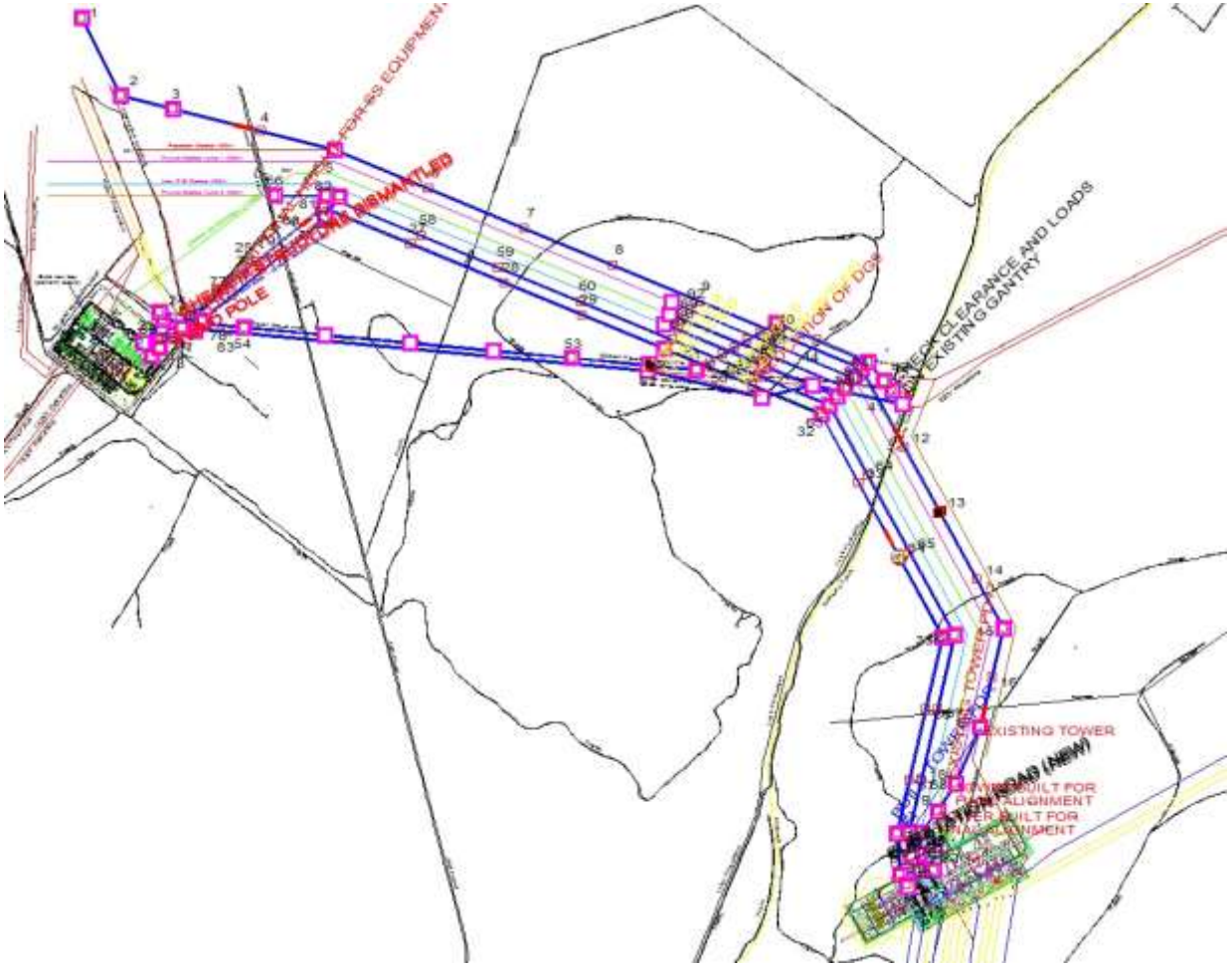


Figure 7a: Development plan indicating the proposed construction sites and relevant access tracks that must be used

Note: Figures 7 b – g ,moving from west to east along the proposed line shown greater detail.

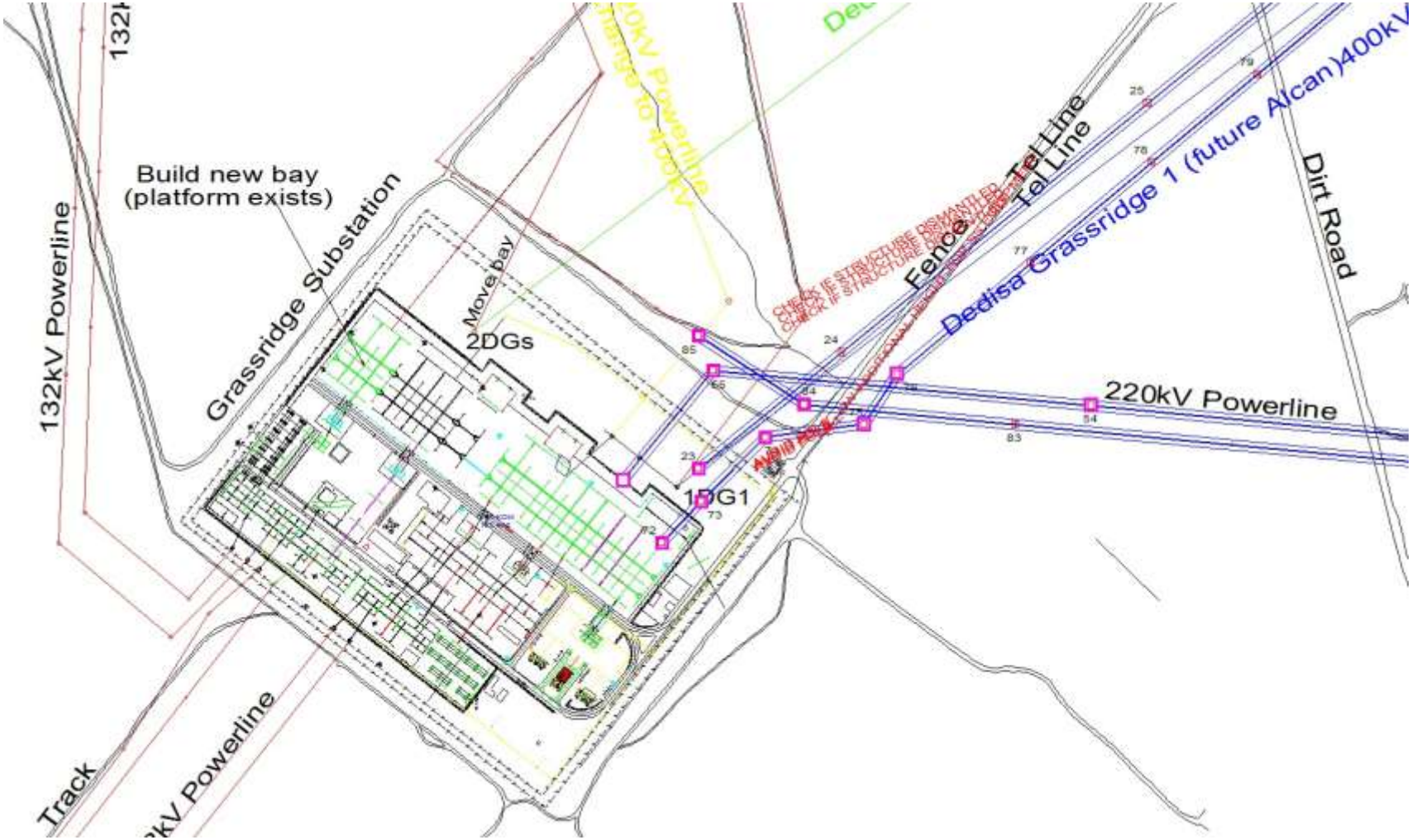


Figure 7b: Development plan indicating the proposed construction sites and relevant access tracks that must be used

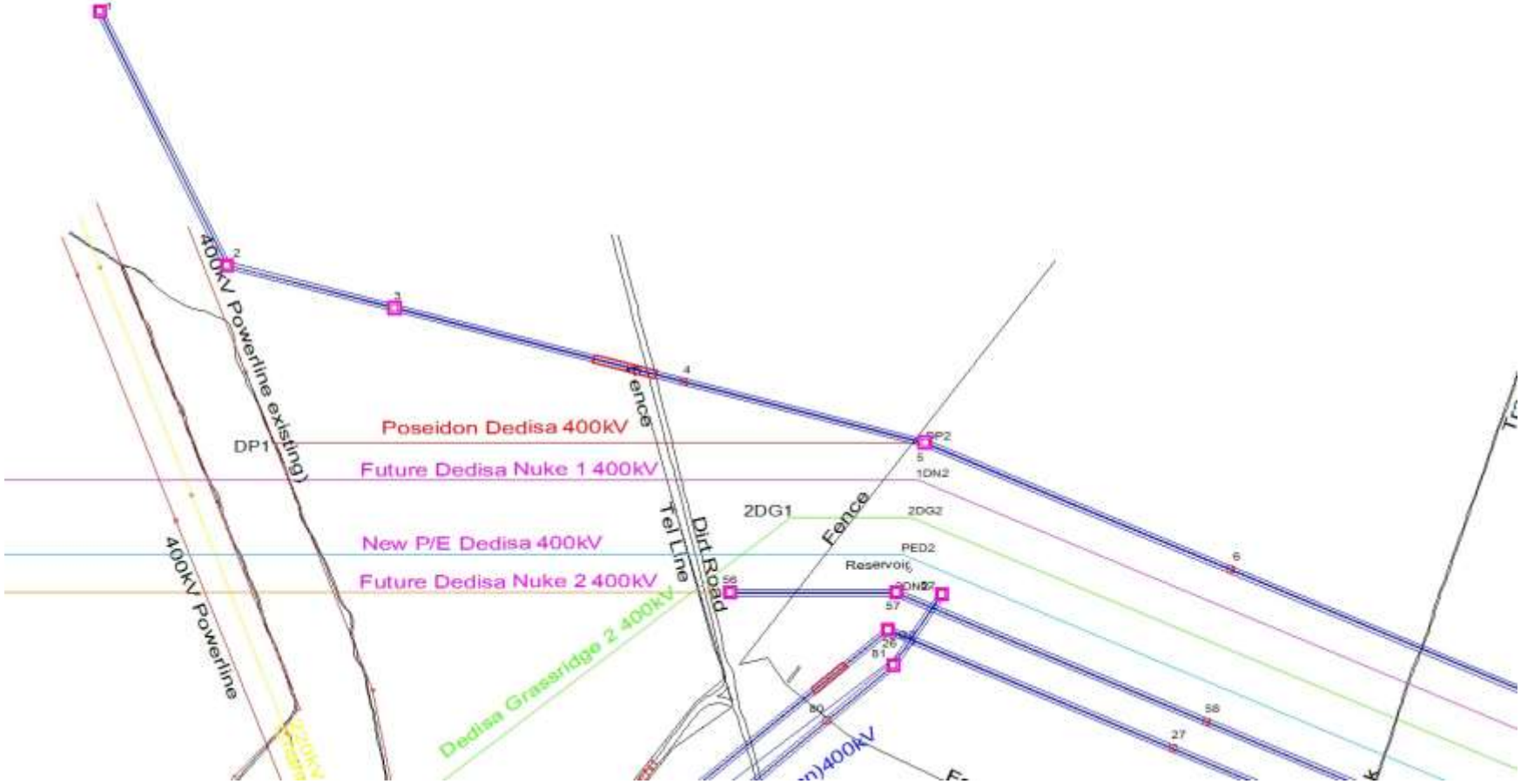


Figure 7c: Development plan indicating the proposed construction sites and relevant access tracks that must be used.

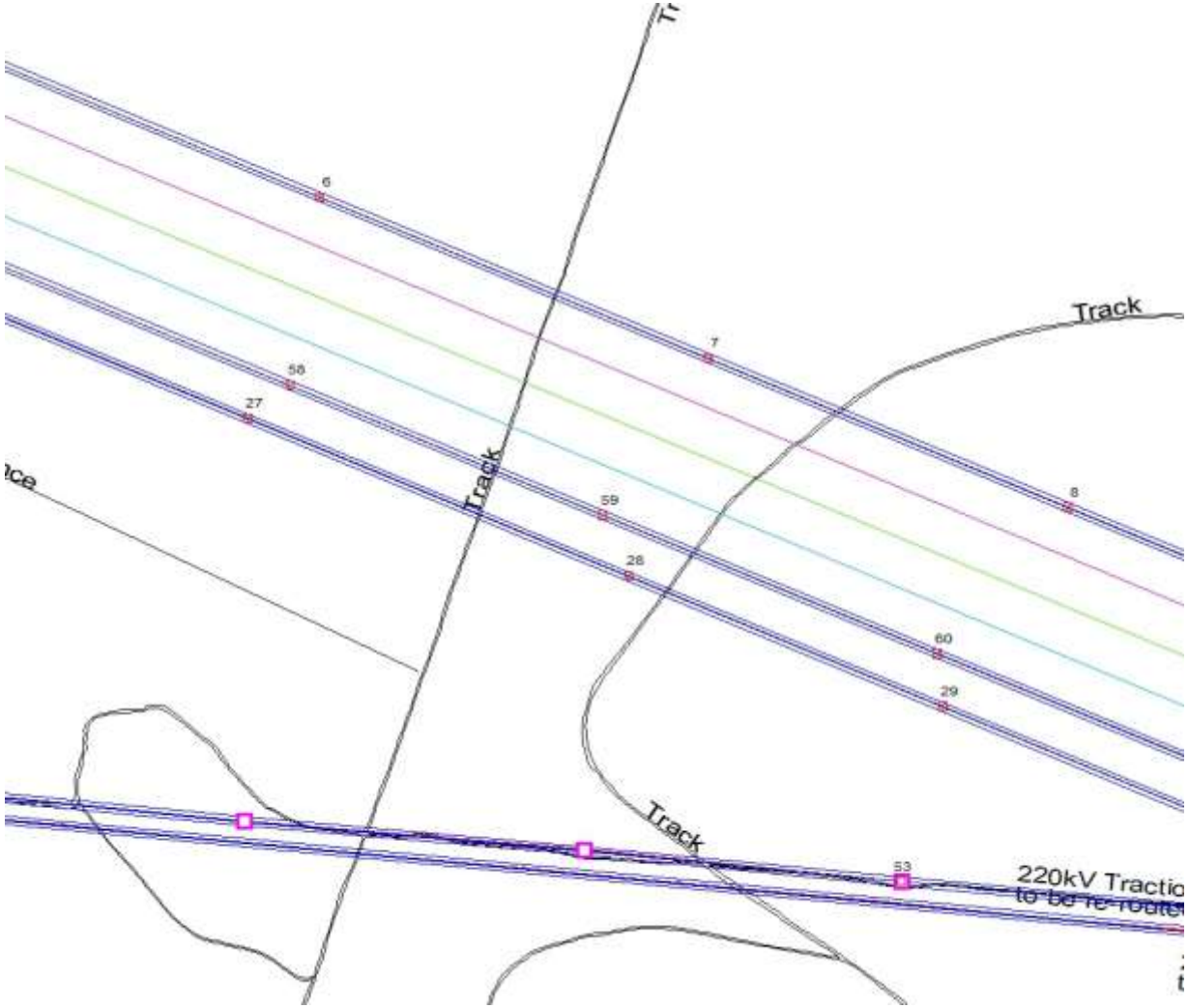


Figure 7d: Development plan indicating the proposed construction sites and relevant access tracks that must be used.

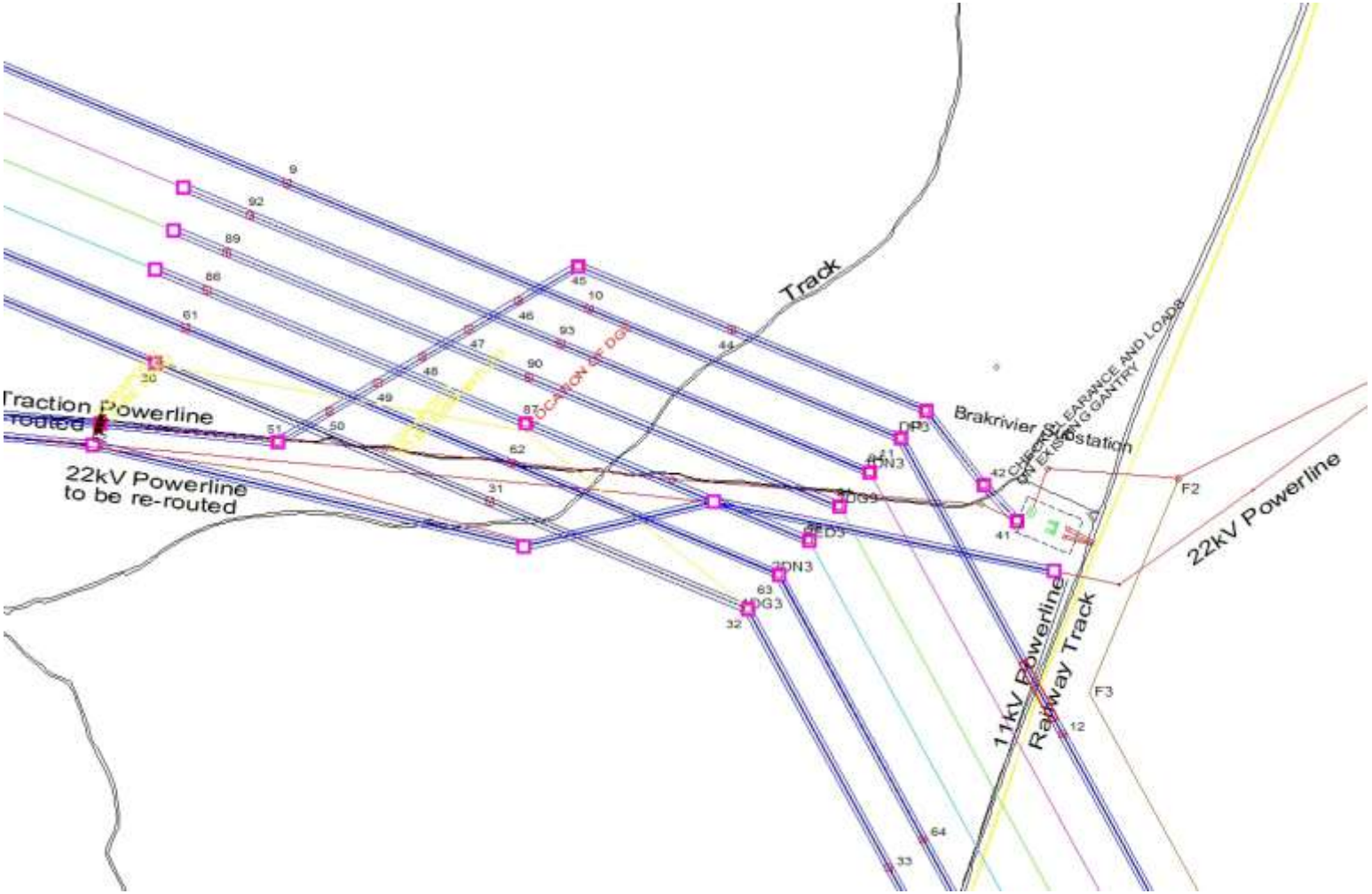


Figure 7e: Development plan indicating the proposed construction sites and relevant access tracks that must be used.

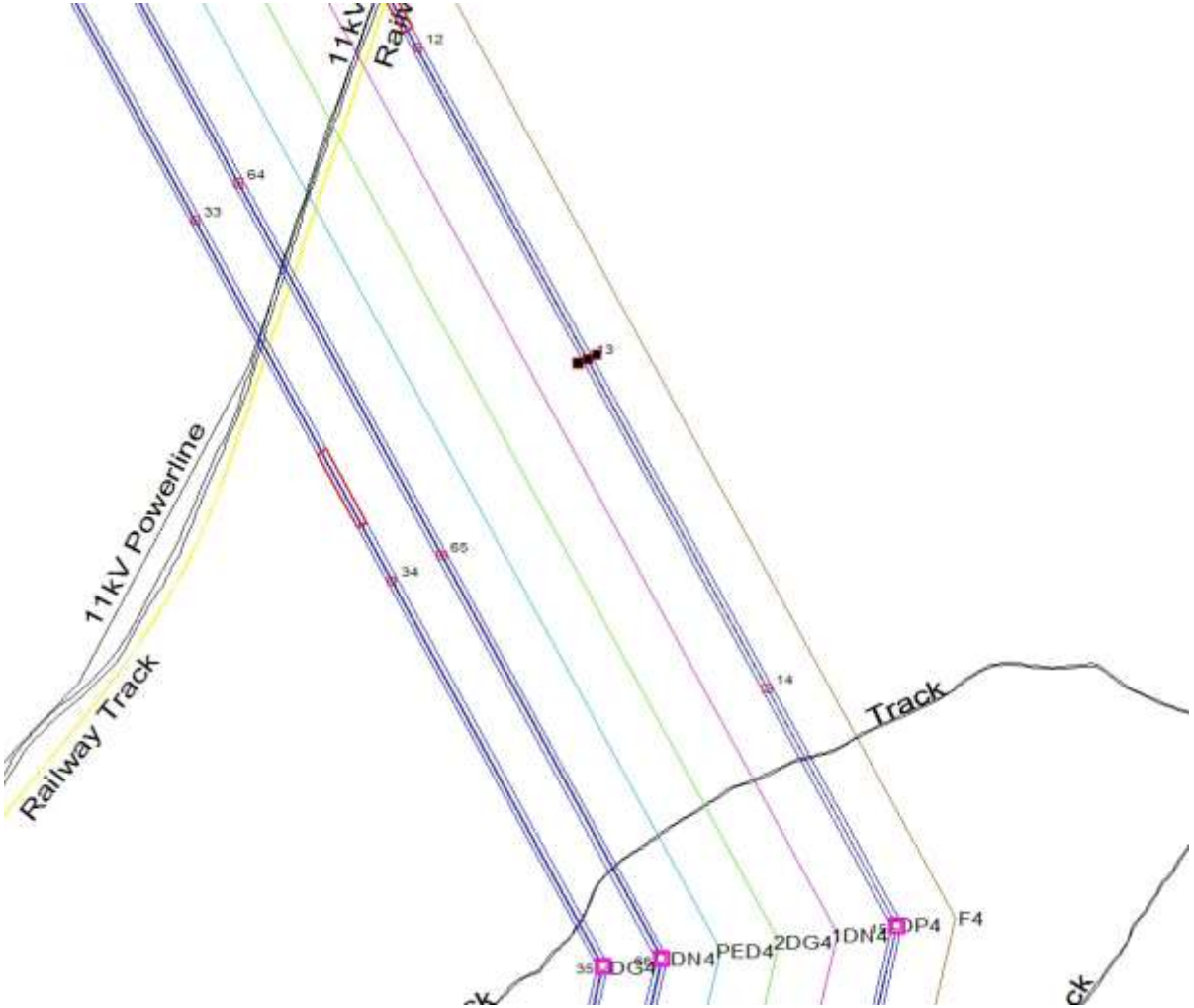


Figure 7f: Development plan indicating the proposed construction sites and relevant access tracks that must be used.

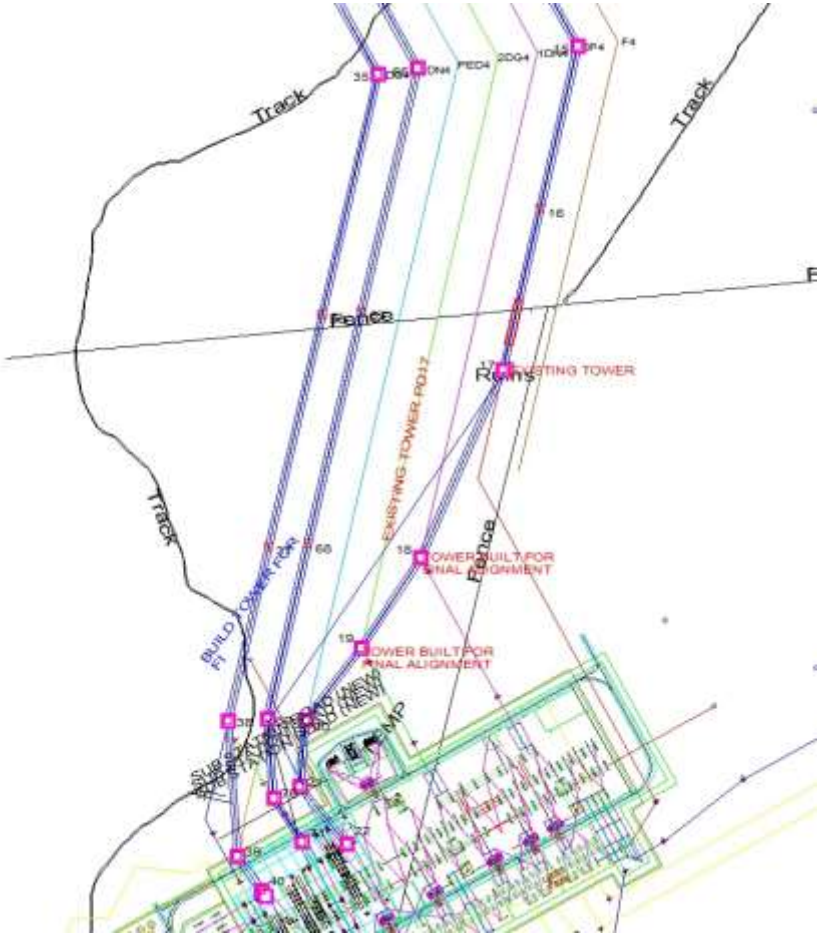


Figure 7g: Development plan indicating the proposed construction sites and relevant access tracks that must be used.

3.1.2. Work Site Clearance (Clearance within the Construction Footprint)

- Selective clearing of vegetation will be required at equipment laydown areas, tower positions and at drum stations along the line route, as follows:
    - Equipment Laydown Areas (20 m X 20 m) Construction Footprint)(for cranes, pylons,
    - Tower positions, [12 m x 12 m] = 144m² each (Total = 1 872 m²).
    - Drum stations (6 off locations) [30m x 30m] = 900 m² each (Total = 5 400m²).
- Selective pruning of vegetation will be necessary in order to safely conduct stringing activities. The only protected species that has been identified in terms of the National Forest Act is *Sideroxylon inerme* (Milkwood), which will require a permit to prune (a permit for pruning is currently being applied for).
- For equipment laydown areas, clearing of grasses, herbaceous plants and other bulbous plants will not be necessary, as equipment will merely be layed down on the ground. Only if bush clumps (trees and shrubs) occur within the equipment laydown areas will vegetation clearing be necessary.

Where selective clearing takes places, the following specifications will apply:

Removal of Species of Special Concern: Threatened, Endemic and/or Protected species

- The Contractor shall contact a botanical specialist with previous experience with the vegetation on site, and approved by the Engineer, at least three weeks before Site Clearance, to provide the specialist with the opportunity to advise the Contractor with regards to the removal of Species of Special Concern (Threatened, Endemic and/or Protected species).
- The specialist should visit the site to determine whether the final placement of the pylon foundations will remove any plant Species of Special Concern.
- A site survey was conducted for plant Species of Special Concern (2 May 2013). None of the plant species identified in the Standard Vegetation Specification for Construction (developed by the Coega Development Corporation) were identified during the site survey. However, a number of additional pylons were indicated subsequent to the site survey, and as a result, the specialist botanist must survey these additional pylons for plant Species of Special Concern prior to construction in order to plan the rescue and translocation procedure.
- The appointed specialist shall advise the Contractor within one week if it is necessary to remove endemic or rare plant species prior to Site clearance.
- The following plant species were recorded within the Construction Footprint or bordering the fringes of the Construction Footprint. Those that can be translocated and those that require replacement (where possible) are indicated.

Species	Translocate	Replace
▪ Aloes: *Aloe africana, Aloe humilis, Aloe striata*	All Aloes	Not applicable
▪ Succulents:*Bergeranthus scapiger, Carpobrotus deliciosus, Corpuscularia lehmannii, Drosanthemum hispidum, Delosperma sp., Ruschia sp.*	*Bergeranthus scapiger, Corpuscularia lehmannii Crassula perfoliata*	Unless these species can be translocated, replace them: *Carpobrotus deliciosus, Drosanthemum hispidum, Delosperma*

		sp.,Ruschiasp,
▪ Trees: *Sideroxylon inerme*	Not applicable	Replace as many as those removed
▪ Herbaceous: *Euryops ericifolius, Haemanthus coccineus, Ficinia truncate.*	All species, where possible; otherwise replace, if available from the CDC nursery.	Not applicable

- If translocated plants cannot be transplanted immediately after removal at target sites, then translocated speciesshall be removed to the Coega Development Corporation (CDC) central holding nursery prior to Site clearance for translocation into an area identified by the botanist. Alternatively translocated sites can be located several metres from the erected pylons, where the plants were originally removed from and where they will not be disturbed during maintenance activities.
- Should any plant species that are Threatened (rare, endangered or vulnerable) be found that were not previously recorded during the site survey (and which are not recorded by the Coega IDZ), these species should be reported to the Engineer and CDC; and upon their instruction, translocation should proceed as for the listed species.
- If no response confirming the presence of any of these species is received from the specialist within one week, the Contractor may proceed with the clearance of the Site.
- Where plants are identified for removal, an appropriately qualified specialist approved by the Engineer must then be appointed by the Contractor to remove and subsequently maintain the species at the CDCs central holding nursery for the duration of the project until such time that they can be re-planted, as directed by the Engineer.
- Translocation of these species shall take place strictly in accordance with the translocation procedure detailed for each species in the Project Vegetation Specification. If the Project Vegetation Specification does not detail how to translocate the specific species, then the Contractor must get instructions from the botanistas to how the species are to be translocated.
- If applicable, suitable plant species, other than those stipulated in the above list and identified by the Engineer for general re-vegetation purposes, must be relocated prior to clearing of the vegetation to a suitable holding site or directly to areas being landscaped.
- Except to the extent necessary for the carrying out of the Works, existing vegetation on site shall not be removed, damaged or disturbedoutside of the Construction Footprint.

3.1.2.1. Rescue and Translocation of Species of Special Concern

The following specifications developed by the Coega Development Corporation ‘‘Project Vegetation Specifications for Construction’’ shall apply to the removal and translocation of Species of Special Concern:

If plants are not immediately translocated or transplanted to the target sites on removal from the Construction Footprint then the plants shall be held at the CDCs central holding nursery, and the relevant plant potting and storage specifications below shall apply.

(a) *Aloe striata, Aloe africana and Aloe humilis*

Plant removal: A pickaxe or spade can be used to loosen the soil around the base of the plants and to lever them out of the soil. Care should be taken to dig deep at a wide perimeter around the specimen to limit root damage and to enable the root ball to be removed with surrounding topsoil for transplanting.

Plant storage: Plants may be exposed to a period of drying for 2 to 4 weeks before being potted. During this time any damaged parts of the plant seal, and survival success is improved. Plants should not be left for more than 4 weeks before being potted.

The drying plants should be left in a dry area to avoid rotting during rainfall and out of direct sunlight to avoid excessive heat.

Plant potting: Translocation is most successful when plants are potted and the stabilised plants placed into their new habitat. The soil mixture to be used for *Aloe striata* should be four parts topsoil with one part fine gravel. When potting the plants, all underground storage organs should be buried to prevent them from rotting and being exposed to further damage by insects and weathering.

(b) *Bergeranthus scapiger*

Plant removal: Removal of *Bergeranthus* plants can be done by firstly loosening the soil with a geopick or similar pointed implement. The plant should be removed with its roots with as much soil as practically possible.

Plant storage: The plants should be exposed to a period of drying for 2 weeks before being potted. Plants should not be left for more than 6 weeks before being potted. Drying plants should be kept dry and cool. The soil mixture should be four parts topsoil to one part course sand. When potting the plants, the plants must be planted to the same soil level as they were when removed.

(c) *Mesembryanthemaceae species (Carpobrotus deliciosus, Ruschia sp., Corpuscularia lehmannii, Drosanthemum hispidum, Delosperma sp.), Crassula perfoliata, Ficinia truncate, Haemanthus coccineus*

Plant removal: Removal of plants can be done by firstly loosening the soil with a geopick or similar pointed implement. The plant should be removed with its roots with as much soil as practically possible. Removed plants shall be excavated in such a way that the plants, especially the roots are not damaged.

Plant storage: Plants shall be temporarily planted out either in plastic bags or in-situ in an area that is not affected by the proposed development. Should bags be used, they shall be large enough to contain the entire plant's root system. Bags shall be filled with local top material. Plants shall be watered regularly, protected from damage and otherwise maintained to ensure healthy growth. On completion of the work, plants shall be re-planted out in scattered clumps at areas of the Site to be rehabilitated as directed by the Engineer. Individuals of all removed species will need to be housed in the CDC nursery until such time as relocation areas have been identified.

Translocation by Seed

The translocation of plants that have minimal vegetative reproductive potential will have to be done by collection of seed. The species may include *Euryops ericifolius*. The specialist botanist shall determine which species will require translocation by seed.

Target Sites

(a) All plants, apart from *Sideroxylon inerme,* should be translocated into the grassveld community of the Bontveld Open Space System, in areas as indicated by the by the Coega Development Corporation's Environmental Officer. Alternatively translocated sites can be located several metres from the erected

pylons, where the plants were originally removed from and where they will not be disturbed during maintenance activities.

(b) *Sideroxylon inerme* shall be planted within thicket bush clumps as indicated by the Coega Development Corporation's Environmental Officer.

Planting Procedures

If plants are not immediately translocated to the target sites on removal from the Construction Footprint then the plants shall be carefully transported to Coega Development Corporation's central holding nursery for storage where they shall be kept under light shade sheeting and watered lightly, protected from damage and otherwise maintained to ensure healthy growth.

Once potted plants have stabilised (in the central holding nursery), the following procedures should follow:

(a) Acclimatisation

- Place the pots at site for a while.
- Discard pot-bound individuals, these should be returned to the nursery and re-potted.
- Remove flowers and fruits to avoid pollen and seed from the nursery being introduced at the target site. Closed buds may be retained.

(b) Planting

- Match the spatial arrangement or the donor population. In all cases 10 to 15 plants should be planted in small clumps (within 4 m^2) in several sites in the Open Space System, or at the target site.
- Soil preparation should be by removal of a plug of soil the size of the pot and the plant inserted with its soil after removal from the pot.
- Water individuals to settle.
- Tagging. Each individual or cluster of individuals must be clearly marked and a GPS reading noted. This is done to ensure that they can be found during monitoring.

Record-Keeping

(a) The following information must be recorded and stored in a secure locality with backups:

- Location of extraction: plot on a map with dates of extraction
- Nature of collection: plant removal or seed collection
- Method of collection: packets, vacuum removal, hand-picking of seeds, digging out of plants, cutting of leaves.
- Method of storage: dates and duration of drying
- Method of acclimatisation: dates and duration of placement at site
- Exact location of planting sites: GPS readings
- Survival percentages after each step: at collection, potting, after stabilisation in pots, after acclimatisation at site; after planting.
- Environmental conditions during each step: particularly rainfall.

(b) The translocation should be registered with the National Botanical Institute (contact C. Hilton-Taylor).

Post-translocation action

(a) After planting, the following actions should be done:

- Monitor the following:
  - Survival
  - Recruitment: note seedlings in the vicinity or budding of plants
  - Flower production

- Viable seed production
- Restock planting areas if necessary.
- Evaluate the procedure and cost-effectiveness annually.
- Adjust the protocol if necessary.
- Thorough documentation of the entire program should be presented in peer-reviewed literature (Minckley, 1995; NCC, 1988; IUCN, 1995; Allen, 1994; Milton et al., 1999).

3.1.2.2. Method Statement for the Removal of Species of Special Concern

As per the CDC Standard Environmental Specification, the following method statements, as well as any required by the Project Specification, shall be provided by the Contractor and submitted to the Engineer with the tender for reviewing prior to the awarding of a Contract:

- Details regarding the removal of rare, endemic or endangered species Detail the name and qualifications of the sub-contractor undertaking this, the timing, methodologies, equipment, storage, maintenance procedures, transport and any other relevant information.

3.1.3. Protection of Vegetation, Aquatic Features and Natural Features (Biodiversity Features)

- All plants and aquatic features that require consideration and protection during construction[2] are indicated in Table 1 and Figure 4.
- These plants are Species of Special Concern (Threatened, Endemic and/or Protected).
- The aquatic features refer to wetlands, drainage lines, and riparian vegetation along these drainage lines. The drainage areas represent the non-perennial Brak River, and a tributary thereof.
- All proposed infrastructure is sited well outside of the 50 m buffer area of natural wetlands, however access tracks do traverse the non-perennial Brak River.
- Identified plants (Table 1), and any additional plant Species of Special Concern identified by the specialist botanist prior to construction, will need to be translocated where necessary, and where this is not possible, rehabilitation with such species will be required post construction. Refer to Site Clearance section above regarding translocation and replacement of identified species.
- Plant removal shall be limited to the pylon foundations, while disturbance to vegetation shall be limited to the 20 m X 20 m Construction Footprint. Where trimming of woody thicket species is required, this will be at the advise and specification of the EO or ECO.
- No herbicides, pesticides or poisonous substances shall be used to remove plants.
- The Construction Footprint (20 m X 20 m) around the new pylons shall be demarcated using danger tape and steel droppers to prevent movement into the surrounding vegetation.
- Maintain plant demarcations in position until the cessation of construction works.
- The construction camp should be located within one of the substations, and therefore shall not be positioned within 100 m from wetlands or natural drainage areas (includes riparian vegetation zone).

[2]The ECO will be available to aid the Contractor with the identification of these features.

- The EO / ECO may add to the plant list, as long as motivation for doing so is in line with the criteria used to initially identify plant Species of Special Concern (i.e. during the specialised studies conducted for this EMP).
- Do not disturb, deface, destroy or remove plants or natural features, whether fenced or not, for the duration of the Contractor's presence on site, unless otherwise specified by the EO / ECO.
- The Contractor will be held liable for the replacement of any plant or feature under the protection of these specifications that is removed or damaged by the Contractor's negligence or mismanagement.
- Do not remove any large tree without the permission of the EO / ECO. In all areas mark trees earmarked for removal prior to felling for approval by the EO / ECO.
- No open fires are permitted under trees.
- No material storage or laydown is permitted under trees.
- Avoid locating buildings and structures (temporary or otherwise) under trees wherever possible. Where this is unavoidable, screen corrugated iron roof surfaces with shade net suspended 1m above the roof to protect the tree from the damaging reflection.
- No heavy equipment, machinery and vehicles may be parked under any tree, unless authorized by the ECO.
- No vegetative matter may be removed for firewood.

3.1.4. Protection of Fauna

- No animal species, populations and nests require relocation.
- No wild animal may under any circumstance be handled, removed or be interfered with.
- No wild animal may be fed on site.
- No wild animal may under any circumstance be hunted, snared, captured, injured or killed. This includes animals perceived to be vermin. The penalty clause associated with the needless destruction of wildlife is a fine of R2 000 and / 12 months imprisonment[3].
- Regularly undertake checks of the surrounding natural vegetation, in fences etc. to ensure no traps have been set. Remove and dispose of any snares or traps found on or adjacent to the site.
- Ensure that the Work Site (Construction Footprint) is kept clean, tidy and free of rubbish that would attract animal pests.
- Have problem animals and vermin removed by an appropriate organization or authority (i.e. such as the Parks Board, the SPCA or a registered exterminator).
- Do not make use of any pesticides, unless approved by the EO / ECO.

3.1.5. Protection of the Cultural Historical Aspects

- Sites of social and / or cultural historical significance were not recorded in the field (Refer Section 1.4.4).

[3]In terms of the Animals Protection Act (Act 71 of 1962) Section 2.

3.1.6. Topsoil Conservation

- Ahead of all construction (i.e. when removing soil for the establishment of concrete pylon foundations and erection), remove the available topsoil layer[4]. Stockpile separately from overburden (subsoil and rocky material).
- In the absence of a recognizable topsoil layer, strip the upper most 300mm of soil.
- Co-ordinate Works to limit unnecessarily prolonged exposure of bare (stripped) areas and stockpiles. In other words, pylon foundations and erection should be undertaken in succession (one by one), andrehabilitation of these bare areas should be undertaken immediately after each pylon has been erected, if cost permitting.
- If cost permitting, rehabilitation should commence immediately on completion of erection of each individual pylon. Where stockpiled material remains,this material should be spread lightly over disturbed construction areas for the rehabilitation process to commence and/or over surrounding bare areas (that occur naturally in the surrounding environment).
- It is unlikely that removed topsoil and overburden will require storage for an extended period (as rehabilitation should preferably commence immediately after each pylon has been erected). However, if storage of these materials is required:
    - ♦ Storage should either occur within the Construction Footprint (20 m X 20 m), or alternatively at the Construction Camp.
    - ♦ Storage should be undertaken in an approved manner (refer Section 3.5), for later reuse in the rehabilitation process.Stockpiles shall not be higher than 2 m in order to minimize composting.
    - ♦ If stored at the Construction Camp, stockpiles shall be marked to indicate the origin of the topsoil in the stockpile to facilitate accurate replacement in the same area of origin.
    - ♦ If necessary, keep a stockpile register i.e. Do not mix topsoil obtained from different sites.
    - ♦ Stockpiled soil must be protected from erosion.
    - ♦ Stockpile sites must be fully rehabilitated after the removal of the stockpile and excess material disposed of in an appropriate manner.
- Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction in that area.
- Remove (strip) and stockpile herbaceous vegetation, overlying grass and other fine organic matter along with the topsoil.
- Do not remove topsoil when it is wet.
- If the topsoil is in danger of being washed or blown away, the Contractor shall cover it with a suitable material, such as mulch and/or seed it with a fast-growing annual grass. Stockpiles shall be monitored at monthly intervals to identify invasive plants, which shall be removed when they germinate, to prevent contamination of the seed bank.
- Stockpiles shall not be covered with materials, such as plastic, that may cause it to compost, or kill any seeds.

3.1.6.1. Method Statements with regards to Stockpiling of Topsoil

As per the CDC Standard Environmental Specification, the following method statements, as well as any required by the Project Specification, shall be provided by the Contractor and submitted to the Engineer with the tender for reviewing prior to the awarding of a Contract.

[4]To be indicated by the ECO.

- Location of topsoil stockpiles, methods to prevent erosion of these stockpiles and rehabilitation of stockpile sites.

3.1.7. De-bushing and de-stumping

- No de-bushing or de-stumping will be permitted within the Construction Footprint, as per the requirement of the Coega Development Corporation, other than the small areas required for the pylon foundations, drum stations and equipment laydown areas.

3.2. CAMPSITE INFRASTRUCTURE

3.2.1. Structures and Accommodation

- Construction staff will be accommodated within the dedicated Coega IDZ construction village.
- Essential services (including showers, appropriate sanitation and drinking water facilities) are provided in all housing sites.
- Maintain essential services in a functional state. These may not be overloaded. Defects and inadequacies must be rectified immediately.
- Designated place for food storage, preparation and consumption is provided. Food storage must be separate from sleeping quarters and waste storage areas.
- All labour housing is serviced with cooking facilities, within the dedicated Coega IDZ construction village.
- Household amenities, such as washing and drying of clothes, as well as areas for social interaction, are allowed for within the dedicated Coega IDZ construction village.
- Locate all buildings and structures, including offices, workshops, stores, as per the approved Development Plan.

3.2.2. Contractors Camp and Lay-Down Areas

- The Contractors Camp /construction camp shall be sited at either the Dedisa or Grassridge substations.
- Only security and emergency personnel are to be housed at the construction site, if necessary.
- Only equipment laydown areas will be required at each tower location.
- Locate all storage areas and equipment laydown areas within predetermined zones i.e. at each tower location, as per the approved Development Plan
- Additional areas required by the contractor for laydown and storage must be approved by the EO / ECO, in the form of an amended Development Plan indicating the extent and anticipated utilisation of the storage and laydown area.
- Keep the camp and all its storage and laydown areas secure and neat at all times and employ appropriate access control measures during construction.
- Clearly indicate which activities are to take place within which areas of the site.
- Position security lighting so that it does not pose a nuisance to other CDC facilities or is a danger to road users.
- Locate all other structures (including site offices, workshops, wash bays, stores, etc.) as indicated on the approved Development Plan.

3.2.3. Batching Plants

- No batching plants will be required for this project.

3.2.4. Crusher Plants

- No crusher plants will be required for this project.

3.2.5. Nurseries

- A new on-site nursery will not be required for this project.
- The Coega Development Corporation Nursery will be utilised for all translocated plants and, if necessary, other plants in the rehabilitation process.

The following specifications regarding translocated and rehabilitation species must be adhered to:(To be read in conjunction with section 3.1.2: Removal of Species of Special Concern: Threatened, Endemic and/or Protected species)

- Take all necessary precautions to ensure that procured plants arrive on Site in conditions suitable so as to ensure healthy and successful growth.
- Delivered plants must be healthy, full in shape, well rooted, free of insects, pests and diseases.
- Damaged or deformed plant material will not be received, stored or planted on the Site.
- All plants removed for transplanting which are not immediately re-planted, are the responsibility of the Contractor and must be kept under approved nursery conditions.
- All specified species supplied or bought in from nurseries or lifted from open ground must be delivered and / or retained in containers or bags as specified.
- For plants in containers held in the nursery, use 2 parts of supplier approved topsoil to 1 part of approved compost.
- Ensure that the nursery is properly equipped with the necessary implements, containers, fertilizers and other equipment necessary to function efficiently.
- All plants must be fully maintained by staff dedicated from the date of receipt until the end of the Maintenance Period. This includes watering, weeding, fertilising, etc.
- All plants must be regularly watered and fertiliser applied as required.
- All plants must be protected against wind, frost and direct sunlight, until such time as they are fully acclimatised. Provide shade net or a shade house as required for this purpose.
- Plants held in the nursery for more than one year, must be replanted into larger containers.
- The Contractor must regularly inspect and replace broken containers.
- The Contractor will be held liable for the replacement of plants lost due to his negligence or mismanagement.

3.2.6. Roads and Access

- Allexisting access tracksand proposed access tracks, as indicated on the approved Development Plan, must be adhered to.
- Should any new access tracks for accessing pylons be required, then these must be indicated on the approved Development Plan in consultation with the EO /ECO.
- Ensure that adequate vehicle turning areas are allowed for, if necessary.
- Although considered an unlikely event, any additional routes and turning areas required by the Contractor must be approved by the EO / ECO, in the form of

an amended Development Plan indicating the position and extent of the proposed route / area.

- ❖ In this regard, ensure that additional access routes avoid significant vegetation specimens and communities, natural features and sites of cultural and historical significance.
- ❖ Routes should not traverse slopes with gradients in excess of 8%. Where this is unavoidable, stabilise the road surface.
- ❖ Avoid planning routes through wetlands: seek an alternative route.
- ❖ Avoid routes through drainage lines and riparian zones wherever possible. Where access through drainage lines and riparian zones is unavoidable, only one road is permitted, constructed perpendicular to the drainage line. Avoid roads that follow drainage lines within the floodplain.

- Enforce speed limits at all times, both on public roads and on-site roads. Unless otherwise specified by the EO / ECO, the speed limit on construction roads is 50km/h.
- Ensure that only authorised roads and access routes are used, as indicated on the Development Plan. If necessary, turnaround points will be limited to specific pylon sites.
- Maintain all access routes adequately in order to minimise erosion and undue surface damage. Repair rutting and potholing.
- Runoff from access routes must be managed to avoid erosion and pollution problems.
- Clear up any cement spillage on access routes.
- Clean and make good any damage to public or private roads caused by the Contractor during the construction phase.
- No offroad driving is permitted, unless authorised by the CDCs Environmental Officer and the ECO.
- Do not permit vehicular or pedestrian access into natural areas beyond the necessary work site.

3.3. SITE MANAGEMENT

3.3.1. Rubble and Waste Rock

- Store inert building rubble and waste rock as indicated on the approved Development Plan i.e. at the substations or must be sent directly to a registered solid waste disposal facility.
- Subject to approval by the EO / ECO, certain borrow pits and / or quarries may be utilised for the disposal of waste rock and inert building rubble (refer to section 3.4).
- If no on-site disposal opportunities existsthen rubble and waste rock must be disposed of at the nearest registered solid waste disposal facility.

3.3.2. Solid Waste

- A dedicated solid waste disposal site will not be required for this project. Boththe Dedisa and Grassridge substations have a waste disposal system which allows for waste recycling, as well as removal of waste by the Contractor, Enviro-Serv, to a registered waste disposal site.
- No solid waste disposal is to take place on site.
- Litter bins are available at the substations, as part of Eskom's operational waste storage and disposal system.

- Litter bins must be equipped with a closing mechanism to prevent their contents from blowing out.
- Empty litter bins weekly (or as required before they reach capacity).
- Waste disposal containers (litter bins with lids) and/or bags shall be available for use by all personnel during construction activities for the storage of domestic waste during the day.
- Waste generated during construction activities shall be separated into recyclable materials, non-recyclable materials and hazardous materials (e.g. electrical cleaning solvent, used pesticide containers), and shall be stored at the substations waste storage depot, to be disposed of by the Contractor, Enviro-Serv, responsible for the regular disposal of waste at a licensed waste disposal site.
- All hazardous waste not earmarked for reuse, recycling or resale (such as oil contaminated with chlorinated hydrocarbons, electrical cleaning solvent, certain chemicals, ‘’used’’ pesticide containers) must be disposed of at a registered hazardous waste disposal site.
- Retain waste oils and batteries for recycling by the supplier wherever possible.
- To prevent contamination of the environment, including groundwater, no hazardous wastes (e.g. electrical cleaning solvents, pesticides) shall be stored within the Works Site/Construction Footprint.
- Where accidental leakage of hazardous waste occurs, immediate remedial action must be implemented to remove spilt materials. Spilt material shall be packaged and stored at the substations waste disposal site for later disposal at a registered hazardous waste disposal site.
- Ensure that personnel make use of the litter bins and/or bags provided. Keep all Work Sites and at the Contractors camp tidy and litter free at all times.
- Where necessary, dedicate a storage area within the substations for the collection of construction waste.
- Unless otherwise specified by the EO / ECO, remove stored domestic waste to the nearest registered solid waste disposal facility.
- Ensure that solid waste is transported properly, avoiding waste spills en-route.
- No solid waste may be burned on site.

3.3.3. Liquid Waste

- Only portable chemical toilets will be provided for this project.
- Provide portable chemical toilets at all Work Sites.
- Ensure that adequate numbers of conveniently located site toilets are available on all Work Sites at all times in quantities related to the number of users (1 toilet per 30 users is the norm).
- Do not locate any site toilet within the 1:100 year floodline, or within a horizontal distance of 100m (whichever is greater) of a drainage line or identified wetland.
- Maintain and clean site toilets regularly as is required to keep them in good, functional working order and in an acceptable state of hygiene.
- Combine drinking water facilities with hand washing facilities near site toilets.

3.3.4. Hazardous Waste: Storage and Disposal

- Store hazardous waste as indicated on the approved Development Plan i.e. in the established waste disposal system sited within the Dedisa and Grassridge substations.

- Ensure compliance with all national, regional and local legislation with regard to the disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.
- Collect any hazardous waste in receptacles located on a drip tray on site pending disposal.
- Retain waste oils and batteries for recycling by the supplier wherever possible.
- Regularly dispose of all hazardous waste not earmarked for reuse, recycling or resale (such as oil contaminated with chlorinated hydrocarbons, electrical cleaning solvent, certain chemicals and fluorescent tubes) at a registered hazardous waste disposal site.
- Contain chemical spills, and arrange for clean-up / control by the supplier, or by professional pollution control personnel.

3.3.5. Pollution Control

- Nonew reservoirs, dams or depots will need to be established for this project.
- Do not dump waste of any nature, or any foreign material into any drainage line or wetland.
- Do not allow the use of any drainage line or wetland for swimming, bathing, or the cleaning of clothing, tools or equipment.
- Prevent the discharge of water containing polluting matter or visible suspended materials directly into drainage lines or wetlands.
- Deflect any unpolluted water / runoff away from any dirty area (including plants, maintenance areas, workshops and contractors yards).
- Otherwise clean, but silt laden water may be discharged overland, provided no erosion is resultant from this discharge.
- Do not hose oil or fuel spills into the surrounding natural environment.
- Clean small oil or fuel spills with an approved absorbent material, such as 'Drizit' or ‘Spill-sorb’.
- Contain oil or fuel spills in water using an approved oil absorbent fibre.
- Treat soil contaminated by oil or fuel using one of the following approved methods, as per instruction of the RE / EO / ECO:
    - Remove the soil to the depth of the contamination and dispose of at a registered Hazardous Waste Disposal Site.
    - Remove the soil to the depth of the contamination, and regenerate using approved bio-remediation methods.
- Report major oil or fuel spills to the provincial Department of Water Affairs, as well as to the relevant Local Authority.
- Only ready mix concrete will be used for the pylon foundations.
- Carefully control all on-site operations that involve the use of cement and concrete.
- Dispose of all visible remains of excess cement and concrete after the completion of tasks. Dispose of in the approved manner (solid waste concrete may be treated as inert construction rubble, but wet cement and liquid slurry, as well as cement powder must be treated as hazardous waste).
- Do not allow the washing of trucks delivering concrete anywhere but within designated wash bays equipped with runoff containment. Direct such waste water into a settlement pond or sludge dam for later disposal.

3.3.6. Implements and Equipment

- Make use of mobile plant and equipment which is appropriate to the task (i.e. for construction, rehabilitation and maintenance) in order to minimise the impact on and extent of damage to the environment. Such may include (but is not necessarily limited to) the following:
    - Excavator / back-actor for trenching and digging holes (unless in sensitive areas, where it will be specified that this be done by hand).
    - Front end loader / bulldozer / scraper / bobcat for earthworks, trimming and shaping. Final shaping may be done by hand.
    - A crane truck and flatbed for the hoisting, transportation and final positioning of large tree transplants.
    - Water cart for water provision plus sprinkler attachment for irrigation and dust suppression.
    - Tractor / bulldozer / scraper with ripper attachment for ripping.
    - Tractor with scarifyer attachment for scarifying.
    - Light delivery vehicle for the transport of tools, equipment and people (LDV's used to transported people must be fitted with a canopy or have built up back and sides for the protection of the passengers).
    - A hydroseeder for the application of hydroseed mixtures (if required).
    - Power tools for clearing and maintenance work, including but not necessarily limited to the following:
        - Chainsaw for felling.
        - Mulcher for processing cleared / pruned plant material.
        - Mowers and edge trimmers for lawn maintenance.
        - Brush cutters for veld grass maintenance.
    - Hand tools for clearing and maintenance work, including but not necessarily limited to the following:
        - Spades.
        - Shovels.
        - Garden forks.
        - Rakes.
        - Buckets.
        - Watering cans.
        - Axes.
        - Picks.
        - Brooms.
        - Pangas.
        - Pruning shears.
        - Bow saws.
        - Wheelbarrows.
    - Hoses and impact sprayers for irrigation (attachments may be required either for the water cart or the water reticulation supply).
    - General tool kit for everyday repairs and handyman tasks.
- Should the EO / ECO at any time determine that the method, mobile plant or equipment utilised by the contractor is unsuitable for the task at hand, or unnecessarily detrimental to the environment, then he may specify the use of a suitable alternative.

3.3.7. Blasting

- Blasting will not be required for this project.

3.3.8. Air Quality

- Manage dust resultant from the Works and fugitive dust in an efficient and environmentally sensitive manner.
- Limit the production of dust and damage caused by dust through regular watering of the work areas, if necessary.
- Dust from the construction site must not disturb economic or social activities in the vicinity of the construction site.

3.3.9. Noise Control

- Unless otherwise specified by the EO / ECO, normal work hours will apply (i.e. from 06h30 to 16h15, Mondays to Fridays).
- Ensure that employees and staff conduct themselves in an acceptable manner while on site, both during Work hours and after hours.
- No loud music is permitted on site or in the Camp.
- Notify adjacent landowners of after-hours construction Work and of any other activity that could cause a nuisance.
- Respond to community complaints with regard to noise generation, taking reasonable action to ameliorate the impact.

3.3.10. Fire Control

- Take adequate precautions to ensure that fires are not started as a result of Works on site: the Contractor will be held liable for any damage to property adjoining the Site as a result of any fire caused by one of his employees.
- Establish and maintain fire breaks around the Work Sites if as and when specified by the EO / ECO and as required by applicable legislation and the local authority.
- Do not permit any fires or open flames in the vicinity of a wetland, especially during the dry season.
- Ensure that the Work Site, the contractor's camp and all living quarters are equipped with adequate fire fighting equipment[5]. This includes at least rubber beaters when working in veld areas, and at least one fire extinguisher of the appropriate type irrespective of the site.
- Take immediate steps to extinguish any fire which may break out on the construction site.
- No open fires are permitted anywhere on site.
- Prevent employees from creating fires randomly outside designated areas.
- Do not store any fuel or chemicals under trees.
- Do not store gas and liquid fuel in the same storage area.
- Do not permit any smoking within 3m of any fuel or chemical storage area, or refuelling area.

[5]In terms of SABS 1200

3.3.11. Health and Safety

- The specifications included under this section do no exempt Eskom or any Contractors from complying with all the Regulations as included in the Occupational Health and Safety Act (Act 85 Of 1993). Eskom and Contractorsare further referred to this Act and all its regulations.
- The CDC has prepared and published a Standard Occupational Health and Safety Specification for Construction (OHSS). The OHSS sets out guidelines and minimum levels of awareness and guidance for health and safety requirements within the Industrial Development Zone for the Construction EMP which Eskom and any Contractor must comply with (Appendix)
- The safety of all construction personnel, as well as any member of the public on the site is the responsibility of the Contractor.
- Control access onto and off the site by means of a register system. This includes visitors.
- Ensure that first aid / emergency facilities / procedures are in place.
- Ensure that all personnel are trained in basic site safety procedures.
- Keep a register with contact numbers of all people employed and one relative for each.
- Keep a list of all relevant emergency numbers in an easily accessible location on site.
- Keep a record of all incidents, accidents and illnesses on site and make the information available at meetings.
- Ensure that proper footwear is worn by employees at all times.
- Ensure that employees are issued with and make use of the necessary safety equipment when working in dusty, noisy and / or dangerous situations. Such equipment may include, but is not necessarily limited to hardhats, goggles, masks, earplugs, gloves, safety footwear and safety ropes as required.
- Ensure that adequate drinking water, wash water and sanitary facilities are available at all times and on all work sites.
- Ensure that personnel are transported legally, and in a safe and responsible manner.
- Ensure that all vehicle and machine operators are qualified and licensed to operate their vehicles / machines.
- Protect dangerous excavations or Works that may pose a hazard to humans and animals. Demarcate these areas with hazard tape or fencing as required and post the appropriate danger signs.
- Respect workers' right to refuse work in unsafe conditions.

3.4. Earthworks

3.4.1. Prospecting Boreholes and Test Pits

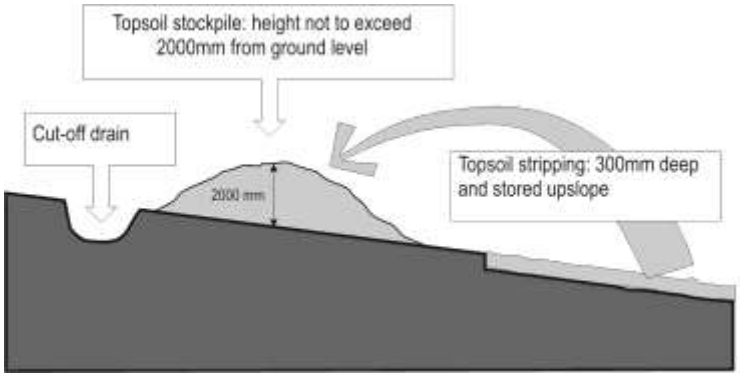
- No prospecting boreholes or test pits will be required for this project.

3.5. Stockpiles, Storage and Handling

3.5.1. Topsoil

- Topsoil is to be handled twice only – once to strip and stockpile, and once to replace and level.
- Position topsoil stockpiles as indicated on the approved DevelopmentPlan i.e. within the pylon Construction Footprint (20 m X 20 m).

- Any additional topsoil stockpile areas required by the contractor must be approved by the EO / ECO, in the form of an amended DevelopmentPlan indicating the position and extent of thereof.
- Position topsoil stockpiles on the higher side of a disturbed area
- Do not stockpile topsoil in drainage lines (outside the 1:100 year flood).
- Ensure that all topsoil is stored in such a way and in such a place that it will not cause the damming up of water, erosion gullies, or wash away itself.
- Do not stockpile topsoil in heaps exceeding 2m in height.
- Protect topsoil stockpiles from erosion.
- Remove exotic / invasive plants and broad leaf weeds that emerge on topsoil stockpiles (refer to section 3.7).
- If topsoil is to be stockpiled for extended periods, although unlikely for this project, especially during the wet season, then the ECO may recommend one of the following measures:
    - The re-vegetation of the stockpiles with indigenous grasses[6].
    - The covering of the stockpiles with a protective material such as hessian mats.
- If the topsoil is in danger of being washed or blown away, the Contractor shall cover it with a suitable material, such as mulch and/or seed it with a fast-growing annual grass. Stockpiles shall be monitored at monthly intervals to identify invasive plants, which shall be removed when they germinate, to prevent contamination of the seed bank.
- Stockpiles shall not be covered with materials, such as plastic, that may cause it to compost, or kill any seeds.
- Ensure that topsoil is at no time buried, mixed with spoil (excavated subsoil), rubble or building material, or subjected to compaction or contamination by vehicles or machinery. This will render the topsoil unsuitable for use during rehabilitation.
- The Contractor will be held liable for the replacement of any topsoil rendered unsuitable for use during rehabilitation, for reasons due to his negligence or mismanagement on site.



Section through a typical topsoil stripping and stockpiling operation

3.5.2. Spoil

- Position spoil (excavated subsoil) as indicated on the approved Development Plan.
- Any additional spoil storage area required by the contractor must be approved by the EO / ECO, in the form of an amended Development Plan at least 30

[6]To be indicated by the ECO.

days prior to initiating the activity. The following information is required for approval:
    - The location, description of and access to proposed sites.
    - The quantity of material to be stored as spoil.
    - The type of material to be stored as spoil (i.e. excavated rock, subsoil etc.).
    - The proposed method of storing spoil.
    - A proposal for the reinstatement and rehabilitation plan, including the final profile.
    - Written approval form the landowner / relevant authority that material may be stored on the land in question, subject to conditions.
- Position spoil on the higher side of a disturbed area, if applicable.
- Do not stockpile spoil in drainage lines (outside the 1:100 year flood).
- Ensure that all spoil is stored in such a way and in such a place that it will not cause the damming up of water, erosion gullies, or wash away itself.
- Store spoil in low heaps, not exceeding 2m in height.

3.5.3. Vehicles and Equipment

- Maintenance work on vehicles will not be undertaken at the Work Site or Substations.
- Vehicles used during construction must have the minimum impact on the environment or other road users. The size, height and weight of the vehicle must be kept in mind.
- Regularly check vehicles, machinery and equipment operating on site to ensure that none have leaks or cause spills of oil, diesel, grease or hydraulic fluid.
- No vehicles, machinery or equipment with leaks or causing spills may be allowed to operate on the construction site. These must be removed from site and must be sent to a workshop for repair.
- Ensure that the maintenance of all vehicles and equipment, including oil and lubricant changes, takes place only within properly equipped, bunded maintenance areas or workshops as indicated on the Development Plan, and preferably located at one of the substations.
- Only emergency and essential repairs of vehicles and equipment may take place on site.
- Provide drip pans for generators, or any machinery that will be in position for longer than one day.
- Drip trays are to be watertight, and must be emptied regularly and before rain events. The contents of drip trays are to be treated as hazardous waste (refer to section 3.5.5).
- Day to day parking of vehicles is to be on hard surfacing within the substations.
- Where oil and fuel spills are expected, parking is to be on an impervious surface with adequate pollution control mechanisms in place.

3.5.4. Fuel

- A fuel depot will not be required for this project and no re-fuelling of vehicles and related equipment (e.g. compactor, cranes and trucks) will within the Construction Footprint.
- If fuel must be stored for any equipment used in the construction of the Transmission Line, then store fuel at the substation within a bunded area, or alternatively in an area underlain by heavy duty PVC sheeting and covered with

100mm of sand. This is to include an area adjacent to the tanks upon which vehicles must park during refuelling.

- The only permitted method of fuel transferto equipment is by means of a pump / controlled valve / tap / hose / funnel within the designated areas.
- Treat spills within the bund as hazardous waste (refer to section 3.5.5 below).

3.5.5. Hazardous Substances:Storage

- Any hazardous waste (e.g. oil, cement& paint) material shall be stored at the substation for removal by the Contractor to a licensed waste disposal site. The substation has such a waste disposal system that includes hazardous waste.
- Ensure compliance with all national, regional and local legislation with regard to the storage, transport and use of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.
- Position hazardous substance stores as indicated on the Development Plan, in areas not threatening human life or the environment.
- Keep a record of all hazardous substances stored on site for submission to the EO / ECO.
- Store all hazardous substances in secure, safe and weatherproof facilities at the substation, underlain by a bunded concrete slab to protect against soil and water pollution.
- Clean any accidental spills immediately, treating the spilled material and used cleaning products as hazardous waste.
- Provide for controlled loading / unloading areas, underlain by an impervious paving or PVC sheet to protect against soil and water pollution.
- Ensure that personnel handling hazardous substances have been educated in terms of the correct handling, use and disposal thereof.
- Empty containers in which hazardous substances were kept are to be treated as hazardous waste.

3.6. Erosion control

3.6.1. Surface Water Management

- No water abstraction points will be required for this project.
- No water may be abstracted from any surface water body for the purpose of construction unless specifically authorised by the Department of Water Affairs, and therefore the EO / ECO.
- Monitor water consumption and ensure that all uses are accounted for and areas of waste are identified (i.e. water used for surface wetting, for potable supply etc.).
- Repair identified leaks and address issues of water wastage as soon as these are identified.
- Where possible, recycle water.
- Avoid over-wetting, saturation and unnecessary run-off during dust control activities and irrigation (rehabilitation).
- Do not drain, fill or alter in any way, any wetland or drainage line and banks unless specifically authorised by the Department of Water Affairs, and therefore the EO / ECO.
- Do not allow surface water or storm water to be concentrated, or to flow down cut or fill slopes or along access routes without erosion protection measures being in place.

3.6.2. Erosion Protection

- Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the Construction Footprint.
- Retain natural trees, shrubbery and grass species wherever possible.
- Do not permit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the Work Area/Construction Footprint.
- Avoid access into seasonally wet areas during and immediately after rainy periods, until such a time that the soil has dried out[7].
- Utilise only light equipment for access and deliveries into areas of unstable soils, in areas where erosion is evident[8].
- Limit vehicular access to existing access routes and proposed access routes[9].
- Institute adequate sedimentation control measures at drainage lines, if necessary[10].
- Address erosion at drainage lines, if necessary, applying soil erosion control and bank stabilisation procedures as specified by the EO / ECO.
- Do not allow erosion to develop on a large scale before effecting repairs. When in doubt, seek advice from the EO / ECO.
- Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth.
- In general, slopes steeper than 1(V):3(H) or slopes where the soils are by nature dispersive or sandy, must be stabilised. 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:
    - Topsoil covered with a geotextile[11], plus a specified grass seed mixture[12].
    - A 50:50 by volume rock:topsoil mix 200mm thick, plus specified grass seed mixture[13].
    - Logging or stepping (logs placed in continuous lines following the contours).
    - Earth or rock-pack cut-off berms[14].
    - Benches (sand bags).
    - Packed branches.
    - Ripping and / or scarifying along the contours.
    - Stormwater berms.

3.7. Control of Alien Plants

- Not many alien invasive species occurred within the pylon Construction Footprints. Alien plants included A*cacia cyclops, Acacia saligna, Lantana camara* and *Opuntia ficus-indica* at varying degrees of intensity, as well as *Solanum haermanii*.
- Identify, locate all exotics and invasive plants to be eradicated[15].
- Control exotics and invasive plants to be eradicated. Control involves killing plants, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion.

[7] To be indicated by the ECO, if this takes place along drainage lines during the construction phase.
[8] To be indicated by the ECO, although none were discovered during the specialist screening studies.
[9] To be indicated by the ECO. Proposed access routes are located at a few new pylon sites.
[10] To be indicated by the ECO, if this takes place along drainage lines during the construction phase.
[11] Preferably made of sisal, with openings of at least be 225mm^2 and guaranteed to last at least 24 months
[12] The subsoil must be broken up / roughened to properly bind with the topsoil.
[13] The subsoil must be broken up / roughened to properly bind with the topsoil.
[14] Angled across the contour at approximately 30 degrees form the bisector of the contour.
[15] To be indicated by the ECO. The EO / ECO may add to this list where other alien plants are identified.

- Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge.
- Ensure that only properly trained people handle and make use of chemicals.
- Dispose of the eradicated plant material at an approved solid waste disposal site. If no toxic sprays or persistent poisons were used during eradication, then the wood may be sold or donated.
- Rehabilitate all identified areas as soon as practically possible, utilising specified methods and species[16].

3.7.1. The following specifications as per the CDC Project Vegetation Specifications shall apply:

Species specific control methods: *Acacia cyclops* (Rooikrans), *Acacia saligna* (Port Jackson Willow).

Mechanical control
- Seedlings: Hand-pull
- Trees: Cut stump as close to ground level as possible (must in addition chemically treat stumps to prevent coppicing).

Chemical control
- Seedlings: Foliar spray with herbicide e.g. Mamba, Touch Down or Garlon
- Trees: Stump treatment with a herbicide.

Species specific control methods: *Datura ferox* (Large Thorn Apple) – although not recorded within the Construction Footprint

Mechanical control
- Seedlings: Hand pull
- Mature plants: Hand pull where possible.

Chemical control
- Foliar spray with a herbicide e.g. Mamba, Touch Down or Garlon

Species specific control methods: *Opuntia ficus-indica* (Sweet Prickly Pear)

Mechanical control
- Slash plants and remove roots (Note: all plant sections must be carefully removed from site as any remaining plant sections in contact with the soil will grow into new plants)

Chemical control
- MSMA must be injected into the basal cladode or the plant will re-sprout.

Species specific control methods: *Sesbania punicea* (Red Sesbania) – although not recorded within the Construction Footprint

Mechanical control

[16] To be indicated by the ECO and EO.

- Seedlings: Hand-pull
- Trees: Cut stump as close to ground level as possible (must in addition chemically treat stumps to prevent coppicing.) OR
- Trees: Slash (and treat new coppice growth chemically)

Chemical control
- Seedlings: Foliar spray with herbicide e.g. Mamba, Touch Down or Garlon.
- Trees: Stump treatment with a herbicide.
- Trees: Spray coppice with herbicide e.g. Touch Down or Garlon

Species specific control methods: *Solanum* species

Mechanical control
- Seedlings: Hand pull
- Mature plants: Hand pull where possible.

Chemical control
- Foliar spray with a herbicide e.g. Mamba, Touch Down or Garlon

General Specifications

Manual Control

Seedlings
- Seedlings should preferably be pulled by hand while young. Should they be left to grow, control of these plants will become more problematic and costly.
- It is important to ensure that the roots are pulled out of the ground, and that the seedling is not snapped of at ground level, as it will re-grow. Seedling removal will be most effective when soil is wet after a good rainfall.

Mature plants
- Mature plant species that do not coppice, should be cut as close to ground level as possible with a chain saw or brushcutter.

Chemical control
- Re-growth of any alien vegetation on site may only be chemically controlled, under tightly monitored application techniques, if physical removal is not possible, and if appropriate to the species.
- Follow the manufacturer's instruction when using chemical methods, especially in terms of quantities, time of application etc.
- Painting on of chemicals is preferred to spraying, as this allows for better control of the area being affected.
- Chemicals are to be strictly approved by the Engineer and applied as per specific product specifications.
- Colour dyes e.g. Methol Blue must be used with the herbicide to clearly mark areas that have been treated.
- Foliar treatment is only to be considered for dense homogenous stands of alien plant seedlings where no nearby indigenous plant material could be affected and where plants are below 1 m high on average.
- Stump treatment is required for cut alien species which are known to coppice. Stump Treatment procedure:
  - A neat flat stump should be cut, and loose sawdust brushed off.

- A mix of Garlon at a 2% concentration in water, with 0,5% Actipron as a wetting agent (or as otherwise recommended by the chemical manufacturers) is to be used.
- A suitable dye, such as Methol Blue, shall be incorporated into the chemical mix to indicate which stumps have been treated.
- The chemical mix can be applied using a small paintbrush, directly onto the upper surface of the stump.

- Great care is to be taken to prevent spills of chemicals onto the soil or other non-targeted plants.

Disposal of cut alien plant material

- All alien plant material removed from the site is to be disposed of at a waste disposal site approved by the Engineer.
- *Opuntia sp.* cut material shall be carefully collected so that no stem sections remain on any soil area (these will grow into new plants) and shall be disposed of at a site indicated by the Engineer, where there is no risk of propagation from these plant sections.
- Non-seed bearing woody alien vegetation as directed by the Engineer shall be chipped as a source of mulch.
- Burning of dried alien vegetation is to take place only with the permission of relevant authorities e.g. burning permit and is to take place in suitable weather conditions under close staff supervision. Adequate fire – fighting equipment is to be on hand at all times during any burning operation.

Additional Specifications are provided in theAppendix.

4. REHABILITATION PERFORMANCE SPECIFICATIONS

The Rehabilitation Phase refers to the period of the project after the completion of the actual Works, the onset signalled by site clean-up, site rehabilitation, the withdrawal of the Contractor from site, and coinciding with the maintenance period.

4.1. REMOVAL OF STRUCTURES AND INFRASTRUCTURE

- Clear and completely remove from site all construction equipment, storage containers, fixtures and any other temporary Works.
- Materials that will not be used again must be sold, if possible.
- Ensure that all access tracks utilised during construction (which are not earmarked for closure and rehabilitation) are returned to a usable state and / or a state no worse than prior to construction.

4.2. INERT WASTE AND RUBBLE

- Clear the site of all inert waste and rubble, including surplus rock and foundations.
- Load and haul excess spoil and inert rubble to fill in dongas to prevent further erosion, if applicable, or to dump sites indicated by the EO / ECO i.e. a registered waste disposal site.
- Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal site.

4.3. FINAL SHAPING

- No final shaping will be required where pylon excavations have been made. This is because, as much in-situ material (topsoil and subsoil) required, will be returned to the excavated holes when installing / erecting the pylons.
- Subsoil must be deposited first, followed by the topsoil. Compact in layers for best results.
- Deficiency of backfill may not be made up by excavating haphazardly within the Work Site. Additional fill may only be imported from approved borrow areas as indicated by the EO / ECO.
- Monitor backfilled areas for subsidence (as the backfill settles) and fill depressions using available material.
- Shape all disturbed areas to blend in with the surrounding landscape.
- Ensure that no excavated material or stockpiles are left on site and that all material remaining after backfill is smoothed over to blend in with the surrounding landscape.

4.4. VEGETATION REHABILIATION

Vegetation rehabilitation will most likely be required at the Construction Footprint of each pylon and drum station, as well as equipment laydown areas (which should comprise the pylon Construction Footprint area, and possibly beyond).

As per the Coega Development Corporation's 'Standard Vegetation Specification for Construction', the following Method Statements, as well as any required by the Project Vegetation Specification, shall be provided by the Contractor and submitted within 20 days prior to commencement of the works or activities to which they apply

(no work can commence on an activity requiring a Method Statement until the Method Statement for that activity has been approved by the CDC):

Rehabilitation (Clause 5.4)

- Restoration of areas that have been cleared or disturbed for construction purposes, which are going to be incorporated into the open space system or buffer zones including plant species, sources and types, seeding/planting methods, timing of planting, fertilization, irrigation and maintenance procedures.

Planting for stabilization (Clause 5.5)

- Stabilization by means of planting of areas that have been cleared or disturbed for construction purposes, which are not going to be incorporated into open space or buffer zones and not being immediately developed including plant species, sources and types, seeding/planting methods, timing of planting, fertilization, irrigation and maintenance procedures.

Erosion and sedimentation control (Clause 5.6)

- The type of stabilization methods to be implemented for exposed soils and slopes as well as drainage works and earth shaping measures to manage the erosive effects of stormwater on the site.

4.4.1. Topsoil Replacement and Soil Amelioration

- The principle of Progressive Reinstatement must be followed wherever possible. This includes the reinstatement of disturbed areas on an on-going basis, immediately after the specified construction activities for each pylon/drum station and equipment laydown area are concluded.
- If top soiling is required, execute top soiling activity prior to the rainy season or any expected wet weather conditions.
- Execute topsoil placement concurrently with construction where possible, or as soon as construction in an area has ceased.
- Where topsoil has been removed during construction, replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas of the construction site. Replace topsoil to the original depth (i.e. as much as was removed prior to construction - refer to section 5). These areas will be quantified by the EO / ECO.
- Place topsoil in the same area from where it was stripped (refer to section 5).
- If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality. The EO / ECO will advise.
- The suitability of substitute material will be determined by means of a soil analysis addressing soil fraction, fertility, pH and drainage, and approved by the EO / ECO.
- Do not use topsoil suspected to be contaminated with the seed of alien vegetation (e.g. *Acacia cyclops*). Alternatively, the soil is to be sprayed with specified herbicides (ECO to specify).
- Ensure that storm water run-off is not channelled alongside any gentle mounding, if applicable, but that it is taken diagonally across it.
- Shape remaining stockpiled topsoil not utilised elsewhere in an acceptable manner so as to blend in with the local surrounding area.
- After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.

- In the event that no topsoil is available on site prior to construction, and thus no topsoil is available for rehabilitation, undertake the following ameliorative action:
    - Sample the soil to a depth of 200mm in all areas allocated for grass planting and send the sample for soils analysis to determine the type of fertiliser and rate thereof to be applied.
    - The necessary soil amendments as indicated by soil tests must be added to and worked into the soil.
    - After the application of fertilisers such as superphosphate, a waiting period of six to eight weeks is required prior to the execution of planting and/or grassing.

4.5. RIPPING AND SCARIFYING

- Rip[17] and / or scarify[18] all areas following the application of topsoil to facilitate mixing of the upper most layers. The EO / ECO will specify whether ripping and / or scarifying is necessary, based on the site conditions immediately before these works begin.
- Rip and / or scarify all disturbed (and other specified) areas of the construction site, including temporary access routes and roads, compacted during the execution of the Works.
- Rip and / or scarify along the contour to prevent the creation of down-slope channels.
- Rip and / or scarify all areas at 300mm intervals (but not more than 400mm intervals), ensuring that the lines overlap.
- Do not rip and / or scarify areas under wet conditions, as the soil will not break up.

4.6. PLANTING

4.6.1. Transplanted Plants

- All planting work is to be undertaken by a suitably qualified Contractor, making use of the appropriate equipment.
- Transplanting entails the removal of plant material and replanting the same plants in another designated position.
- Transplant trees and shrubs into positions as indicated on the plant plans.
- Transplant trees and shrubs during the winter (between April and September). Transplant deciduous trees, before the new growth appears.
- Prune back the plants to limit transpiration and spray foliage with an evapo-transpiration retardant liquid if they are evergreen.
- Aloes and bulbous plants may be transplanted at any time of the year.
- Trees to be transplanted must be carefully removed from the soil so as to retain as large a rootball as practically possible. Use the tree's driplines as an indicator: the larger the tree the larger the rootball (and subsequently the planting hole).
- Minimise disturbance of the soil and the remaining roots in the rootball during the lifting, moving and or transportation of all species.
- Wrap the rootball in Hessian or in plastic sheeting to retain the soil and to keep the rootball moist.

[17] Loosening of the soil to a depth of 300mm.
[18] The roughening of the surface of the soil to a depth of approximately 50mm, creating a smoother surface than ripping.

- Unless otherwise specified by the EO / ECO, excavate square holes of 800mm x 800mm x 800mm on average for trees and 500mm x 500mm x 500mm on average for shrubs.
- If impenetrable shale, rock, clay or a high water table is encountered, making the above hole sizes impossible, then seek advice from the EO / ECO.
- Where local soil has poor drainage, broken rock (Approx. 75 mm in diameter) must be placed to a depth of 150mm at the bottom of the planting hole prior to planting and backfilling with approved plant medium mixture.
- Backfill planting holes with excavated material / approved topsoil, thoroughly mixed with weed free manure or compost (per volume about one quarter of the plant hole), one cup of 2:3:2 fertiliser and an approved ant and termite poison.
- Plant trees and shrubs so that their stems or trunks are at the same depth as in their original position.
- Orientate trees and shrubs in the same direction as in their original position.
- Plant aloes and bulbs in similar soil conditions and to the same depth as in their original position.
- Stake all trees using three weather resistant wooden or steel stakes anchored firmly into the ground. Two of the three stakes are to be located on the windward side of the plant. Galvanised wire binding, 3 mm thick, covered with a 20mm diameter plastic hosepipe must be tied tightly to the stakes, half to two thirds the height of the tree above the ground and looped around the trunk of the tree.
- Place stakes at least 500mm apart and away from the stem and roots of the tree, so as not to damage the tree or its roots. This distance will depend upon the size of the tree planted and must be approved by the EO / ECO before staking.
- Where necessary, protect newly planted trees against wind, frost and wild animals by means of fencing, sacking or frost nets, as specified by the EO / ECO.
- Trees should be watered three times weekly for the first 3 months and once weekly thereafter unless sufficient rain occurs.
- Water transplanted trees and shrubs as required until the plants are able to survive independently (i.e. depending on the rainfall).
- A raised circular 200mm high subsoil berm, placed 500mm (shrubs) to 750mm (trees) from the plant's stem must be provided for the watering. Do not simply leave the excavated plant hole partially backfilled for this purpose – the berm must be raised above the natural soil level.
- Water aloes and bulbs once directly after transplanting to settle the soil.
- Remove stakes and wire binds over time as required, as plants become established.

4.6.2. Nursery Plants – SSC species

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- All planting work is to be undertaken by a suitably qualified Contractor, making use of the appropriate equipment.
- Plant all trees, shrubs and individual plants in positions as indicated on the plant plans.
- Planting should preferably be done during the rainy season.
- Unless otherwise specified by the EO / ECO, excavate square holes of 800mm x 800mm x 800mm on average for trees and 500mm x 500mm x 500mm on average for shrubs.

- If impenetrable shale, rock, clay or a high water table is encountered, making the above hole sizes impossible, then seek advice from the EO / ECO.
- Where local soil has poor drainage, broken rock (Approx. 75 mm in diameter) must be placed to a depth of 150mm at the bottom of the planting hole prior to planting and backfilling with approved plant medium mixture.
- Backfill planting holes with excavated material / approved topsoil, thoroughly mixed with weed free manure or compost (per volume about one quarter of the plant hole), one cup of 2:3:2 fertiliser and an approved ant and termite poison.
- As much of the soil from container plants as possible must be retained around the roots of the plant during planting.
- The plant must be planted into the specified hole size with the approved soil, compost and fertiliser mix used to refill the plant hole and must cover all the roots and be well firmed down to a level equal to that of the surrounding insitu material.
- After planting, each plant must be well watered, adding more soil upon settlement if necessary.
- Add mulch to the surface area of the bermed basin.
- Stake all trees using three weather resistant wooden or steel stakes anchored firmly into the ground. Two of the three stakes are to be located on the windward side of the plant. Galvanised wire binding, 3 mm thick, covered with a 20mm diameter plastic hosepipe must be tied tightly to the stakes, half to two thirds the height of the tree above the ground and looped around the trunk of the tree.
- Place stakes at least 500mm apart and away from the stem and roots of the tree, so as not to damage the tree or its roots. This distance will depend upon the size of the tree planted and must be approved by the EO / ECO before staking.
- Where necessary, protect newly planted trees against wind, frost and wild animals by means of fencing, sacking or frost nets, as specified by the EO / ECO.
- Thoroughly water plants as required until the plants are able to survive independently (i.e. depending on the rainfall).
- A raised circular 200mm high subsoil berm, placed 500mm (shrubs) to 750mm (trees) from the plant's stem must be provided for the watering. Do not simply leave the excavated plant hole partially backfilled for this purpose – the berm must be raised above the natural soil level.
- Water aloes and bulbs once directly after transplanting to settle the soil.
- Remove stakes and wire binds over time as required, as plants become established.

The following grass species can be used for rehabilitation of disturbed areas (within the Construction Footprint), as per the CDCs Project Vegetation Specification:

- Only non-invasive annual grasses, such as *Eragrostis curvula* (if used at a lower density than the recommended stocking rate and/or in a mix), *Eragrostis tef, Themeda triandra* and *Panicum maximum* shall be used in planting for stabilisation to provide initial cover.
- Summer seed mixture:
  - *Eragrostis tef*
  - *Eragrostis curvula*
  - *Themeda triandra*
  - *Panicum maximum* (replace with *P. deustum* in Thicket areas if seed can be obtained)
- Winter seed mixture:

- Same as summer mix but applied at a slightly higher sowing rate than the recommended rates.

A final Bill of Quantities to be specified by the Contractor responsible for rehabilitation works.

4.7. MAINTENANCE

- Allow for a maintenance period of **one year** following practical completion, unless otherwise specified.
- Landscape maintenance is to be undertaken by suitably qualified persons, making use of the appropriate equipment (refer to section 5).
- Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access.
- Re-vegetation must match the vegetation type which previously existed, unless otherwise indicated in the Contract or specified by the EO / ECO.
- Base the new carrying capacity of rehabilitated land on the status quo rather than the regional estimate.
- Control weeds by means of extraction, cutting or other approved methods.
- Bare areas that show no specified vegetation growth after three months of the Rehabilitation Work are to be spread with additional topsoil, ripped to a depth of 100mm and re-planted, or re-hand sown.

Responsibility for establishing an acceptable cover (as per the CDCs Project Vegetation Specification – see Appendix for additional information):

- Where only indigenous seed, harvested from the site, has been used, acceptable cover shall mean that:
    - Not less than 60% of the area seeded shall be covered with acceptable plants; and
    - There shall be no bare patches greater than 800 mm in maximum dimension through the area, except where large rocks or boulders occur.
- Where commercial grass seed is used, acceptable cover shall mean that:
    - Not less than 75% of the area seeded shall be covered with grass; and
    - There shall be no bare patches greater than 500 mm in maximum dimension.
- The grass shall not comprise more than 40% of the 60% vegetation cover.
- In the case of grass sodding, acceptable cover shall mean that the full area shall be covered with live grass at the end of any period not less than three months after sodding.
- The Engineer shall have the final decision regarding the establishment of an acceptable cover.

5. MONITORING AND AUDITING

5.1. INTRODUCTION

In keeping with current environmental and associated legislation, all environmental management procedures and actions should be reviewed and refined on an on-going basis. This is in accordance with the dynamic nature of environmental management and allows for the timeous identification and mitigation of issues as they come to light. The process of review and refinement, built into the requirements of the IEMF, is known as Monitoring and Auditing.

5.2. ROLES AND RESPONSIBILITIES

Efficient implementation of the Performance Specifications, effective Monitoring and Auditing, as well as clear Responsibility and Accountability allocation requires that various role-players be defined for a construction of the Transmission Line.

5.2.1. Land Owner or Custodian of the Land

The Land Owner or Custodian of the Land is the CDC with the Servitude held by Eskom, the organization with decision making capacity for the land in which the Transmission Line is sited, and thus ultimately accountable for what takes place on that land.

5.2.2. Developer

The Developer is Eskom Holdings Ltd: Transmission Division, the organization that has funded the implementation of the Transmission Line. Ultimately the liability associated with environmental non-compliance rests with Eskom. As a result, Eskom must ensure that the requirement for Environmental Compliance is understood by all Eskom employees and that it is clearly defined in the Terms of Reference for any Contractors.

5.2.3. Project Manager

The Project Manager (Ms Lindi Haarhof) represents the Developer (Eskom). The Project Manager co-ordinates all aspects of the project, streamlines planning and implementation. All members of the Implementing Team as described hereunder report to the Project Manager, who in turn provides feedback to the Developer (Eskom) and the Coega Development Corporation.

Employees and Contractors may only take instruction from the Project Manager, the Environmental Control Officer and the Environmental Officer of the CDC, and all decisions regarding environmental procedure and protocol are to be approved by the Project Manager, the Environmental Control Officer and the Environmental Officer of the CDC, who have the power to stop any construction activity in contravention of the Environmental Performance Specifications.

5.2.4. Design Engineer

The Design Engineer (Eskom Electrical Engineer) is involved during the planning and design phase of the Transmission Line, and must ensure that relevant environmental planning and design considerations are taken into account during design and

planning of the Transmission Line. In this respect, the Design Engineer will usually work in conjunction with the Environmental Consultants and/or Specialist Consultants responsible for the compilation of this document.

During the construction phase, the Design Engineer will fulfil a quality control function and monitor the works on a regular basis.

5.2.5. Site Engineer

Also referred to in some instances as a Resident Engineer, the Site Engineer is responsible for construction site supervision and quality control during Construction. In some instances the Site Engineer may also assume the responsibilities of the Project Manager.

5.2.6. Contractor

The Contractor is the successful tenderer, appointed by Eskom to undertake the construction of the Transmission Line as specified in the Contract, as well as rehabilitation and plant rescue and translocation.

Plant rehabilitation, rescue and translocation will most likely be undertaken by Linda Redfern (Landscape & Environmental Services, 19 Amsterdam Hoek, Swartkops 6210, Port Elizabeth, South Africa, Phone : (+27) 041 – 4661694, Mobile : (+27) 082 – 9602099, Fax : (+27) 041 – 4672856, E.Mail : edline@absamail.co.za).

It is the responsibility of the Contractors to be well versed in the Construction EMP in order to accurately and efficiently carry out the requirements of the Environmental Performance Specifications. The Contractor is liable for any remedial Work required in terms of the Environmental Performance Specifications, resulting from environmental negligence, mismanagement and / or non-compliance by the Contractor.

5.2.7. Eskom Environmental Manager/Advisor

The Environmental Manager/Advisor (Ms Rudzani Ranwedzi) is the representative of Eskom. The role of Environmental Manager/Advisor is one of strategic management of all issues pertaining to the environment, not limited to any single project. The Environmental Manager/Advisor is responsible for ensuring that the above Environmental roles are filled for all projects under his / her jurisdiction, and will be required to provide guidance, assistance and input as required during project lifecycle. In this respect, the Environmental Manager must be well versed in the minimum standards and responsibilities for each of the Environmental roles. From time to time, the Environmental Manager/Advisor will also be called upon to resolve conflicts and disputes.

5.2.8. Coega Development Corporation (CDC) Environmental Officer (EO)

The Environmental Officer is the representative of the Coega Development Corporation. The Environmental Officer is responsible for managing the day-to-day on-site implementation of the Environmental Performance Specifications, and for the compilation of regular Monitoring Reports. The Environmental Officer must act as liaison and advisor on all environmental and related issues, seek advice from the Coega Development Corporation when necessary and ensure that any complaints received from stakeholders are duly processed and addressed, and that conflicts are resolved in an acceptable manner. The Environmental Officer must:

- Be well versed in the Construction EMP and the associated specialist environmental studies.
- 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 the requirements of the Environmental Performance Specifications.

5.2.9. Independent Environmental Control Officer

An Independent Environmental Control Officer will undertake environmental audits for the duration of the construction of the Transmission Line and rehabilitation post construction.The primary role of the Environmental Control Officer is to act as quality controller regarding all environmental concerns. In this respect, the ECO is to conduct periodic site inspections, attend regular site meetings, pre-empt problems and suggest mitigation and be available to advise on incidental issues that arise.

The ECO is also required to conduct compliance audits, verifying the monitoring reports submitted by the Environmental Officer (above).

The role of ECO may be fulfilled by any person, well versed in environmental issues and construction processes, who is able to make meaningful and workable recommendations as required.

The Contractor and the Environmental Control Officer are answerable to the CDCs Environmental Officer for non-compliance with the Environmental Performance Specifications. The Environmental Control Officer provides feedback to the Project Manager, who in turn reports back to Eskom, as required. Issues of non-compliance raised by the ECO must be taken up by the Project Manager and the CDCs EO, and resolved with the Contractor as per the conditions of the contract.

Decisions regarding environmental procedures, specifications and requirements which have a cost implication (i.e. those that are deemed to be a variation, not allowed for in the Environmental Performance Specification) must be endorsed by the Project Manager and the CDCs Environmental Officer.

5.2.10. Environmental Consultants/Specialist Consultants

The Specialist Consultants for the Transmission Line are represented by Envirolution Consulting. The specialist consultants included botanical, aquatic, avifauna and heritage specialists who have assisted with the relevant specialist studies that have been incorporated into this Environmental Management Plan, and which usually get incorporated into the Environmental Impact Assessment Reports. For the Dedisa Grassridge Transmission Line, the specialist consultants have compiled this Construction EMP. The Specialist Botanist also assists with identifying plant Species of Special Concern within the Construction Footprint, including providing specifications for plant rescue and translocation and rehabilitation works.

5.3. THE MONITORING PROCEDURE

Environmental Monitoring is the continuous evaluation of the status and condition of environmental elements. Its purpose is to detect change that takes place in the environment over time and involves the measuring and recording of physical, social and economic variables associated with development impacts.

To these ends, the Environmental Officer and Independent Environmental Control Officer will monitor the site for compliance (i.e. Compliance Monitoring) with the Environmental Performance Specifications. The ultimate aim is that each environmental management specification be checked by means of a system in which a score may be allocated for:

- Full compliance,
- Satisfactory performance,
- Unsatisfactory performance ,and
- No action.

Monitoring will take place **at least every month during construction, and every three months during the maintenance period**.

Completed Monitoring Reports will be submitted to the Project Manager, the Contractor, who will attend to issues, and the Environmental Control Officer, who will perform Audits at appointed intervals. These reports must be kept on record and be made available upon request by the Land Owner and any Environmental Authority or stakeholder requesting such.

- All persons employed by the Contractor (and sub-contractors) must abide by the requirements of these Environmental Performance Specifications as they apply to the Works.
- Any employees of the Contractor or sub-contractors found to be in breach of any of the Environmental Performance Specifications may be ordered to leave the site forthwith. The order may be given orally or in writing by the CDCs Environmental Officer, the Independent Environmental Control Officer or Environmental Manager/Advisor. Confirmation of an oral order will be given as soon as practicable, but lack of confirmation in writing shall not be a cause for the offender to remain on site.
- Confirmation of an oral order will be given as soon as practicable but lack of confirmation in writing shall not be a cause for the offender to remain on site.
- Supervisory staff of the Contractor (and sub-contractors) may not direct any person to undertake any activities which would place such person in contravention of the Environmental Performance Specifications.

The Contractor is deemed not to have complied with the Environmental Performance Specifications if:

- There is evidence of wilful or accidental contravention of any specification included in the Specification.
- There is evidence of the Contractor carrying out activities not permitted in terms of the Contract and / or the Specification.
- There is evidence of environmental negligence and / or mismanagement resulting in negative impacts on the environment.
- The Contractor has failed to meet with the requirements of the approved schedule.

The Contractor will be informed via Monitoring and Auditing Reports as well as by means of direct instruction as to what corrective actions are required in terms of Environmental Compliance:

- Disregard for instruction, and failure to respond adequately to complaints from the public will be construed as non-compliance.
- Non-compliance may lead to the Contractor forfeiting his Environmental Retention or being penalised (refer to section 5.5). In more serious cases, the Project Manager and the CDCs Environmental Officer may give notice, and then halt construction Works until such a time that the Contractor has upgraded his site to comply with the Performance Specifications. Resultant delays may not be claimed, and will be for the Contractor's own cost.
- In prolonged cases of persistent non-compliance, the Contractor may be evicted from site. Only the CDCs Environmental Officer may issue such instruction, retaining any costs required to remedy situations perpetuated by environmental negligence, mismanagement and / or non-compliance.

5.4. THEAUDITING PROCEDURE

Environmental Auditing is the process of comparing the impacts predicted with those which have actually occurred during construction. An Environmental Performance Audit examines and assesses practices and procedures which, in the event of failure, would cause an environmental impact or result in an environmental risk. The Performance Audit will ensure that monitoring was correctly undertaken and that compliance was achieved.

To these ends, the Environmental Control Officer will audit the project and its environmental management system for effectiveness on a **monthly basis** for the duration of the construction phase. The ultimate aim of an Environmental Audit entails the following:

- The review of Monitoring Reports for the time elapsed,
- The verification of recorded monitoring results on site,
- The examination and evaluation of environmental management actions in terms of achieving responsible environmental management and the identification of deficiencies.
- The evaluation of the environmental management structure in terms of achieving responsible environmental management and the identification of deficiencies.
- The recommendation of amendments to the specifications, actions and management structure as deemed appropriate.

5.5. RETENTIONS AND PENALTIES

It is recommended that a retention system be combined with a penalty system to both motivate and compel the Contractor to adhere to the Environmental Performance Specifications for the duration of the contract.

In this way incentive may be created to perform (i.e. in the form of the retention amounts that will be paid to the Contractor at the end of the contract), without creating the misimpression that adherence to the Environmental Performance Specifications is optional (i.e. persistent non-compliance will not only result in the Contractor forfeiting the retention amount, but he will also be fined).

The Contract must specify exactly how the penalty and retention system will operate, as well as how any funds resultant from retentions and penalties will be utilised. All such funds must be used to improve *environmental* conditions on the site under

development, either during or post-construction, and may not be used to recoup losses incurred as a result of overspent construction items.

5.5.1. The retention system

For this system, a percentage value for each of the sections priced for in the Environmental Bill of Quantities is retained until the completion of the Contract Works. If the Monitoring process reveals persistent and / or wilful non-compliance with any aspect of the Environmental Performance Specifications, then the retention associated with that particular item will be withheld.

The Project Manager and/or CDCs Environmental Officer may then utilise these retained funds to rectify the problem on site making use of other resources at their disposal.

At the end of the Contract, all remaining Environmental Retention amounts will be paid out to the Contractor (pending approval by the CDCs Environmental Officer ECO, and/or Environmental Manager/Advisor, confirming compliance with the relevant Environmental Performance and Rehabilitation Specifications).

5.5.2. The penalty system

A penalty system is one in which monetary values are attached to various specification items. Such values may include, but are not necessarily limited to the following[19]:

- Access into designated 'no-go' areas: **R2000**;
- Vehicles, plant, equipment or material outside of the demarcated site: **R1000**;
- Persons walking outside of the authorized area: **R250**;
- Persistent un-repaired machinery leaks: **R1500**;
- Litter on site: **R500**;
- Lighting of fires outside of designated areas: **R2500**;
- Eating meals outside of designated areas: **R500**;
- Individual not making use of site ablution facilities: **R500**;
- Persons, vehicles, items or plant causing a public nuisance: **R1000**.
- Erosion: Cost to repair rehabilitate plus 20%;
- Oil spills: Cost to clean plus 20%;
- Unauthorised damage to vegetation: Cost to replace plus 20%;
- Unauthorised damage to the environment: Cost to rehabilitate plus 20%;
- Unauthorised damage to cultural historical sites: to a maximum of R100000;
- Unauthorised damage or deformation of small trees (<75mm girth diameter @ a height of 1m): **R1000**;
- Unauthorised damage or deformation of medium trees (75-200mm girth diameter @ a height of 1m): **R3500**;
- Unauthorised damage or deformation of large trees (>200mm girth diameter @ a height of 1m): **R10000**.

Should the Monitoring process (refer to section 5.3) reveal acts of persistent and / or wilful non-compliance with the Environmental Performance Specifications, then the Contractor will be fined according to the specified value of that item.

[19]This system of penalties is one employed by the Kruger National Park for the development of various Poverty Relief Projects (2004 / 2005). It is important, however, to recommend penalty values based on the specific sensitivities of the environment in question.

6. ENVIRONMENTAL AWARENESS

Proper environmental awareness training is a requirement for all construction crews working within the Construction Footprint of the Transmission Line (and substations). This ensures the safety of personnel, and helps to protect the integrity of the environment during the construction of the Transmission Line.

Eskom, plus Contractors (including sub-contractors), must arrange that all employeesreceive an environmental training course before the commencement of construction to the satisfaction of the CDCs Environmental Officer, Resident Engineer and Environmental Control Officer. Both the course, and the training memorandum, applicable for employees on two different levels of responsibility will be made available to the Contractor:

Such a course is compulsory for all employees and must be structured in accordance with their relevant rank, level and responsibility, in order that these employees:

- Acquire a basic understanding of the environment and the environmental features pertaining to the Work Site and environs.
- Are familiar with the requirements of the Environmental Performance Specifications as they apply to the Works.
- Are made aware of site specific environmental matters which are deemed to be necessary by the CDCs Environmental Officer and ECO.

It may also be necessary to present the CEMP to employees, highlighting specific requirements and sensitivities e.g. wetlands.

The Skills Development Act and Levy can be utilised to claim back a significant portion of training costs and, in terms of that Act, the learners receive credits for the training received.

7. REFERENCES

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

National Water Act, 1998 (Act No. 36 of 1998), as amended

SANBI (2009).Further Development of a Proposed National Wetland Classification System for South Africa.Primary Project Report.Prepared by the Freshwater Consulting Group (FCG) for the South African National Biodiversity Institute (SANBI).

SRK Consulting (2010). Nelson Mandela Bay Municipality Draft Bioregional Plan. SRK Consulting Report

APPENDICES

Appendix 1:	Principles and Methods of Alien Plant Control
Appendix 2:	CDC Standard Environmental Specifications
Appendix 3:	CDC Standard vegetation specification
Appendix 4:	CDC Compilation document for Construction EMP

APPENDIX 1:

PRINCIPLES AND METHODS OF ALIEN PLANT CONTROL

Source: RENNIES WETLAND PROJECT. WETLAND FIX. 1997.

a) Principles for control

- Light invader plant infestations are easier to deal with than heavy infestations. They can also get worse if ignored: heavy infestations may not. So tackle the easiest problems first.
- Infestation generally proceeds downhill: start at the highest point and work downwards.
- No control operation succeeds the first time - one or more follow-ups are essential. So when attempting to clear a large area piece-meal, it is better to make the second effort a follow up operation on the first area cleared than to start on a new area. Cleared areas should be inspected at intervals to ensure that alien elimination is complete.
- Take into account other plants present and possible damage or disturbance to desirable plants or to the soil during control, as long term site rehabilitation costs need to be further considered.
- Do not overlook commercial prospects. Some alien plants might have a market value for use as compost, firewood or even building materials.
- In cases where large infestations are being tackled it is advisable to consult with the Agricultural Research Council, Plant Protection Research Unit; as their expertise could save time and money.

b) Methods of control

1. Biological control (the use of natural biological agents such as insects, mites and pathogens)

- Even though a biological agent might become well established , eradication of the target weed does not usually occur. The main aim of biological control is not to eradicate but to reduce the vigour of the weed and to impair its reproductive capacity

2. Mechanical control (action in which force is exerted)

- This method is target specific, requires little expertise, but is generally slow, labour intensive and involves soil disturbance:
    - Raking / dragging of aquatic weeds.
    - Hand-pulling / uprooting (small infestations and where invaders are shallow).
    - Cutting / slashing as close to the ground as possible (usually used as an initial treatment prior to chemical treatment).
    - Ring-barking and strip-barking (used when felling is impractical, or when damage from felling large trees is to be limited).
    - Felling.

3. Chemical control

- In certain cases, the use of herbicides is preferable to mechanical methods, for example when the disturbance created by digging and uprooting could be disastrous on steep slopes prone to soil erosion or when chemical control may be more economical than mechanical control.
- Consider the following when choosing a herbicide:
    - It should be one registered for use against the weed to be eliminated.
    - Note the level of persistency displayed by the herbicide after application. Residual herbicides preclude immediate re-growth or replanting.
    - The degree of selectivity of action of the herbicide may be critical. Some kill all plants, others have no effect on non-target species, particularly grasses.

    - The effect of the herbicide upon animal life must be considered. Some herbicides are dangerous to particular groups of animals (e.g., fish) and should never be used near water.
- Methods:
    - Foliar application (only kills the plant after translocation to the roots and is therefore slow acting. Environmental conditions are important during application).
    - Basal bark treatment (for plants with a diameter of 5-15cm. Highly selective and efficient for control in rugged terrain).
    - Cut stump treatment (for plants with a diameter of greater than 15cm).
    - Soil applied herbicides (not selective and usually persistent. Effectively used for control of bush encroachment).

	Biological	Mechanical	Mechanical	Mechanical	Mechanical	Chemical	Chemical	Chemical	Chemical	Other
Alien Plant Species		**Hand-pulling**	**Cutting or slashing**	**Ringbarking barkstripping**	**Felling**	**Foliar Spray**	**Cut Stump**	**Basal bark**	**Soil treatment**	
Barbados Gooseberry		Seedlings and re-growth				Garlon				Burn heaped material
Blackwood		Seedlings		□	□					
Bramble			□			Garlon Roundup Brushoff Escort			Reclaim Grasslan	
Brazil Pepper		Seedlings				Garlon				Veld Burn
Bugweed		Seedlings				Garlon Roundup Chopper Starane	Chopper	Garlon Starane	Reclaim Grasslan	
Guava							Chopper Tordon super	Tordon super		
Gum-saligna				□	□	Garlon Chopper Escort	Garlon Chopper		Reclaim Grasslan	
Inkberry		Seedlings		□						
Kariba weed	Leaf feeding weavils					Igran				
Lantana		Seedlings	□			Roundup Chopper	Tordon super Chopper		Reclaim Grasslan	
Mauritius thorn		Seedlings	□			Garlon Roundup				
Parrots feather										Raking or dragging
Pine		Seedlings	□	□	□					Veld burn
Poplar-grey				□						
Port Jackson willow	Seed borrer	Seedlings				Garlon Roundup			Reclaim Graslan	
Prickley pear	Sap-sucking cochineal and leaf eating					Roundup MSMA				Inject Masmar

	cactoblastis									
Rooikrans		Seedlings				Garlon			Reclaim Grasslan	
Sesbania red	Flower or seed feeding weavils					Garlon Roundup	Garlon		Reclaim Graslan	

Spanish reed										
Syringa		Seedlings		□	□	Garlon		Garlon		
Triffid weed		□	□			Garlon roundup Brushoff Escort	Garlon Chopper		Reclaim Grasslan	Veld burn
Water fern										Raking or dragging
Water hyacinth	Leaf feeding weavils					Roundup Igran				Raking or dragging
Water lettuce / cabbage	Leaf feeding weavils									Raking or dragging
Wattle-black	Seed feeding weavils	Seedlings		□	□	Garlon Roundup	Tordon super	Garlon Tordon super	Reclaim Grasslan	
Wattle-Longleaf	Wasp causes galls	Seedlings		□						
Wattle-Silver		Seedlings		□		Garlon	Garlon Tordon super	Tordon super		
Weeping willow				□	□					
Wild tobacco		Seedlings								

Source: RENNIES WETLAND PROJECT. Wetland Fix. 1997.

Any aquatic plant can become a nuisance and it is often indicative of a silt build-up or excessive amounts of nutrient being available - should this situation arise it is advisable to determine the cause. Fertiliser being washed off surrounding lands, washings from a dairy or sewerage can create problems

APPENDIX 2:

CDC Standard Environmental Specifications

APPENDIX 3:

CDC rehabilitation specification

APPENDIX 4:

CDC vegetation specification