

REPORT

Environmental Management Programme for the proposed Planning & Design for the Maintenance and/or Upgrade of the Patrol Roads and Fencing on the Borders between RSA, Swaziland & Mozambique – Phase 1

Mozambique Border Control Infrastructure Upgrade
EMPr - Phase 1

Client: Department of Public Works

Reference: T&PMD2264/2675R001D01

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Acronyms

AMSL	Above Mean Sea Level
BA	Basic Assessment
BAR	Basic Assessment Report
BGIS	Biodiversity Geographic Information Systems
BID	Background Information Document
CA	Competent Authority
CBA	Critical Biodiversity Area
CBAR	Consultation Basic Assessment Report
CV	Curriculum Vitae
DAFF	Department of Agriculture, Fisheries and Forestry
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EDTEA	KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EKZNW	eZemvelo KZN Wildlife
EMPr	Environmental Management Programme
ESI	Environmental Screening Investigation
FEPA	Freshwater Ecosystem Priority Area
GA	General Authorisation
GIS	Geographic Information System
GNR	Government Notice Regulation
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
ITB	Ingonyama Trust Board
IWP	iSimangaliso Wetland Park
KZN	KwaZulu-Natal
KZN BSP	Kwazulu-Natal Biodiversity Sector Plan
KZN DoT	KwaZulu-Natal Department of Transport
MCE	Maputaland Centre of Endemism
NBA	National Biodiversity Assessment, 2006
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEM:AQA	National Environmental Management Air Quality Act (Act No. 39 of 2004)
NEM:BA	National Environmental Management Biodiversity Act (Act No. 10 of 2004)
NEM:PAA	National Environmental Management Protected Areas Act (Act No. 57 of 2003)
NEM:WA	National Environmental Management – Waste Act (Act No. 59 of 2008)
NFA	National Forests Act (Act No. 84 of 1998)
NGO	Non-Governmental Organisation
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NWA	National Water Act (Act No. 36 of 1998)
OHSA	Occupational Health and Safety Act (Act No 85 of 1993)

PES	Present Ecological State
PPE	Personnel Protective Equipment
PPP	Public Participation Process
PSEDS	KwaZulu-Natal Spatial Economic Development Strategy
REC	Recommended Ecological Category
RMO	Resource Management Objective
SACNASP	South African Council of Natural Science Professionals
SANDF	South African National Defence Force
SAHRA	South African Heritage Resource Agency
SWMP	Stormwater Management Plan
TEP	Tembe Elephant Park
TFCA	Transfrontier Conservation Area
WUA	Water Use Application

Glossary

Activity (Development)	An action either planned or existing that may result in environmental impacts through pollution or resource use. For the purpose of this report, the terms ‘activity’ and ‘development’ are freely interchanged.
Alternatives	Different means of meeting the general purpose and requirements of the activity, which may include site or location alternatives; alternatives to the type of activity being undertaken; the design or layout of the activity; the technology to be used in the activity and the operational aspects of the activity.
Applicant	The project proponent or developer responsible for submitting an environmental application to the relevant environmental authority for environmental authorisation.
Biodiversity	The diversity of animals, plants and other organisms found within and between ecosystems, habitats, and the ecological complexes.
Buffer	A buffer is seen as an area that protects adjacent communities from unfavourable conditions. A buffer is usually an artificially imposed zone included in a management plan.
Construction	The building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.
Cumulative Impact	The impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.
Decommissioning	The demolition of a building, facility, structure or infrastructure.
Direct Impact	Impacts that are caused directly by the activity and generally occur at the same time and at the same place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally quantifiable.
Ecosystem	A dynamic system of plant, animal (including humans) and micro-organism communities and their non-living physical environment interacting as a functional unit. The basic structural unit of the biosphere, ecosystems are characterised by interdependent interaction between the component species and their physical surroundings. Each ecosystem occupies a space in which macro-scale conditions and interactions are relatively homogenous.
Environment	In terms of the National Environmental Management Act (NEMA) (Act No 107 of 1998) (as amended), “Environment” means the surroundings within which humans exist and that are made up of: <ul style="list-style-type: none"> i. the land, water and atmosphere of the earth; ii. micro-organisms, plants 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 wellbeing.
Environmental Assessment	The generic term for all forms of environmental assessment for projects, plans, programmes or policies and includes methodologies or tools such as environmental impact assessments, strategic environmental assessments and risk assessments.
Environmental Authorisation	An authorisation issued by the competent authority in respect of a listed activity, or an activity which takes place within a sensitive environment.
Environmental Assessment Practitioner (EAP)	The individual responsible for planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instrument introduced through the EIA Regulations.
Environmental	An individual nominated through the Client to be present on site to act on behalf

Control Officer (ECO)	of the Client in matters concerning the implementation and day to day monitoring of the EMPr and conditions stipulated by the authorities.
Environmental Impact	Change to the environment (biophysical, social and/ or economic), whether adverse or beneficial, wholly or partially, resulting from an organisation's activities, products or services.
Environmental Impact Assessment (EIA)	In relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application as defined in NEMA.
Environmental Issue	A concern raised by a stakeholder, interested or affected parties about an existing or perceived environmental impact of an activity.
Environmental Management	Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.
Environmental Management Programme (EMPr)	A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive impacts and limiting or preventing negative environmental impacts are implemented during the life cycle of a project. This EMPr focuses on the construction phase, operation (maintenance) phase and decommissioning phase of the proposed project.
Fatal Flaw	An event or condition that could cause an unanticipated problem and/or conflict which will could result in a development being rejected or stopped.
Groundwater	Water in the ground that is in the zone of saturation from which wells, springs, and groundwater runoff are supplied.
Hazardous Waste	Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles as outlined in the National Environmental Management: Waste Amendment Act (No 26 of 2014).Schedule 3: Category A – Hazardous Waste.
Hydrology	The science encompassing the behaviour of water as it occurs in the atmosphere, on the surface of the ground, and underground.
Indirect Impacts	Indirect or induced changes that may occur as a result of the activity. These types if impacts include all of the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity
Integrated Environmental Management	A philosophy that prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development and decision-making process. The IEM philosophy (and principles) is interpreted as applying to the planning, assessment, implementation and management of any proposal (project, plan, programme or policy) or activity - at local, national and international level – that has a potentially significant effect on the environment. Implementation of this philosophy relies on the selection and application of appropriate tools for a particular proposal or activity. These may include environmental assessment tools (such as strategic environmental assessment and risk assessment), environmental management tools (such as monitoring, auditing and reporting) and decision-making tools (such as multi-criteria decision support systems or advisory councils).
Interested and Affected Party (I&AP)	Any person, group of persons or organisation interested in or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.
Method Statement	A method statement is a written submission by the Contractor to the Engineer in response to the specification or a request by the Engineer, setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Engineer when requesting a Method Statement. It contains sufficient detail to enable the Engineer to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.

Mitigate	The implementation of practical measures designed to avoid, reduce or remedy adverse impacts or enhance beneficial impacts of an action.
No-Go Option	In this instance the proposed activity would not take place, and the resulting environmental effects from taking no action are compared with the effects of permitting the proposed activity to go forward.
Pollution	The National Environmental Management Act, No. 107 of 1998 defines pollution to mean any change in the environment caused by – substances; radioactive or other waves; or noise, odours, dust or heat emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.
Public Participation Process	A process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to, specific matters.
Re-use	To utilise articles from the waste stream again for a similar or a different purpose without changing the form of properties of the articles.
Rehabilitation	A measure aimed at reinstating an ecosystem to its original function and state (or as close as possible to its original function and state) following activities that have disrupted those functions.
Sensitive Environments	Any environment identified as being sensitive to the impacts of the development.
Significance	Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. magnitude, intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e. biophysical, social and economic).
Stakeholder Engagement	The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities.
Sustainable Development	Development which meets the needs of current generations without hindering future generations from meeting their own needs.
Watercourse	Defined as: <ul style="list-style-type: none"> i. a river or spring; ii. a natural channel or depression in which water flows regularly or intermittently; iii. a wetland, lake or dam into which, or from which, water flows; and iv. any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998) and a reference to a watercourse includes, where relevant, its bed and banks.
Water Pollution	The National Water Act, 36 of 1998 defined water pollution to be the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it – less fit for any beneficial purpose for which it may reasonably be expected to be used; or harmful or potentially harmful (aa) to the welfare, health or safety of human beings; (bb) to any aquatic or non-aquatic organisms; (cc) to the resource quality; or (dd) to property”.
Wetland	Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

1 INTRODUCTION

The Department of Public Works (DPW) as the applicant, in conjunction with the KwaZulu-Natal Department of Transport (KZN DoT) as the implementing agent for a certain component of the project, are proposing the upgrade of existing border control infrastructure, and development of new border control infrastructure along a portion of the South Africa -Mozambique Border in the north-eastern part of the KwaZulu-Natal (KZN) Province. This application is termed the 'Phase 1' application and forms a component of a wider project being undertaken by the Department of Public Works for the upgrading of border control infrastructure along the South Africa-Swaziland border and the southern part of the South Africa (KZN)-Mozambique border. The Phase 1 alignment is comprised of the section of the international border with Mozambique from the high water mark of the Indian Ocean (KM0) to the eastern boundary of the Ndumo Game Reserve (KM54).

The current Phase 1 project is the culmination of two (2) initially separate infrastructure projects; (1) the proposed upgrading of the border control infrastructure (border patrol road and fence) along the entirety of the South Africa-Swaziland International Border, and the South Africa (KZN)-Mozambique International Border as being undertaken by the National DPW, as part of the wider departmental initiative to secure all of South Africa's borders; and (2) the proposed development of a border control barrier along sections of the South Africa (KZN) international border with Mozambique as being undertaken by the KZN DoT as implementing agent on behalf of the DPW. Following high level consultation between these two organs of state a resolution was made to combine the environmental authorisation processes for the two projects for a section of the KZN-Mozambique International Border for a number of reasons including the proximity of the two projects and the resultant similarity in affected environment and environmental impacts, and in order to minimise stakeholder confusion related to public participation for the environmental authorisation processes. It is thus important to note that there are two implementing agents for the project, KZN DoT and the DPW for the different infrastructure components.

The project is being undertaken by the DPW in conjunction with the Department of Agriculture Forestry and Fisheries (DAFF) and the South African National Defence Force (SANDF) as end users. The aim of the project is to stop the illegal trafficking of stolen vehicles and contraband across this section of the international border, as well as to prevent the illegal movement of people as well as livestock that could transmit disease. South Africa has approximately 4 800 km of land border and 2 800 km of coastline border which is required to be secured. South Africa is greatly affected and financially impacted by illegal imports, smuggling and other similar illegal activities which transpire over borders. In order to effectively respond to the range of security and control challenges that are being experienced by responsible organs of the State, it is important to assess the situation and to be able to incorporate a viable solution.

The Phase 1 section of the wider project is being prioritised for development as it is considered a 'high risk' area where significant numbers of stolen vehicles are currently being trafficked into Mozambique from South Africa.

The Phase 1 application for environmental authorisation is being lodged for a fifty (50) meter-wide corridor (as measured from the existing border fence) for a fifty four (54) km long section of the international border with Mozambique. The extent of the study area is indicated in Figures 1 and 2.

The proposed infrastructure that will be developed within this corridor will include the following components:

- The upgrading / replacing of the existing fence running along the border with a 2.4m high elephant-proof fence along most of the length of the project section (with the exception of the fence in the vicinity of the Farazela (Kosi Bay) Border Post which will be replaced with a ClearVu or similar fence).
- The development of an inner fence.
- The development of a servitude fence.
- The development of a 1.5m high Border Barrier structure along two (2) sub-sections of the Phase 1 section; (1) between the western boundary of the iSimangaliso Wetland Park and the eastern boundary of the Tembe Elephant Park; and (2) between the western boundary of the Tembe Elephant Park and the eastern boundary of the Ndumo Game Reserve.
- The development of a new 5.5m wide gravel border patrol road within a sub-section of the Phase 1 section that extends westwards from the foot of the primary dune near the Indian Ocean to the eastern boundary of the Ndumo Game Reserve (excluding Lake kuZilonde).
- The development of a wooden 'boardwalk' structure for the use of all-terrain vehicles (ATVs) across Lake kuZilonde within the iSimangaliso Wetland Park.
- The development of a 1m-wide footpath across the primary dune at the Indian Ocean, extending from the western foot of the dune to the high water mark of the sea on its eastern side.

In addition a 5ha construction camp is proposed to be developed near the Farazela Border Post.

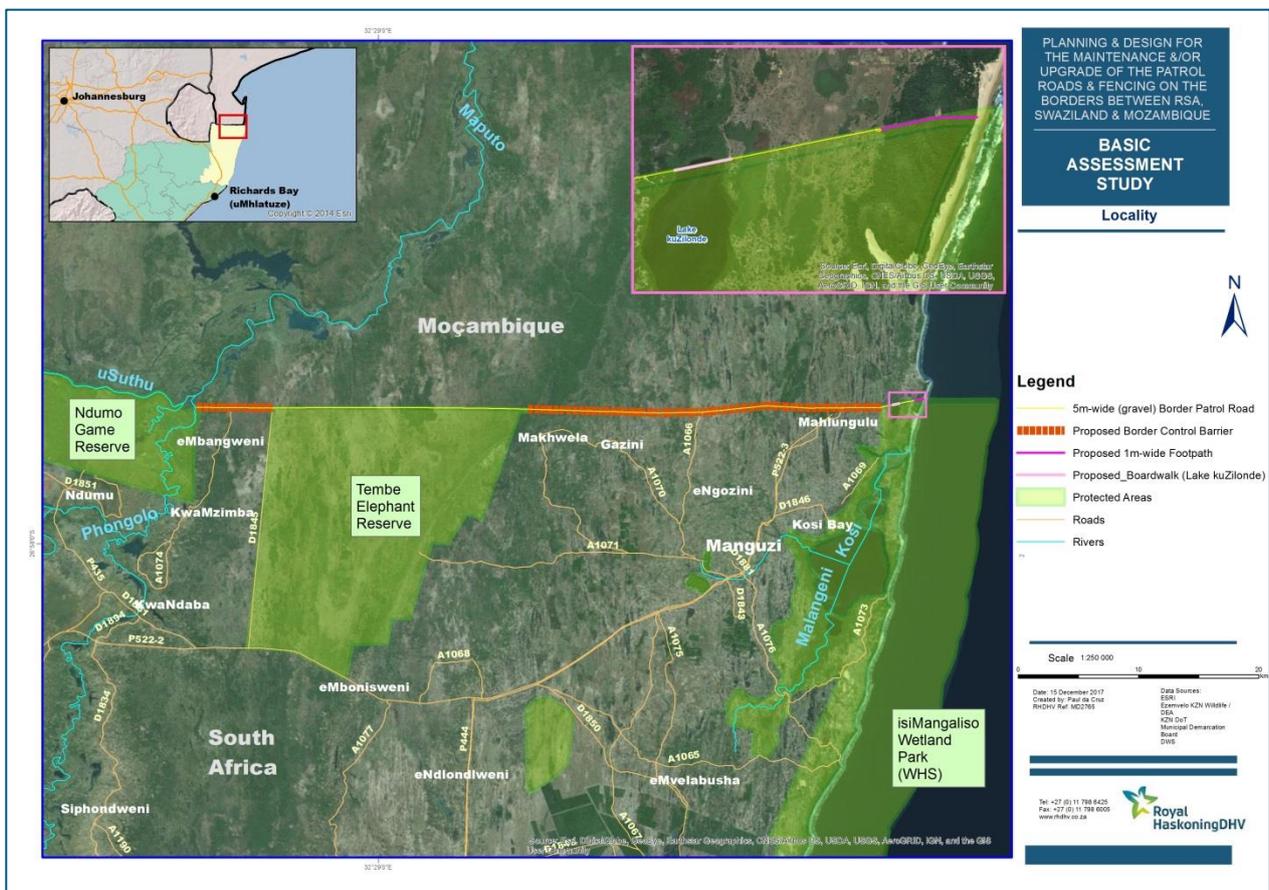


Figure 1: Locality map

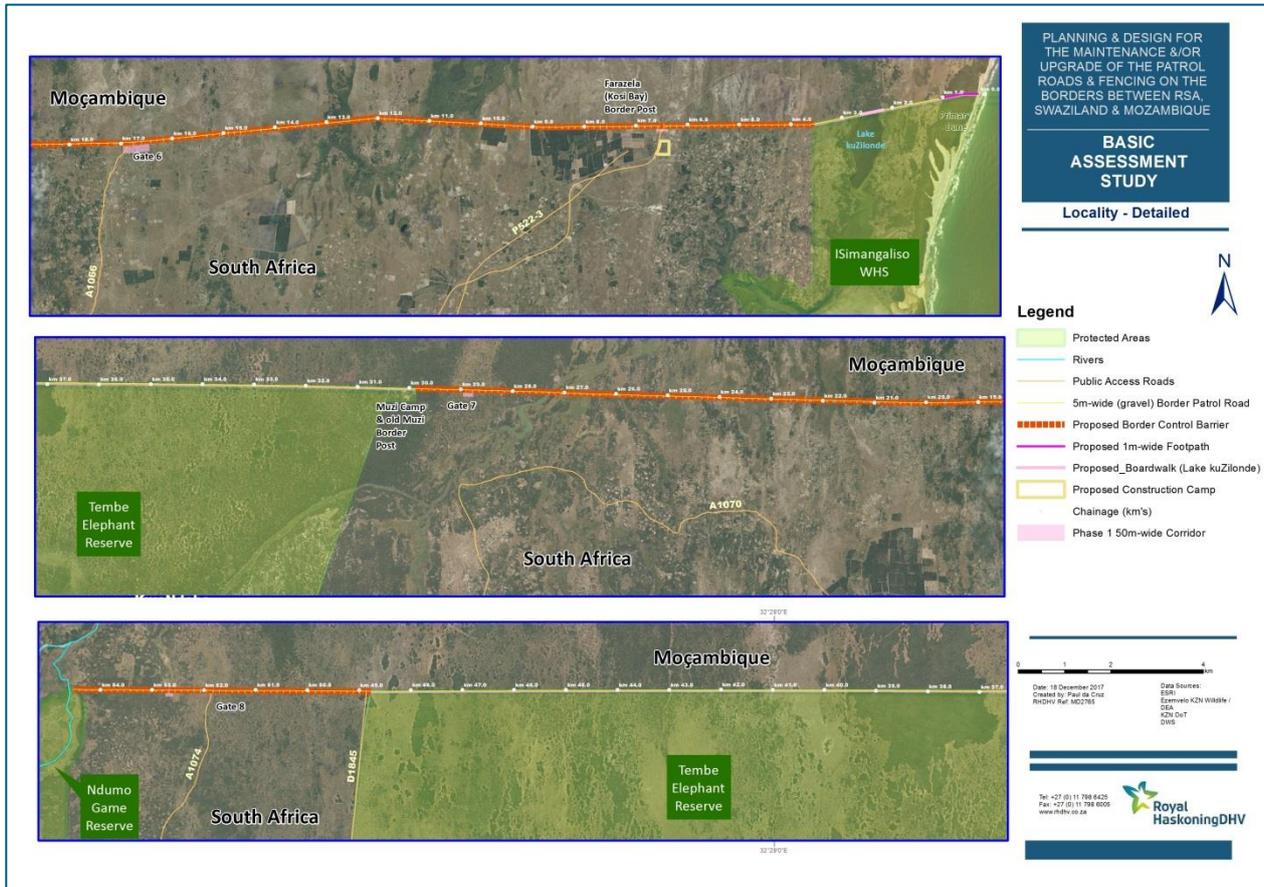


Figure 2: Locality map - Detailed

1.1 Purpose of the Environmental Management Programme (EMPr)

In terms of The Constitution of the Republic of South Africa (1996), everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for benefit of present and future generations, through reasonable legislation and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development (Section 24). The needs of the environment as well as affected parties must thus be integrated into overall project management.

The Constitution is underpinned by the suite of Specific Environmental Management Acts (SEMAs) – including the National Environmental Management Act (Act No. 107 of 1998, NEMA), National Environmental Management Waste Act (Act No. 59 of 2008, NEM:WA), National Environmental Management Air Quality Act (Act No. 39 of 2004, NEM:AQA), National Environmental Management Biodiversity Act (Act No. 10 of 2004, NEM:BA), National Environmental Management Integrated Coastal Management Act (Act No. 24 of 2008, NEM:ICMA), National Environmental Management Protected Area Act (Act No. 57 of 2003, NEM:PAA), as well as the National Water Act (Act No. 36 of 1998, NWA) – which combined, serve to control all relevant facets of the environment so as to ensure that **section 24** of the Constitution is ensured.

The EMPr is developed in terms of the SEMAs and ensures that construction activities meet the requirements of existing environmental legislation and good environmental practice in terms of local and international standards and guidelines. This is achieved by identifying those construction activities for the proposed development that may have a negative impact on the environment; outlining the mitigation measures that will need to be taken and the steps necessary for their implementation and describing the reporting system to be undertaken during construction.

It is noted that protection of the environment is enshrined in the Duty of Care requirement of the NEMA (as amended), which thus means that it is the duty of all landowners and users to ensure that the activities they carry out on a site do not cause detriment to the environmental facets thereof. The EMPr thus functions as a programme which can be monitored and audited that will allow the Developer the ability to ensure that all that operate on the site do so in an environmentally safe manner. It is also structured in such a way that the conditions may be linked to a standard construction contract. It is essential that the EMPr requirements be carefully studied, understood, implemented, and adhered to at all time. Each action within the EMPr is supported by the priority of when the specific action will need to be implemented.

Core to the purpose of the EMPr is to implement the 'mitigation hierarchy' (DEA et al., 2013), which is illustrated in Figure 3.

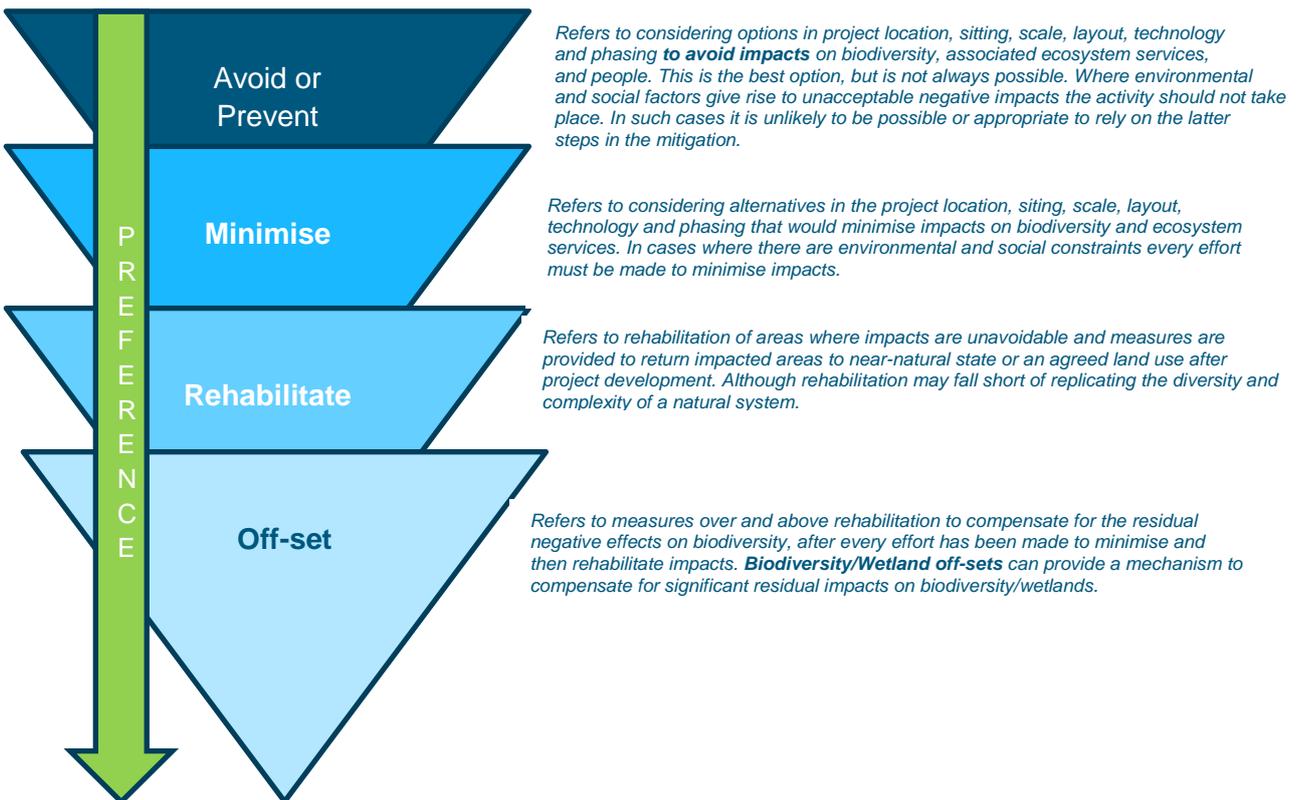


Figure 3: Mitigation Hierarchy

1.2 Objectives of the EMPr

The EMPr has the following objectives:

- To ensure compliance with regulatory authority stipulations and guidelines; which may be local, provincial, national, and/or, international.
- To outline functions and responsibilities of responsible persons.
- To state standards and guidelines, which are required to be achieved / complied with in terms of environmental legislation.
- To outline mitigation measures and environmental specifications which are required to be implemented for all phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the proposed project.
- To identify measures that could optimise beneficial impacts.
- To prevent long-term or permanent environmental degradation.
- To establish a method of monitoring and auditing environmental management practices during all phases of development.
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project.
- Ensure that the safety recommendations are complied with.
- Propose mechanisms for monitoring compliance with the EMPr and reporting thereon.
- Specify time periods within which the measures contemplated in the draft EMPr must be implemented, where appropriate.
- To provide an environmental awareness plan.
- Provide rational and practical environmental conditions / requirements to:
 - Minimise disturbance of the natural environment;
 - Ensure water resource protection;
 - Prevent or minimise all forms of pollution;
 - Protect indigenous flora and fauna;
 - Prevent soil and sand erosion and facilitate the re-vegetation of affected areas;
 - Maintenance of newly re-vegetated areas;
 - Restrict noise disturbance;
 - Ensure compliance with all applicable laws, regulations, standards and guidelines for the protection of the environment;
 - Adopt the best practical means available to prevent or minimise adverse environmental impacts;
 - Develop waste management practices based on prevention, minimisation, recycling, treatment or disposal of waste; and
 - Train the Developer, their employees and contractors (including all sub-contractors) with regard to their environmental obligations.

The EMPr is essentially, a written programme of how the environment is to be managed in practical and achievable terms.

An independent Environmental Control Officer (ECO) must be appointed by the Developer (i.e. KZN DoT), to ensure compliance with the EMPr.

1.3 Scope of the EMPr

In accordance with the requirements of the NEMA, this EMPr is to be implemented by the Developer as well as any employee, contractor, agent, or sub-contractor appointed to act on behalf of the Developer in the execution of the project, in order to ensure environmental compliance on site.

The specifications outlined in this EMPr are thus applicable to all activities undertaken by the Developer as well as their appointed contractors and all persons involved in the execution of the works, including sub-contractors, the workforce, suppliers, and volunteers, for the duration of construction, operation and future maintenance.

Included within the EMPr is guidance for on-going training with respect to the implementation of the conditions included therein, including induction by all new people coming onto site to carry out work, and 'top-up' activities such as regular 'toolbox talks' on specific key issues.

An Environmental Code of Conduct has also been developed that provides a simplified set of rules that must be adhered to by all persons involved with the project at all times. This is to be displayed at strategic points to ensure constant environmental awareness.

The effectiveness of the EMPr is limited by the level of adherence to the conditions set forth in the EMPr by the Developer, the Contractor and Sub-contractors. It is further assumed that compliance with the EMPr will be monitored and audited as set out in this EMPr and contractual clauses.

1.4 Structure of the EMPr

The EMPr provides proposed mitigation and management measures for the following phases of the project (**Table 1**).

Table 1: Different Phases of the Project Construction

PHASE	DESCRIPTION
Pre-Construction (Planning & Design)	This section will provide guidelines on pre-construction activities including site establishment and clearance; environmental induction and training and awareness; site access and health and safety.
Construction	This section will provide guidelines on construction methods and considerations.
Post-Construction	This section of the EMPr provides management principles for the rehabilitation, maintenance and operational phases of the project. This will include best practice, procedures and responsibilities as required for various associated activities.

1.5 The EMPr as a “Live” Document

The approach adopted for this EMPr is derived from the Deming Cycle (Figure 4), a cycle of continuous improvement that entails the reiterative actions of plan, do, check, act, and critically to then return to the planning phase.

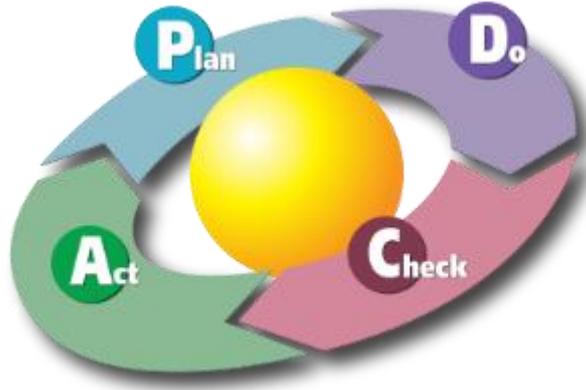


Figure 4: Deming Cycle of Continuous Improvement

1.5.1 Plan

Project-specific planning for the proposed project involves consideration of the legal triggers, the specifics of the proposed development, and the nature of the receiving environment. This provides a starting point for targeted environmental management objectives.

Environmental performance indicators are then determined with measurable targets prescribed to monitor the environmental performance of the project. Achieving the targets depends on compliance with this EMPr and the legislative requirements that underpin it.

1.5.2 Do

Throughout the development’s life-span, the Developer will be required to develop and maintain a Quality Management System (QMS) – designed to ensure that best management practices are implemented in day-to-day management.

Such a QMS must at least include the following information:

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

These topics will be cross-linked into the contracts related to the development of the project.

1.5.3 Check

A system of assessing monitoring results has been developed to check the environmental management performance. Continuous assessment facilitates proactive management of the environmental issues. Mitigation measures can then be successfully implemented on an on-going basis to keep environmental indicators within their target thresholds. Moreover, the assessment system also enables the assessment of the efficacy of the EMPr. Regular auditing of environmental performance is prescribed to prove and preserve accountability.

1.5.4 Act

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

1.6 Project Team Details

1.6.1 Project Developer

The Developer is the Department of Public Works and the details of the responsible person are listed in Table 2. The Environmental Authorisation for the Phase 1 project will be issued to the Department of Works.

Table 2: Details of the Developer

Applicant	Department of Public Works	
Representative	Mr. Malusi Ganiso (Director)	 public works Department: Public Works REPUBLIC OF SOUTH AFRICA
Physical Address	Cnr. West & Aliwal Street, Durban, 4001	
Postal Address	Private Bag X 54315, Durban	
Telephone	031 314 7149	
E-mail	malusi.ganiso@dpw.gov.za	

1.6.2 Details of the Environmental Assessment Practitioner

The team responsible for the preparation of the EMPr is presented in Table 3 below.

Table 3: Details of the Environmental Team

Consultant	Royal HaskoningDHV	Royal HaskoningDHV	Royal HaskoningDHV
Contact Persons	Malcolm Roods	Paul da Cruz	Johan Blignaut
Postal Address	PO Box 867 Gallo Manor 2191		
Telephone	011 798 6000		
E-mail	Malcolm.roods@rhdhv.com	Paul.dacruz@rhdhv.com	Johan.blignaut@rhdhv.com
Qualification	BA (Hons) Geography and Environmental Management	BA (Hons) Geography and Environmental Management	BSc (Hons) Geography
Expertise	Malcolm Roods is a Principal with RHDHV specializing in Environmental Impact Assessments (EIA) for electricity supply (generation, transmission and distribution), road infrastructure, residential developments as well as water management projects. This builds on a broad government background, which has made him particularly flexible. His past experience includes 6 years public service which included policy development, environmental law reform and EIA reviews. His experience also includes more than 9 years of environmental consulting in the field of Impact Assessment and Authorisation Applications, with a focus on legislative requirements and business management. Since joining the company he has been involved with major EIA projects such as the Transnet New Multi Product Pipeline (NMPP), various	Paul da Cruz offers a varied set of skills and a wide set of experience in different disciplines. He performs the role of an environmental specialist and EIA project management. He has worked on SEAs, EIAs, EMPs and environmental auditing. He also performed the role the project manager for a number of large EIAs. Paul has acquired a multi-disciplinary package of specialist skills which includes wetland assessment, visual impact assessment, tourism assessment, and avifaunal assessment. His extensive wetland assessment experience was gained during work undertaken for the Mondi Wetlands Project. He worked in the UK for three years in regulatory and water resources assessment roles for both the Environment Agency in England and the Scottish Environmental Protection Agency (SEPA). During this period he gained excellent	Johan is an Environmental Consultant who is responsible for a number of duties, including monitoring the implementation of the Environmental Authorisation (EA) and the Environmental Management Programme (EMPr) during the construction phase of projects, serving as a liaison between property owners and contractors, undertaking of Environmental Control Officer (ECO) audits, writing of ECO reports, and assisting with public participation processes.

Consultant	Royal HaskoningDHV	Royal HaskoningDHV	Royal HaskoningDHV
	Rand Water Pipeline projects, numerous Eskom Research, Generation, Transmission and Distribution projects, SANRAL road developments as well as undertook Independent Reviews of the EIA process for the National Department of Environmental Affairs, etc. to name but a few.	experience and skills relating to catchment management planning, hydro-ecological risk assessment, water resource regulations and water resources strategies	

CVs of the Environmental Team are provided in **Appendix A**.

2 SITE DESCRIPTION

2.1 Site Description and Ownership

The study area is almost exclusively rural in nature, with no large towns or urban centres occurring close to the section of the South Africa-Mozambique border under consideration. The Phase 1 section spans two protected areas – the iSimangaliso Wetland Park in the east along the Indian Ocean Coastline, and the Tembe Elephant Park, which are highly natural in character with no human habitation. The remainder of the study area is predominantly tribal (communal) land and is managed by the Ingonyama Trust Board (ITB). Areas of human habitation take the form of scattered individual homesteads, but are all located away from the border line and no such homesteads occur within the corridor.

For most of its length, the corridor currently consists of an existing fence (approximately 1.5m high) and a sandy track running parallel to the fence, with the remainder of the corridor comprising of the natural vegetation. The only change in the natural vegetation occurs in limited areas located to the west of the Farazela Border Post where forestry plantations (Eucalyptus) have been established. The natural vegetation varies in composition and structure along the Phase 1 alignment. Dense coastal forest with a closed canopy is located on the primary dune situated immediately to the west of the Indian Ocean. The section of the alignment closer to the coast (around the Farazela Border Post) is largely comprised of grassland interspersed with bush / forest patches, with certain wetlands being covered in Swamp Forest (characterised by large mature trees with a closed canopy). Closer to the Tembe Elephant Park, and in large parts of Tembe itself, the natural vegetation is characterised by dense bush and thicket (sand forest). The sand forest is interspersed with more open grassy woodland in places. The sand forest extends west of Tembe till the western extent of the Phase 1 alignment to the Phongolo River floodplain.

In certain sections of the corridor located between the Farazela (Kosi Bay) Border Post and Tembe, an approximately 2.5m high single strand electric strand (fence) has been erected on the southern side of the border patrol track by eZemvelo KZN Wildlife (EKZNW) to prevent elephants from Mozambique from crossing into South Africa. Within the Tembe Elephant Park the reserve fence and track are located immediately to the south of the existing border fence and patrol track. The only section of the Phase 1 alignment where no fence along the border currently exists is at Lake kuZilonde (a freshwater coastal lake) where no fence or track exists through the open water and adjacent wetland (swamp).

2.2 Co-ordinates

Table 4: Co-ordinates of the Corridor

	Latitude	Longitude
Eastern extent of Corridor (high water mark of the Indian Ocean)	26°51'30.61"S	32°53'27.65"E
	26°51'30.70"S	32°53'16.42"E
	26°51'37.92"S	32°52'40.22"E
	26° 51' 51.70"S	32° 51' 31.47"E
	26° 51' 52.06"S	32° 51' 7.62"E
	26° 51' 52.55"S	32° 50' 16.23"E
	26° 51' 53.04"S	32° 47' 57.48"E
	26° 51' 54.69"S	32° 49' 49.94"E

	Latitude	Longitude
	26° 51' 54.68"S	32° 49' 44.85"E
	26° 51' 51.93"S	32° 45' 44.17"E
	26°51'56.83"S	32°35'42.05"E
	26°52'4.55"S	32°35'41.70"E
	26°52'3.91"S	32°35'20.53"E
	26°51'56.33"S	32°35'23.06"E
	26° 51' 59.12"S	32° 44' 31.41"E
	26° 52' 6.44"S	32° 42' 1.98"E
	26° 52' 8.36"S	32° 43' 46.98"E
	26° 52' 9.74"S	32° 43' 29.99"E
	26° 52' 5.24"S	32° 43' 31.79"E
	26° 52' 6.44"S	32° 42' 1.98"E
	26° 52' 2.61"S	32°38' 57.36"E
	26° 52' 0.47"S	32° 36' 21.36"E
	26° 52' 0.33"S	32° 36' 15.30"E
	26° 51' 56.92"S	32° 35' 41.73"E
	26° 51' 54.92"S	32° 21' 58.30"E
	26° 51' 54.88"S	32° 21' 54.43"E
	26° 51' 53.51"S	32° 24' 17.07"E
	26° 51' 52.53"S	32° 22' 33.60"E
Western extent of corridor (Phongolo River floodplain and eastern boundary of Ndumo Game Reserve)	26° 51' 51.90"S	32° 20' 50.06"E

Table 5: Co-ordinates of the Construction Camp

	Latitude	Longitude
North-western corner of the Site	26°52'2.03"S	32°49'45.10"E
North-eastern corner of the Site	26°52'2.30"S	32°49'51.40"E
South-eastern corner of the Site	26°52'11.72"S	32°49'51.37"E
South-western corner of the Site	26°52'10.93"S	32°49'42.27"E
Point on western site boundary	26°52'8.88"S	32°49'43.50"E
Point on western site boundary	26°52'5.41"S	32°49'44.67"E

Table 6: Co-ordinates of the Access Road to Muzi Camp (that is proposed to be upgraded)

	Latitude	Longitude
Southern end of road	26°52'37.04"S	32°36'8.61"E
	26°52'30.50"S	32°36'3.56"E
	26°52'27.08"S	32°36'0.52"E
	26°52'21.82"S	32°35'52.95"E
	26°52'11.45"S	32°35'35.73"E
Northern end of Road	26°52'4.89"S	32°35'32.39"E

2.3 Description of the Sensitive Environments

2.3.1 Surface Water / Freshwater

The Phase 1 alignment is almost completely contained within one quaternary catchment – W70A. This quaternary catchment is very large in spatial extent, primarily due to the absence of large rivers within the Maputaland Coastal Plain, in the far north-eastern part of KwaZulu-Natal, which it occupies. A small part of the far western part of the alignment falls within the W45B quaternary catchment. This catchment comprises the lower most reach of the Phongolo River within South Africa, and encompasses the extensive floodplain formed by this river that falls within the Ndumo Game Reserve.

Wetlands are not evenly distributed across the W70A catchment and parts of this catchment have a very low density of wetlands, as evidence by the very low overall drainage density within the wider catchment, in particular the western part of the quaternary catchment comprising of the Tembe Elephant Park and the corridor west of the Park to Ndumo. The section of the catchment from the primary dunes near the Indian Ocean to the eastern boundary of the Tembe Elephant Park is conversely characterised by a high number of wetlands, and importantly a number of wetlands of very wide extent (thus collectively comprising a very large area of wetland habitat).

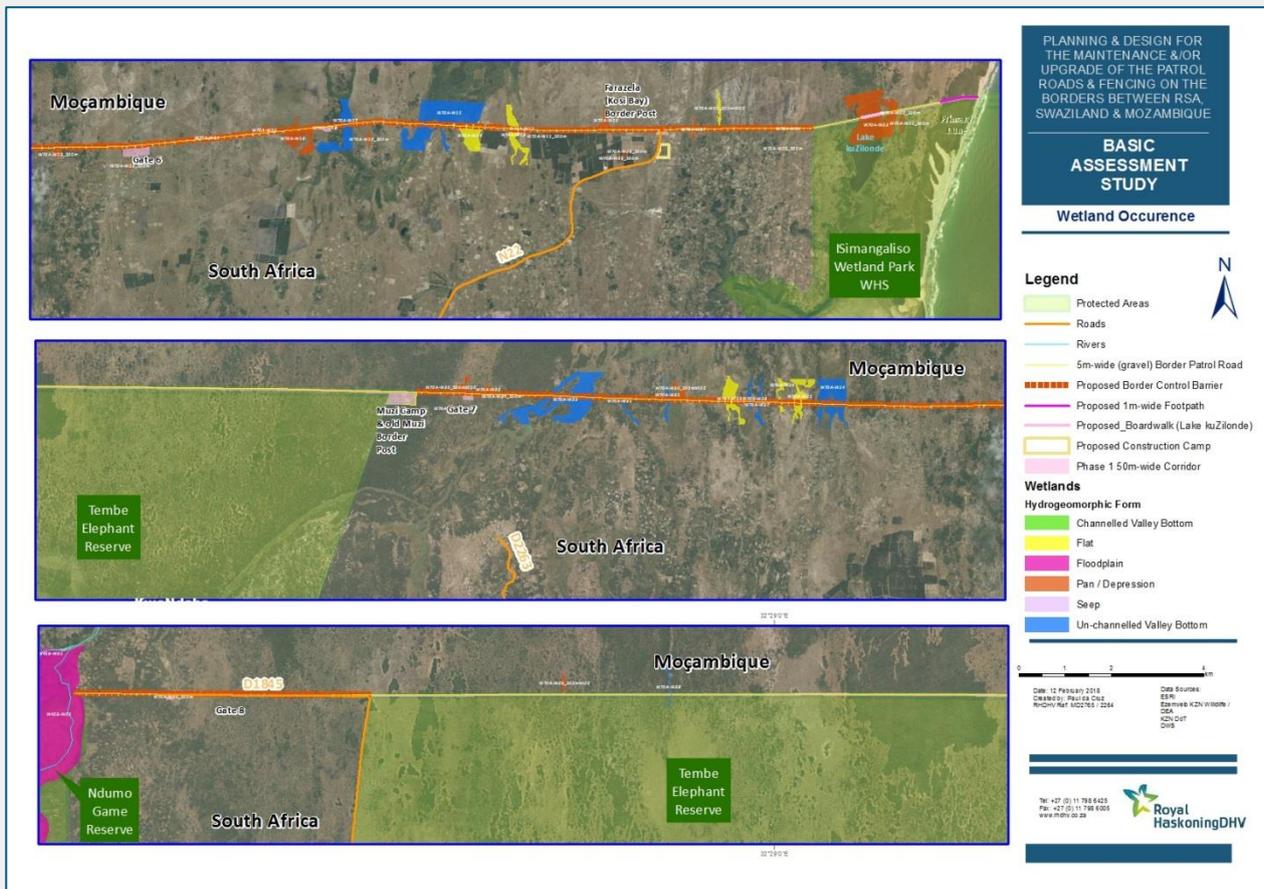


Figure 5: Wetland Occurrence within the Phase 1 Study Area

Many of the un-channelled valley bottom wetlands along the Phase 1 alignment are wide in lateral extent, and are vegetatively diverse. The flat terrain setting of the area that is characterised by a low drainage network density facilitates the development of pans / depressions which are endorheic (inwardly draining), typically with no surface linkage to the surrounding drainage system. Such HGM wetland units primarily occur closer to the Farazela area and closer to the Indian Ocean. The large coastal lake - Lake kuZilonde, and a small number of depressions located at the foot of the primary dune system running parallel to the Indian Ocean (dune slacks) have been included in this HGM category. A number of wetland flats are located in the area west of Farazela, but differ from pan / depression wetlands in that they are not surrounded by closed elevation contours.

A number of wetlands in the coastal plain are unique in a study area context in that they contain Swamp Forest. Swamp Forest is characterised by dominance of mature trees forming a closed canopy within the HGM setting of un-channelled valley bottoms and coastal lakes (pan / depression) wetlands. The uniqueness of the swamp forest vegetation has allowed the wetlands units that predominantly contain swamp forest to be classified as a separate wetland vegetation community - *Maputaland Coastal Plain - Mixed swamp forest & peripheral hygrophilous grass & sedge marshland*. Swamp Forest is listed as a threatened (terrestrial) vegetation type and swamp forest wetlands that are in a good state are highly sensitive.

The coastal lake, Lake kuZilonde, is also unique in a study area context in that it is the only natural permanently inundated lake / pan wetland unit. This lake is also characterised by a lateral distribution of vegetation sub-communities with the wetland unit. The central part of the wetland unit is characterised by open water containing aquatic (submerged) plant species on its margins. Beyond the margins of the lake a band of swamp forest occurs, which on the eastern side of the lake borders a wide *Cyperus papyrus* swamp. The lake and associated wetland habitat is located within a protected area and is highly natural, and thus is a highly sensitive wetland habitat.

The Phongolo River floodplain is the most prominent wetland feature of the lower-lying parts of the KZN-Mozambique Border that are located between the coastal plain and the higher-lying hilly ground situated to the west. This floodplain (located within the Ndumo Game Reserve) is characterised by extensive floodplain wetland communities and extensive reedbeds. This floodplain is highly sensitive as it has been designated as a Ramsar Wetland of International Importance.

2.3.2 Terrestrial Biodiversity

The study area falls within a very important area in a biodiversity management and conservation context. The entire Phase 1 alignment falls within the Maputaland Centre of Endemism (MCE). The MCE falls within southern Mozambique, north-eastern South Africa and western Swaziland and covers an area of approximately 17 000 km² (Smith *et al*, 2008). Its conservation importance is globally recognised, as it forms part of the Maputaland–Pondoland–Albany biodiversity hotspot and contains the iSimangaliso Wetland Park World Heritage Site, five Ramsar sites and ten Important Bird Areas (IBAs).

The geology and rainfall patterns of Maputaland combine to play a major role in determining biodiversity levels within the region, with spatial change in rainfall and substrate creating distinct ecological heterogeneity (Smith and Leader-Williams, 2006).

This floral diversity in the study area is reflected in the relatively large number of vegetation types that are encountered along the alignment of the section of the wall under consideration, and in the wider area. This floral diversity is enhanced by the occurrence of vegetation types from numerous biomes, including grassland, savanna and forest biomes. In addition a number of azonal vegetation types related to the extensive presence of water surface in the study area are present. A number of these vegetation types / ecosystems have been assessed to be threatened, in terms of the NBA, 2011.

A number of sensitive and threatened faunal species occur in the area. The designation of CBAs under the KwaZulu-Natal Systematic Conservation Plan partially reflects the presence of, and suitable habitat for a number of such sensitive or threatened faunal species. The presence of large areas of land that are conserved within PAs in the northern part of the South African component of Maputaland is significant for the conservation of such species.

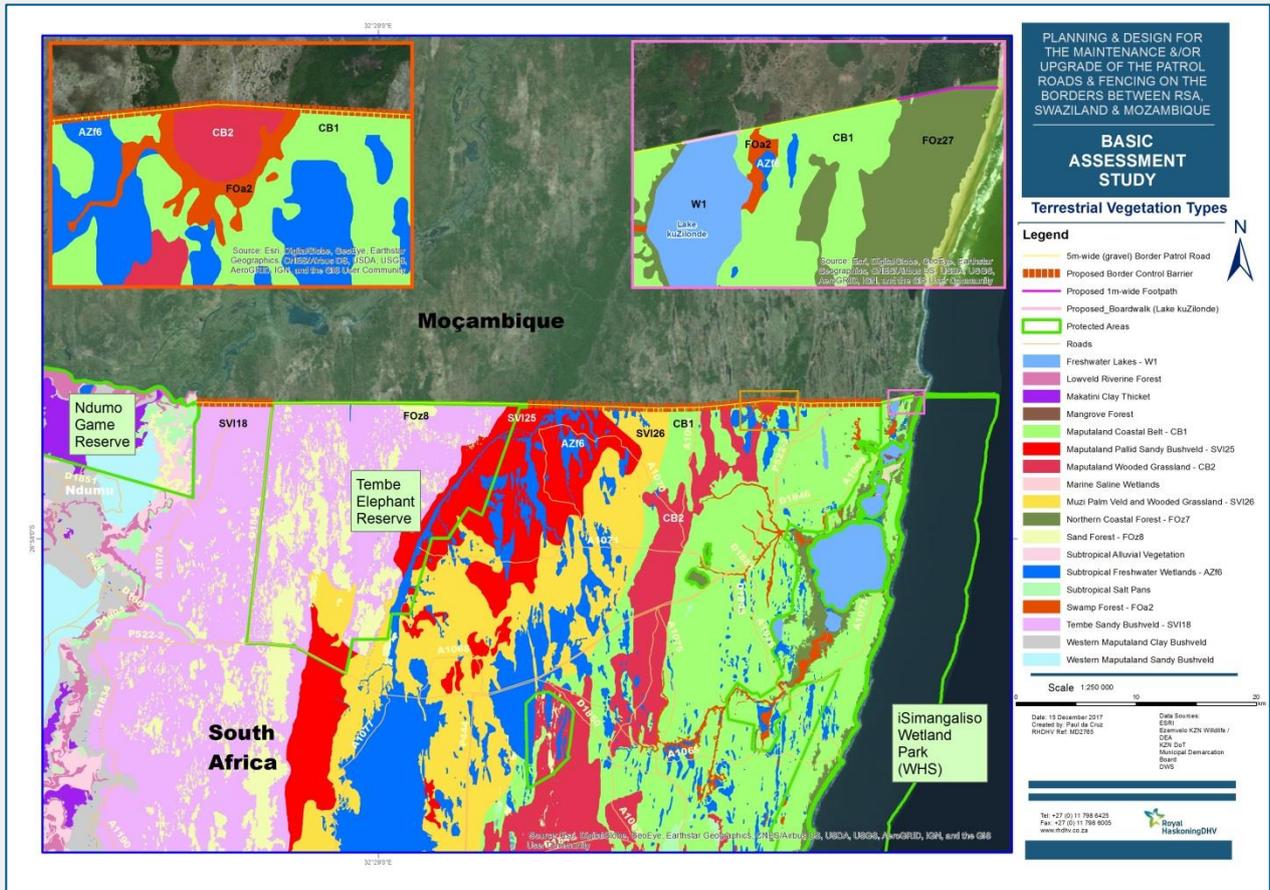


Figure 6: Terrestrial Vegetation Types within the Study Area

Protected Areas

Provincial Nature Reserves

A number of formally protected areas are located in the study area, and are important in the context of the potential environmental impacts of the proposed project.

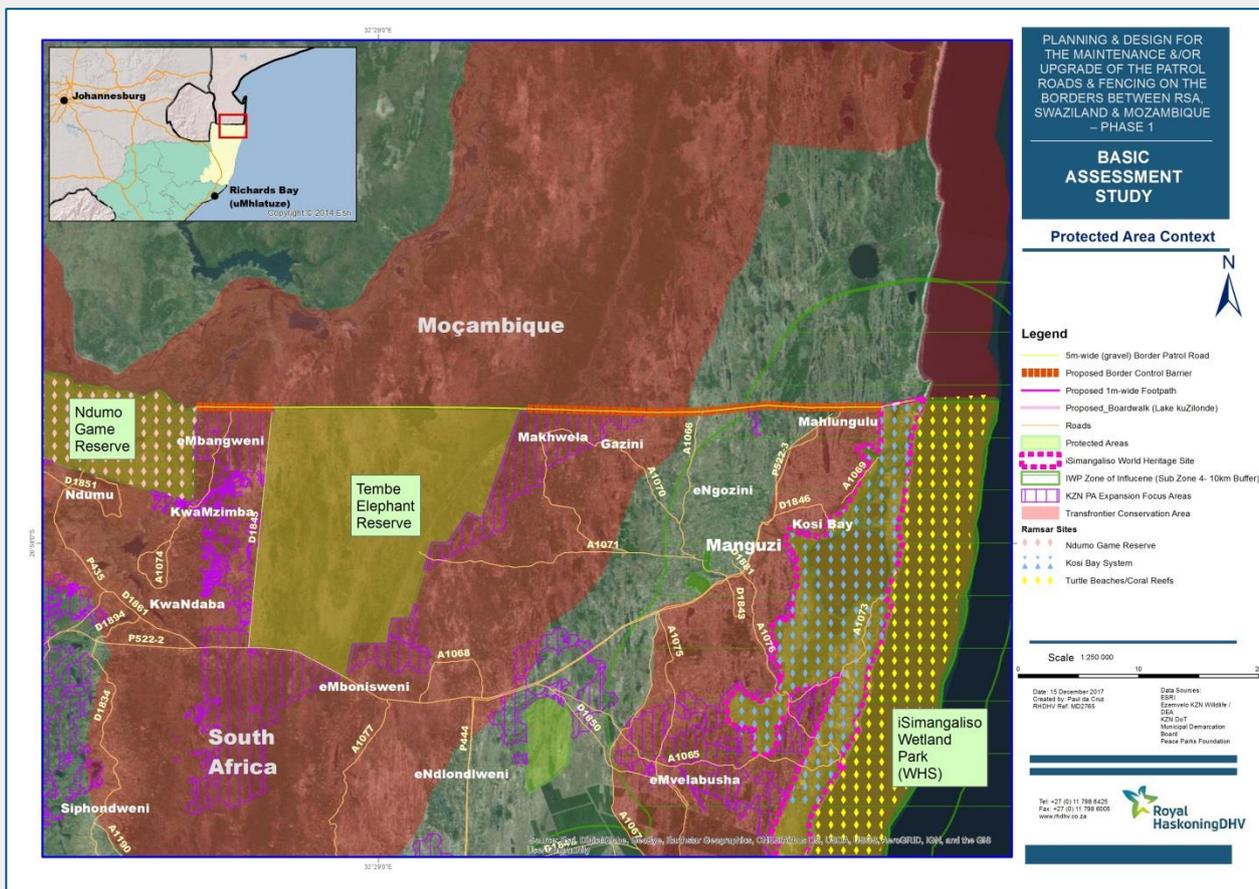


Figure 7: Protected Areas within the Study Area

World Heritage Sites

The iSimangaliso Wetland Park and World Heritage Site's northern boundary is located along the eastern-most part of the South Africa-Mozambique international border and encompasses the eastern-most section of the Phase 1 alignment (Figure 7).

Ramsar Sites

Ramsar sites are present in the wider study area and need to be considered as part of the assessment (Figure 7).

Other (Informal) Protected Areas & Protected Area Expansion Focus Areas

A number of other informal protected types exist in KwaZulu-Natal, including Community Conservation Areas, eZemvelo KZN Stewardship Sites and Natural Heritage Sites, however none of these conserved areas occur along the international boundary, and would not be affected by the proposed development.

Transfrontier Conservation Areas

A Transfrontier Conservation Area (TFCA) was established in 2000 by the governments of South Africa, Swaziland and Mozambique through the signing of a four protocols to establish the Lubombo Transfrontier Conservation and Resource Area¹. The detailed protocol signed by the Ministers includes an extensive list of objectives as well as clear undertakings by the parties, and establishes a TFCA Conservation and Resource Area Commission. Four specific areas targeted in the original protocol were listed as:

- The Lubombo Ponto do Ouro-Kosi Bay marine and coastal area on the Mozambique-South African borders.
- The Ndumo-Tembe-Futi elephant reserves on the border of Mozambique.
- The Nsubane-Pongolo (Jozini) area on the border with Swaziland.
- The Lubombo Conservancy-Hlane-Mlawula/Goba area on the border of Mozambique and Swaziland.

The first two areas are relevant to the current proposed project, as they traverse sections of the international border along which the Phase 1 alignment is proposed.

KwaZulu-Natal Biodiversity Sector Plan 2014

The Kwazulu-Natal Biodiversity Sector Plan (KZN BSP) has been produced to designate areas of both terrestrial and freshwater sensitivity in the province. The key purpose of this BSP is to assist and guide land use planners and managers within various district and local municipalities, to account for biodiversity conservation priorities in all land use planning and management decisions, thereby promoting sustainable development and the protection of biodiversity, and in turn the protection of ecological infrastructure and associated ecosystem services. The plan has identified key areas for the preservation of biodiversity within the province and as such Critical Biodiversity Areas (CBAs), as well as Ecological Support Areas (ESAs). The KZN BSP was interrogated and a number of parcels of land along the proposed alignment have been designated as **Critical Biodiversity Areas (CBAs)**. (Refer to Figure 8).

¹ https://www.environment.gov.za/legislation/international_agreements/agreement_lubombo_transfrontier_conservationareas

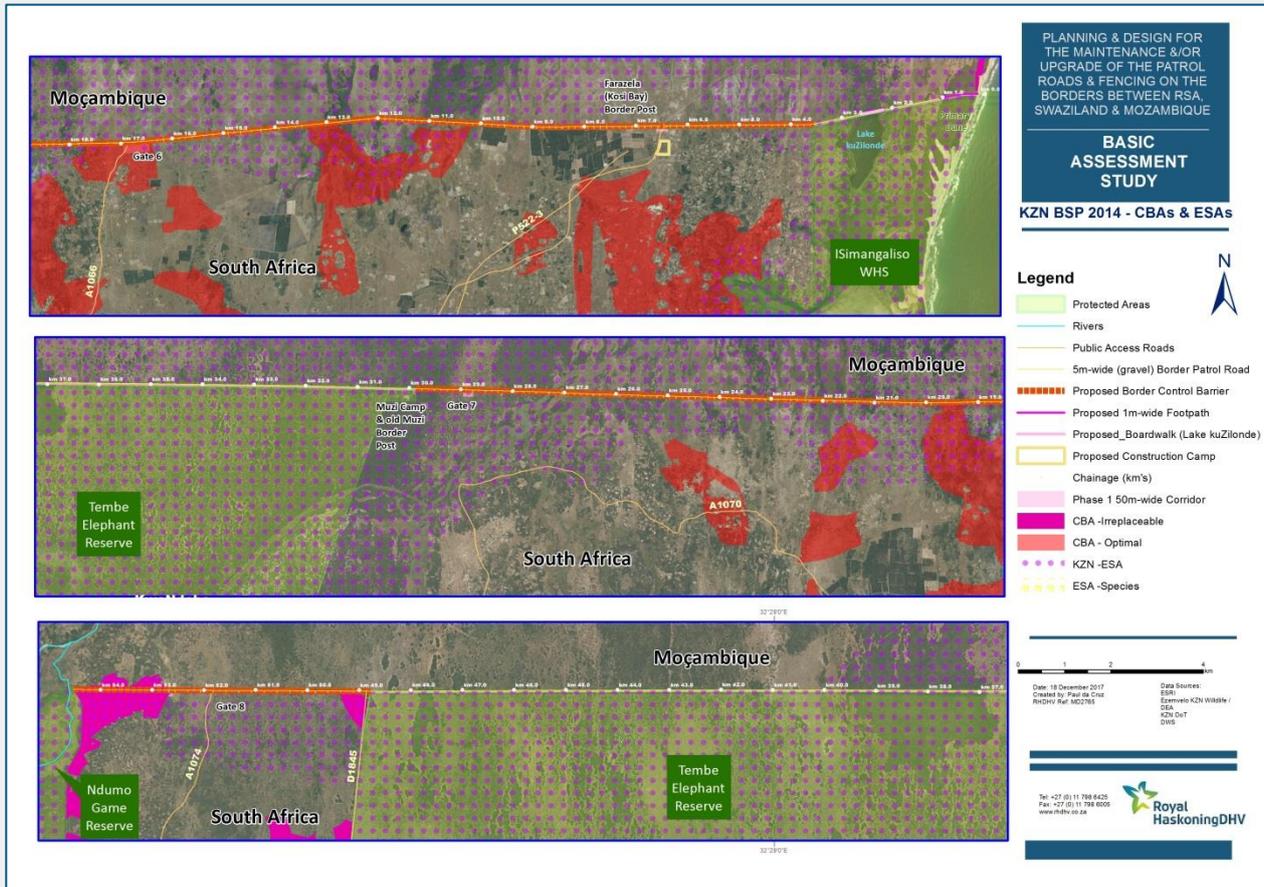


Figure 8: KZN BSP – Critical Biodiversity Areas and Ecological Support Areas

Terrestrial Vegetation Type Ecological Condition and EIS

Comparatively low levels of degradation of the vegetation/habitat within much of the Phase 1 alignment are linked with:

- (i) the numerous protected areas where vegetation types are formally protected (including ISimangaliso WP and Tembe EP,
- (ii) limited agricultural practises along the border within the coastal plain (i.e. along the Phase 1 alignment, and
- (iii) limited number of human settlements along the border.

It should be noted that the findings of the vegetation impact assessment conducted on the primary dune at Kosi Bay noted that the vegetation on the primary dune, primarily Northern Coastal Forest (FOz 7) was untransformed and in a pristine state. The dune forest on the primary dune is thus considered highly sensitive.

Ecological Importance and Ecological Sensitivity (EIS) of the terrestrial vegetation communities and habitats supporting flora/fauna was qualitatively assessed as part of the biodiversity specialist study. Of the vegetation types in the Phase 1 study area falling into the moderate to high EIS value classes two forest vegetation types – KwaZulu-Natal Coastal Forests: Maputaland Moist Coastal Lowlands Forest and KwaZulu-Natal Dune Forests: Maputaland Dune Forest – were assigned High or Moderately High EIS scores. A majority of the area covered by the Maputaland Coastal Belt and the entirety of the Maputaland Wooded Grassland have been assigned a Moderately High EIS score. The remainder of the dominant

vegetation types in the area have been assigned moderate or moderately low EIS scores. These terrestrial vegetation types are considered highly sensitive.

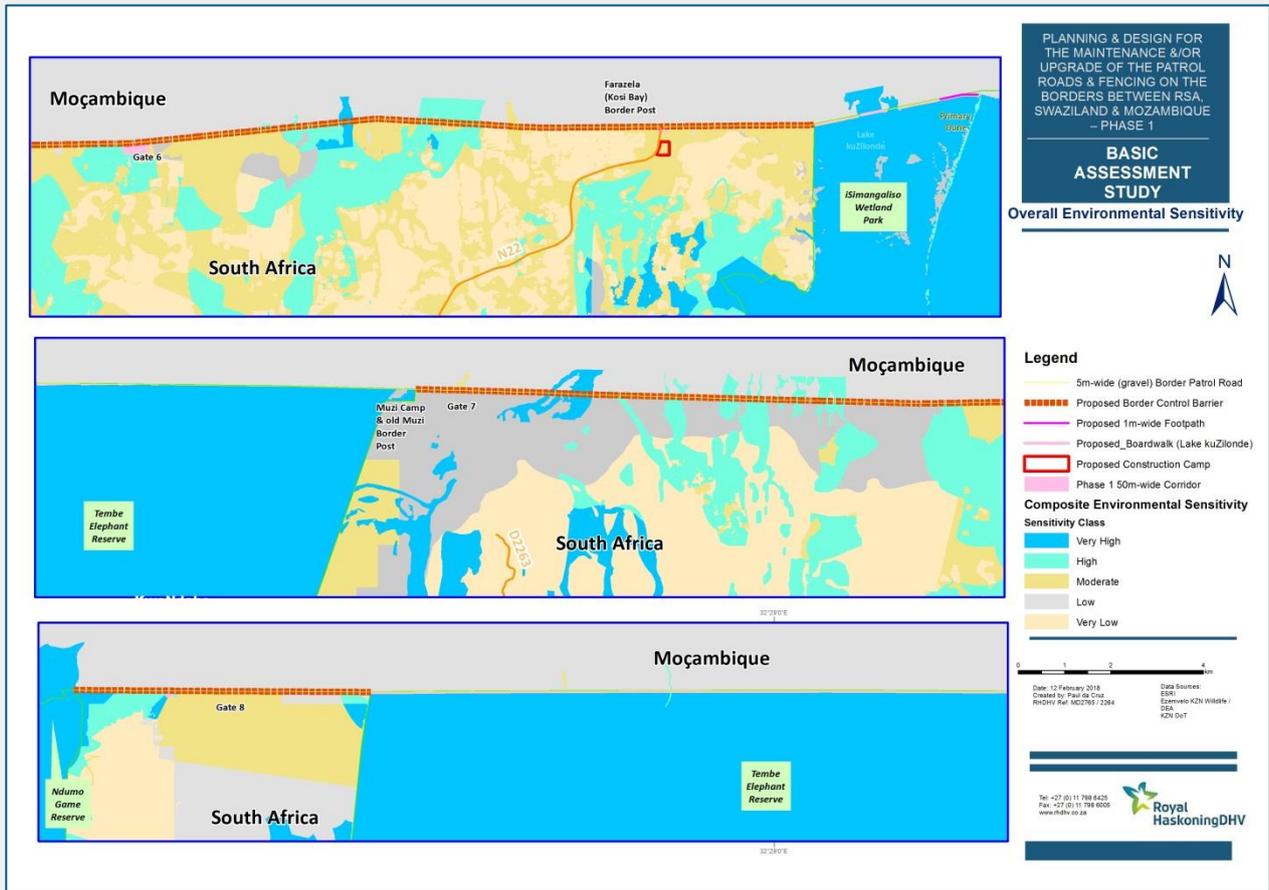


Figure 9: Overall Environmental Sensitivity in the Study Area

3 LEGAL FRAMEWORK

3.1 Legal Framework

3.1.1 EIA Regulations (2014 as amended in 2017)

The potential environmental impacts associated with this proposed project are required to be considered in compliance with (EIA) Regulations (2014 as amended in 2017) made under Section 24(5) of the National Environmental Management Act (Act No. 107 of 1998) (as amended).

The first facet of the advisory process as provided by Royal HaskoningDHV was to determine whether the activity under consideration triggered an environmental legislation specific permitting process. In this regard, an Environmental Screening exercise was undertaken to determine (a) whether the proposal requires an environmental assessment and authorisation by a Competent Authority; and (b) the level of the environmental assessment required.

The competent authority, the Department of Environmental Affairs (DEA), is required to provide an EA (whether positive or negative) for the project. The DEA was consulted from the outset of this study, and has been engaged throughout the project process.

Table 7: Key legislation considered

Acts	Objectives, important aspects, associated notices and regulations
National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended	<p>Objectives: To provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state.</p> <p>Relevant Notices and Regulations:</p> <ul style="list-style-type: none"> • Environmental Impact Assessment Regulations, 2014 (GNR 982 in GG 382 of 4 December 2014 as amended in 2017) • Listing Notice 1 (GNR 983 in GG 38282 of 4 December 2014 as amended in 2017) • Listing Notice 2 (GNR 984 in GG 38282 of 4 December 2014 as amended in 2017) • Listing Notice 3 (GN R984 in GG 38282 of 4 December 2014 as amended in 2017) <p>Relevance to the proposed project:</p> <ul style="list-style-type: none"> • Development must be socially, environmentally and economically sustainable. • Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated; the social, economic and environmental impacts of activities including disadvantages and benefits, must be considered, assessed and evaluated and decisions must be appropriate in the light of such consideration. • 'Polluter Pays' principle.

Acts	Objectives, important aspects, associated notices and regulations
	<ul style="list-style-type: none"> Any activity that is proposed and which is listed in the NEMA EIA Regulations requires environmental authorisation. <p>Listed Activity/ies & Applicability:</p> <p>Listing Notice 1</p> <p>Activity 12 - The development of -</p> <ul style="list-style-type: none"> (iii) bridges exceeding 100 m² in size; (vi) bulk storm water outlet structures exceeding 100 m² in size; (xii) infrastructure or structures with a physical footprint of 100 m² or more; <p>where such development occurs—</p> <ul style="list-style-type: none"> a) within a watercourse <p>This activity will be triggered as the proposed infrastructure will be constructed within (across) numerous watercourses (wetlands) and will have physical footprints of >100m².</p> <p>Activity 15 – The development of structures in the coastal public property where the development footprint is bigger than 50 square metres</p> <p>This activity will be triggered as the proposed border fence is proposed to be extended to the high water mark of the Indian Ocean and thus into the coastal public property.</p> <p>Activity 17 – Development—</p> <ul style="list-style-type: none"> i) in the sea; ii) within the littoral active zone; v) if no development setback exists, within a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever is the greater; <p>in respect of—</p> <ul style="list-style-type: none"> (f) infrastructure or structures with a development footprint of 50 square metres or more <p>This activity will be triggered as the proposed border fence is proposed to be extended to the high water mark of the Indian Ocean. The proposed fence and footpath will be developed within 100m inland of the high-water mark and is likely to have a combined footprint of 50 square metres or more.</p> <p>Activity 19 – The infilling or depositing of any material of more than 10 m³ into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 m³ from a watercourse.</p> <p>This activity will apply as the proposed infrastructure will be constructed within a number of watercourses (wetlands) and will thus constitute infilling or depositing of material of more than 10m³ as well as the excavation, removal or moving of soil, sand or rock of more than 10m³ from / into these wetlands.</p> <p>Activity 19A – The infilling or depositing of any material of more than 5m³ into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 m³ from the seashore.</p>

Acts	Objectives, important aspects, associated notices and regulations
	<p>This activity will apply as the proposed infrastructure (fence) will be constructed within the seashore (to the high water mark) and will thus require infilling or depositing of material of more than 5m³ or the dredging, excavation, removal or moving of soil, sand or rock of more than 5m³ from / into the seashore.</p> <p>Activity 27 - The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for—</p> <ul style="list-style-type: none"> (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan. <p>This activity will apply as a construction camp of approximately 5ha in size is planned to be developed as part of the proposed development that will result in the clearing of an area of >1ha of indigenous vegetation.</p> <p>Activity 48 - The expansion of—</p> <ul style="list-style-type: none"> i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; <p>where such expansion [or expansion and related operation] occurs—</p> <ul style="list-style-type: none"> (a) within a watercourse; (c) if no development setback exists, within 32m of a watercourse, measured from the edge of a watercourse. <p>This listed activity will apply as existing culvert structures and the existing border patrol road structure may be expanded within wetlands which are crossed.</p> <p>Listing Notice 3</p> <p>Activity 4 - The development of a road wider than 4 metres with a reserve less than 13,5 metres within:</p> <ul style="list-style-type: none"> ii. Trans- frontier protected areas managed under international conventions; v. World Heritage Sites; vi. A protected area identified in terms of NEMPAA; vii. Sites or areas identified in terms of an international convention; viii. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; x. Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; xi. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;

Acts	Objectives, important aspects, associated notices and regulations
	<p>xii .Outside urban areas: (aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any terrestrial protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve; or</p> <p>This listed activity will apply as it is likely that a new 5.5.m wide border patrol road will be developed along most of the length of the section of the border under consideration. All of the above sensitive areas are traversed and this listed activity would thus apply.</p> <p>Activity 12 - The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan within the following sensitive areas</p> <p>d) in KwaZulu-Natal:</p> <ul style="list-style-type: none"> i. Trans-frontier protected areas managed under international conventions; iv. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; v. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; vi. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas; vii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; viii. A protected area identified in terms of NEMPAA, excluding conservancies; ix. World Heritage Sites; x. Sites or areas identified in terms of an international convention; xi. Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; <p>This listed activity will apply as it is highly likely that this threshold will be exceeded due to the removal of indigenous vegetation associated with the development of the proposed infrastructure within all of the above sensitive areas.</p> <p>Activity 14 – The development of infrastructure or structures with a physical footprint of 10 square metres or more where such development occurs (a) within a watercourse within the following sensitive areas in KwaZulu-Natal:</p> <ul style="list-style-type: none"> iv. A protected area identified in terms of NEMPAA, excluding conservancies;

Acts	Objectives, important aspects, associated notices and regulations
	<p>v. World Heritage Sites;</p> <p>vii. Critical biodiversity areas or ecological support areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</p> <p>viii. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</p> <p>x. Outside urban areas:</p> <p>(aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEM:PAA or from the core area of a biosphere reserve</p> <p>This listed activity will apply as the proposed infrastructure will be constructed within and across numerous watercourses (wetlands) and structures exceeding the threshold will be constructed within watercourses that occur within sensitive areas identified.</p> <p>Activity 18 - The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre within the following sensitive areas in KwaZulu-Natal:</p> <p>i. Trans-frontier protected areas managed under international conventions;</p> <p>World Heritage Sites;</p> <p>vi. A protected area identified in terms of NEMPAA;</p> <p>viii. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</p> <p>x. Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose;</p> <p>xii. Outside urban areas:</p> <p>(aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any terrestrial protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve</p> <p>This listed activity will apply due to the existing border patrol road potentially being widened by more than 4m in the sensitive areas identified as part of the development of infrastructure.</p> <p>Activity 23 - The expansion of—</p> <p>(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;</p> <p>where such expansion occurs—</p> <p>(a) within a watercourse in the following sensitive areas within KZN:</p> <p>iv. A protected area identified in terms of NEMPAA, excluding conservancies;</p> <p>v. World Heritage Sites;</p> <p>vii. Critical biodiversity areas or ecological support areas as identified in</p>

Acts	Objectives, important aspects, associated notices and regulations
	<p>systematic biodiversity plans adopted by the competent authority or in bioregional plans;</p> <p>viii. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</p> <p>Outside urban areas:</p> <p>(aa) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any terrestrial protected area identified in terms of NEMPAA or from the core area of a biosphere reserve</p> <p>This listed activity will apply due to existing culvert structures potentially being expanded within wetlands which are crossed within the sensitive areas identified, as part of the development of infrastructure.</p>
<p>National Water Act (Act No. 36 of 1998) (as amended)</p>	<p>Objectives: The National Water Act (NWA) is a legal framework for the effective and sustainable management of water resources in South Africa. Central to the NWA is recognition that water is a scarce resource in the country which belongs to all the people of South Africa and needs to be managed in a sustainable manner to benefit all members of society. The NWA places a strong emphasis on the protection of water resources in South Africa, especially against its exploitation, and the insurance that there is water for social and economic development in the country for present and future generations.</p> <p>Relevance to the proposed project:</p> <ul style="list-style-type: none"> • Sustainable protection, use, development and conservation of water resources – including aquatic ecosystems. • Defines 11 water uses and provides licencing procedures. <p>Notices and Regulations:</p> <ul style="list-style-type: none"> • General Authorisation in terms of Section 39 of the National Water Act (Act No. 36 of 1998, Water Uses Section 21 (c) and (i) (GN in GG 40229 of 26 August 2016). <p>Water uses triggered: As the proposed development involves the crossing of numerous wetlands , a Water Use Authorisation is required in terms of Section 21 (c) and (i) of the NWA:</p> <ul style="list-style-type: none"> • Section 21(c) - impeding or diverting the flow of water in a watercourse (applicable for the construction within watercourses); and • Section 21 (i) - altering the bed, banks, course or characteristics of a watercourse (applicable for the construction within watercourses).

3.1.2 National Water Act (Act No. 36 of 1998)

The National Water Act (NWA) is a legal framework for the effective and sustainable management of water resources in South Africa. Central to the NWA is recognition that water is a scarce resource in the country which belongs to all the people of South Africa and needs to be managed in a sustainable manner to benefit all members of society. The NWA places a strong emphasis on the protection of water resources in South Africa, especially against its exploitation, and the insurance that there is water for social and economic development in the country for present and future generations.

As the proposed development involves the crossing of numerous wetlands, a Water Use Authorisation is required in terms of Section 21 (c) and (i) of the NWA:

- Section 21(c) - impeding or diverting the flow of water in a watercourse (applicable for the construction within watercourses); and
- Section 21 (i) - altering the bed, banks, course or characteristics of a watercourse (applicable for the construction within watercourses).

3.1.3 Other Relevant Acts, Guidelines, Department Policies and Environmental Management Instruments

Table 8: Legislative Requirements²

Acts/Guideline/Policies/Environmental Management Instruments	Considerations
The Constitution (No. 108 of 1996)	Chapter 2 – Bill of Rights Section 24 – Environmental Rights
KZN Nature Conservation Ordinance (Ordinance No. 15 of 1974)	Protected indigenous plants in general are controlled under the relevant provincial Ordinances or Acts dealing with nature conservation. In KwaZulu-Natal the relevant statute is the 1974 Provincial Nature Conservation Ordinance. In terms of this Ordinance, a permit must be obtained from <i>eZemvelo</i> KZN Wildlife to remove or destroy any plants listed in the Ordinance.
National Forests Act (Act No. 84 of 1998)	Certain tree species were observed within the study area that are protected under the NFA of 1998, which will require a permit from DAFF should the trees need to be removed for the construction of any infrastructure.
National Environmental Management Biodiversity Act (Act No. 10 of 2004) and Regulations: <ul style="list-style-type: none"> • Threatened or protected species (GN 388) • Lists of species that are threatened or protected (GN 389) • Alien and invasive species 	Provide for the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources. Three terrestrial ecosystems located within the study area have been listed as threatened under the National Biodiversity Assessment (2011).

² It is noted that the legal framework provided in this document relates to the most recent legislation at the time of compiling this document. It is noted that legislation changes continuously and it is the Developer's responsibility to ensure that they are compliant with the most relevant legislation at any given time.

Acts/Guideline/Policies/Environmental Management Instruments	Considerations
regulations (GNR 506) <ul style="list-style-type: none"> • Publication of exempted alien species (GNR 509) • Publication of National list of invasive species (GNR 507) • Publication of prohibited alien species (GNR 508) 	
National Environmental Management: Protected Areas Act (Act No. 57 of 2003) - NEMPAA	Creates a legal framework and management system for all protected areas in South Africa as well as establishing the South African National Parks (SANParks) as a statutory board. Each conservation area will have its own set of land use restrictions or regulations that stem either from generic restrictions under NEM:PAA, or customized regulations for individual protected areas.
National Environmental Management: Waste Act (Act No. 59 of 2008)(as amended)	Section 17 - Every attempt must be made to reduce, recycle or re-use all waste before it is disposed. Section 25 - All waste (general and hazardous) generated during construction may only be disposed of at appropriately licenced waste disposal sites.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	Section 32 - Control of dust. Section 34 - Control of noise. Section 35 - Control of offensive odours.
National Environmental Management: Integrated Coastal Management Amendment Act, 2008 (Act No. 24 of 2008)(as amended)	The Act establishes a system of integrated coastal and estuarine to promote the conservation of the coastal environment, and maintain the natural attributes of coastal landscapes and seascapes. The Act defines the coastal public property and sets out the use and management of the coastal protection zone.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)(as amended)	Section 22 - Application for a mining permit / right. Section 39 - Environmental management programme and environmental management plan. <i>Material for construction will be obtained from commercial sources.</i>
National Heritage Resources Act (Act No. 25 of 1999)	Section 34 - No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority. Section 35 - No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site.

Acts/Guideline/Policies/Environmental Management Instruments	Considerations
	Section 36 - No person may, without a permit issued by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority. "Grave" is widely defined in the Act to include the contents, headstone or other marker of such a place, and any other structure on or associated with such place.
Occupational Health and Safety Act (Act No. 85 of 1993)	Section 8 - General duties of employers to their employees. Section 9 - General duties of employers and self-employed persons to persons other than their employees.
Construction Regulations (2014)	Contractors must comply with the Construction Regulations which lay out the framework for construction related activities.
National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998)	Chapter 4 – Veld Fire Prevention through firebreaks - places a duty on owners to prepare and maintain firebreaks. An owner whose land is subject to a risk of veld fire whose land or any part of it coincides with the border of the Republic, must prepare and maintain a firebreak on his or her land as close as possible to that border.
Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)	The objects of this Act are to provide for the conservation of the natural agricultural resources of the Republic by <ul style="list-style-type: none"> • the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or • destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants. Section 5 details measures for the prohibition of the spreading of weeds.
World Heritage Convention Act, 1999 (No, 49 of 1999)	The Act provides for the incorporation of the World Heritage Convention into South African law; the enforcement and implementation of the World Heritage Convention in South Africa; the recognition and establishment of World Heritage Sites.
Spatial Planning and Land Use Management Act, 2013; Act of 2013	The primary object of the Act is to provide for a uniform, effective and comprehensive system of spatial planning and land use management in South Africa that promotes social and economic inclusion. The Act sets out the spatial planning system in South Africa, including spatial development frameworks at varying levels of government in South Africa. SDFs interpret and

Acts/Guideline/Policies/Environmental Management Instruments	Considerations
	represent the spatial development vision of the responsible sphere of government / authority, guiding infrastructure development in a spatial context.
Lubombo Transfrontier Conservation Resource Area Protocol, 22 June, 2000	
By-laws	
Umkhanyakude District Municipality IDP (2016 – 2017)	
Umhlabuyalingana Local Municipality IDP review 2017/2018	
Umhlabuyalingana Local Municipality Spatial Development Framework (2017)	

3.1.4 Sustainable Development

The principle of Sustainable Development has been established in the Constitution of the Republic of South Africa (Act No. 108 of 1996) and given effect by NEMA. Section 1(29) of NEMA states that sustainable development means the integration of social, economic and environmental factors into the planning, implementation and decision-making process so as to ensure that development serves present and future generations.

Therefore, Sustainable Development requires that:

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- The disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
- Waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
- A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Negative impacts on the environment and on people's environmental rights be anticipated; and, prevented and where they cannot altogether be prevented, are minimised and remedied.

3.2 Applicable Documentation

The following environmental documentation is applicable for the project, and must be read in conjunction with this EMPr:

- Environmental Authorisation (EA) – *once issued*;
- Final Approved Consultation Basic Assessment Report for the project, including the specialist studies compiled for the Basic Assessment Study;
- Water Use Authorisation– *once issued*;
- eZemvelo KZN Wildlife Permits for the removal / relocation of indigenous plants – *once issued*;
- DAFF Protected Plant (Tree) Species Permits for the removal of protected tree species – *once issued*; and
- Stormwater Management Plan.

Once the relevant authorisations and / or permissions have been obtained, these must be kept on site.

4 ENVIRONMENTAL CODE OF CONDUCT

One of the objectives of the EMPr is to ensure that all the workforce, contractors, sub-contractors and construction staff have an understanding of environmental issues and potential impacts on-site activities. This environmental code of conduct provides the basic rules that must be strictly adhered to.

It is the responsibility of the Site Environmental Officer, the Environmental Officer and ECO (as appointed) to ensure that each contractor, sub-contractor and workforce understand and adhere to the Code of Conduct.

All persons are obliged to keep to the rules of this Code of Conduct

Ignorance, negligence, recklessness or a general lack of commitment resulting in environmental degradation or pollution must not be tolerated!

Environmental Rules

NB – The Contractor must erect a Site Notice Board that reflects the code of conduct/ environmental rules

- Do not waste electricity, water or consumables;
- Only use authorised accesses;
- Do not litter;
- Dispose solid waste to the correct waste containers provided;
- Prevent pollution;
- Use the toilet facilities provided;
- Do not dispose contaminated wastewater to the stormwater or the environment;
- Immediately report any spillage from containers, plant or vehicles;
- Do not burn or bury any waste in the sand;
- Do not trespass onto private properties;
- Strictly leave all animals alone. Never tease, catch or set devices to trap or kill any animal;
- Never damage or remove any trees, shrubs or branches unless it forms part of working instructions;
- Do not deface, draw or cut lettering or any other markings on trees, rocks or buildings in the area;
- Know the firefighting procedure and locations of firefighting equipment; and
- Know the environmental incident procedures.

5 MANAGEMENT AND MONITORING PROCEDURES

5.1 Organisational Structure and Responsibilities

The DPW is the Primary Developer for the Project. It is noted that KZN DoT and their respective professional project teams, will be responsible for construction of certain infrastructural components of the project – i.e. the border barrier control structure.

Each of the team roles are elaborated on in terms of their specific duties hereafter.

The following outlines the defined and specific roles and responsibilities of each team member:

Table 9: Roles and Responsibilities

ROLES AND RESPONSIBILITIES
DEVELOPER
<p>Note: The DPW and KZN DoT are collectively referred to as the ‘Developer’.</p> <p>The Developer is ultimately responsible for ensuring compliance with the environmental specification and upholding DPW’s / KZN DoT’s environmental commitment to 100% compliance with all National, Provincial and local legislation that relates to management of the environment.</p> <p>The Developer will:</p> <ul style="list-style-type: none"> ▪ Appoint a Project Manager (PM) to assume ultimate project responsibility; ▪ Appoint an Environmental Control Officer (ECO) to monitor environmental compliance according to the EA, Final Approved EMPr and all other relevant licences and permits; ▪ Be familiar with the contents of the EMPr; ▪ Ensure the EA, Final Approved EMPr and all other relevant licences and permits are in the tender documentation issued to prospective Contractors; ▪ Request for, review and approve the method statements prepared by the Contractor; ▪ Review and comment on environmental assessments and / or reports produced by the Contractor and ECO; ▪ Discuss with the ECO the application of penalties for the infringement of the Environmental Specifications, another possible enforcement measures necessary; ▪ Issue penalties as and when necessary based on the recommendation of the ECO; ▪ Arrange information meetings for or consult with I&APs about the impending construction activities; ▪ May on the recommendation of the Engineer and / or ECO order the Contractor to suspend any or all works on-site if the Contractor or his sub-contractor / supplier fails to comply with the said environmental specifications for the project; ▪ Ensure the EMPr is implemented as well as revised and updated as and when required.
ENGINEER (Client / Developer’s Representative on-site)
<p>The Engineer will:</p> <ul style="list-style-type: none"> ▪ Enforce the environmental specification on site; ▪ Be familiar with the contents of the EMPr; ▪ Ensure the EA, Final Approved EMPr and all other relevant licences and permits are in the tender documentation issued to prospective Contractors;; ▪ Request for, review and approve the method statements prepared by the Contractor; ▪ Review and comment on environmental assessments and / or reports produced by the Contractor and ECO;

ROLES AND RESPONSIBILITIES

- Undertake regular site visits and ensure environmental specifications are implemented;
- Assess the Contractor's environmental performance in consultation with the ECO from which a brief monthly statement of environmental performance is drawn up for record purposes and to be reported on within project meetings; and
- Undertake a Pre-construction survey of the site - entire works area - and all support infrastructure (such as site construction camps) etc. This must include a complete photographic record and may also include video recordings.

ROLES AND RESPONSIBILITIES

CONTRACTOR (INCLUDING SUB-CONTRACTORS)

The Contractor is required to:

- Be fully conversant and comply with the EA, Final Approved EMPr and all other relevant licences and permits;
- Convene SHEQ Meetings
- Implement the EMPr
- Manage and maintain the Site Environmental File
- Appoint a suitably qualified Site Environmental Officer whose responsibility includes on-going monitoring and control of all construction activities concerning minimisation of environmental impact and adherence to all relevant environmental documentation for the duration of the project;
- Supply method statements timeously for all activities requiring special attention as specified and / or requested by the Developer, ECO and / or Engineer during the duration of the Contract;
- Ensure any sub-contractors / suppliers who are utilised within the context of the contract comply with the environmental requirements of the project, in terms of the specifications. The Contractor will be held responsible for non-compliance on their behalf. All relevant environmental documentation must be provided to such suppliers during tender stage, or prior to their appointment (if direct appointment); and these Sub-contractors and Suppliers must comply
- Provide sufficient resources - budgets, equipment, personnel and training - for the effective control and management of the environmental risks associated with the construction of the development;
- Bear the cost of any delays, with no extension of time granted, should he or his sub-contractors / suppliers contravene the said specifications such that the Engineer orders a suspension of work. The suspension will be enforced until such time as the offending party(ies), procedure, or equipment is corrected;
- Bear the costs of any damages / compensation resulting from non-adherence to the said specifications or written site instructions;
- Read ECO reports and take cognisance of the information / recommendations contained therein;
- Comply with all applicable legislation;
- Ensure that he informs the Engineer timeously of any foreseeable activities which will require input from the Environmental Control Officer;
- Notify the ECO and PM, verbally and in writing at least ten (10) working days in advance of any activity he has reason to believe may have significant adverse environmental impacts, so that mitigatory measures may be implemented timeously;
- Ensure environmental awareness among his employees, sub-contractors and workforce so that they are fully aware of, and understand the Environmental Specifications and the need for them;
- Maintain a register of environmental training for site staff and sub-contractor's staff for the duration of the contract;
- Communicate and liaise frequently and promptly with the ECO and the PM to ensure effective, proactive environmental management with the overall objective of preventing or reducing negative environmental impacts while enhancing positive environmental impacts;
- The Contractor will conduct all activities in a manner that minimises disturbance to the natural environment as well as directly affected residents and the public in general; and

The Principal Contractor assumes responsibility and accountability of all appointed sub-contractors and must ensure their compliance with this EMPr.

ROLES AND RESPONSIBILITIES

ENVIRONMENTAL CONTROL OFFICER

The ECO will:

- Provide the Contractor with the Site Environmental File (in hard and soft copy);
- Report to the relevant competent authority at the frequency stipulated either within the EA, or EMPr, or as agreed to by the competent authority (in the instance of the EA and EMPr contradicting each other);
- Be familiar with the conditions attached to the EA, EMPr and all other relevant licences and permits;
- Be familiar with the recommendations and mitigation measures of the associated EMPr for the project;
- Monitor the implementation of the EA, EMPr and all other relevant licences and permits during the pre-construction, maintenance and rehabilitation phases;
- Monitor and verify that environmental impacts are kept to a minimum, as far as possible;
- Monitor that the Developer and Principal Contractor are in compliance with the EA, EMPr and all other relevant licences and permits at all times during the pre-construction, maintenance and rehabilitation phases of the project;
- Monitor all site activities monthly for compliance;
- Conduct monthly audits of the site according to the EA, EMPr and all other relevant licences and permits, and report findings to the project team;
- Attend monthly site meetings and provide feedback on compliance, updates on outstanding reviews or approvals and highlight areas of potential environmental risk based on current and upcoming construction activities;
- Recommend corrective action for any environmental non-compliance at the site;
- Issue NCR's where necessary;
- Compile a monthly ECO report highlighting any non-compliance issues as well as progress and compliance with the EMPr prescriptions; and
- Conduct once-off training with the Contractor on the requirements of the EA, EMPr, and other relevant licences and permits; and may include general environmental awareness based on best practice.
- Monitor compliance with the requirements of the specification;

It must be noted that the responsibility of the ECO is to monitor compliance and give advice on the implementation of the EMPr and not to enforce compliance. Ensuring compliance is the responsibility of the Developer, Contractor and the Site Environmental Officer.

SITE ENVIRONMENTAL OFFICER (EO)

The Site Environmental Officer will:

- Be present on site on a day-to-day basis;
- Be fully conversant and assist the Contractor in complying with the EA, Final Approved EMPr and all other relevant licences and permits;
- Be fully conversant with all relevant environmental legislation applicable to the project, and ensure compliance with them;
- Compile environmental method statements on behalf of the Principal Contractor that will specify how potential environmental impacts will be managed in line with the requirements of the EA, Final Approved EMPr, other relevant licences and permits, and, where relevant, environmental best practice, and how they will practically ensure that the objectives of the EMPr are achieved;
- Convey the contents of the EA, Final Approved EMPr and other relevant licences and permits to the Principal Contractor, sub-contractors and suppliers. Ensure all relevant information is relayed to construction site-staff in a manner that is easily understandable;
- Undertake daily and comprehensive inspection of the site and surrounding areas in order to monitor compliance with the EA, Final Approved EMPr and other relevant licences and permits;

ROLES AND RESPONSIBILITIES

- Take appropriate action if the specifications contained in the EA, Final Approved EMPr and other relevant licences and permits are not followed. This must include reporting transgressions to the Project Manager, Engineer and Principal Contractor, and may include the recommendation for penalties to be imposed on the Principal Contractor;
- Monitor and verify that environmental impacts are kept to a minimum, as far as possible;
- Order the removal from the construction site of any person(s) and / or equipment in contravention of the specifications of the EMPr;
- Submitting a report at each site meeting which will document all incidents that have occurred during the period before the site meeting;
- Ensuring that the list of transgressions issued by the ECO is available on request; and
- Maintain an environmental register which keeps a record of all incidents which occur on the site during construction.

5.2 Monitoring

A monitoring programme will be in place not only to ensure compliance with the EMPr through the contract / work instruction specifications, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required.

A monitoring programme will be implemented for the duration of the construction phase of the project. This programme will include:

- Monthly audits will be conducted by the ECO for the duration of the maintenance activities including rehabilitation – the ECO shall undertake this environmental monitoring with the audits considering compliance with the EMPr.
- On-going daily monitoring is to be undertaken by the Contractor's Site Environmental Officer – this will include notification to the ECO should an incident take place.
- External auditing may take place at unspecified times by the authorities and / or other relevant authorities.
- The Contractor's Site Environmental Officer must undertake regular site inspections (every part of the site to be covered at least twice weekly) to ensure all legislative requirements are adhered to.

5.3 Reporting Procedures

5.3.1 Documentation

The following documentation must be kept on site within a Site Environmental File in order to record compliance with the EMPr: The Site Environmental File must include:

- Copy of the EA
- Copy of the Final Approved EMPr;
- Copy of all relevant licences and permits;
- Environmental Policy of the Principal Contractor;
- Environmental method statements compiled by the Contractor (approved by the ECO);
- Non-conformance Reports;
- Communications Register – including records of Complaints, and, minutes and attendance registers of all environmental meetings;

- Monitoring Results – including environmental monitoring reports, register of audits, non-conformance reports; and
- Environmental Incidents Register, which shall include copies of notification of Emergencies and Incidents, this must be accompanied by a photographic record.
- Waste Documentation such as, but not necessarily limited to: Waste Manifest Documents, Safe Disposal Certificates (SDCs) and Sewerage Disposal Receipts;
- Material Safety Data Sheets (MSDSs) for all hazardous substances;
- Dust suppression register;
- Written Corrective Action Instructions; and
- Notification of Emergencies and Incidents.

5.3.2 Environmental Register

The Developer will put in place an Environmental Register. The Contractor will ensure that the following information is recorded for all environmental incidents:

- Nature of incident.
- Causes of incident.
- Party / parties responsible for causing incident.
- Immediate actions undertaken to stop / reduce / contain the causes of the incident.
- Additional corrective or remedial action taken and / or to be taken to address and to prevent reoccurrence of the incident.
- Timeframes and the parties responsible for the implementation of the corrective or remedial actions.
- Procedures to be undertaken and / or penalties to be applied if corrective or remedial actions are not implemented.
- Copies of all correspondence received regarding incidents.

The above records will form an integral part of the Contractor's records. These records will be kept with the EMPr, and will be made available for scrutiny if so requested by the Developer.

5.3.3 Complaints Register

The Developer will put in place a Complaints Register. The Contractor will ensure that the following information is recorded for all complaints:

- Nature of complaint.
- Causes of complaint.
- Party / parties responsible for causing complaint.
- Immediate actions undertaken to stop / reduce / contain the causes of the complaint.
- Additional corrective or remedial action taken and / or to be taken to address and to prevent reoccurrence of the complaint.
- Timeframes and the parties responsible for the implementation of the corrective or remedial actions.
- Procedures to be undertaken and / or penalties to be applied if corrective or remedial actions are not implemented.
- Copies of all correspondence received regarding complaints.

The above records will form an integral part of the Contractor's records. These records will be kept with the EMPr, and will be made available for scrutiny if so requested by the Developer.

5.3.4 Non-Conformance Report

A Non-Conformance Report (NCR) will be issued to the Contractor as a final step towards rectifying a failure in complying with a requirement of the EMPr. This will be issued by the ECO to the Contractor in writing. Preceding the issuing of an NCR, the Contractor must be given an opportunity to rectify the issue. Should the ECO assess an incident or issue and find it to be significant (e.g. non-repairable damage to the environment), it will be reported to the relevant authorities and immediately escalated to the level of a NCR. The following information must be recorded in the NCR:

- Details of non-conformance;
- Any plant or equipment involved;
- Any chemicals or hazardous substances involved;
- Work procedures not followed;

- Any other physical aspects;
- Nature of the risk;
- Actions agreed to by all parties following consultation to adequately address the non-conformance in terms of specific control measures and must take the hierarchy of controls into account;
- Agreed timeframe by which the actions documented in the NCR must be carried out; and
- ECO must verify that the agreed actions have taken place by the agreed completion date, when completed satisfactorily; the ECO and Contractor must sign the Close-Out portion of the Non-Conformance Form and file it with the contract documentation.

It is very important that root cause analysis be undertaken as part of the compilation of each NCR. As part of this preventative actions need to be identified and recommended in order to prevent a recurrence of the issues / incident.

5.3.5 Environmental Emergency Response

The Contractor's environmental emergency procedures must ensure appropriate responses to unexpected / accidental actions / incidents that could cause environmental impacts. Such incidents may include:

- Accidental discharges to water (i.e. into the watercourse) and land;
- Accidental spillage of hazardous substances (typically oil, petrol, and diesel);
- Accidental damage to existing utilities e.g. sewer and water pipelines;
- Accidental toxic emissions into the air; and
- Specific environmental and ecosystem effects from accidental releases or incidents.

The Environmental Emergency Response Plan is separate to the Health and Safety Plan as it is aimed at responding specifically to environmental incidents and must ensure and include the following:

- Construction employees shall be adequately trained in terms of incidents and emergency situations;
- Details of the organisation (i.e. manpower) and responsibilities, accountability and liability of personnel;
- A list of key personnel and contact numbers;
- Details of emergency services (e.g. the fire department / on-site fire detail, spill clean-up services) shall be listed;
- Internal and external communication plans, including prescribed reporting procedures;
- Actions to be taken in the event of different types of emergencies;
- Incident recording, progress reporting and remediation measures to be implemented; and
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.

The Contractor and their sub-contractor(s) must comply with the environmental emergency preparedness and incident and accident-reporting requirements as per the relevant legal requirements.

5.3.6 Public Communication and Liaison with I&APs

The Developer must ensure that the adjacent landowners are informed and updated throughout the construction phases, especially of activities that would adversely affect these communities – e.g. extremely noisy activities, or activities that could block road access to certain areas.

A Community Liaison Officer (CLO) must be appointed for the duration of the project. The CLO must be fully conversant in isiZulu and be familiar with the community dynamics in the area. There are not many

communities located in direct proximity to the planned Phase 1 alignment; however activities such as livestock rearing and subsistence cultivation of crops due occur in direct proximity to the alignment. The CLO will also be responsible to communicating with the relevant traditional authorities in the area. The CLO must be available to receive communities and feedback from locally affected communities.

Sufficient signage must be erected around the site (including at the entrance), informing the public of the construction activities taking place. The signboards must include the following information:

- The name of the Contractor; and
- The name and contact details of the site representative to be contacted in the event of emergencies or complaint registration.

6 ENVIRONMENTAL AWARENESS PLAN

The Developer is committed to promoting and implementing sustainability throughout their operations. As part of this commitment, the Developer recognises the importance of making all employees aware of the potential environmental impacts that could result from conducting their jobs and how this potential can be minimised through effective training. Environmental awareness to the employees of the project will be provided by the Principal Contractor using the following means:

- Toolbox Talks (Weekly)
- Environmental Awareness Courses (*Ad hoc*)
- EMPr Awareness (as and when required)

The above mentioned awareness activities will be used to share information and to ensure that all personnel are aware of the environment in which they operate and what environmental aspects require attention during their daily operations / activities / tasks. Additionally, personnel awareness training will be undertaken if and when required to strengthen the personnel's understanding of environmental issues.

The method and medium of communication during the environmental training will be determined by the Site Environmental Officer facilitating the training. The topics discussed during training sessions will be recorded, with all employees present signing an attendance register. As potential environmental impacts differ in each department of the operation, the environmental topics selected for discussion can either be:

- General topics that are applicable to the entire activity;
- Area specific topics as identified in the impacts on the receiving environment or based on findings from the most recent ECO report;
- Topics that can be "taken home" and implemented off-site.

6.1 General Topics

There are a number of environmental impacts resulting from the proposed project. General topics include, but are not limited to, the following:

- Water consumption and conservation;
- Dust generation related impacts (including health-related) ;
- Noise generation and related impact (including health-related);
- Domestic waste minimisation and recycling;
- Practical training regarding the clean-up of major and minor hydrocarbon spills / use of spill management kit;
- Practical training on using a fire extinguisher;
- Social awareness and HIV/AIDS education;
- Alien vegetation identification and removal, and the importance of indigenous vegetation.

6.2 Activity Specific Topics

Some activities may have environmental impacts that are unique to each area. These must be addressed in the SHEQ meetings. Area specific topics include and some of these topics may be a repeat of those covered under general topics.

- Protection of water resources;
- Stormwater management;
- Potential for water pollution and the related impacts;
- Identification and management of erosion;
- Vehicle emissions and related impacts (including health related);
- Practical training regarding the clean-up of major and minor hydrocarbon spills;
- The importance of the waste management system and implementing good housekeeping;
- Dust generation and why and how to reduce dust; and
- Biodiversity interaction awareness.

These topics need to be based on risk – i.e. prior identification of environmental impacts in environmentally sensitive areas, as well as on current findings linked to the ECO reports

6.3 Take-home Topics

Environmental awareness must not stop at the work place. Many of the concepts learned at work can be applied to employees' life style at home. Topics that can be covered under "take home topics" include, but are not limited to:

- Water consumption and conservation, and;
- Domestic waste minimisation and recycling - "Reduce, Reuse and Recycle".

7 IMPLEMENTATION OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

The EMPr specifies the minimum requirements to be implemented by the Developer and the developer's implementing agents as per the scope of works, in order to minimise and manage the potential environmental impacts and ensure sound environmental management practices. It also provides the framework for environmental monitoring throughout the maintenance activities including rehabilitation.

The provisions of this EMPr are binding on the Developer and their teams during the maintenance activities including rehabilitation. The EMPr must be binding to KZN DoT or any authority to which responsibility for the construction activities has been delegated to.

It is essential that the EMPr requirements be carefully studied, understood, implemented, and adhered to at all time.

To simplify the EMPr requirements, each aspect related to the EMPr has been addressed in the tables hereafter.

Each action within the EMPr is supported by the priority of when the specific action will need to be implemented. Each of these aspects is briefly described below (Table 10) for ease of reference.

Table 10: Summary of Aspects included in the EMPr Tables

ENVIRONMENTAL MEASURES, ACTIONS AND CONTROLS:

This section indicates the actions required to either prevent and/or minimise the potential impacts on the environment that is associated with the project.

RESPONSIBILITY:

This section indicates the party responsible for implementing the environmental measures and action plans laid out in the EMPr.

MONITORING FREQUENCY:

This section indicates when the actions for that specific aspect must be implemented and/or monitored.

7.1 Pre-Construction (Planning & Design) Phase

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
7.1.1 Authorisations, Permits and Licences		
All necessary authorisations, permits and licences must be obtained by the Developer prior to the commencement of construction (if required).	Developer	Once-off and On-going
All applications for licences in respect of protected trees and natural forest must be made to the relevant provincial DAFF office. As for threatened and specially protected plants, an application for a plant permit must be made to the EKZNW.		
Any biodiversity offset requirements as specified by the Environmental Authorisation must be adhered to.		
All activities must comply with the EA, Approved EMPr and all other relevant licences and permits.		
7.1.2 Appointment of Contractor		
The Developer must ensure that this EMPr forms part of any contractual agreements with a Contractor(s) and sub-contractors for the execution of the proposed project. The Contractor must make adequate financial provision in their budgets for the implementation of the EA, Approved EMPr and all other relevant licences and permits.	Developer	Once-off
The principal Contractor (including sub-contractors and suppliers) must comply with the relevant provisions of the EA, Approved EMPr and all other relevant licences and permits, and also applicable environmental legislation, by-laws and associated regulations promulgated in terms of these laws.		
Tender documents must include statements which include the use of local communities or local community organisation(s) in supplying services and labour for the construction activities. The Contractor must appoint a CLO (Community Liaison Officer).		
7.1.3 Public Communication		
The Developer must ensure that the adjacent landowners are informed and updated throughout the construction phases. Sufficient signage must be erected around the site (including at the entrance), informing the public of the construction activities taking place. Such signage must be in isiZulu, the predominant language of the area.	Contractor / EO	Once-off

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>The signboards must include the following information:</p> <ul style="list-style-type: none"> ▪ The name of the Contractor. ▪ The name and contact details of the site representatives (both Safety and Environmental contacts) to be contacted in the event of emergencies or complaint registration. 		
<p>A formal communications protocol must be set up during this phase. The aim of the protocol is to ensure that effective communication on key issues that may arise during construction is maintained between key parties such as the ECO, EO and Contractor. The protocol must also ensure that concerns / issues raised by I&APs are formally recorded and considered and where necessary acted upon. If necessary, a forum for communicating with key stakeholders on a regular (Monthly) basis may need to be set up. The communications protocol must be maintained throughout the construction phase.</p>		
<h3>7.1.4 Protected Plants</h3>		
<ul style="list-style-type: none"> ▪ The areas (vegetation types) as specified in the biodiversity specialist study that have been prioritised for search and rescue must be subject to a walkdown, undertaken by a suitably qualified botanist. ▪ The appointed botanist/specialist must: <ul style="list-style-type: none"> ▪ visit priority vegetation communities; ▪ identify and geo-reference the location of all threatened and protected plants at risk of destruction/damage; ▪ identify vegetation communities that qualify as a 'natural forest' as defined by DAFF ▪ prepare a suitable plant rescue translocation plan that considers species requirements and identifies suitable receiving areas for rescued plants; and ▪ assist with undertaking and/or supervising the relevant plant rescue and translocation. ▪ A plant rescue operation to rescue sensitive plants and rehabilitation material from the construction footprint along the primary dune must be undertaken. The focus of this operation would be on plants in the understorey that would be able to be used as part of the rehabilitation of the understorey of the dune forest. ▪ It is recommended that the rescued plants be maintained in a nursery during construction. The rescued plants must then be re-planted in the disturbed area outside of the 3m-wide footpath after construction is complete to minimise the disturbed area. ▪ Conservation-important plants falling just outside the construction footprint must be fenced off / demarcated to minimise any accidental impacts such as destruction. The following techniques can be used to demarcate protected plants: fencing off or using perimeter stakes and high visibility netting / barrier tape. ▪ No clearing of indigenous vegetation outside of the defined working servitudes is permitted for any 	<p>Developer, Contractor, ECO, EO, Ecologist (Botanist)</p>	<p>Once-off</p>

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
reason (i.e. for fire wood or medicinal use).		
7.1.5 Demarcation of the Construction Servitude		
<ul style="list-style-type: none"> ▪ The construction area must be clearly designated in sensitive environmental areas (in particular wetlands) and no extension of the permitted construction footprint (as specified in the engineering construction methodology) must be allowed. All wetland boundaries must be clearly designated prior to construction commencing. ▪ Stipulations of the BAR with respect to the minimisation of the construction footprint in the highly sensitive parts of the alignment must be strictly adhered to. These areas include : <ul style="list-style-type: none"> ▪ The two swamp forest wetlands Wetland unit W70A-W15 between 26°51'47.73"S 32°46'55.47"E (KM11.225) and 26°51'48.29"S 32°47'6.54"E (KM10.9). In wetland unit W70A-W17/18 between 26°51'49.18"S 32°45'55.88"E (KM12.875) and 26°51'47.64"S 32°46'9.73"E (KM12.485) ▪ Lake kuZilonde - between 26°51'40.40"S 32°52'20.35"E (KM2.08) and 26°51'39.56"S 32°52'24.41"E (KM1.89). ▪ Primary dune at the Indian Ocean ▪ The construction servitude must be limited to the proposed development footprint. This working servitude must accommodate all construction-related activities, including materials storage and access routes. The outer edge of the construction servitude / working area (as defined above) must be clearly demarcated for the entire construction phase using a brightly coloured hazard fence (snow netting) or string or twine with bows made of danger tape at 1 – 3 m intervals. ▪ Maintain site demarcations in position until the completion of construction works. ▪ The location of stockpile areas, site camps and equipment laydown areas must be agreed to and demarcated to the satisfaction of the ECO prior to the clearing. A recommended setback distance of at least 30 m from the active river channel edge is recommended. ▪ All areas outside (including up-stream and downstream) of this demarcated construction servitude must be considered 'No-Go' areas. Any contractors found working inside the no-go areas must be fined as per fining schedule / system setup for the project. ▪ The demarcation work must be signed off by the ECO before any work commences ▪ Do not paint or mark any natural feature. Marking for surveying and other purposes must be done using pegs, beacons or rope and droppers. 	Engineering team ECO	Once-off

Project related

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<ul style="list-style-type: none"> The approved extent of the Farazela Construction Camp area must be demarcated, as above for the construction servitude 		

7.2 Construction Phase

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
7.2.1 Site Preparation & Site Offices		
<ul style="list-style-type: none"> ▪ Vegetation removed for the Farazela construction camp establishment must to be kept to a minimum. The vegetation within the 5ha footprint must only be removed as and where necessary for temporary offices, laydown areas etc. No trees or plants are to be removed with the exception of alien weeds and invader plants identified and approved by the EO and ECO. ▪ Adequate parking (to accommodate all vehicles at the peak of construction) must be provided for site staff and visitors at the construction camp with the intention to disturb as little grassland as possible. ▪ For other construction camps that are to be located within the DEA approved (as per the EA) application corridor, the footprint must be limited as far as possible. The location of these camps must be approved by the ECO prior to their establishment. 	Contractor EO ECO	Once-off
Temporary Site Camp Establishment: <ul style="list-style-type: none"> ▪ All temporary site camps must be established on disturbed habitats of low or moderately low EIS subject to approval by the ECO (e.g. existing homestead yards or forestry timber laydown areas). ▪ Site camps must be located within the approved application corridor. ▪ Avoid site camps within intact habitat, especially those containing identified protected plants and native woody plant species such as areas with abundant trees and shrubs. ▪ Fewer, densified site camps spread along the border patrol road or border fence are recommended over many site camps. ▪ All site camps must be fenced off to limit any accidental vegetation disturbance outside the approved area. ▪ Vegetation clearing must be kept to an absolute minimum, with grass/vegetation to be mowed/cut to ground level rather than cleared entirely 	Contractor EO ECO	Once-off
<ul style="list-style-type: none"> ▪ The construction areas must be kept in an orderly state at all times. ▪ Unauthorised entry, stockpiling, dumping or storage of equipment, material or waste must be strictly prohibited in identified No-go areas. ▪ The Contractor must ensure that stormwater management at the Farazela Construction Camp and other temporary construction camps is such to prevent standing water and/or sheet erosion from taking place or that it is not altered even temporarily which adversely impacts on drainage. 	Contractor	Weekly

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
7.2.2 Pollution (Soil, Groundwater and Surface Water) Prevention Measures		
<p>The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, bitumen, paint, etc.) must be undertaken. Storage containers must be regularly inspected to prevent leaks and all hazardous storage must take place in a bunded area or within drip trays to prevent soil/water contamination, able to contain 110% of the total volume of materials stored at any given time.</p>	Contractor EO	Daily
<p>Access to storage areas on-site must be restricted to authorised employees only.</p>		
<p>Material Safety Data Sheets (MSDSs) must be readily available on site for all chemicals and hazardous substances to be used on site. Where possible, the available MSDSs must additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.</p>		
<p>Mixing and / or decanting of all chemicals and hazardous substances (including dry cement and wet concrete") must take place on trays. Cement or concrete mixing is allowed on a batching board or other suitable impermeable surface, but hazardous substances must always be contained within secondary containment such as a drip tray. Controls for cement mixing or concrete batching must include:</p> <ul style="list-style-type: none"> ▪ Mixing on a batching board or other suitable impermeable surface. ▪ Any concrete effluent must be captured in a plastic-lined catch-pit. This must be allowed to dry before being removed from site as inert concrete waste 		
<p>The integrity of the impervious surface and bunded area must be inspected regularly and any maintenance work conducted must be recorded in a maintenance report.</p>		
<p>Drip trays must be utilised at all dispensing areas.</p>		
<p>No potentially hazardous substances must be placed within 50m of the boundary of any wetland. No refuelling, servicing or chemical storage must occur within 50m of a wetland boundary.</p>		
<p>No vehicles transporting concrete, asphalt or any other bituminous product must be washed on site, except at a formal wash area provided on site.</p>		
<p>All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. No repairs may be undertaken beyond the Farazela Construction Camp or any other subsequently environmentally authorised contractor laydown areas.</p>		
<p>Ensure that transport, storage, handling and disposal of hazardous substances is adequately controlled and managed. Correct emergency procedures and cleaning up operations must be implemented in the event of an accidental spillage.</p>		
<p>If a water pump is required, the water pump must operate inside or on top of a drip tray to prevent any spillage of fuel and limit the risk of soil / water contamination. The drip tray must be lined with absorbent pads</p>		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>and checked daily while in use.</p> <p>All contaminated stormwater must be treated before being discharged into the surrounding natural environment</p> <p>All equipment to be used within the sensitive working areas (within wetlands and sensitive terrestrial environments) must be checked daily for oil and diesel leaks before gaining access to these working areas.</p> <p>The sanitation facilities must be on-site before the extended workforce is employed to ensure that no unauthorised sanitation practices are implemented on-site.</p> <p>Waste from chemical toilets must be disposed of regularly (at least once a week) and in a responsible manner by a registered waste contractor.</p> <p>Workers need to be encouraged to use toilet facilities provided and not the natural environment.</p> <p>Toilets must not be located closer than 50m from any wetlands.</p> <p>Any spill incident, which may occur, must be investigated and immediate action must be taken. This must also be reported to the ECO and EO.</p> <p>An emergency spill response procedure must be formulated and staff are to be trained in spill response. Employees must be provided with absorbent spill kits and disposal containers to handle spillages.</p> <p>In the case of a spill of hydrocarbons, chemicals or bituminous material in the construction camp or on the construction-site / bunding area, the spill must be contained and cleaned up and the material together with any contaminated soil collected and disposed of as hazardous waste to minimize pollution risk and reduce bunding capacity.</p> <p>Should a pollution incident occur on-site, the Contractor must:</p> <ul style="list-style-type: none"> o Implement reasonable measures immediately to contain and minimise the impacts of the incident; o Contain the spill; o Notify all persons whose health may be affected by the incident; o Undertake clean up procedures immediately; o Notify the Contractor of the incident immediately who will advise the employee as to the measures that must be implemented; o Record the incident in the Environmental Incident Register; and o Implement measures to prevent similar incidents from occurring in the future. <p>Contractors will be held liable for any environmental damages caused by spillages.</p>		
<p>7.2.3 Worker Conduct on-site – please refer to Section 4 – Environmental Code of Conduct</p>		
<p>A general regard for the social and ecological wellbeing of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules:</p> <ul style="list-style-type: none"> ▪ No alcohol / drugs to be present on the site. ▪ No firearms allowed on-site or in vehicles transporting staff to and from site, unless used by security 	<p>Contractor EO</p>	<p>Daily</p>

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>personnel.</p> <ul style="list-style-type: none"> ▪ Prevent excessive noise. ▪ Prevent unsocial behaviour. ▪ Bringing pets onto the site is forbidden. ▪ No harvesting of firewood from the site or from the areas adjacent to it. ▪ Construction staff are to make use of the facilities provided for them, as opposed to ad hoc alternatives (e.g. fires for cooking, the use of surrounding bush for toilet facilities). ▪ Trespassing on private properties adjoining the site. ▪ Driving under the influence of alcohol is prohibited. 		
7.2.4 Protection of Natural Terrestrial Habitat and Fauna		
<p>The construction servitude must be limited to the proposed development footprint and a 10 m working servitude either side thereof. This working servitude must accommodate all construction related activities, including materials storage, access routes, etc.</p>	Contractor	Daily
<p>Under no circumstances must the construction servitude encroach out of the 50m authorisation corridor, or any other approved construction area (e.g. the Farazela Construction Camp)</p>		
<p>The outer edge of the construction servitude/working area (as defined above) must be clearly demarcated for the entire construction phase using a brightly coloured snow netting. All areas outside of this demarcated construction servitude must be considered 'No-Go' areas.</p>		
<p>The construction/work servitude must accommodate all construction related activities, including materials storage, soil stockpiles, access routes etc.</p>		
<p>Access routes within the construction area must be confined to the existing road infrastructure and disturbed areas and must not fall outside the construction servitude.</p>		
<p>Vegetation clearing/stripping within the construction footprint must only be done as the construction front progresses.</p>		
<p>The extent of disturbance must be limited to the extent of the construction footprint. No areas outside the construction footprint may be cleared unless authorised.</p>		
<p>Working right of ways / construction servitudes must be limited to the widths specified in the construction methodology for each infrastructure component.</p>		
<p>Measures for minimising the destruction of the forest canopy in the Primary Dune Forest.</p> <ul style="list-style-type: none"> ▪ Allow for slight deviations in the fence line to miss specific protected (marked with danger tape with the letter "P") and mature trees. ▪ Limit the pruning of trees only to the removal of side branches that are in direct conflict with the fence line leaving the main trunk of the tree and the canopy intact. 		
<p>Temporary Site Camp Establishment must follow the ECO approval procedure as detailed for temp site</p>		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
camp establishment (Section 8.2.1) above.		
No natural vegetation is to be collected for use as firewood.		
<p>No animals are to be disturbed unnecessarily and no animals are allowed to be shot, trapped or caught for any reason. If this is identified on site it needs to be reported as an environmental incident and investigated. The perpetrators must be removed from the project</p> <p>Any wildlife that is injured or killed on the site by accidental means i.e. hit by a vehicle, are to be reported to the Developer, who must take appropriate action to facilitate the recovery of the animal where possible i.e. take the animal to the nearest wildlife rehabilitation centre.</p>		
<p>Education of workers/employees onsite on not to harm wildlife unnecessarily will assist in mitigating impacts on fauna. Contractor induction and staff/labour environmental awareness training needs are to be identified and implemented through staff/contractor environmental induction training. This must include basic environmental training based on the requirements of the EMP, including training on avoiding and conserving local wildlife.</p>		
<p>Any fauna that are found within the construction zone must be moved to the closest point of natural or semi-natural habitat outside the construction corridor. This must be undertaken by a person who is in possession of the necessary permits for handling wildlife.</p>		
<p>The handling and relocation of any animal perceived to be dangerous/venomous/poisonous must be undertaken by a suitably trained individual.</p>		
<p>All vehicles accessing the site must adhere to a low speed limit (30km/h is recommended) to avoid collisions with susceptible species such as reptiles (snakes and lizards).</p>		
<p>No litter, food or other foreign material must be disposed of on the ground or left around the site or within adjacent natural areas and must be placed in demarcated and fenced rubbish and litter areas that are animal proof.</p>		
<p>Ensure that workers accessing the site conduct themselves in an acceptable manner while on site, both during work hours and after hours.</p>		
<p>Temporary noise pollution must be minimized by ensuring the proper maintenance of equipment and vehicles, and tuning of engines and mufflers as well as employing low noise equipment where possible.</p>		
<p>No activities must be permitted at the site after dark (between sunset and sunrise), except for security personnel guarding the development site</p>		
<p>No clearing of indigenous vegetation outside of the defined working servitudes is permitted for any reason (i.e. for fire wood or medicinal use).</p>		
<p>All invasive alien plants found, must be immediately removed and disposed of responsibly in accordance with the requirements of the ECO. No alien plants are permitted to be brought to site. Invader species and weeds must be removed and disposed of in accordance with existing legislation on a regular basis.</p>		
<p>Cleared areas must be rehabilitated and reseeded if necessary, as soon as is possible. All alien invasive</p>		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>vegetation that has colonised the construction-site must be removed, preferably by uprooting. The contractor must consult the ECO regarding the method of removal.</p> <p>All bare surfaces across the construction-site must be checked for alien invasive plants every 2 weeks and alien plants removed by hand pulling / uprooting and adequately disposed.</p> <p>Herbicides must be utilised where hand pulling / uprooting is not possible. Only herbicides which have been certified safe for use in wetlands by independent testing authority to be used. The ECO must be consulted in this regard. Herbicides must be applied by persons trained and certified for use of herbicides.</p> <p>Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas.</p> <p>Where IAPs have been introduced on to the site during clearing and infilling, they must be removed. The Contractor must develop an Action Plan for the removal of IAPs and submit it to the ECO for approval.</p> <p>The removal of indigenous / endemic shrubs and small trees must be kept to a minimum and only be removed if absolutely necessary and where authorisation has been received where applicable.</p>		
<h3>7.2.5 Heritage and Palaeontology</h3>		
<p>Older buildings and structures older than 60 years old are protected by heritage legislation. A Phase Two Heritage Impact Assessment must be undertaken by a built heritage specialist before any development takes place in the immediate environs of the existing Farazela Border Post.</p> <p>Any graves encountered within the 50m wide application corridor must have a buffer zone of at least 30m maintained around the grave site. No development may occur within the buffer zone around the grave. Should it not be possible to respect a buffer zone then the developer would need to motivate for a Phase Two Heritage Impact Assessment in order to investigate potential grave exhumation and reburial.</p> <p>Various open-air Stone Age sites occur along the proposed wider project, but none have been identified along the Phase 1 alignment. Should any such sites be encountered, however, mitigation is necessary and a buffer zone of at least 10m must be maintained around them. No artefacts may be collected or removed from these sites.</p> <p>If an artefact on-site is uncovered, work in the immediate vicinity must be stopped immediately.</p> <p>The Contractor must take reasonable precautions to prevent any person from removing or damaging any such article and must immediately, upon discovery thereof, inform the Construction Engineer of such discovery which in turn must contact a registered archaeologist and AMAFA.</p> <p>Work may only resume once clearance is given in writing by the archaeologist and/or AMAFA.</p> <p>Mitigation measures are not deemed necessary by the palaeontological specialist due to the low risk of encountering and disturbing palaeontological resources associated with the development. However in the event of palaeontological resources being discovered the following measures must be implemented:</p> <ul style="list-style-type: none"> ▪ The ECO in charge of these developments must be immediately notified. 	<p>Contractor</p>	<p>Daily</p>

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<ul style="list-style-type: none"> ▪ The discoveries must be protected (preferably in situ) and the ECO must report to SAHRA so that appropriate mitigation (e.g. recording, collection) can be undertaken by a professional palaeontologist. ▪ Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an approved collection which comprises a museum or university collection, while all fieldwork and reports must meet the minimum standards for palaeontological impact studies proposed by AMAFA. 		
7.2.6 Traffic and Safety		
<p>Traffic to the site must ideally follow pre-authorized routes. As far as possible access must be within the 50m application corridor.</p>	Contractor	Daily
<p>Temporary loading and off-loading areas and holding of construction vehicles must be designed prior to construction activities to ensure that the most preferable access and haulage routes has been identified.</p>		
<p>Speed limits on public access roads must be strictly enforced; construction vehicles must not exceed 30km/hr.</p>		
<p>Construction routes on public access roads must be signposted, warning of construction vehicles.</p>		
<p>All contractors must ensure that their employees and in particular, construction vehicle drivers / operators comply with the safe access and egress plans that are to be put in place during the construction process. Appropriate warning and reduced speed signage must be erected where necessary.</p>		
7.2.7 Construction Vehicles		
<p>Access of all construction and material delivery vehicles must be strictly controlled.</p>	Contractor	Daily
<p>Holding of all construction vehicles is to be controlled to ensure that traffic is not unnecessarily impeded.</p>		
<p>Vehicles and equipment must be serviced according to the manufacturer's specifications to avoid the contamination of the area from oil and hydraulic fluid leaks, etc.</p>		
<p>Servicing of vehicles must be done off-site or on impermeable and bunded service bay area.</p>		
<p>All speed limits must be adhered to.</p>		
<p>Machinery or equipment used on-site must not constitute a pollution hazard in respect of the above substances.</p>		
<p>The Contractor must order such equipment to be repaired or withdrawn from use if they consider the equipment or machinery to be polluting and irreparable.</p>		
<p>Suitably covered receptacles must be available at all times and conveniently placed for the disposal of waste.</p>		
<p>Waste receptacles must be clearly labelled – i.e. general or hazardous waste. All used oils, grease or hydraulic fluids must be placed therein and these receptacles will be removed from</p>		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
the site when full for disposal at a registered or licenced disposal facility, or to be recycled on site. .		
7.2.8 Soils (Soil Excavation, Storage and Stockpiling)		
The Contractor must strip and stockpile all topsoil within the work area for subsequent use at a later stage.	Contractor	Daily
Litter and general waste is to be removed from the topsoil and spoil material before stockpiling.		
The topsoil layer must be stripped from the construction footprint and stockpiled separately from overburden (subsoil and rocky material, if applicable).		
Topsoil is to be handled twice only – once to strip and stockpile, and once to replace and level.		
In the absence of a recognizable topsoil layer, strip the upper most 300mm of soil and treat this as topsoil.		
The removal of any topsoil from site is prohibited and this must be stockpiled and used solely in the rehabilitation of the works area.		
Subsoil and topsoil must be stockpiled separately, in particular where there is a marked difference between topsoil with more organic material content (darker) and the underlying subsoils – particularly in wetlands. Stockpiled soil must be replaced in the reverse order to which it was removed (subsoil first followed by topsoil).		
All stockpile areas must ideally be established on disturbed flat ground.		
Stockpile topsoil stripped from different sites separately, as re-application during rehabilitation must be site specific		
For the border barrier it is recommended that stockpiling of excavated soil occurs along the trench given that the construction footprint of the obstacle barrier is flat, sandy and transformed. The soil stockpile will need to be established between the existing border fence and the trench.		
The stockpiles may only be placed within demarcated stockpile areas. A recommended set-back distance of at least 30 m from the wetland boundaries is recommended.		
Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils.		
The contractor must, avoid stockpiling materials in vegetated areas that will not be cleared.		
Erosion / sediment control measures such as silt fences must be placed around the stockpiles to limit sediment runoff from stockpiles.		
The height of stockpiles must be limited to 2m to avoid soil compaction and destruction of soil micro-organisms.		
Stockpiles must be protected from wind and rain with the use of tarpaulins where necessary. The Contractor is to use his discretion as to the mechanism to be used to ensure this protection.		
Topsoil must be kept separate from overburden and must not be used for infilling.		
Noxious weeds must be eradicated from topsoil stockpiles.		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>The Contractor must exercise suitable precautions with the storage, handling and transport of all materials that could adversely affect the environment. If pollution of any surface or groundwater occurs, it must immediately be reported to the DWS and appropriate mitigation measures must be employed.</p>		
7.2.9 Spoil		
<p>Spoil sites must receive a minimum of 75 mm topsoil and be grassed with a recommended seed mixture by a qualified horticulturist.</p>		
<p>Slopes must not exceed a vertical: horizontal ratio of 1:3.</p>		
<p>Spoil material must be hauled to a designated spoil site. No spoil material must be pushed down slope or discarded on site.</p>		
7.2.10 Soil Erosion and Sedimentation		
<p>Any vegetation clearing must be done immediately before construction activities to avoid prolonged exposure of the soil to weather elements.</p>	Contractor	Daily
<p>Construction activities must be scheduled to minimise the duration of exposure to bare soils on site, especially where sloping ground is encountered.</p>		
<p>The unnecessary removal of groundcover from slopes must be prevented.</p>		
<p>All bare slopes and surfaces to be exposed to the elements of weather during clearing and earthworks must be protected against erosion using rows of silt fences, sandbags or any adequate methods which will achieve the outcome of erosion prevention.</p>		
<p>Sediment barriers such as berms, sandbags and/or silt fences must be monitored for the duration of the construction phase and repaired immediately when damaged.</p>		
<p>Sediment barriers must only be removed once vegetation cover has successfully re-colonised the embankments.</p>		
<p>After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately.</p>		
<p>Erosion rills and gullies must be filled-in with appropriate material and silt fences or fascine work must be established along the gully for additional protection until grass has re-colonised the rehabilitated area.</p>		
<p>Primary Dune-specific measures:</p> <ul style="list-style-type: none"> ▪ Note a suitably qualified specialist must be appointed to oversee works on the primary dune. ▪ Construction-phase stormwater management is highly important in the context of the sensitive and steeply sloping primary dune. Temporary stormwater engineering controls (berms and sandbags, soil curtains across the slope contour) must be implemented at the dune to ensure effective control of 		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>stormwater during construction.</p> <ul style="list-style-type: none"> ▪ Dune forest understorey vegetation must be rescued and propagated in a nursery during construction, and then be replanted on disturbed sloping ground on the primary dune to prevent erosion of the sandy, unconsolidated dune soils. Salt-tolerant plants must also be utilised for rehabilitation of these surfaces. ▪ Soft engineering measures, e.g. sand filled Bidim bags must be used to stabilise the toe of the dune slope to prevent the slumping of the dune and submerging of vegetation where vegetation has been removed ▪ Construction-phase stormwater management is highly important in the context of the sensitive and steeply sloping primary dune. Temporary stormwater engineering controls (berms and sandbags, soil curtains across the slope contour) must be implemented at the dune to ensure effective control of stormwater during construction. ▪ Measures to secure the sandy substrate along the footpath must be implemented as part of the design and construction of the footpath across the dune. It is recommended that branches cut off trees to open up the fence line and footpath servitude be laid across the slope on the contour and pegged into place to serve as steps and to limit soil movement. Sandbags can also be utilised to create a stepped or terraced footpath. 		
<p>Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities must be put on hold. In this regard, the contractor must be aware of weather forecasts.</p>		
<p>The slope and height of stockpiles must be limited to 2 m to avoid collapse and thus potentially create silt into the surrounding environment.</p>		
<p>The Contractor must, where possible, avoid stockpiling materials in vegetated areas that will not be cleared. Stockpiled soils are to be kept free of weeds and are not to be compacted. The stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions.</p>		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
7.2.11 Waste Management		
<p>General Waste:</p> <ul style="list-style-type: none"> ▪ Provide adequate rubbish bins and waste disposal facilities on the construction site and at site camps. ▪ All bins must be animal proof. ▪ Clear and completely remove from site all general waste, constructional plant, equipment, surplus rock and other foreign materials once construction has been completed. ▪ All remaining General waste produced on-site is to be collected in skips for disposal at a registered landfill site, or if no such site exists in the wider area, at a locally recognised municipal landfill site. ▪ If the landfill site does not produce proof of safe disposal, the Contractor must get some form of document signed and take photographs to prove safe disposal. ▪ Hazardous waste in not to be mixed or combined with general waste earmarked for disposal at a relevant licensed municipal landfill site. ▪ The construction site must be kept clean and tidy and free from rubbish. ▪ Recycling/re-use of waste is to be encouraged. ▪ Eating areas must not be located within 30m of wetlands. Waste bins must be provided at the eating areas. ▪ Under no circumstances is waste to be burnt or buried on-site. The excavation and use of rubbish pits on-site is forbidden. ▪ Waste bins must be cleaned out on a regular basis to prevent any windblown waste and/or visual disturbance. A tarpaulin or sail must be placed on skips, and all bins must have lids. ▪ All general waste must be removed from the construction areas on a daily basis and disposed of in suitable waste receptacles. No general waste is to be disposed of on-site. 	Contractor EO	Daily
<p>Construction rubble:</p> <ul style="list-style-type: none"> ▪ Rubble generated from demolishing of existing infrastructure (if and where applicable) must be loaded onto a dump truck as soon as it is generated. A dump truck must be on standby while such infrastructure is being demolished. ▪ No building material, soils or rubble is to be disposed of within any watercourse (wetland or river). ▪ Once loaded onto a truck, the rubble must be taken to a landfill site and a waybill must be retained as proof of safe disposal. ▪ Should rubble be required as a raw material for the construction, it must be taken to a designated stockpile area – which must be approved by the ECO. 		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>Hazardous waste:</p> <ul style="list-style-type: none"> ▪ Hazardous waste produced on-site includes: Oil and other lubricants, diesel, paints, solvent; containers that contained chemicals, oils or greases; and equipment, steel, other material (rags), soils, gravel and water contaminated by hazardous substances (oil, fuel, grease, chemicals or bitumen). ▪ Hazardous waste is to be disposed of at a licenced hazardous waste landfill site. ▪ No vehicles transporting asphalt, concrete or any other bituminous product may be washed on site. ▪ Mixing and/or decanting of all chemicals and hazardous substances must take place on trays, shutter boards or on impermeable surfaces and must be protected from the ingress and egress of stormwater. ▪ Drip trays must be utilised at all dispensing areas. ▪ No refuelling, servicing or chemical storage must occur within 50m of wetlands. ▪ Vehicle maintenance must not take place on site unless a specific bunded area with an oil filter trap is constructed at the site camp for such a purpose. ▪ If a water pump is required, the water pump must operate inside or on top of a drip tray to prevent any spillage of fuel and limit the risk of soil/water contamination. The drip tray will need to be lined with absorbent pads and checked daily while in use. ▪ All equipment to be used within the sensitive working areas (within the drainage channel) must be checked daily for oil and diesel leaks before gaining access to these working areas. ▪ An emergency spill response procedure must be formulated and staff is to be trained in spill response. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site. ▪ The ECO must approve a licenced waste disposal site at the inception of the project. ▪ Hazardous waste bins must be clearly marked, stored in a contained area (or have a drip tray) and covered (either stored under a roof or the top of the container must be covered with a lid). ▪ Waste from chemical toilets must be disposed of regularly (at least once a week) and in a responsible manner by a registered waste contractor. ▪ SDCs must be obtained from the waste removal company as evidence of correct disposal and kept on-site within the Site Environmental File. ▪ Transport of hazardous materials must be done in accordance with legislative control and Relevant SABS Codes of Practice must be adhered to. 		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
7.2.12 Wastewater		
All wastewater generated at the proposed development must be disposed of in a suitable manner so as not to cause any surface or subsurface water pollution or health hazard	Contractor	Daily
Wastewater, including cement-contaminated water, must not enter any wetland and must be managed by the site manager to ensure that the existing water resources on and off site are not polluted by activities emanating from the above development.		
Used oil and wastewater must be disposed of at a registered facility. A SDC is to be obtained by the Contractor and kept on-site within the Site Environmental File.		
Water containing waste must not under any condition be discharged into the natural environment. Measures to contain water containing waste and safe disposal of such must be implemented.		
7.2.13 Protection of Freshwater Habitat (Wetlands)		
It is recommended that construction across wetlands take place preferably during the dry/winter months where possible to reduce risk of erosion and sedimentation associated with summer rainfall in the region. Such timing in seasonal and ephemeral wetlands (especially in channelled settings) will greatly reduce suspended solid and erosions and sedimentation impacts and will allow for easier isolation works (coffer dams and diversion where required) and less risk of compromising the construction process due to unplanned high water levels and flooding.	Contractor	Daily
For the Phase 1 project no water is to be abstracted from wetlands for use in construction activities and all water must be obtained from municipal sources		
Fill embankments located within the larger valley bottom wetland features must incorporate culverts to allow for the dissipation of flood water across these features during flood events.		
Ensure fill embankments are stabilised and vegetated with grass cover.		
Where possible, road batters must be designed to a minimum of a 1:3 slope in order to minimise unstable eroding slopes. Slopes steeper than 1:2 are more prone to erosion, slumping and washouts.		
Measures must be implemented to distribute stormwater as evenly as possible to avoid point sources of discharge directly into watercourses / wetland and subsequent erosion.		
<p>The location and design of road drainage and discharge points shall be done in a manner that minimises peak discharge to downstream aquatic resources by considering the following:</p> <ul style="list-style-type: none"> ▪ Decreasing volume of water reaching wetlands as surface flow by encouraging infiltration; and ▪ Decreasing velocity of flows entering aquatic resources (either through structural or vegetative means). 		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>In order to reduce the volume and velocity of stormwater runoff received by wetlands, road runoff must be removed from roads via road drainage infrastructure constructed at regular intervals to avoid point source scouring at the outlets.</p>		
<p>Wherever possible, all outlets must be located outside of the delineated wetland.</p>		
<p>When designing stormwater outlets, many small outlet discharges must be favoured over a few large outlets to reduce outlet flow volumes and velocities.</p>		
<p>All outlets must have adequately designed erosion protection and energy dissipation measures e.g. Reno-mattresses, stone-pitching) suitable to reduce anticipated discharge velocities to levels that do not pose an erosion risk.</p>		
<p>Armouring of the downstream buffer zones area (e.g. reno-mattresses with vetiver bands) must be installed below all storm water outlets prior to flows entering downstream wetlands.</p>		
<p>Wherever possible, vegetated swales/side drains must be specified rather than concrete lined drainage channels (e.g. concrete V-drains). Vegetated swales/side drains must be well-vegetated with appropriate species and stabilized by means of gabion or concrete cut-off walls to prevent erosion and vertical incision. Similarly outlets must not be piped outlets but open vegetated channels or vegetated mitre drains.</p>		
<p>Water must be discharged at regular intervals along road segments on the approach to watercourses / wetlands so that the volume and velocity of flows reaching final discharge point into a watercourse is reduced as far as possible.</p>		
<p>Appropriate outlet structures and energy dissipater blocks are to be specified at all discharge points to break the energy of the storm water.</p>		
<p>Where possible, construct attenuation features (e.g. stilling basins) at the discharge points of the side drains to control the flows entering wetlands.</p>		
<p>Coarse bedding material or geotextile wrapped dump rock must be used wherever the roads crosses wetland characterised by diffuse subsurface flows. Based on the nature of wetlands in the study area, this is likely to include most wetlands, in particular un-channelled valley-bottoms</p>		
<p>A series of portal (preferably) culverts must be installed across the width of any broad un-channelled valley bottom wetlands so as to maintain diffuse surface flows to downstream wetland areas.</p>		
<p>Crossings that are installed below the natural ground level are to be constructed with an appropriate drop inlet structure on the upstream side to ensure that headcut erosion does not develop as a result of the gradient change from the natural ground level to the invert level of the culvert.</p>		
<p>In some instances it may be appropriate to construct a drop inlet structure on the upstream side of the culvert with overflow walls raised slightly above the natural ground level. This will encourage the development of an area that will remove sediment from the water as well as lead to the establishment wetland habitat that will enhance water quality.</p>		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
Under no circumstance must a river or wetland be impounded / dammed in such a manner as to totally restrict the flow and cause flooding/inundation upstream of the road embankment. This includes the impoundment of sub-surface flows (interflow).		
Where existing roads are utilised as the border patrol road, an assessment of whether sufficient numbers of existing culverts are located across the extent of the wetland as crossed by the road must be made prior to construction. If insufficient numbers of existing culverts are located within the existing road structure to allow flows across the width of the wetland to be maintained, additional culverts must be included in the design of the upgraded road		
Any direct modification of wetland and river channels for the installation of culverts and road drainage must be limited to the construction servitude.		
Before any work commences, sediment control/silt capture measures (e.g. bidim/silt curtains) must be installed downstream/downslope of the active working areas. Quantities of silt fences/curtains shall be decided on site with the engineer, contractor and ECO. The ECO must be present during the location and installation of the silt curtains.		
Silt fences/curtains must be regularly checked and maintained (de-silted to ensure continued capacity to trap silt), and repaired where necessary. When de-silting takes place silt must not be returned to the wetland / watercourse.		
Temporary stormwater control measures must be implemented within the construction servitude, especially where sloping ground is encountered in close proximity to wetlands. This includes the use of stormwater retardation measures such as low earth bunds / sand bags to manage and prevent the un-controlled ingress of stormwater surface flows into wetlands		
The construction/work servitude must accommodate all construction related activities, including materials storage, soil stockpiles, access routes etc.		
Where possible, access within the construction area must be confined to the existing road infrastructure and disturbed areas		
Vegetation clearing/stripping within the construction footprint must only be done as the construction front progresses.		
At wetland crossings, the outer edge of the construction servitude/working area/corridor as defined above must be clearly demarcated for the entire construction phase using plastic orange bonnox/other hazard fencing. All areas outside of this demarcated corridor must be considered 'No-Go' areas.		
Under no circumstances must any wetland outside of the permitted construction footprint be impacted by temporary accesses. In this regard, all temporary access routes located outside of the construction servitude must be existing accesses.		
Wetlands outside of the demarcated construction area (i.e. downstream of the infrastructure upgrade) are strictly 'No Go' areas. These areas must not be accessed by machinery or workers for any reason. This		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
includes any water resources originally rated as of low to very low risk during the desktop mapping and risk screening.		
Any contractors found working inside the 'No-Go' areas (areas outside the working servitude) must be fined as per fining schedule/system setup for the project.		
Wetland areas outside of the construction servitude that are disturbed during the construction phase must be rehabilitated immediately (as per the recommendations of the Freshwater Report). All disturbed areas must be prepared and then re-vegetated to the satisfaction of the ECO as per the relevant re-vegetation/re-planting plan.		
Heavy machinery will be likely to need to work in saturated or inundated situations in a number of the larger wetlands along the route. Such machinery (e.g. excavators) could potentially cause a lot of damage to saturated soils (wetland substrate) if they were to move directly on these soils, by both compacting the soils and churning. For wetlands that are saturated at the time of construction it is recommended that a form of running track be constructed into the wetland to allow such heavy machinery to move and work within the construction footprint without exerting excess impacts on wetland soils and vegetation. Running tracks can be constructed from materials such as crushed stones underlain by bidum to form a raised track above the ground level of the wetland. It is important that the material utilised to create the running track be fully removed from the wetland at the conclusion of construction at each site (wetland).		
Indigenous wetland and riparian vegetation removed from the road footprint and suitable for rehabilitation activities must be carefully removed and stored in an appropriate facility for rehabilitation purposes.		
Where possible, vegetation must be cut to ground level rather than removing completely so as to assist with binding/stabilising the soil during land-clearing operations.		
Movement of construction vehicles across wetlands must be minimised as much as possible.		
Any topsoil and vegetation from areas to be excavated must be stripped and stored at the designated soil stockpile area outside of the wetland for use later in rehabilitation. Excavated sediments from the construction zone, including any foreign materials, must not be placed within the delineated wetlands in order to reduce the possibility of material being washed downstream.		
Soil and other material required for construction purposes must not be derived from any river or wetland.		
Any topsoil removed from watercourses must be stockpiled separately from subsoil material and be stored appropriately for use in rehabilitation activities		
Where possible, vegetation must be cut to ground level rather than removing completely so as to assist with binding/stabilising the soil during land-clearing operations.		
All cleared and trimmed vegetation shall be removed from the wetland upon completion of clearing in order to prevent the risk of flooding/snagging.		
The ECO will need to mark any indigenous wetland and trees together with the vegetation specialist or ecologist appointed for this purpose (especially within swamp forests) or sensitive plant species adjacent to		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
the construction servitude that are not to be damaged during construction.		
No building material, soils or rubble is to be disposed of within any wetland.		
Run-off generated from cleared and disturbed areas/slopes that drains into wetlands must be controlled using erosion control and sediment trapping measures like silt fences, sandbags, earthen berms and synthetic logs, particularly where slopes are exposed. These control measures must be established at regular intervals perpendicular to the slope to break surface flow energy and reduce erosion as well as trap sediment.		
Sediment barriers (e.g. silt fences, sandbags, hay bales, earthen filter berms, retaining walls and check dams) must be established to protect water resources from erosion and sedimentation impacts from upslope. Sediment barriers must be regularly maintained and cleared so as to ensure effective drainage.		
Berms, sandbags and/or silt fences employed must be maintained and monitored for the duration of the construction phase and repaired immediately when damaged. The berms, sandbags and silt fences must only be removed once vegetation cover has successfully re-colonised the disturbed areas post-rehabilitation.		
Any flow diversions are to be done so in such a manner that water does not result in concentrated flow downslope that could initiate soil erosion.		
Ensure that any trenches or excavations are closed and compacted immediately after construction is completed.		
No building material, soils or rubble is to be disposed of within any wetland.		
<p>Site-specific measures – Lake kuZilonde</p> <ul style="list-style-type: none"> ▪ It is recommended that the boardwalk structure not only traverse the lake, but must traverse the wetlands to the east of the lake, in particular the swamp forest wetland which is highly sensitive. No fences apart from the international (elephant border fence) must traverse the swamp forest as cattle and other livestock are unlikely to be able to move through this area of swamp forest that is likely to be permanently inundated. Inner and servitude fences can however be erected in the ‘dry’ non-wetland section of the border line between 26°51’40.40”S 32°52’20.35”E (KM2.08) and 26°51’39.56”S 32°52’24.41”E (KM1.89). ▪ For the construction of the boardwalk and elephant fence across the lake, swamp forest and papyrus swamp which is permanently saturated, an elevated running track must be constructed <i>between the fence and the road alignment</i>, so that a single running track is able to be used for both the fence and the boardwalk construction. The purpose of the running track is to allow tracked construction vehicles (such as excavators) to move across the lake for construction purposes without causing damage to the lake substrate. ▪ The running track must not be wider than the width required for one excavator to move along it, and must be kept as narrow as possible. ▪ It is recommended that the running track be constructed from rip rap or similar large sized rock and boulders that will be able to be fully removed once construction is complete. 		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<ul style="list-style-type: none"> ▪ Once construction of the boardwalk and fence is complete the running track must be fully removed, with care taken not to remove the lake substrate. No material that will prevent the free movement of fish and other aquatic fauna must be retained within the lake. ▪ If possible, the design of the international border fence through the open water section must allow the free movement of hippopotami (<i>Hippopotamus amphibius</i>) to the northern section of the lake. <p>Mitigation measures for Swamp Forest Wetlands</p> <ul style="list-style-type: none"> ▪ In addition to Lake kuZilonde, there are two large swamp forest wetlands (W70A-W17/18 & W70A-W15 as named in the freshwater report) that are highly sensitive as they are in a largely natural state. It is imperative that the footprint of the infrastructure be kept as narrow as possible through these two wetlands. ▪ It is strongly recommended that the border barrier structure through these wetlands be constructed along the existing road and that the elephant fence be incorporated into the barrier at through these wetlands. The (new) border patrol road must be developed in immediate proximity to the barrier with the inner fence being placed immediately adjacent to the south side of the patrol road. ▪ It is recommended that the existing culverts along the existing patrol road be lengthened to accommodate through flows under the road. Additional pipe culverts must be placed under the road in line with the spacings in the barrier to allow diffuse (surface and subsurface) flows to underpass the infrastructure. ▪ It is strongly recommended that no servitude fence be developed through these two wetlands as this would result in the impacting of swamp forest habitat away from the road where no impact currently exists. ▪ In wetland unit W70A-W15 these measures must be implemented between 26°51'47.73"S 32°46'55.47"E (KM11.225) and 26°51'48.29"S 32°47'6.54"E (KM10.9). In wetland unit W70A-W17/18 these measures must be implemented between 26°51'49.18"S 32°45'55.88"E (KM12.875) and 26°51'47.64"S 32°46'9.73"E (KM12.485) <p>A method statement for working in wetlands is provided in section 8.</p>		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
7.2.14 Noise		
A Complaints Register is to be kept at the Site Office at all times.	Contractor	Daily
All mobile plant and equipment must be regularly maintained to ensure their integrity and reliability.		
The management of the Farazela Construction Camp must take potential noise receptors such as nearby homesteads into account and potentially noisy activities must be limited to daytime hours. Should construction staff be housed within the construction camp potentially noisy social activities must be kept to a minimum.		
Surrounding communities and adjacent landowners are to be notified upfront of noisy construction activities (blasting and excavations).		
All construction vehicles and equipment are to be kept in good repair and must be fitted with standard silencers prior to construction.		
Where possible, stationary noisy equipment (for example compressors, generators etc. must be encapsulated in acoustic covers, screens or sheds. Portable acoustic shields must be used in the case where noisy equipment is not stationary (for example drills, angle grinders, chipping hammers).		
Construction activities, and particularly the noisy ones, are to be contained to reasonable hours during the day and early evening.		
Machines in intermittent use must be shut down in the intervening periods between work or throttled down to a minimum.		
In general, operations must meet the noise standard requirements of the Occupational Health and Safety Act (Act No. 85 of 1993).		
Construction staff working in areas where the 8-hour ambient noise levels exceed 75 dBA must wear ear protection equipment.		
Noise levels must be kept within acceptable limits. All noise and sounds generated must adhere to SANS 10103 specifications for maximum allowable noise levels for central business districts. No pure tone sirens or hooters may be utilised except where required in terms of SANS standards or in emergencies.		
Noisy operations must be combined so that they occur where possible at the same time.		
Noise from labourers must be controlled.		
Noise suppression measures must be applied to all construction equipment. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site.		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
The Contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance. Where possible labour must be transported to and from the site by the Contractor or his sub-contractors by the contractors own transport.		
7.2.15 Air Quality Pollution Management and Odour Control		
All mobile plant and equipment must be in good working order.	Contractor	Daily
A register must be maintained for vehicle maintenance.		
Chemical toilets must be provided and cleaned on a regular (weekly) basis.		
Servicing receipts must be maintained and kept on site within the site environmental file.		
Any oil containing equipment or containers must be managed in a manner to avoid oil exposure to atmosphere to limit evaporation of volatiles to atmosphere.		
Vehicles must be maintained to avoid excessive emissions and smoke. Similarly equipment must be serviced.		
7.2.16 Dust Control		
Dust must be suppressed on the construction site during dry periods by the regular application of water. Water used for this purpose must be used in quantities that will not result in the generation of runoff.	Contractor EO ECO	Daily
No water must be abstracted for dust suppression.		
Dust dispersion from construction activities, roads, soil stockpiles and other construction locations will be limited and suppressed to the maximum extent practical.		
Surplus fill material sites and stockpiles will be positioned such that they are not vulnerable to wind erosion.		
Skips and trucks which are loaded with construction materials must be covered with a sail or tarpaulin.		
All stockpiles must be maintained for as short a time as possible and must be enclosed by wind-breaking enclosures of similar height to the pile.		
Stockpiles must be situated away from nearby receptors and must take into account the predominant wind direction.		
A speed limit of 30 km/hr must be set for all vehicles travelling over exposed areas or near stockpiles		
Dust and mud must be controlled at vehicle exit and entry points to prevent the dispersion of dust and mud beyond the site boundary.		
Dust track-on from disturbed areas to gravel road surfaces must be avoided by making use of one of the following measures to:		
<ul style="list-style-type: none"> ▪ Chemical dust suppression of disturbed areas to reduce the amount of dust which can be lifted by the wheels of trucks. ▪ Wet suppression to the roads using a light spray. 		
Re-vegetation of exposed areas for long-term dust and water erosion control is commonly used and is the		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>most cost-effective option. Plant roots bind the soil, and vegetation cover breaks the impact of falling raindrops, thus preventing wind and water erosion.</p> <p>Plants used for re-vegetation must be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and must easily be propagated by seed or cuttings.</p> <p>In areas where there is a large potential for dust liberation (high wind days) wet suppression using a light spray must be applied to the areas in question.</p> <p>A dust suppression register as well as a complaints register needs to be kept.</p>		
7.2.17 Fire Management		
<ul style="list-style-type: none"> ▪ No open fires to be permitted on construction sites. Fires may only be made within the construction camp and only in areas and for purposes approved by the ECO. ▪ Fire prevention facilities must be present at all hazardous storage facilities. ▪ Ensure adequate fire-fighting equipment is available and train workers on how to use it. ▪ Ensure that all workers on site know the proper procedure in case of a fire occurring on site. ▪ Smoking must not be permitted in areas considered to be a fire hazard. ▪ Ensure that no refuse wastes are burnt or buried on the construction site or on surrounding areas. 	Contractor	Daily
7.2.18 Social Considerations		
<p>Working hours are restricted to 07:00 – 18:00 during weekdays and 08:00 - 17:00 over weekends if necessary. Should work be required after these hours, the ECO must be notified and any person who resides in close proximity to the site and who may be impacted upon by the disturbance must also be notified.</p> <p>Recruitment at the construction site must not be allowed.</p> <p>A CLO must be appointed to deal with the employment of local labour and to interface between the contractor and the local community.</p> <p>Where possible, labour intensive practices (as opposed to mechanised) must be implemented.</p> <p>The principles of equality, BEE, gender equality and non-discrimination must be implemented.</p> <p>All neighbouring landowners and those that are disturbed due to construction activities are to be notified of construction activities and provided with regular feedback on the status of construction.</p> <p>A labour and recruitment policy must be developed, displayed and implemented by the contractor.</p> <p>All labour (skilled and unskilled) and Contractors must be sourced locally where possible. The Contractor is to arrange for a suitable candidate to assist with the appointment of local labour and assist with labour disputes.</p> <p>Due to the concentration of a workforce in the area over the construction period, the Contractor must</p>	Contractor	Daily

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>implement an HIV / AIDS Awareness Programme on-site. The Contractor must appoint an HIV / AIDS Awareness Officer for the duration of the construction period. Activities for HIV / AIDS awareness and prevention will be broad based, targeting both individuals and groups. They may consist of:</p> <ul style="list-style-type: none"> ▪ Information posters in public places both on and off site (eating places, bars, guest houses, etc.); ▪ Peer educators (reference people) drawn from the local labour force and trained in HIV/AIDS issues for discussions with colleagues (estimate 1 per 30 employees); ▪ Small focus group discussions and information covering key issues must be held; ▪ Inclusion of HIV / AIDS activities at site meetings and other discussions; and ▪ Voluntary Counselling and Testing. <p>Education must cover:</p> <ul style="list-style-type: none"> ▪ Stigma and discrimination issues; ▪ Preventative behaviours including partner reduction, condom use, and awareness and importance of treatment of STDs; ▪ Skills including negotiating safer sex, correct condom use, purchase without embarrassment; and ▪ Referral to local health centres and services available. 		
Contractors and their families may not stay on-site, with the exception of the Farazela Construction Camp.		
No informal settlements will be allowed.		
Strict penalties will be built into tenders to deal with issues such as petty crime, stock theft, fence cutting, trespassing etc.		
Ensure the appointment of a Safety Officer to continuously monitor safety conditions during construction.		
The Contractor and Safety Officer must maintain daily communication with the SANDF units responsible for patrolling the international border. The Phase 1 alignment is located along an area in which much criminal activity in the form of illegal movement of vehicles and other stolen goods occurs and accordingly safety and security must be a priority. The SANDF must be informed daily of construction numbers and progress, especially with respect to the demolishing and replacing of the border fence.		
All construction camps must be fenced and patrolled 24 hours a day by security personnel.		
It is recommended that construction workers be accompanied by members of the SANDF or SAPS in order to prevent any incidents of conflict with the Mozambican authorities related to construction activities close to, or on the border line that could lead to South African construction workers being detained. In this context it is recommended that the safety officer set up a communication protocol with the relevant Mozambican authorities to inform them of construction areas and progress to facilitate safe working conditions and to minimise the possibility of any international incidents. In this regard the safety officer must be fully conversant in Portuguese.		
All construction staff must have the appropriate PPE.		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
The construction staff handling chemicals or hazardous materials must be trained in the use of the substances and the environmental, health and safety consequences of incidents.		
Report and record any environmental, health and safety incidents to the responsible person.		
7.2.19 Reporting & Record Keeping - Complaints Register		
<p>Complaints received must be registered and recorded by the contractor and also brought to the attention of the contractor. Both parties will respond accordingly.</p> <p>The following information must be recorded in the case of any complaint / incident:</p> <ul style="list-style-type: none"> ▪ Time, date and nature of complaint; ▪ Response and investigation undertaken; and ▪ Corrective and preventative actions taken and by whom. 	Contractor	Daily
All complaints received will be investigated and a response is to be given to the complainant within 7 days.		

7.3 Post Construction and Operational Phase

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
7.3.1 Construction areas		
All structures comprising the construction affected areas are to be removed from the site and surrounding areas.	Contractor Developer	Post- Construction
The area that previously housed the construction materials is to be checked for spills of substances such as oil, paint, diesel, etc. and these must be cleaned up.		
All hardened surfaces within the construction affected area must be ripped, all imported materials removed, and the area must be top soiled and re-grassed accordingly with indigenous species.		
The Contractor must arrange the cancellation of any temporary services.		
7.3.2 Vegetation		
All areas that have been disturbed by construction activities (including the construction affected areas) must be cleared of alien vegetation.	Developer	Post- Construction
All vegetation that has been cleared during construction is to be removed from site or used as mulch, (except for vegetation which may result in inadvertently seeding alien vegetation).		
7.3.3 Operational Maintenance of Infrastructure		
The border patrol road must be inspected daily by SANDF personnel while undertaking their daily patrols. Should any damage be detected, maintenance/repairs of the road infrastructure must be done in accordance with construction mitigation measures provided.	Developer & End Users	Operational Phases – on- going
The livestock exclusion zone must be strictly maintained as such, and all damaged to inner fences be repaired so that livestock do not enter this zone.		
Stormwater infrastructure must be inspected preferably on an annual prior to the start of the rainy season. Blocked infrastructure will need to be unblocked while silted structures will need to have excess sediment removed.		
Maintenance of the fences and barrier: this infrastructure must be inspected by SANDF personnel while undertaking their patrols. Should any sections be damaged and require replacement, this must be done in accordance with construction mitigation measures provided.		
Major structural maintenance of infrastructure (i.e. replacement or major repairs) within wetlands must take into account the construction phase mitigation measures above.		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>Erosion headcuts, eroding river banks and scouring downstream for fence foundations in wetlands (where applicable) must be stabilised immediately to avoid damage to the wetland and to infrastructure. Eroding and/or unstable road batters must also be stabilised and rehabilitated for the same reasons</p> <p>Regular monitoring and clearing of sediment laden roadside drains is recommended to avoid excessive accumulation of sediment in drains which will eventually render them useless</p> <p>Surfaces of gravel roads within wetlands, and within the catchment of wetlands must be monitored for the presence of developing erosion that could lead to sedimentation in the downstream wetland.</p>		
<p>Maintenance of the border 'Detection Zone'</p> <ul style="list-style-type: none"> ▪ Grass Mowing: Grass mowing particularly on gentle to flat areas has been identified as a preferred method to keep grass short and maintaining a clear Detection Zone. In this regard, it is recommended that tall grass be mowed biannually. The first cut can be made prior to the start of the wet season (August – September) and the second cut towards the end of the wet season (February - March). ▪ Veld Burning: In areas where mowing is not feasible, veld burning may be a viable alternative used to maintain visibility within the Detection Zone. This requires a cool burn (downwind fire) that will proceed through the grassland as quickly as possible so as to cause the least damage to herbaceous plants. Ideally grass must be burnt only in winter (May - June) when temperatures are low. Use of fire requires a firebreak system to ensure effective management of controlled burns. 		
7.3.4 Materials and Infrastructure		
<p>All residual stockpiles must be removed to spoil or spread on-site as directed by the Developer and/ or Engineer.</p>	<p>Developer Engineer Contractor</p>	<p>Post- Construction</p>
<p>All leftover building materials must be returned to the depot or removed from the site.</p>		
<p>Fences, barriers and demarcations associated with the construction phase are to be removed from the site unless stipulated otherwise by the Developer.</p>		
7.3.5 Rehabilitation		
<p>The Developer is responsible for compliance with the provisions for Duty of Care and Remediation of Damage in accordance with section 28 of National Environmental Management Act (NEMA), Act No. 107 of 1998.</p>	<p>Contractor Engineer Developer ECO</p>	<p>Post- Construction</p>
<p>The '<i>precautionary principle</i>' must apply and cost-effective measures must be implemented to pro-actively prevent degradation of the region's water resource and the social systems that depend on it. Ultimately, the risk of water resource degradation must drive sustainability in development design. The protection of water resources begins with the avoidance of adverse impacts and where such avoidance is not feasible; to apply</p>		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>appropriate mitigation in the form of reactive practical actions that minimises or reduces impacts. Examples of mitigation can include changes to the scale, design, location, siting, process, sequencing, phasing, and management and/or monitoring of the proposed development activities, as well as the restoration or rehabilitation of disturbed sites. Where environmental impacts can be severe, the guiding principle must be “anticipate and prevent” rather than “assess and repair.</p>		
<p>All remaining maintenance materials, building rubble and waste are to be removed from the site to an approved disposal site. Burying rubble on the site is prohibited.</p>		
<p>All disturbed surfaces compacted by maintenance activities including the ablutions and loading areas must be ripped to a minimum depth of 30 cm to allow organic contaminants to breakdown and promote vegetation establishment.</p>		
<p>The Contractor is required to rehabilitate all impacted areas according to the approved Method Statement for the Rehabilitation of Modified Environments.</p>		
<p>Final rehabilitation must be completed within a period specified by the Engineer.</p>		
<p>The site and surrounding areas is to be cleared of all litter.</p>		
<p>Surfaces are to be checked for waste products from activities such as concreting or asphaltting.</p>		
<p>All embankments are to be trimmed, shaped and replanted to the satisfaction of the ECO.</p>		
<p>Immediately after construction disturbed areas must be re-vegetated and supplemented with transplants from adjoining like habitats if required. Alternatively, reseeding via broadcasting using an indigenous seed mix reflecting the general species composition of the area must also be used where necessary. If such seed mixes are not available, seed will need to be harvested from the area and grown nearby for later re-vegetation using plugs/sprigs.</p>		
<p>A biodegradable geo-fabric mat (or vegetation blanket) must be utilized to protect the topsoil on steep slopes from water and wind erosion during re-vegetation. Alternatively, the plants can be secured using a coarse mesh (steel wire or plastic). The mesh or mat is placed over the vegetation securing it until it can fully establish. The plants must be able to grow unhindered through the mesh or matting. Mats can be staked down.</p>		
<p>Alien and weedy vegetation that colonise the disturbed areas must be removed and eradicated. It is the responsibility of the Developer to eradicate and control alien invasive plants that invade all areas disturbed by the construction and operation of the proposed development. In terms of section 75 of NEM:BA, the following applies to the control and eradication of invasive species:</p> <ul style="list-style-type: none"> ▪ The control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs; ▪ Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment; and ▪ The methods employed to control and eradicate a listed invasive species must also be directed at the 		

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
<p>offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.</p> <p>Bi-annual alien plant clearing must be undertaken by the applicant for the first year post-rehabilitation. Thereafter, alien plant clearing must be undertaken annually until such a time that further risks of alien invasion resulting from disturbance factors are considered negligible.</p> <p>The soils must be adequately prepared prior to planting by a contractor with experience in re-vegetation and under no circumstances must fertiliser be applied.</p> <p>Once the initial transplants / plugs are planted, the contractor must conduct weekly site visits to monitor re-establishment and remove alien plants (in accordance with the latest revised NEM:BA requirements) and address any re-vegetation concerns until re-vegetation is considered successful (i.e. >90% indigenous cover). Thereafter, the rehabilitation must be signed off by the ECO.</p> <p>All disturbed areas must be prepared and then re-vegetated to the satisfaction of the ECO.</p> <p>Where drainage channels have been disturbed, the channels must be re-graded, stabilised using erosion control measures and re-vegetated as per the relevant re-vegetation/re-planting plan.</p> <p>The Contractor must check that all watercourses are free from building rubble, spoil materials and waste materials.</p>		
7.3.6 End of Contractor Services		
<p>A meeting is to be held on-site between the Developer and the ECO to approve all remediation activities and ensure that the site has been restored to a condition acceptable to the ECO and the Developer.</p>	<p>ECO Developer</p>	<p>Post-Construction</p>
<p>A site close-out audit is to be undertaken by the ECO prior to handover of the site by the Contractor.</p>		
7.3.7 Waste Management		
<p>The site must be kept void of litter.</p> <p>Waste management at the site must subscribe to the principles of sustainable waste management. This includes:</p> <ul style="list-style-type: none"> ▪ Waste prevention - the prevention and avoidance of the production of waste at source; ▪ Waste reduction - the reduction of the volume or hazardous nature of the waste during production; ▪ Resource recovery - recycling or re-use of the waste; ▪ Waste treatment - the treatment of waste to reduce volume or risk to human and environmental safety and health to reduce the degree of hazard when waste is disposed of in a landfill or discharged into a water source; and ▪ Waste disposal - the environmentally acceptable and safe disposal or discharge of waste, (e.g. 	<p>Developer</p>	<p>On-going</p>

ENVIRONMENTAL SPECIFICATION	RESPONSIBILITY	FREQUENCY
encapsulation, incineration, landfill or discharge to a water source). These principles must be practiced to the greatest extent possible.		
7.3.8 Social Concerns		
Job creation expectations will have to be well managed via management systems and communication mechanisms that regularly inform the local community (on-site and at local community centres) of the progress and job / skills needs at the development sites.	Developer	Construction and operational phases – on-going
7.3.9 Operational Use of Infrastructure		
Unless absolutely necessary (under special circumstances), patrol vehicles of any type must remain on roads and are not to create unauthorised tracks or roads. These informal roads and tracks cause unnecessary disturbance, adversely affect surface hydrology by creating ruts that can act as paths of preferential flow (thus affecting diffuse flow settings) and induce erosion where the groundcover has been disturbed. This is particularly important in depression and other un-channelled valley bottom wetland types where the wetland is characterised by moist grassland which is particularly susceptible to this type of impact.	End Users	Construction and operational phases – on-going
Quad patrols must make use of the same tracks and not create a series of tracks. Similar impacts to those detailed in the point above are applicable.		
7.3.10 Operational Control of Alien Invasive Vegetation		
It is the responsibility of the developer/applicant to eradicate and control alien invasive plants that invade all areas disturbed by the construction and operation of the proposed road. In terms of section 75 of NEMBA.	Developer	Construction and operational phases – on-going
The control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.		
Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment		
The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.		
It is recommended that bi-annual annual alien plant clearing be undertaken by the applicant for the first year post-rehabilitation. Thereafter, alien plant clearing must be undertaken annually until such a time that further risks of alien invasion resulting from disturbance factors are considered negligible.		

8 METHOD STATEMENT FOR WETLAND CROSSINGS

This Method Statement describes the methods and manner in which construction is implemented within wetlands such that negative impacts on the environment are mitigated as far as practically possible. Best Management Practices (BMP) are applied to construct access without serious long-term impact on the condition and natural functioning of the particular watercourse being traversed.

There are two typical scenarios in crossing wetlands, namely:

- Permanent road, fence and barrier obstacle construction associated with unpaved roads, culverts and bridge crossing and fence footing/foundations.
- Temporary access associated with roads to and from active work areas (as above).

8.1 Construction Methods

8.1.1 Typical Equipment Needed

Items needed for installation may include:

- Excavators.
- Crane of sufficient lifting capacity and reach.
- Compacting equipment.
- Culvert / bridge components.
- An on-site concrete batching plant.
- Concrete delivery vehicles for wet concrete.
- Formwork, reinforcing steel, and the necessary tools for assembly.
- Equipment for construction of foundations where required.
- Equipment for construction of inlet- and outlet end walls.

8.1.2 Typical Construction Steps

Typical construction steps associated with river and wetland crossings are presented below. Specific environmental considerations related to water resources will be covered in detail later should the construction step indicate so.

1. Demarcate the construction area where construction works occur within or in close proximity to a wetland.
2. Ensure that the design of watercourse crossings complies with best-practice guidelines for design
3. Ensure that site workers are well versed in the Method Statement, including environmental restrictions.
4. Ensure that general mitigation measures to limit impacts on wetlands are complied with.
5. Ensure that appropriate mitigation measures for Site establishment are implemented.
6. Ensure that mitigation measures for access control are implemented.
7. Establish depths of wetland at various chainages along specific crossing.
8. Establish approximate bearing capacities of soil at bottom of wetland crossing. **Due to the sandy nature of all wetlands in the study area, these are likely to have very poor bearing capacities, in particular when soils are saturated as in most wetlands. Thus in this context**

it is unlikely to be impractical and potentially unsafe to excavate in the wetland without some form of running track. The method proposed in these situations involves 'end tipping' the rock fill to create a solid foundation for the road fill embankment (creation of a running track). The rock is tipped at the edge of the wetland and gradually pushed in until firm enough footing is achieved. Subsequent loads can then be placed further into the wetland. Thus the rock fill is gradually placed across the affected area. A geo-grid or geotextile, as appropriate, is to be placed on top of the levelled rock fill. **Note the method for temporary access over wetlands can also be utilised in this instance.**

9. Ensure that appropriate mitigation measures for site clearing and vegetation stripping are implemented.
10. Ensure that appropriate mitigation measures for cut and fill embankments are implemented.
11. Ensure that appropriate storm water management and erosion control measures are implemented.
12. Excavate to the required width and depth, with shoring or cofferdams to prevent slumping of the saturated material (*see Method Statement for the Use of Cofferdams*).
13. If required, excavate further to acceptable bearing capacities.
14. Place a pioneer layer of permeable material over the bed of the excavation, or place a layer of suitable geo grid.
15. Lay down a double layer of suitable geotextile to cover the base and sides of the excavation, plus sufficient geotextile to fold over the rock fill.
16. Place rock fill, size between 50mm and 200mm to width of road bed in layers not exceeding 500 mm. The top of the layer is not to extend above any required culvert invert levels.
17. Fold geotextile back over rock fill and tuck in on other side.
18. Construct road fill embankment with dry, selected materials.
19. Allow the fill embankment time to settle and install culverts as necessary
20. Construct pavement and sub-base layers to specified compactions.
21. Construct base coarse layers to specified compaction.

8.1.3 General Construction Method for Culverts

The general construction method for culverts for wetland crossings includes the following general steps:

1. Competent site investigation, sampling and relevant testing to build up an informed picture of the task.
2. Ensure adequate design of all the stages of the construction
3. Ensure adequate mitigation of all impact identified for the duration of construction.
4. Trench for culverts through the road fill embankment at the specified positions down to grade but not less than 300mm above the geotextile folder over the rock fill.
5. If it is required that the culvert invert be lowered further, carefully excavate by hand to ensure that the geotextile is not damaged.
6. Construct culvert bedding to correct fall and specification.
7. Lay culvert to correct crossing angle and fall.
8. Backfill according to the specifications indicated on the construction drawings with material approved by the engineer to the height of the fill.
9. Perform required compaction tests on all backfill material.
10. Construct the culvert inlet and outlet structures, which will typically be headwalls, wingwalls and apron slabs.

11. Trim the fills and construct any erosion protection works such as gabions, stone pitching, and berms.

Some slight changes to this approach are relevant to pre-cast and in-situ culverts as detailed below.

8.1.4 Construction Method for Pre-Cast Culverts

The construction of pre-cast culverts includes the following steps:

1. Competent site investigation, sampling and relevant testing to build up an informed picture of the task.
2. Adequate design of all the stages of the construction
3. Partially divert the stream flow to facilitate construction of the culvert in dry conditions within the defined watercourse where possible (*see Method Statement for the use of cofferdams and diversions*).
4. Set out crossing angle for culvert in relation to road alignment.
5. Trim the bed of the water course to the desired levels and to create a suitable platform for construction.
6. For small culverts, it may be appropriate to trench through an already constructed fill embankment.
7. Construct foundations where required for bottomless structures.
8. Place and compact bedding in accordance with specifications and drawings.
9. Place culvert components, i.e. pipe sections, box sections or arch sections, to correct levels and falls and secure.
10. Ensure adequate anchorage of the culvert components against flood forces.
11. Backfill either side of the culvert (and also between barrels where required) in accordance with the specifications.
12. Backfill over the culvert in accordance with the specifications.
13. Construct inlet and outlet structures, as well as necessary erosion protection measures.
14. Relocate channelization back to original stream channel.
15. Re-instate stream bed and embankments as well as possible.
16. Construct the road pavement layers and surfacing.

8.1.5 Construction Method for Cast In situ Culverts

Cast in-situ culverts offer flexibility in the sizing of the culvert openings and in the alignment of the culvert barrel. The in-situ option is generally preferred for very large culverts due to the weight of such large pre-cast units. An in-situ culvert will have fewer joints than the pre-cast option, and reinforcing steel can pass through the construction joint, minimising the risk of movement at the joints. Cast in-situ culverts are also more labour intensive than the pre-cast option, providing increased employment opportunities for local labour. The construction method and sequence is essentially the same as for pre-cast culverts described in 9.1.4 (above) up to **Step 6**. The only addition to the method is that at **step 6**, the following sub items apply as follows:

- Undertake steps 1-5 as described above.
- 6(a) Fix the reinforcement steel for the culvert floor and walls.
- 6(b) Erect appropriate formwork for the floor and cast the concrete.
- 6(c) Erect appropriate formwork for the walls and cast the concrete.

- 6(d) Erect soffit formwork and fix the reinforcement steel for the culvert roof / deck.
- 6(e) Cast the concrete for the roof / deck slab.
- 6(f) Strip the formwork when the concrete is suitable cured.
- Undertake steps 7-17 as described above.

8.1.6 Construction Method for Temporary Access over saturated wetland areas using decks or mats

Temporary access may be necessary to facilitate vehicle/personnel access for activities such as excavations or piling. The following method is to be applied for temporary access:

1. Demarcate the construction area where construction works occur within or in close proximity to a wetland.
2. Ensure that general mitigation measures to limit impacts on wetlands are complied with
3. Mark out temporary access edge line (direction of increasing chainage).
4. Use DURA-BASE Composite Mat System or other Deck/Mat system approved by the Engineer.
5. Lay mats to 3 overlapped widths along the complete route.
6. Where wider work areas are required, lay extra mats as needed.
7. Lock all mats in position with the twist lock or other specified fasteners.
8. If a proprietary deck system is approved, construction and fasteners must be in accordance with the supplier's specifications.

8.1.7 Key Documents Consulted

1. SANRAL: Drainage Manual – 6th Edition 2013.
2. SANRAL: Geometric Design Guidelines.
3. COLTO: Standard Specifications for Road and Bridge Works, specifically Section 6100.
4. SANRAL: Code of Procedures for the Planning and Design of Highway and Road Structures in South Africa – 1st Edition 2002, updated 2008.
5. SANRAL: Construction Monitoring Manual for Bridges and Structures – 1st Edition 2011 – Chapter 4.8.

8.2 Use of Cofferdams for the Purpose of Constructing Bridge Foundations and Substructures

Cofferdams are temporary diversion are intended to ensure a dry active work area during construction of infrastructure within watercourses. This is generally applicable to construction activities occurring within/across wetlands, especially where overland flow is encountered. The use of cofferdams in the construction of bridge foundations and piers in watercourses is standard practice in the construction sector. This part of the method statement describes the processes in the design, construction and removal of cofferdams and temporary diversions, together with appropriate mitigation measures aimed at minimising the ecological impact of coffer dams/diversion structures on the watercourse.

8.2.1 Choosing an Approach

There a number of options available for isolating work areas from water flow, depending on the specific construction requirements and the nature of the watercourses flow dynamics. Figure * (below) serves as a guide to support decisions around the use of coffer dams versus temporary barriers, etc.

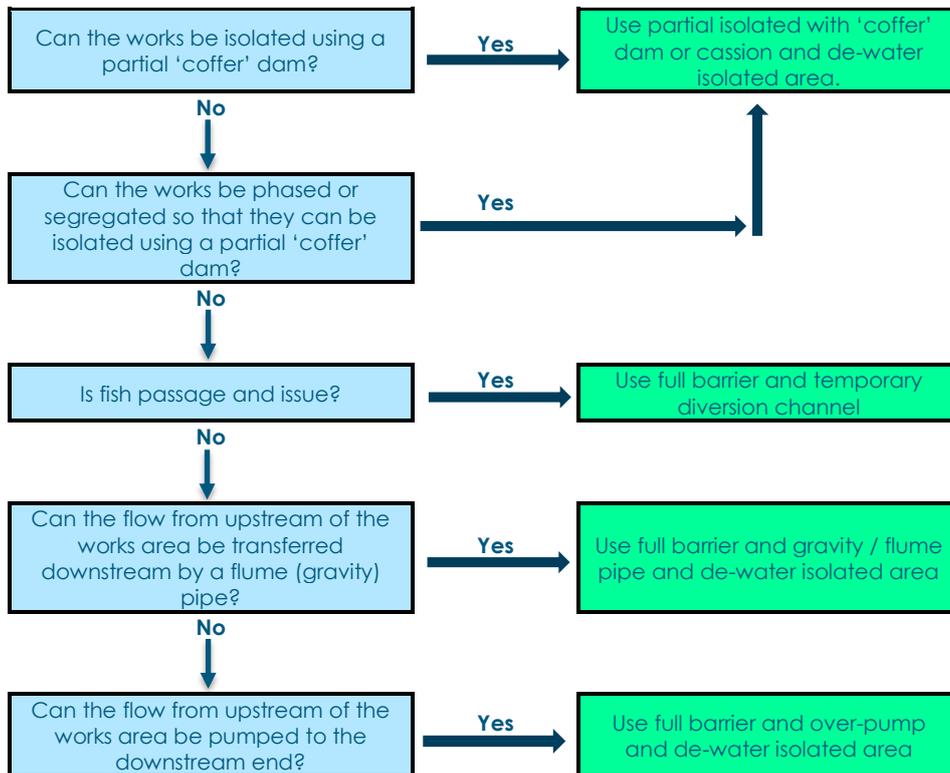
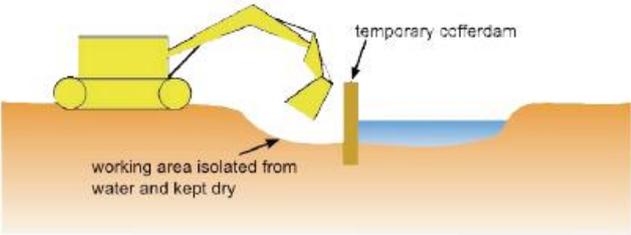
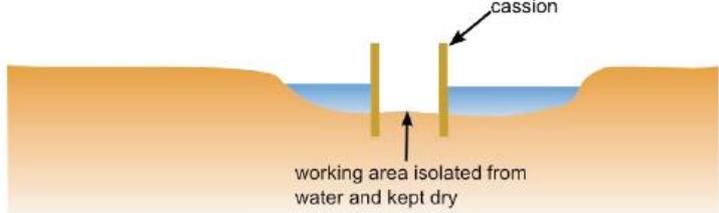
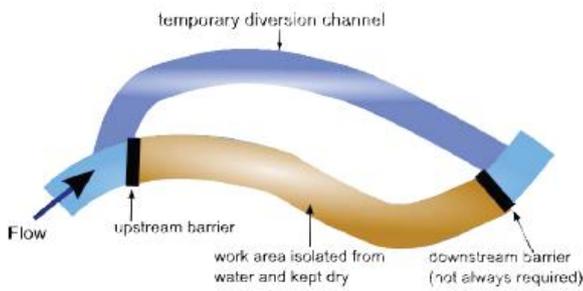
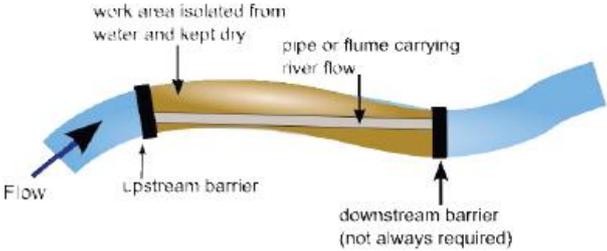
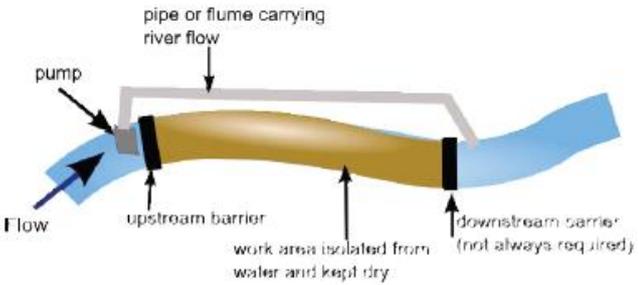
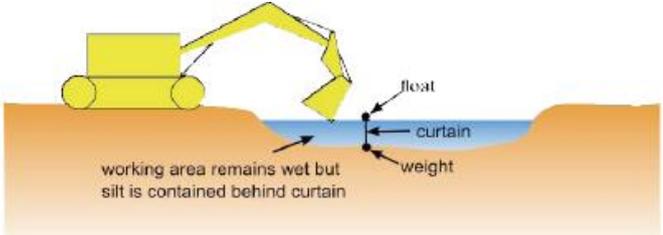


Figure 10: Decision support system for using cofferdams (after SEPA, 2009)

Once the correct approach has been adopted for the type of construction, it will be important to undertake the desired approach according to the best practise methods, as described in the table below.

Method/Approach	Description
<p>Partial isolation</p>	<p>Partial area of the channel is isolated and kept dry with the use of barriers (often referred to as a cofferdam) and flow is allowed to continue in the remainder of the channel. Barriers used to isolate part of the channel can be made of a number of different materials.</p> 
<p>Partial isolation using a Caisson</p>	<p>Provides isolation of the channel similar to cofferdams. They are essentially large boxes or cylinders (usually pre-cast concrete and steel) which are open at the top and bottom and are lowered into the water to isolate an area of bed.</p> 
<p>Full isolation Temporary diversion channel</p>	<p>A whole section of the channel is isolated and kept dry, and the water is transferred downstream of the works area by excavating a temporary open channel.</p> 
<p>Full isolation gravity/flume pipe</p>	<p>A whole section of the channel is isolated using barriers that span the full width of the river. This keeps a stretch of the river dry and the water is transferred downstream of the works area through gravity fed flumes/pipes. The flume(s) is normally placed on the bed of the watercourse through the works area and outfalls at the downstream barrier, if present, or far enough downstream to prevent the water backing up into the work area.</p>

Method/Approach	Description
	
<p>Full isolation over pumping / siphon</p>	<p>A whole section of the channel is isolated using barriers that span the full width of the river. This keeps a stretch of the river dry and the water is transferred downstream of the works area by mechanical assistance (pumping or siphon). The pump and associated pipework need not be located in the isolated area.</p> 
<p>Isolation with silt curtain</p>	<p>In this case the works area still remains wet and a silt curtain is placed around the works area to minimise sediment being transferred downstream.</p> 

8.2.2 General Principles relating to Cofferd Dams

- A cofferdam involves the interaction of the structure, soil, and water. The loads imposed include the hydrostatic forces of the water, as well as the dynamic forces resulting from currents and waves.
- The loads imposed on the cofferdam structure by construction equipment and operations are considered, both during installation of the cofferdam and during construction of the permanent structure itself.
- In the construction of cofferdams, it is difficult to maintain close tolerances since cofferdams are usually constructed in flowing water and sometimes under severe weather conditions. Under these circumstances, significant deformations of cofferdam elements may happen during the course of construction, and therefore it may be necessary to deviate from the design dimensions in order to complete the project according to plan and timeframes.

- In cofferdam construction, health and safety is of paramount importance, since workers will be exposed to the hazards of flooding and collapse.
- Safety requires that every cofferdam, and every component thereof, shall be of robust design and construction, of suitable and sound materials and of sufficient strength and capacity for the site conditions in which it is used.
- Proper construction of the cofferdam, verification that the structure is being constructed as planned, monitoring the behaviour of the cofferdam and surrounding area, provision of adequate access, light and ventilation, and attention to safe practices on the part of all workers and supervisors is required.
- The cofferdam construction shall be properly maintained.
- Finally, removal of the cofferdam is to be planned and executed with the same degree of care as its installation, using a phased approach (on a stage by stage basis). The effect of the removal on the permanent structure must also be considered. For this reason, it may be necessary that sheet piles extending below the permanent structure are cut off and left in place, since their removal could disturb the foundation soils and gravels in the river bed adjacent to the structure.

Box 1: Advantages and disadvantages of cofferdams

Advantages	Disadvantages
<ul style="list-style-type: none"> • Facilitates the excavation and the construction of structures in an otherwise poor environment. • Provides a safer working environment. • Contractors typically have design responsibility as the experienced contractors have developed their own techniques and systems. • The sheet piles typically used are easily installed and removed. • Materials can often be re-used on other parts of the same project or other projects. 	<ul style="list-style-type: none"> • Damage to the channel bed and banks generally occurs. • Cofferdams may be damaged during extreme weather conditions. • Can be costly and require regular maintenance and monitoring. • Presents a sedimentation risk • Temporarily block and/or divert flows affecting hydrological functioning and species movement

8.2.3 Outline of general approach

The sheet piling operations typically used require completion of the following stages for successful construction:

- Competent site investigation, sampling and relevant testing to build up an informed picture of the task.
- Adequate design of all the stages of the construction.
- Proper setting out and installation of the piles.
- Strict adherence to all health and safety requirements.

It is generally specified that work in watercourses is carried out during periods of low average rainfall. This reduces the risks inherent in their construction. Further, the lower stream flows reduce the risks of scour and disturbance of sediment in the river beds during construction. A Hazard Identification and Risk Assessment, together with mitigation measures, are required from the designer.

8.2.4 Typical equipment needed

Items needed for cofferdam installation may include:

- Survey and setting out to fix the correct location;
- Pile driving hammer (vibratory or impact);
- Crane of sufficient size;
- Steel sheet piles;
- Wide-flange beams for wales and stringers; and
- In specific cases, barges may be required for efficient installation.

8.2.5 Stage 1: Pre-construction

1. Refer to approved plans for construction.
2. Train staff in cofferdam construction.
3. Identify, demarcate and protect any affected water resources or sensitive habitat likely to be affected by the construction.

Environmental requirements during Stage 1:

- Existing access roads and tracks must be used to access the site, additional roads through wetland/river areas will need to be avoided unless absolutely necessary and under the strict direction of the ECO.
- Manage access at the approach and departure points to wetlands and river channels to prevent vehicles crossing these areas upstream or downstream of designated construction areas.
- Install appropriate downstream sediment control and flow diversion systems.
- Remove invasive alien plants from the work area prior to construction to avoid dispersal downstream.
- Ensure construction staff is well versed in the method and approach being followed including environmental matters. This may include:
 - Pollution incidents
 - Sediment and erosion
 - Extreme weather events
 - Protective works

8.2.6 Stage 2: Installation

4. Site clearing.
5. Pre-dredge to remove soil or soft sediments and level the area of the cofferdam.
6. Drive temporary support piles.
7. Temporarily erect bracing frame on the support piles.
8. Set steel sheet piles, starting at all four corners and meeting at the centre of each side.

9. Drive sheet piles to grade.
 10. Block between bracing frame and sheets, and provide ties for sheet piles at the top as necessary.
 11. Excavate inside the grade or slightly below grade, while leaving the cofferdam full of water.
 12. Drive or otherwise construct bearing piles.
 13. Place rock-fill as a levelling and support course.
 14. Place underwater tremie concrete seal.
 15. Check blocking between bracing and sheet piles.
 16. Dewater.
 17. Construct new permanent foundation and substructure of the bridge.
- Environmental requirements during stage 2:
 - When working within a watercourse, use excavators instead of bulldozers to reduce sedimentation.
 - Avoid unnecessary clearance of vegetation as well as disturbance of channel bed and banks.
 - Hand-clearing of vegetation must be undertaken within a watercourse (rivers & wetlands) and no heavy machinery shall be permitted within watercourses without the prior approval of the RE and ECO.
 - Do not dispose of removed vegetation into the watercourse.
 - Where practically possible construction must not occur in open flowing water.
 - Ensure that access and disturbance outside of the primary work area (including bed and banks) is limited.
 - Leave buffer strips of 5-10m wide at the site boundaries to act as sediment filters.
 - Appropriate and adequate sediment control measures must be implemented downstream of the work area.
 - Areas prone to erosion such as bare soils and steep banks must be stabilised. This applies to areas unstable prior to construction and areas that have become unstable as a result of construction.
 - Any sandbags used for erosion control shall be in a good condition to prevent additional sedimentation and/ or failure.
 - To aid in later cofferdam removal, a protective layer (i.e. geotextile filter) must be placed over the channel.
 - All areas subjected to flows are to be stabilised to avoid erosion.
 - Perform periodic visual inspections of on-site water quality at river/wetland crossing sites, identifying the source of any rapid increases in turbidity of surface waters and remedying this where necessary. These actions form part of monitoring activities.
 - Dewatering of excavated pits shall be undertaken in a manner that does not cause erosion and does not result in heavily silt-laden water flowing into any downstream wetland/river. Water is to be pumped out of saturated trenches/pits into a well vegetated area some distance from any watercourse to facilitate sediment trapping and reduce the chance of sediment entering wetlands/rivers.
 - Locate potential sources of contaminants away from water resources. these include:
 - Site compounds/parking areas.
 - Fuel and chemical storage.
 - Refuelling areas.
 - Stockpiles.
 - Vehicle and equipment washing areas.

8.2.7 Stage 3: Removal

18. Flood cofferdam.
19. Remove sheet piles.
20. Remove bracing.
21. Backfill as required.
22. End of cofferdam removal.
23. Rehabilitate disturbed areas.

- Environmental requirements during stage 3:
- Install appropriate downstream sediment control measures prior to removal of diversions/dams.
- Cofferdams must be removed as soon as practically possible following construction.
- Ensure that disturbance of channel bed and banks is minimised during removal.
- If excess debris and sediment has collected upstream of the structure, remove the material before the dam is removed and dispose of the material properly.
- Ensure that water in the enclosed area is either pumped out of the channel or adequately treated before discharging into the receiving watercourse.
- All construction related material, including organic material accumulated during use, is properly removed and disposed of.
- Restore channel to previous dimensions and appropriately rehabilitate disturbed areas.
- Rehabilitate disturbed watercourses as per Method Statement for Rehabilitation of Disturbed Watercourses.

8.2.8 Key Documents Consulted

- SANRAL: Drainage Manual – 6th Edition 2013.
- SANRAL: Geometric Design Guidelines.
- COLTO: Specifications for Road and Bridge Works, specifically Section 6100.
- SANRAL: Code of Procedures for the Planning and Design of Highway and Road Structures in South Africa – 1st Edition 2002, updated 2008.
- SANRAL: Construction Monitoring Manual for Bridges and Structures – 1st Edition 2011 – Chapter 4.8.
- SEPA (Scottish Environment Protection Agency): Engineering in the Water Environment Good Practice Guide: Temporary Construction Methods, First edition, March 2009, Document reference: WAT-SG-29.

8.3 Rehabilitation Activities

Note: The Conceptual Post-Construction Rehabilitation Plan for Aquatic Habitats has been compiled as part of the Freshwater Report, and is specific to aquatic / freshwater habitats. This document has been appended as Appendix B.

8.3.1 Site Preparation Prior to Re-vegetation

The following key rehabilitation objectives are proposed:

- To reshape, stabilise and re-vegetate (reinstate) wetland and riparian areas physically disturbed by construction activities, both planned and accidental. Rehabilitation must be pragmatic and focus on

the stabilisation and re-vegetation of disturbed areas, with less focus on biodiversity aspects (i.e. reinstating reference species diversity).

- To remove all sediment and construction materials washed into wetlands / channels during construction and reshape and revegetate the affected surface (if applicable).
- To eradicate and control invasive alien plants and weeds that invade and colonise the watercourses post-disturbance; and
- To monitor the success of the rehabilitation actions and ensure that the above-listed objectives are achieved.

It must be emphasised however that these guidelines are not intended to be a detailed rehabilitation implementation plan for the site and detailed method statements, planting plans, bills of quantities and budget for rehabilitation will need to be developed based on these guidelines.

8.3.2 Conceptual Rehabilitation Strategy

Post-construction rehabilitation will aid the recovery of the disturbed ecosystems and is critical in preventing further impacts including those associated with IAP infestations, soil erosion and sedimentation, although it is important to note that the freshwater habitat within the construction servitude (road reserve) is already degraded and characterised by secondary vegetation. **Table 11** below provides guidance on the approach and basic methods for rehabilitating disturbed aquatic habitat during culvert replacement:

Table 11: Post Construction Rehabilitation Guidelines for Disturbed River and Riparian Habitat

Rehabilitation Step	Rehabilitation Guidelines and Specific Actions
STEP 1: Initial planning and strategy	<ul style="list-style-type: none"> • Upfront it is important to note that these guidelines do not constitute a detailed rehabilitation plan that includes detailed implementation measures and bills of quantities. As part of the approval of the final construction EMPr, a detailed plan must be compiled and appended to the EMPr. • A budget including costing of all re-vegetation activities and equipment costs will need to be compiled prior to commencement of construction. A financial provision for all rehabilitation costs must be included in the contractual agreement for the project. • Rehabilitation must target all areas to be physically disturbed by activities, planned and unplanned. These areas must be identified prior to the implementation of the Plan. • It is important to keep in mind that quantities of required geofabric and plant material must be ordered at the right time to ensure that adequate quantities of the materials are available during implementation. • Rehabilitation of disturbed watercourses must ideally be initiated as soon as possible and occur as construction works progress. • Whilst appointment of external landscapers is a feasible and acceptable option, a lot of preparation will need to be undertaken exclusively by the main contractor at the inception of the project. Preparation activities include correct stockpiling of topsoil needed for rehabilitation, harvesting of indigenous plants for use later on in rehabilitation, managing a nursery for rescued plants, etc. • A suitably qualified aquatic / river ecologist with experience in rehabilitation may be required to

	provide practical input into the rehabilitation during implementation of the rehabilitation plan.
STEP 2: Plant Rescue and Topsoil Management	<ul style="list-style-type: none"> Where indigenous vegetation can be harvested and retained for use in re-vegetation, this must be done. Retained vegetation must be kept moist at all times until replanting can be achieved. Where applicable topsoil stripped from the construction zones within the construction footprint must be conserved, stored and used in rehabilitation. An effort must be made to ensure topsoils are not mixed with subsoils (to be kept separate). Pre-emergent herbicide may be applied to stockpiled topsoil to rid it of IAPs.
STEP 3: Remove any waste products	<ul style="list-style-type: none"> All waste products (spoil, construction materials, hazardous substances and general litter) must be removed from the construction footprint and disposed of at an appropriate landfill site. Minimise additional disturbance by limiting the use of heavy vehicles and personnel during clean-up operations. Any large plumes of sediment washed into river from upslope must be removed, taking care not to remove or disturb the natural soil profiles including instream and riparian habitats.
STEP 4: Remove/control invasive alien plants	<ul style="list-style-type: none"> All exotic / alien plants and weeds must be removed and properly disposed of prior to the implementation of rehabilitation measures. Note that frequent <u>hand removal is the most preferred option</u> and only in the event that this is not a viable means of control, should chemical means be considered. Only herbicides which have been certified safe for use in aquatic environments by an independent testing authority may be considered. The ECO must be consulted in this regard.
STEP 5: Formulation of Revegetation Strategy	<p>A formal, detailed re-vegetation strategy will need to be formulated for the disturbed aquatic habitat, with some guidance on vegetation provided below:</p> <ul style="list-style-type: none"> Based on the low diversity and existing disturbance at the site, we envisage a simple and functional re-vegetation strategy with the focus on achieving an adequate cover in the shortest time. A minimalistic approach to re-vegetation of the disturbed areas is thus proposed for this site that will involve the rapid re-establishment of an indigenous pioneer plant dominated vegetation cover via a combination of cost-effective planting methods. At this stage re-vegetation using combination plugs of <i>Cynodon dactylon</i> and <i>Stenotaphrum secundatum</i>, with the hydroseeding of <i>Eragrostis tef</i> as a nursery cover, is proposed. Although it does not offer instant protection as with sodding, planting of plugs has a high success rate and provides protection within a few weeks, while being comparatively cheaper than sods. Plugs must ideally be planted at a high density of 16 plugs / m². This will ensure that a cover of 80% is achieved within 4 – 6 weeks (Granger, 2015). The planting density can be altered as required. The plugs must be sourced from an appropriate nursery with capacity to produce the required quantities of plugs. The planting of plugs must ideally be undertaken early in summer. However, as it is recommended that construction occur in winter months to avoid peak flows and associated erosion issues, hydrosopic gel will be required for the plugs Geofabric will be generally required for soil stabilisation on steep slopes. This strategy may be changed / revised following the finalisation of the detailed re-vegetation plan which will include the plating method, species and quantities / costs.

<p>STEP 6: Stabilise, reshape and prepare soil profiles</p>	<ul style="list-style-type: none"> • Any erosion features created by construction activities must be stabilised. • Exposed banks and slopes must be stabilized and re-vegetated as soon as practically possible. • Erosion control measures such as geofabric, eco-logs and biodegradable silt fences must generally be installed prior to re-vegetation. • Channel banks must be shaped to a stable angle of repose to avoid slumping and prepared for re-vegetation immediately. • Where significant soil compaction has occurred, the soil must be ripped in order to reduce the bulk density of the soil such that vegetation can become established at the site. Rip and / or scarify all disturbed and compacted areas of the construction site. The ECO with the assistance of the engineer must specify whether ripping and / or scarifying is necessary, based on the site conditions. Do not rip and / or scarify areas that are saturated with water, as the soil will not break up. • Stored topsoil must be re-spread across the reshaped surfaces prior to re-vegetation. • For the seeding of <i>E. tef</i>, the soil needs to be prepared to optimise germination. Such preparation is undertaken by hand hoeing. The soil in the seedbed must be loosened to facilitate good contact between the seeds and the soil. • Fertilizer / lime is not necessary nor is it permitted to be used for the re-vegetation of wetlands, rivers and riparian areas as this may promote increased weed growth and alter the soil structure. • A weed-free mulch is recommended to help retain moisture for germination on channel banks. It is very important that mulch not be derived from stands of IAPs or weeds.
	<ul style="list-style-type: none"> • Once construction is completed and alien vegetation and waste products have been removed and soils are prepared for planting, re-vegetation must commence as per the strategy in Step 5 above as soon as weather conditions allow for good plant growth. • Re-vegetation must focus primarily on bare exposed / unstable soils. Key focal areas include channel banks / margins of the active channel and riparian areas. • It would be advisable to plant at the onset of the wet season (early spring – August to October) so that watering requirements are minimal. This may however not coincide with the construction period and needs to be carefully planned. • Do not use fertilizer or lime. • A trained re-vegetation / rehabilitation expert must be contracted to oversee the rehabilitation of areas.
<p>STEP 8: Monitor re-vegetation progress and administer alien plant control</p>	<ul style="list-style-type: none"> • The first 6 weeks after re-vegetation are the most critical in terms of maintenance and monitoring and weekly audits by an ECO with the contractor must be undertaken to monitor re-vegetation success. Only once an adequate ground cover is established must the ECO sign-off on the completion re-vegetation. Targets for re-vegetation success include: <ul style="list-style-type: none"> ○ Low levels of Invasive Alien Plants (<10% IAP cover). ○ >90% indigenous vegetation cover. • Thereafter, monitoring visits by the ECO and contractor must be undertaken every 3 months for the first 6 months (two monitoring visits) after the completion of construction. At such visits the need for further re-vegetation, IAP clearing and erosion control / damage repair must be addressed where necessary. Any areas that are not progressing satisfactorily must be identified and action must be taken to actively revegetate these areas. If natural recovery is progressing well, no further intervention may be required.

- The ECO must assess the need / desirability for further monitoring and control after the first 6 months and include any recommendations for further action to the relevant environmental authority.

Crossings, Road Batters and Roadside Drains

The following are land preparation requirements for watercourse crossings, road batters and side drains that need to be taken into account:

- Road batters range from gentle to steep slopes on which vegetation must be established. Where slopes are gentle, general land preparation requirements will apply but where slopes are steep, soft intervention techniques will need to be employed to provide sufficient slope stabilisation.
- As a principle, soft interventions must be favoured over hard interventions wherever possible to ensure that the watercourse crossings retain their natural flow regimes and habitat.
- The following soft interventions are recommended for steep slopes:
 - Soil savers;
 - Vegetation blankets or mats;
 - Geo-cells; and
 - Fibre rolls or bags.
- It is important to note that bioengineering interventions are vulnerable to failure if not adequately implemented or poorly maintained.
- Retaining structures such as silt fences, sandbags, hay bales, brush packs, timber logs placed in continuous lines following the slope contours or cut-off trenches can be used across the entire slope to retain eroded sediment.
- Use sandbags or timber logs place at regular intervals along the contour of slopes to retain sediment and stabilize the soils.
- Temporary sediment barriers will need to remain in place until such time as re-vegetation and stabilization of disturbed areas is judged to be a success and the risk of erosion / sedimentation has been reduced to a respectfully low level.
- Note that care must be taken not to disturb the vegetation, river banks, soils or in-stream areas during site clean-up. No natural material (e.g. sediment, rocks, and stones) from the stream channel or river banks shall be removed during this activity.
- Slope instability or where slumping / erosion of stream banks have occurred be identified and recorded during and immediately after the initial clearing. These areas will then need to be stabilised / repaired using suitable interventions depending on the extent / intensity of erosion / destabilisation and risk of further bank instability. Potential measures suitable for bank stabilisation may include:
 - Compaction of soils on stream banks by hand (no machinery to be used within sensitive riparian areas);
 - Planting of suitable indigenous ground-cover to stabilise soils on stream banks;
 - Use of rock pack for eroded banks; and
 - Use of gabion baskets for eroded banks.

Re-vegetation of Disturbed Areas

Once construction is completed and alien vegetation and waste products have been removed and soils are prepared for planting, vegetation is to be reinstated as soon as weather conditions allow for good plant growth.

Road Batters, Road Reserve and Roadside Drains

Immediately after preparing the soil, re-vegetation must commence in order to help bind the soil and prevent soil erosion and to inhibit IAP / weed establishment which will compete with the natural vegetation for space, light, nutrients and water. In this regard, the following mitigation measures must be implemented for road batters, roadside drains and general road reserves disturbed during construction:

Method 1: Sodding

- Runner grass sods comprising indigenous species must be laid out on all road batters and secured in place using wooden pegs. Use of grass sods is the most preferred re-vegetation method because it offers instant protection of vulnerable areas. It is best to install the sod as soon as it is delivered.
- No exotic / alien plants are to be used in sodding.
- Prior to installing sods, rake or harrow to achieve a smooth, final grade.
- When sodding is carried out in alternating strips, or other patterns the areas between the sods must be seeded immediately after the sodding.
- Immediately after re-vegetation, the grass sods must be watered thoroughly. Watering must be undertaken on a daily basis until such time as the sod becomes well rooted within the soil.
- Thereafter, less frequent watering should be sufficient until such time as the vegetation is established to the satisfaction of the rehabilitation implementer and ECO / resident engineer.

Method 2: Hydroseeding

- Hydroseeding is the second preferred option to re-vegetating slopes. The advantages of hydroseeding include faster germination, increased plant survival, and the ability to cover large, often inaccessible areas rapidly.
- The slurry (basic materials) for hydroseeding must consist of water, seed, fertiliser, anti-erosion compounds (soil binders) and organic supplements to enhance grass growth.
- Prior to hydroseeding water must be sprayed over target area to provide added moisture.
- The target groundcover of re-vegetated areas shall be no less than 80% of specified vegetation and there must be no bare patches of more than 500 x 500 mm in maximum dimension.
- Ideal species for hydroseeding include runner and short tufted species, such as *Cynodon dactylon* or suitable alternative indigenous grasses species.
- No exotic / alien plants are to be used in hydroseeding.

Active re-vegetation refers to the manual planting / seeding of vegetation within a riparian area and is considered important if there are risks involved in waiting for natural recruitment to occur or in situations where re-vegetation may be useful or even necessary, depending upon the objectives of rehabilitation or

the particular conditions at a site³. Re-vegetation of different riparian areas is likely to require planting mixes and planting strategies specific to a particular bioregion, or even at a local site level⁴. Planting the “wet zone” can be a complicated task that requires consideration of water management levels, restrictions on use of herbicides, equipment limitations, site preparation and a good understanding of the “wetness requirements” for various wetland plants⁵.

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³ **Russell, W.B., 2009.** *WET-Rehab Methods: National guidelines and methods for wetland rehabilitation.* WRC Report No. TT 341/09. Water Research Commission, Pretoria.

⁴ **Jacobson, R.L., 2006.** *Restoring & Managing Native Wetland & Upland Vegetation.* Minnesota Board of Soil & Water Resources Minnesota Department of Transportation. January 2006.

⁵ **Clarkson, B. and Peters, M., 2012.** *Wetland Restoration: A handbook for New Zealand Freshwater Systems.* Chapter 10: Revegetation. NSW Murray Wetlands Working Group Inc., Albury NSW.

9 Method Statement for Invasive Alien Plant Eradication

It is the responsibility of the Developer to eradicate and control alien invasive plants that invade all areas disturbed by the construction and operation of the proposed development. In terms of section 75 of NEM:BA, the following applies to the control and eradication of invasive species:

- The control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs (see Box 1 below for guidance on alien plant control methods);
- Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment; and
- The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

It is recommended that bi-annual annual alien plant clearing be undertaken by the applicant for the first year post-rehabilitation. Thereafter, alien plant clearing must be undertaken annually until such a time that further risks of alien invasion resulting from disturbance factors are considered negligible.

Box 1. Guidance on Invasive Alien Plant Control

There are various means of controlling invasive alien plants in South Africa. The primary methods are discussed below. The suitability of control methods depends on a number of factors, including practical constraints, economic constraints and applicability of methods for particular species of alien plants. It is generally advised that a form of integrated control be implemented; however the final selection of the appropriate methods of control must be based on the following criteria:

- **Species to be controlled:** herbicides are registered for specific species. Selection must be based on “*A Guide to the use of Herbicides*” issued by the Directorate: Agricultural Production Inputs and labels and information brochures provides by herbicide suppliers.
- **Size/age of target plants:**
 - For seedlings: hand-pulling or hoeing and foliar applications of herbicides for dense stands.
 - For saplings: hand-pulling or hoeing, foliar applications of herbicides for dense stands, basal stem treatments and cut stump treatments recommended.
 - For mature trees: ring barking, frilling, basal stem treatments and cut stump treatments recommended.
- **Density of stands:** Overall applications of herbicide can be made to dense stands of seedlings or saplings. Where dense stands of large trees are present, treatment of standing trees may be appropriate to obviate the problem of disposing felled trees.
- **Accessibility of terrain:** In inaccessible areas, methods that rely on the minimum amount of transportation of equipment and chemicals must be given preference.
- **Environmental considerations:** Riparian/wetland areas require a careful approach to treatment/control. Only herbicides approved for use in wetland/riparian areas are to be considered. Washing of equipment or disposal of any chemical substances is prohibited in or near areas where there is a potential risk of contamination of wetlands/riparian areas.
- **Desirable vegetation:** Control methods that will cause the least damage to desirable vegetation must be considered. Selective herbicides or mixes that will not damage other desirable vegetation must be applied where relevant.
- **Disposal of dead vegetation:** Where possible, utilizable wood must be removed after tree felling. This is

also the case for trees that could cause the blockage of watercourses. Brushwood must be spread rather than stacked to limit soil damage in instances where burning is planned.

- **Cost of application:** the cost of application and re-treatment must be taken into consideration when selecting methods/herbicides, etc.

The control methods detailed below have been adapted from the ARC-PPRI (Agricultural Research Commission: Plant Protection Research Institute) Weed Research Programme (online at www.arc.agric.za/arc-ppri/), the DWA Working for Water Programme (<http://www.dwaf.gov.za/wfw/Control/>).

1. Mechanical control

Mechanical control entails physically damaging or removing the target alien plant. Mechanical control is generally labour-intensive and therefore expensive, and can also result in severe soil disturbance and erosion. Different techniques can be applied and include uprooting/hand-pulling, felling, slashing, mowing, ring-barking or bark stripping. This control option is only really feasible in sparse infestations or on a small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice (e.g. *Eucalyptus spp.*, *Melia azedarach*) need to have the cut stumps or coppice growth treated with herbicides following mechanical treatment.

Examples of mechanical controls include:

- **Hand pulling / uprooting:** must be reserved for small plants and shrubs with shallow root systems (not recommended for trees with a stem diameter of more than 10 cm). Grip the young plant low down and pull out by hand (using gloves). Uprooting is similar but is undertaken on slightly older individuals
- **Chopping/ cutting/ slashing:** This method is most effective for plants in the immature stage, or for plants that have relatively woody stems/trunks. An effective method for non re-sprouters or in the case of re-sprouts (coppicing). It must be done in conjunction with chemical treatment of the cut stumps. Cut/slash the stem of the plant as near as possible to ground level. Paint re-sprouting plants with an appropriate herbicide immediately after they have been cut.
- **Strip bark:** Using a bush knife, strip bark away from tree from waist height down to soil. Cambium is stripped with the bark. No herbicide used.
- **Felling:** Large trees can be cut-down in their entirety, however, this is often not recommended unless absolutely necessary as large trees can play a pivot role in soil protection and biodiversity maintenance.
- **Girdling:** Girdling involves cutting a groove or notch into the trunk of a tree to interrupt the flow of sap between the roots and crown of the tree. The groove must completely encircle the trunk and must penetrate into the wood to a depth of at least 1.5 centimetres on small trees, and 2.5 to 4 centimetres on larger trees. .

2. Chemical control

Chemical control involves the use of registered herbicides to kill the target weed. The use of herbicide is often essential to the success of an eradication/control programme as it greatly reduces the re-growth potential of alien plants. Unfortunately, if the wrong herbicide is chosen, one can potentially cause more harm than good to the environment.

Some additional recommendations regarding herbicide use include:

- Herbicides must only be applied during the active growing season.
- Always observe all safety precautions printed on the labels and manufacturer's instructions when mixing and applying herbicide.
- Herbicides can be applied in various ways. They can be sprayed onto dense infestations or painted onto the main stem of the plant or cut stump.
- Spraying herbicide on small infestations is not recommended, rather cut and apply herbicide to the stumps with a brush.
- Spraying must be restricted to windless days when there is less risk of droplets drifting onto non-target species.
- Pressure or flow regulators must be fitted to sprayers for overall application. Spraying must be restricted to plants waist height or lower, but also ensuring there is sufficient foliage to carry the applied herbicide to the

root system of the target plant.

- For water-based applications, Actipron Super Wetter must be added where recommended on the herbicide label, at a rate of 1.75 litres / ha for dense-closed stands of alien vegetation.
- For all water-based treatments, a suitable brightly coloured dye must be added to the mix to ensure that all target plants are treated. For diesel-based applications, Sudan Red Dye must be added.
- Chemical control of IAPs is not recommended in aquatic systems due to the risk of water pollution, but may be used in conjunction with cutting or slashing of plants.
- Chemicals must only be applied by qualified personnel.
- Only herbicide registered for use on target species may be used.
- Follow the manufacturer's instructions carefully.
- Appropriate protective clothing must be worn.
- Only designated spray bottles to be used for applying chemicals.
- The number of herbicides for safe use under wet conditions is very limited.

3. Biological control

Biological weed control involves the releasing of natural biological enemies to reduce the vigour or reproductive potential of an invasive alien plant. Research into the biological control of invasive alien plants is the main activity of the Weeds Research Programme of ARC-PPRI and a list of biocontrol agents released against invasive alien plants in South Africa can be downloaded from their website. To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), Department of Agriculture, Forestry and Fisheries (DAFF).

4. Mycoherbicides

A mycoherbicide is a formulation of fungal spores in a carrier, which can be applied to weeds in a similar way as a conventional chemical herbicide (using herbicide application equipment). The spores germinate on the plant, penetrating plant tissues and causing a disease which can eventually kill the plant. Mycoherbicides are indigenous to the country of use and therefore are already naturally present in the environment and do not pose a risk to non-target plants. Under natural conditions they do not cause enough damage to the weed to have a damaging impact and are therefore mass produced and applied in an inundative inoculation, which leads to an epidemic of the disease knocking the weed population down. Mycoherbicides need to be re-applied at regular intervals.

5. Integrated control

It is frequently advisable to use a combination of two or more of the control method mentioned above, which is referred to as *integrated control*. Killing plants without cutting down causes the least disturbance to the soil and is the ideal.

The following integrated control options are available:

- **Basal bark and stem application:** apply recommended herbicide mixed in diesel carrier to the base of the stem of trees (<25 cm stem height) and saplings. This method is appropriate for plants with thin bark or stems up to 25 cm in diameter. Do not cut the bark. Apply herbicide mix with paintbrushes or using a coarse droplet spray from a narrow angle solid cone nozzle at low pressure. For multi-stemmed plants, each stem must be treated separately.
- **Ring barking:** Invasive trees growing away from any structures or roads can be ring-barked, poisoned and left standing rather than felled. They will slowly collapse over time and can establish habitat for birds, etc. Strip all bark and cambium from a height of 75 cm to 100 cm down to just below soil level. Cut a ring at the top and pull strips. All bark must be removed to below ground level for good results. Where clean debarking is not possible due to crevices in the stem or where exposed roots are present, a combination of bark removal and basal stem treatments must be carried out. Bush knives or hatchets must be used for debarking.
- **Frilling:** Using an axe or bush knife, make angled cuts downward into the cambium layer through the bark in a ring. Ensure to affect the cuts around the entire stem and apply herbicide into the cuts.

- **Cut stump treatment:** This is a highly effective and appropriate control method for larger woody vegetation that has already been cut off close to the ground. The appropriate herbicide must be applied to the stump using a paintbrush within 30 min of being cut. Apply recommended herbicide mixture to the cut surface with hand sprayers, a paintbrush or knapsack sprayer at low pressure. Apply only to the cambium or outer layer of large stumps and the entire cut surface of small stumps. Ensure the stumps are cut as low to the ground as practically possible (about 10 – 15 cm or as stipulated on specific herbicide label). Herbicides are applied in diesel or water as recommended for the herbicide. Applications in diesel must be to the whole stump and exposed roots and in water to the cut area as recommended on the label.
- **Scrape and paint:** This method is suitable for large vines and scrambling plants i.e. creepers. Starting from the base of the stem, scrape 20-100cm of the stem to expose the sapwood just below the bark. Within 20 seconds apply the herbicide to the scraped section. Do not scrape around the stem. Stems over 1cm in diameter can be scraped in 2 sides. Leave the vines to die in place to prevent damaging any indigenous plants they may be growing over.
- **Foliar spray:** This is not an advocated method of application by unqualified applicators due to the danger of spraying indigenous species. Must be restricted to droplet application made directly on the leaves on plants that are no higher than knee height. Use a solid cone nozzle that ensures an even coverage on all leaves and stems to the point of runoff. Do not spray just before rain (a rainfall-free period of 6 hours is recommended) or before dew falls. Avoid spraying in windy weather as the spray may come into contact with non-target plants. Spraying dormant or drought stressed plants is not effective as they do not absorb enough of the herbicide.
- **Burning:** Spindly invasive alien plant species, such as Triffid Weed (*Chromolaena odorata*), growing on sandy soils, where there is between 30-40% grass still present, can be eradicated using annual controlled burns. Moderate to low infestations in wetland areas can be treated by controlled burning at the beginning of autumn, followed by mechanical removal or herbicide application in mid spring. *Note that burning would generally not be acceptable in an urban area due to fire hazard/risk and nuisance.*

Note that no heavy machinery must be used to remove invasive alien plants, no matter how high the infestation, without prior authorization from relevant government departments when operating in wetlands and riverine areas.

6. Disposal of alien plant material

Treated / removed alien plant material will need to be removed from the site and disposed of at a proper/registered receiving area such as a local registered land fill site.

10 COMPLIANCE WITH THE ENVIRONMENTAL SPECIFICATION

The EMPr forms part of the Contract Documentation and is thus a legally binding document. It is also necessary for the contractor to make provisions as part of their budgets for the implementation of the EMPr. In terms of *Polluter Pays Principle*. Section 28 of the NEMA, an individual responsible for environmental damage must pay the costs for both environmental and human health damage. As far as possible preventative measures must be in place to reduce or prevent additional pollution and/or environmental damage from occurring.

The Contractor is deemed not to have complied with the Environmental Specification / EMPr if:

- There is evidence of contravention of clauses within the boundaries of the site, site extensions and haul/ access roads;
- Environmental damage ensues due to negligence;
- The contractor ignores or fails to comply with corrective or other instructions issued by the Developer, ECO or Engineer within a specified time; or
- The contractor fails to respond adequately to complaints from the public.

10.1 Penalties

Application of a penalty clause will apply for incidents of non-compliance. The contractor will be allowed one offence and a written warning will be issued to the Site Environmental Officer by the ECO. Failure to rectify the offence within one (1) working week of the issue of the warning or a repeat offence will result in a penalty.

The penalty will be issued by a representative of the Developer. The penalty imposed will be per incident at the discretion of the Developer's SHEQ Manager or any other duly authorised representative. The value of the penalty imposed shall be as defined in the contract and enforcement shall be at the discretion of the Developer. Such fines will be issued in addition to any remedial costs incurred as a result of non-compliance with the EMPr. The Developer will inform the contractor of the contravention and the amount of the penalty, and will deduct the amount from monies due under the Contract.

The penalty monies will become the property of the Developer to be used for rehabilitation and maintenance of the site. Unless stated otherwise in the project specification, the penalties imposed per incident or violation will be:

Table 12: Penalties Applicable

OFFENCE	AMOUNT
Failure to demarcate working areas	R10,000
Working outside of demarcated areas	R30,000
Failure to strip topsoil with intact vegetation	R50,000
Failure to stockpile topsoil correctly	R30,000
Failure to stockpile materials in designated areas	R10,000
Failure to take measures to prevent soil contamination	R10,000
Failure to take measures to control dust dispersion on-site	R10,000

OFFENCE	AMOUNT
Washing of vehicles on-site	R10,000
Pollution of water bodies and/or groundwater	R20,000
Failure to implement stormwater management provisions during construction	R20,000
Failure to control stormwater run-off	R30,000
Downstream erosion	R30,000
Failure to provide adequate sanitation	R10,000
Failure to erect temporary fences around trenches	R10,000
Failure to provide adequate waste disposal facilities and services	R50,000
Failure to reinstate disturbed areas within the specified time-frame	R30,000
Any other contravention of the project specific specification	R10,000

The Developer is responsible for the implementation of the EMPr and for compliance monitoring of the EMPr.

The EMPr will be made binding on all contractors (including sub-contractors and service providers) operating on the site and will be included with the Contract.

Non-Compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance. Non-compliance with the conditions of the EMPr constitutes a breach of Contract.

10.2 Removal from Site and Suspension of Works

Failure to remediate after the issue of a financial penalty, depending on the severity and significance of the impact related to non-compliance, the ECO may undertake to report directly to The Department of Environmental Affairs (DEA) (Compliance) recommending that for:

- High impact: to issue a notice to cease construction;
- Medium impact: to issue a notice instructing the Developer to implement recommended remedial action; or
- Low impact: ECO to notify, but up to discretion of DEA to apply sanction.

The Developer, Or otherwise duly authorised at the direction of the ECO, or of his own conviction, has the power to remove from site any person who is in contravention of the EMPr, and if necessary, the Developer can suspend part or the whole of the works, as required.



With its headquarters in Amersfoort, The Netherlands, Royal HaskoningDHV is an independent, international project management, engineering and consultancy service provider. Ranking globally in the top 10 of independently owned, non-listed companies and top 40 overall, the Company's 6,500 staff provide services across the world from more than 100 offices in over 35 countries.

Our connections

Innovation is a collaborative process, which is why Royal HaskoningDHV works in association with Developers, project partners, universities, government agencies, NGOs and many other organisations to develop and introduce new ways of living and working to enhance society together, now and in the future.

Memberships

Royal HaskoningDHV is a member of the recognised engineering and environmental bodies in those countries where it has a permanent office base.

All Royal HaskoningDHV consultants, architects and engineers are members of their individual branch organisations in their various countries.