ENVIRONMENTAL MANAGEMENT PLAN FOR THE PROPOSED UPGRADE OF NATIONAL ROAD (N1) SECTION 4 BETWEEN DOORNFONTEIN (KM 63.0) AND LAINGSBURG (KM 81.7) WITHIN LAINGSBURG LOCAL MUNICIPALITY OF CENTRAL KAROO DISTRICT MUNICIPALITY, WESTERN CAPE PROVINCE

Applicant:	EAP:	Consulting Engineer:
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DOCUMENT CONTROL

DOCUMENT REVISION NUMBER: 002			
Details	**Compiler**	**Reviewer**	**Approver**
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Designation	Environmental Assessment Practitioner - Earthlink Environmental Services (Pty)Ltd	Environmental Assessment Practitioner - Earthlink Environmental Services (Pty)Ltd	
Date	April 2025	April 2025	

PROJECT DETAILS

Project Name: Upgrade of National Road (N1) Section 4 Between Doornfontein (Km 63.0) And Laingsburg (Km 81.7) Under Laingsburg Local Municipality Within Central Karoo District Municipality, Western Cape Province

Applicant: SANRAL Western Region

SANRAL Contract No.: N001-040-2020/2F

Consulting Engineer: V3 Consulting Engineers

Environmental Consultant: Earthlink Environmental Services

EAP DECLARATION:

I **CAIPHUS MUKWEVHO;** herewith undertake that:

- I act as an independent specialist consultant in the field of Environmental Sciences;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- Have and will not have any vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report; and
- Will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favorable to the applicant or not.

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Signature of EAP:

April 2025

Date:

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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
BA	Basic Assessment
DFFE	Department of Forestry, Fisheries and the Environment
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EO	Environmental Officer
EES	Earthlink Environmental Services (Pty) Ltd
MS	Method Statement
MSDS	Material Safety Data Sheet
NEMA	National Environmental Management Act, 1998 (No. 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act 25 of 1999)
Pr.Sci.Nat.	Professional Natural Scientist
RE	Resident Engineer
SANRAL	South African National Roads Agency SOC Ltd

GLOSSARY

Auditing	A systematic and objective assessment of an organisation's activities and services conducted and documented on a period basis
Contractor	a person or company engaged by the principal to carry out all or any part of the work involved in the undertaking of the proposed project.
Corrective action	Action taken to correct a detected non-conformity
Cumulative Impact	The impact of an activity that may not be significant but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities or undertakings in the area.
Direct Impacts	Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
Environment	Organization which its activity is prigged inside weather, water, land, natural resources, plant group (flora), animal group human including ambient these relations.
Environment effect	Positive or negative all type of changes which appear by services, product, and action of organization partly or whole in environment.
Environmental Impact	An action or series of actions that have an effect on the environment.
Environmental Impact Assessment	Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which basic assessment must be applied, means the process of collecting, organising, analysing, interpreting and communicating

	information that is relevant to the consideration of that application.
Environmental Management Programme	A programme that organizes and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the planning and implementation of a proposal and its on-going maintenance and operation after implementation.
Environmental management system	A tool that systemizes the way an organization goes about its environmental business and demand yearly improvements on targets set by the company
Environment policy	Organization declaration which was done to explain intentions and principles, about general environment performance and to provide frame for actions, environment aim and objectives.
Indirect Impact	Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity.
Prevention of pollution	Is to prevent, to decrease, to control pollution. Again, work should be done, other operation dependency should be done, operation should have changes, control mechanism and resources should be used efficiency, including material substitution all type operation and practices should be applied, material or product should be used.
Significant Impact	An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.
Sustainable development	Development that meet the needs of the present without compromising the ability of future generations to meet their own needs

1. INTRODUCTION

1.1 Background

Earthlink Environmental Services (Pty) Ltd is appointed as an independent Environmental Consultant by South African National Roads Agency SOC Ltd (SANRAL) (the applicant) to undertake an Environmental Impact Assessment (Basic Assessment) for the proposed upgrade of the National Road (N1) Section 4 between Doornfontein (Km 63.0) and Laingsburg (Km 81.7). This document represents the Environmental Management Programme (EMPr) compiled for the Environmental Authorisation (Basic Assessment) application currently underway for the proposed upgrade. The EMPr comprises the environmental mitigation/management measures related to the project from the beginning which are the pre-construction, construction, operational and specific mitigation/management measures that arise from the specialist studies compiled in support of the EA application.

1.2 Project Location

The project is located between Doornfontein and Laingsburg town, within the Laingsburg local Municipality, Central Karoo district in Western Cape Province. The proposed project will cover an area of 18 kilometers in total (**Table 1** & **Figure 1**).

Table 1: Location details

PROPERTY DETAILS					
Local area	**Site Coordinates**			**Route Length**	**Local Municipality**
	Start	Middle	End		
Doornfontein and Laingsburg	33˚13'6.87"S 20˚36'19.31"E	33˚11'38.96"S 20˚50'39.29"	33˚11'35.05"S 20˚51'44.74"E	18 KM	Laingsburg

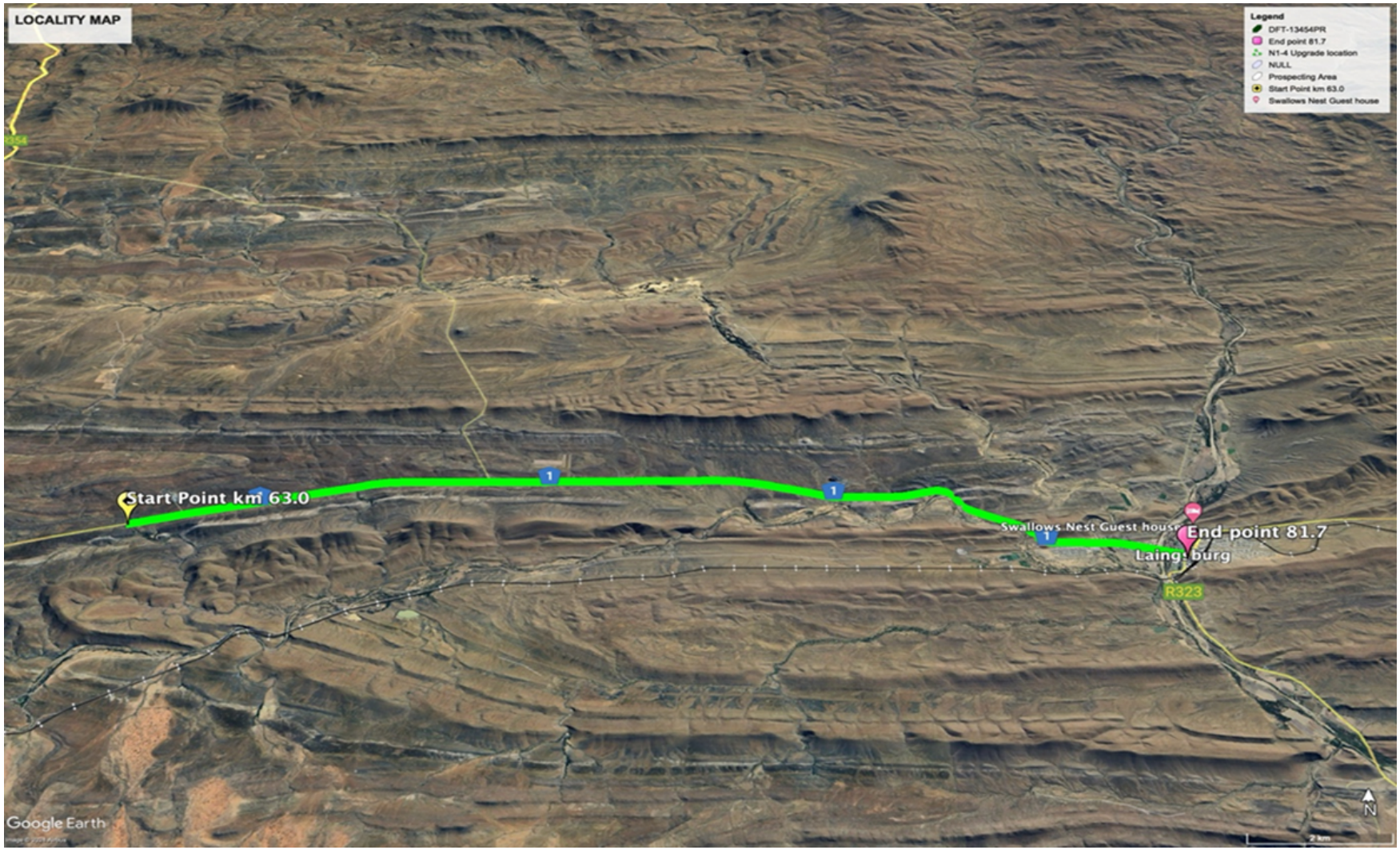

Figure 1: Locality Map

1.3 Project Description

The South African National Roads Agency SOC Ltd (SANRAL) proposes to upgrade the National Road (N1) Section 4 between Doornfontein (KM 63.0) and Laingsburg (KM 81.7).

SANRAL is planning to upgrade the road section and widen the current road reserve. This proposed road upgrade is necessary due to the anticipated impact of freight vehicles (including abnormal loads) and increased traffic volumes on the design and operation of the existing road, as well as considerations of road safety. Given these considerations, the following is suggested:

- Widening the existing standard two-lane single carriageway to a dual-lane carriageway, consisting of two lanes per direction separated by a median and one lane in the other, alternating every few kilometres, and separated by a median. This would entail upgrading the existing surfaced width of the road from 10.8 m to 21.8 m and including a 2 m wide painted median. This would amount to a total surfaced width of 23.8 m;
- Widening the existing road reserve by 20 - 30 m to a total of 60 m to 80m;
- Improvement of the existing N1/Laingsburg intersection to allow for two exclusive turning lanes (left and right) for each approach and two lanes in each direction for vehicles continuing through the intersection (i.e. four lanes in total when approaching the intersection);
- Offering brief periods of temporary deviation, if necessary, to allow for two-way traffic during construction;
- Proving an underpass; and
- Managing access by closing certain minor and major farm entrances and providing safer access points connected to internal farm service roads.

The following bridges will be upgraded in the proposed road upgrade project:

- Buffels River Bridge
- Wilgerhout River Bridge
- Doornfontein River Bridge

The triggered listed activities require the proposed development to undergo a Basic Assessment Process to receive an Environmental Authorization from the competent authority, Department of Forestry, Fisheries and the Environment (DFFE).

1.4 Purpose of The Environmental Management Programme (Empr)

The purpose of the Environmental Management Program Report (EMPr) is to set out methods that can be applied to mitigate and manage negative environmental impacts that are direct or indirect and collective impacts from the identified from the basic assessment for the proposed upgrade of National road (N1) section 4 development. The negative environmental impacts are minimised by taking into consideration all applicable laws, regulations, standards and guidelines for the protection of the environment and by encouraging good management practices through planning and commitment to implementing all the procedures to protect the environment.

The EMPr is used as the guide for contractors and employees on how to perform their roles and responsibilities concerning environmental management on site. Moreover, it provides a framework for environmental monitoring throughout the development's existence. This document sets out applicable mitigation measures to minimise and eliminate the significant negative and positive impacts that may be caused as a result of the proposed upgrade of N1 Section 4 development and to also clarify the positive impacts that will come with the proposed development.

This EMPr has been prepared in compliance with Appendix 4 of the EIA Regulations, 2014 (as amended), the contents of which are outlined in **Table 3** below.

Table 2: Requirements of an EMPr in terms of the EIA Regulations, 2014 (As Amended).

Appendix 4	Content of EMPr	Completed (Y/N or N/A)	Location In EMPr
1 a)	*i) Details of the EAP who prepared the EMPr;*	Y	Section 2
	ii) Details of the expertise of that EAP to prepare a EMPr, including a curriculum vitae;	Y	Appendix A
b)	*A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;*	Y	Section 1.3 and Section 4
c)	*A map at an appropriate scale which superimposes the proposed activity, its associated infrastructure, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;*	Y	Appendix B
d)	*A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including -* *planning and design;* *pre-construction activities;* *construction activities;* *rehabilitation of the environmental after construction and where applicable post closure; and where relevant, operation activities;*	Y	Section 4
e)	*Deleted by R. 326 of 2017.*	N/A	

f)	*A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions -*	Y	Section 4
	i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;		
	ii) comply with any prescribed environmental management standards or practices;		
	iii) comply with any applicable provisions of the Act regarding closure, where applicable; and		
	iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;		
g)	*The method of monitoring the implementation of the impact management actions contemplated in paragraph (f);*	Y	Section 4
h)	*The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);*	Y	Section 4
i)	*An indication of the persons who will be responsible for the implementation of the impact management actions;*	Y	Section 4
j)	*The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;*	Y	Section 4
k)	*The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);*	Y	Section 4

l)	*A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;*	Y	Section 4
m)	*An environmental awareness plan describing the manner in which -*	Y	Section 4
	i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and		
	ii) risk must be dealt with in order to avoid pollution or the degradation of the environment;		
n)	*Any specific information that may be required by the competent authority;*	N/A	
2)	*Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.*	N/A	

2. EXPERTISE OF THE EAP

The details and role of the Environmental Assessment Practitioners (EAPs) involved in preparing this EMPr are provided in **Table 4** below. Curricula Vitae are attached as Appendix G.

Earthlink Environmental Services has no vested interest in the proposed project other than fair remuneration for consulting services rendered as part of the BA process and has declared its independence as required by the EIA Regulations, 2014 (as amended).

In accordance with Regulation 12 of the 2014 EIA Regulations; GN R326 (as amended), the applicant has appointed Earthlink Environmental Services (Pty) Ltd as an independent environmental consultant to undertake the required EIA process in order to obtain EA for the proposed project. The application for EA will be managed in accordance with the requirements of NEMA, 2014 EIA Regulations and all other relevant and applicable legislation.

Earthlink Environmental Services (Pty) Ltd does not have any interests in secondary developments that may arise out of the authorisation of this project. Neither the EAP nor any specialist are subsidiaries or are affiliated to the applicant.

The Lead Environmental Assessment Practitioner for this project is Mr Caiphus Mukwevho:

Mr. Caiphus Mukwevho is a Senior Environmental Assessment Practitioner and he holds a Bachelor of Environmental Sciences and an Honours of Environmental Sciences in the field of Ecology both at the University of Venda, his honours dissertation was aimed at “assessing the environmental compliance of a landfill site” the study was conducted at Makhado Vondeling landfill site.

Mr Mukwevho has attended various training courses to enhance his knowledge and understanding in the Environmental Field, the courses includes; Geographic Information System (GIS), Environmental Management Systems (ISO 14001:2004), Environmental Law & Compliance. He is a registered Environmental Assessment

Practitioner under the Environmental Assessment Practitioners Association of South Africa (EAPASA), and he has applied as Professional Natural Scientist under the South African Council of Natural Science Professions (SACNASP), he is a member of the International Association of Impact Assessment South Africa (IAIASA).

Below are the details of the EAP, For the expertise of the EAP, please refer to Appendix H for a CV.

Table 3: Details of EAP

Environmental Impact Assessment Practitioner	
Company	Earthlink Environmental Services (Pty) Ltd)
Project Team	Mr. Caiphus Mukwevho -EAP
Email	caiphus@earthlinkenvironmental.co.za
Cell	082 269 4524
Physical Address	572th, Withok Estates, Brakpan, 1541

3. IMPLEMENTATION OF THE EMPr

3.1 Implementation

The implementation of the EMPr is a must-do requirement, it is a legally binding document through NEMA and a relevant EA (once issued). The proponent must ensure that throughout the project process the EMPr forms part of the Project Construction Contract Document to be incorporated in line with:

a) General project specifications; and

b) Relevant Standards, Guidelines and Publications (i.e. SANS 1200, SANS 2001, etc.), as applicable

3.2 Role players and responsibility

For the EMPr to be successfully implemented, all the individuals that form part of the project need to cooperate and should clearly understand their respective duties in the project, must be professional in everything, ability to form relationships that are respectful and transparent; and communicate effectively. Individuals involved

as project teams include the Authorities (A), Other Authority Developers/Proponents, Regional Engineers (RE), Environmental Control Officer (ECO), Project Manager (PM), Contractors (C), Environmental Assessment Practitioner (EAP)as well as the landowners, interested and affected parties and the relevant environmental and project specialists are also important role players. The following table below shows different roles and responsibilities for each individual.

Table 4: Functions and responsibility of the project team

FUNCTION	ROLE	RESPONSIBILITIES
Competent Authority	Responsible for issuing of the relevant Environmental Authorisation (if applicable), overall environmental management within the province and ensuring compliance with all applicable environmental legislation and specifications (such as the EMPr and EA conditions). In this case Department of Forestry, Fisheries and the Environment	DEA & DP are responsible for ensuring that the monitoring of the EMPr is carried out, this will be achieved by: Conducting regular site visits; Review Audit Reports submitted by the ECO; Requesting and viewing Environmental Incident Report; requesting and viewing of Complaints Registers; and Issuing directives, notices and/or fines for significant transgressions with the EMPr or environmental legislation.
Other Authority	Includes organisations and bodies like Municipalities, Provincial Department of Water, etc. Other authorities are those that may be involved in the approval process of an EMPr or issuing and enforcing relevant licenses/approvals.	May be required to review EMPr's and provide comments to ensure the accuracy of the information relevant to their specific mandate. May be involved in the development, review or implementation of an EMPr (e.g. if a specific development requires consent from a relevant authority, then that authority should review and comment on the content of the particular EMPr).
Developer/Proponent	The proponent is ultimately accountable for ensuring compliance with the EMPr and good management practice requirements for the duration of the project.	Ensuring that the prospective Tenderers/Contractors adequately provide for the provisions of the EMPr in their submissions. Appointing an independent ECO to objectively monitor the implementation of relevant environmental legislation and requirements of the EMPr for the project.

FUNCTION	ROLE	RESPONSIBILITIES
		Support and provide mandate to enable the ECO to perform responsibilities. Ensuring that the ECO is integrated as part of the project team. Establishing and maintaining proactive communications with the Contractor and ECO. Undertaking periodic site visits and inspections to ensure that the environmental requirements are implemented. Reviewing and commenting on environmental compliance assessments and/or reports. Giving instructions on any procedures and corrective actions. Ensuring that the EMPr is fully implemented and remains so, and when necessary is revised and updated. Reviewing the Complaints Register. Issuing fines, penalties, or suspending work for contravention of the EMPr. Giving instructions regarding corrective action to the Contractor.
Project Manager	The Project Manager has overall responsibility for managing the project, contractors, and consultants and for ensuring that the environmental management requirements	Understanding the EMPr and all its specifications and implications. Ensuring that all aspects and specifications of the EMPr and approved Method Statements are implemented.

FUNCTION	ROLE	RESPONSIBILITIES
	including any EMPr implementation, EMPr compliance and environmental-related activities, issues, and impacts are met.	Enforcing the implementation of the EMPr and ensuring that Contractor and Subcontractor employees comply with the EMPr. Reviewing and commenting on environmental compliance assessments and/or reports. Monitoring environmental impacts and verifying that they are kept to a minimum at all times. Approving all decisions regarding environmental procedures. Note that all decisions regarding environmental procedures must be approved by the PM. Overseeing site works. Taking action to address all EMPr, Method Statement and/or environmental legislation non compliances as well as keeping a record of these actions. Issuing penalties for contravention of the EMPr to the Contractor and Sub-contractor (as deemed necessary). Stopping any construction activity that is in contravention of the EMPr in accordance with an agreed warning procedure. Recording and informing the RE and ECO of incidents or problems while implementing the EMPr as well as recommending ways of resolving these incidents or problems.

FUNCTION	ROLE	RESPONSIBILITIES
		Reporting and recording all accidents and incidents resulting in injury, death or significant environmental liability immediately to the D/P and ECO. Recording all public complaints received and immediately inform the D/P and ECO of these. Ensuring that proper records are kept of all compliance status/feedback reports, incident reports and complaints registers and that these documents are available for auditing by the PM, Authorities or ECO upon request. Communicating the content of the ECO reports and any advice received from the ECO (verbally / in writing) to Contractor and Sub-contractors employees. Designating the working areas and ensuring that these are managed (including sensitive environments) as per the approved construction site layout plan.
Environmental Control Officer (ECO)	An independent appointment as an advisory consultancy, monitoring and reporting role to objectively monitor implementation of relevant environmental legislation, conditions of Environmental Authorisations (EA's), and the	Being pro-active throughout the project which includes access to specialist expertise (botanists, ecologists, etc.) as and when required. Advising the RE, PM and Developer on any necessary environmental authorisations and permits that would be needed to be applied for.

FUNCTION	ROLE	RESPONSIBILITIES
	EMPr for the project. Updating of the EMPr and making recommendations for addressing EMPr and/or environmental legal non-compliances. Liaising with the relevant Environmental Authorities on environmental issues and confirming their requirements, as well as communicating such requirements to the Developer, Consulting Engineer and/or PM The ECO must be suitably experienced with the relevant environmental management qualifications and preferably competent in construction related methods and practices.	Revising and updating the EMPr as and when necessary and submit such updates to the RE, PM and Lead Authority for review. Submitting copies of revised EMPr to all relevant stakeholders for their information and review. Where no EO/EM is appointed, the ECO must convey the contents of this EMPr to the Contractor site team and discuss the contents in detail with the RE, Contractor, PM and possibly sub-contractors, including any employee member they deem necessary, prior to them starting any work on site (once-off). Keeping record of everyone who attended the EMPr introduction training course. Handling and addressing of information received from whistle blowers as confidential and reporting these incidences to the relevant Authority as soon as possible. Maintaining a photographic record of the site prior to, during and after construction activities is undertaken. Conducting audits on compliance to relevant environmental legislation, conditions of EA, and the EMPr for the project at a frequency as determined by the Lead Authority. Monitoring that environmental impacts are kept to a minimum.

FUNCTION	ROLE	RESPONSIBILITIES
		Immediately report any serious environmental incidents or impacts to the PM and/or RE. Preparing monitoring/audit reports that reflect the EMPr compliance status, findings, issues and recommendations for addressing non-compliances and submitting these to the project team and Lead Authorities. Keeping a record of EMPr audits, monitoring and incidents. Reviewing and commenting on all Environmental Method Statements and making recommendations to the CE or ER on whether or not to accept the Method Statement and/or if any amendments or revisions is required. Making recommendations on any additional Method Statements that may be required as construction activities progress.
Contractors (Including Engineers)	The principal contractor, known from hereon as the "Contractor" implements and complies with the requirements of the EMPr and relevant environmental legislation. The Contractor must ensure that all sub-contractors have a copy of and are fully aware of the content and requirements of this EMPr.	Implement, manage and maintain the construction elements of the EMPr for the duration of his/her contract; Provide appropriate resources – budgets, equipment, personnel and training –for the effective control and management of the environmental risks associated with the construction of the project; Ensure that all sub-contractors and other workers appointed by the contractor are aware of their environmental responsibilities while on site or during the provision of their services off site;

FUNCTION	ROLE	RESPONSIBILITIES
		Ensure that all sub-contractors and other workers appointed by the contractor are complying with, and implementing the construction EMPr during the duration of their specific contracts and assign appropriate authority, accountability and responsibility for these personnel to carry out their duties Be familiar with the contents of the EMPr, the recommendations and mitigation measures of this EMPr, and implement these measures; Monitor the contractor's compliance with the environmental specifications on a daily basis, through the site diary, and enforce compliance; Communicate to the contractor in writing to inform the contractor regarding the contents of the report; Review and approve design sketches produced by the contractor in connection with, for example, the construction site layout; Designate and manage the working areas as per the approved construction site layout, including sensitive environments and 'no-go' areas; Advise on materials that may be used to designate working areas and materials to be used for the works as and when necessary;

FUNCTION	ROLE	RESPONSIBILITIES
		Undertake damage assessments where incidents, accidents and serious infringements have occurred on or a relevant distance off site; Review and approve all areas that have been rehabilitated by the contractor; Review complaints received and issue instructions as necessary; Implement temporary work stoppages where serious environmental infringements and non-compliances have occurred; Maintain a record of complaints from the public and communicate these to the contractor; and Facilitate proactive communication between all role-players in the interests of effective environmental management.
Environmental Assessment Practitioner (EAP)	Appointment by the Developer to handle all applications for Environmental Authorisations and conducting of specialist studies as required by the Competent Authority.	The Environmental Assessment Practitioner is the individual responsible for the planning, management and coordination of environmental impact assessments, strategic environmental assessments. environmental management plans or any other appropriate environmental instruments introduced through regulations according to NEMA Section 1.

3.3 EMPr Administration

Copies of the EA and this EMPr shall be kept at the construction camp(s). All relevant personnel shall be required to familiarise themselves with the contents of this document.

Any recommended amendments to the EMPr outcomes must be approved by DFFE and communicated to the relevant stakeholders, as per the EIA Regulations, before the amendments to the EMPr are implemented. The ECO and/or environmental auditor shall identify the need for any amendments to the EMPr document. Records will be kept in the document indicating changes that have been made. The ECO will be responsible for the distribution of copies of the amended EMPr document to all relevant personnel.

The RE may order the Contractor to suspend part of the works if the Contractor fails to comply with the specifications set out in the EA, EMPr and MSs. Such suspension will be enforced until compliance is achieved.

3.4. Information Boards

The Contractor shall be responsible for erecting general information boards on site. The general information board shall provide the name and contact number of the EO, to ensure that the public has access to the EO to request information and / or to lodge any complaints. The EO shall report complaints to the RE and ECO. One of these information boards shall be erected at the main construction camp.

3.5. Methods statements

The Contractor shall submit written MSs for approval by the RE with input from the ECO. The MSs shall cover applicable details concerning the following, as appropriate:

- Type of construction activity and construction procedures;
- Timing and location of the activity;
- Identification of the environmental aspects and impact that might result from the activity;

- The methodology for impact avoidance or minimisation for each activity or aspect;
- Materials and equipment to be used;
- Getting equipment to and from site;
- How the equipment/material will be moved while on site;
- How and where the material will be stored;
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- Treatment and continued maintenance of the impacted environment (where applicable);
- Compliance / non-compliance with the EA and EMPr; and
- Any other information deemed necessary by the RE or ECO.

As a minimum the following MS are required:

- MS indicating the location, preparation and layout of the construction camps and laydown areas;
- MS for site / vegetation clearing;
- MS for the containment, handling, storage and disposal of hazardous substances;
- MS for access and construction works in watercourses;
- MS for handling accidental leaks and spills;
- MS for management of hazardous waste;
- MS for management of general waste;
- MS for management of wastewater;
- MS for dust control;
- MS for management of cement and concrete batching;
- MS for erosion and sedimentation control;
- MS for traffic accommodation and diversions;
- MS for fire prevention and control;
- MS for site rehabilitation; and
- MS for alien vegetation management.

The RE and / or the ECO may specify any additional Ms as may be required. MSs shall be submitted to the RE and ECO at least ten (10) days prior to the commencement of construction. It should be noted that MSs must contain sufficient information and detail to enable the RE and ECO to apply their minds to the potential impacts of the works on the environment.

Work shall not commence until the RE has approved the MS with input from the ECO. Failure to submit MSs may cause the RE to order the Contractor to suspend part or all of the works concerned until a MS has been submitted and approved. Any damage caused to the surrounding environment shall be rehabilitated at the Contractor's cost.

3.6. Environmental Awareness

Before the commencement of any work on-site, the Contractor's site management staff shall attend an environmental awareness training course, presented by the ECO. The Contractor shall liaise with the ECO before the commencement date to fix a date and venue for the course. The Contractor shall provide a suitable venue with facilities and ensure that the specified employees attend the course.

The information presented at the course shall be communicated by the Contractor site management staff to the rest of his employees on the site, to any new employees coming onto the site after the initial training course and to his / her suppliers. The presentation shall be conducted, as far as possible, in the employees' language of choice. As a minimum, training shall include:

- Explanation of the importance of complying with the EA and EMPr;
- Discussion of the potential environmental impacts of construction activities;
- Explanation of the management structure for the administration and regulation of the environmental obligations associated with the project;
- Employees' roles and responsibilities, including emergency preparedness;
- Explanation of the mitigation measures that must be implemented when carrying out their activities;
- Explanation of the requirements of the EA and EMPr; and
- Explanation of the Environmental Do's and Don'ts.

The Contractor shall keep records of all environmental training sessions, including names of attendees, dates of their attendance and the information presented to them. Records of environmental training sessions shall be submitted to the RE and ECO. Example of a template is attached as Annexure E

3.7 Environmental code of conduct

EMPr aims to ensure that all the workforce, contractors, sub-contractors and construction staff understand environmental issues and the potential impacts of on-site activities. The environmental code of conduct provides the basic rules that should be strictly complied with. It is the responsibility of the Contractor to ensure that each contractor, sub-contractor and workforce understand and adhere to the Code of Conduct.

3.8 Layout of the EMPr

The EMPr is divided into three phases of the development, each phase has specific issues unique to that period of the construction and operation of the road to be upgraded. The impacts are identified and given brief description. The three phases of the development are then identified as below:

3.8.1 Planning and design phase

This section of the EMPr provides management principles for the and design phase of the project. Environmental actions, procedures and responsibilities as required from the developer during the planning and design phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfactory of the Engineer and ECO.

3.8.2 Preconstruction phase

This section of the EMPr provides management principles for the preconstruction phase of the project.

Environmental actions, procedures and responsibilities as required during the preconstruction phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfactory of the Engineer and ECO.

3.8.3 Construction phase

This section of the EMPr provides management principles for the construction phase of the project.

Environmental actions, procedures and responsibilities as required during the construction phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfactory of the Engineer and ECO.

3.8.4 Operational and maintenance phase

This section of the EMPr provides management principles for the operation and maintenance phase of the project. Environmental actions, procedures and responsibilities as required from the developer during the operation and maintenance phase are specified.

3.9 Meetings

The ECO shall meet (or otherwise liaise) with the RE and EO monthly, or more frequently as may be required during the initial stages of the project. The ECO shall prepare a monthly environmental audit report and provide feedback (written and/or oral) at monthly site meetings.

3.10 Record of Activities

The EO shall keep a record of activities on site, including but not limited to:

- Meetings attended;
- Site inspections;
- Internal audits;
- Monitoring results;
- Method Statements;
- Issues arising on site;
- Cases of non-compliance with the EA and EMPr;
- Penalties/fines issued;
- Complaints received and corrective action taken; and
- Environmental incidents/non-compliances and corrective actions taken.

The EO and RE shall undertake photographic monitoring of the contract. This shall include a photographic record of all areas that will be impacted by the construction activities prior to construction activities commencing. The ECO shall monitor all sensitive work environments (e.g. bridge and culvert construction areas), which may also include photographic monitoring.

3.11 Fines

A system of fines shall be implemented to ensure compliance with the EA and EMPr. Where the Contractor or their sub-contractors inflicts damage upon the environment or fails to comply with any of the environmental specifications of the EA or EMPr, the Contractor may be liable to pay a fine. The Contractor is deemed not to have complied with the EMPr if:

- There is evidence of a contravention of the EMPr specifications, including any non-compliance with an approved MS;
- Construction activities take place outside the defined boundaries of the site;
- Environmental damage ensues due to negligence;
- The Contractor fails to comply with corrective or other instructions issued by the RE / ECO within a specific time period; and/or
- The Contractor fails to respond adequately to complaints.

If excessive infringement concerning any of the above is registered, then SANRAL reserves the right to terminate the Contractor's contract.

The system of fines shall be implemented in the following way:

- Fines shall be issued per incident at the discretion of the Engineer;
- Fines shall be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental specifications; and
- The Engineer shall inform the Contractor of any contravention, the contravening individual's identity and the amount of the fine, and will deduct the total amount from the amounts due to the Contractor.

Failure by any employee of the Contractor or sub-contractors to show adequate consideration to the environmental aspects of the contract shall be considered

sufficient cause for the ECO to recommend to the RE to have that employee removed from the site. The ECO may, through the Engineer, also order the removal of equipment that is causing continual environmental damage.

3.12 Monitoring and Auditing Procedures

The Contractor shall establish an internal audit and review procedure to monitor the day-to-day implementation of the EA and EMPr requirements. The day-to-day monitoring and verification that the EA and EMPr are being adhered to shall be undertaken by the EO. The EO audit reports shall be submitted to the RE and ECO. Internal audits shall include an assessment of performance against the requirements of other environmental licences or permits (e.g. water use authorisation, flammable substance certificates, etc.).

The ECO shall visit and inspect the site monthly to ensure that adequate operational procedures are being implemented and to audit compliance with the EA and EMPr requirements, as well as the stipulations of other environmental licences or permits issued for the project. Additional (weekly) site inspections by the ECO may be needed during the initial stages of the project. The ECO shall address any queries to the RE. If the queries cannot be resolved at this level, they will be referred to the Engineer and, if necessary, to the SANRAL.

Furthermore, SANRAL must engage an independent auditor with the necessary expertise and experience to assess compliance with the conditions outlined in the Environmental Authorisation (EA) and Environmental Management Programme (EMPr) three months after the construction phase begins and again three months following its completion . The respective environmental audit reports must contain all information required as set out in Appendix 7 of the EIA Regulations, 2014 (as amended) and must be submitted to DFFE for consideration. The following information must, amongst others, be included in the respective audit reports (as appropriate):

- Verifiable findings on the level of compliance with the conditions of the EA and requirements of the EMPr and whether this is acceptable or not;

- The extent to which the environmental management measures specified in the EMPr achieved the environmental outcomes. Any shortcomings must be highlighted and the need for any changes to the environmental management outcomes and measures must be identified; and
- After completion of construction, provide comment on the state of rehabilitation of the site, provide assurance that there are no outstanding issues relevant to the construction phase and identify any environmental issues which will need ongoing monitoring/auditing and action during the maintenance phase of the project.

Access to the site must be granted and the environmental audit reports, ECO reports and other relevant documentation must be produced to any authorised official representing the Competent Authority who requests to see it to assess and/or monitor compliance with the conditions contained therein.

4. MITIGATION AND/OR MANAGEMENT MEASURES

According to Appendix 4 of GN R 326, an environmental programme must include:

(e) A description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and

(e) Will be achieved, and must, where applicable, include to –

i. Avoid, modify, remedy, control or stop any action, activity or process which cause pollution or environmental degradation;

ii. Comply with any prescribed environmental management standards or practices;

iii. Comply with any applicable provisions of the Act regarding closure, where applicable; and

iv. Comply with any provisions of the Act regarding of the financial provisions for rehabilitation, where applicable.

Table 5: Management of Construction Phase activities

Risk	Mitigation measure	Responsibility	Timeframes
SITE CAMP ESTABLISHMENT			
Site camp establishment	• When establishing the site, the environmental objective is to minimize the footprint of the disturbance and to minimize the extant of the soil erosion, loss of vegetation and the potential for pollution of soils and water resources. • The site must be established in accordance with the approved construction layout plan, prior to the commencement of construction. Any relaxation or modification of the construction site layout plan must be approved by the Project Engineer or ECO.	Contractor, Engineer	Construction phase
Demarcation of the site			
Site demarcation	The extent of the construction site, including working areas, must be clearly demarcated and no movement or work outside these areas is permitted. The contractor must: • Identify and demarcate the extent of the construction site as indicated on the approved construction site layout plan using barrier tape or another method as approved by the Project Engineer or ECO. • Minimize the extent of the construction site footprint as much as possible. • Identify and demarcate sensitive sites in collaboration with the ECO. This may require perimeter fencing or steel droppers with barrier tape. • Maintain site demarcation in position until the cessation of construction works and ensure that no personnel or construction materials move outside the designated site.	Contractor, Engineer	Construction phase

	• Ensure that the site is not used for any other purpose other than the carrying out of construction activities. • Ensure that no natural features are painted or permanently marked. Marking for surveying and other purposes must be done using pegs, beacons or ropes and droppers.		
Site clearance			
Vegetation clearance	• Detailed colour photographs of the proposed site shall be taken before any clearing may commence. These records are to be kept by the ECO to aid in the rehabilitation of the site. • Prior to site clearance the ECO must be informed, in order to identify and demarcate any indigenous tree or plants, nesting or heritage sites that required protection or translocation. • Areas of the construction site requiring clearance shall only be cleared immediately prior to construction activities commencing, i.e., at the last practicable stage. • Clearance of indigenous vegetation must be kept to an absolute minimum. • No indigenous tree or shrub may be felled, looped, pruned or removed without prior permission of the ECO. De-bushing and de-stumping are dealt with in this document. • Where topsoil is present, it is to be stripped, together with grass, groundcover and sedges, from all areas where permanent or temporary structures and access roads are to be constructed. Conservation and handling of topsoil is to be implemented in terms of this document.	Contractor, Engineer	Construction phase

	Woody obtained from clearing and grubbing operations remains the property of the authority and must be stacked at sites designated by the ECO. The Contractor shall be required to remove any wood from the site and dispose at a designated site for vegetation disposal, should this be required.		
Protection of Sensitive Habitat			
Loss of plants and animals Species of Conservation Concern (SCC)	• The contractor must ensure that the necessary rescue and translocation of plants and animals be undertaken prior to the commencement of construction. • The width of the initial clearance for the construction servitude must be minimized to reduce the loss of indigenous vegetation and natural forest. • The removal of indigenous vegetation must be kept to a minimum by minimizing the construction footprint and by confining areas for structures, services, stockpiling, new temporary access roads, etc., to existing disturbed areas or areas within the construction servitude. • Protected areas should be avoided as far as possible, however, in the event of avoidance being possible, the Contractor should obtain ECO agreement for the removal. The ECO must identify these trees, in consultation with a suitably qualified botanist, before the commencement of construction. • As far as possible, indigenous plants (Euphorbia spp, Chrysocoma ciliata, Cenchrus ciliaris, Thesium lineatum, Pteronia incana, Acacia spp, Rhanterium spp. and Ricinus communis) or natural features should not be disturbed, defaced, destroyed or removed. The	Contractor	Construction phase

	contractor will be liable for the replacement of any indigenous plant or natural features that is removed or damaged by the Contractor's negligence or mismanagement. • Should the ECO confirm that clearing of indigenous vegetation is unavoidable, plant material must be transplanted where practical and possible. e.g When transplanting indigenous vegetation, carefully excavate the plants with a sufficient root ball, minimize damage to the roots, and replant them in a suitable location that meets their ecological requirements, ensuring proper soil preparation and aftercare to promote successful establishment. • The method of construction must be selected to minimize interference with indigenous vegetation (detailed in the terrestrial biodiversity report) to be retained on either side of the servitude, i.e., manual labour should be utilized in sensitive areas (large excavation machinery can cause considerable damage to trees outside of the construction footprint if working in a narrow corridor flanked by tall trees either side). • No material storage or laydown is permitted under trees. • Vehicle and pedestrian traffic outside the construction area must be avoided. • It is recommenced that no cement mixing take place on site. Ready mix concrete should be used instead. • Contaminated water must be tested and disposed offsite at an approved landfill. • If oil spills occur the contaminated soil should be disposed at an approved landfill site. • No impacts on quality of surface and ground water should be allowed.		

	• Chemical toilets shall not be placed on steep areas with intact vegetation. Exact location of toilets to be approved with the Engineer and ECO prior to construction and must be located at least 50 meters away from wetlands and/or watercourses. • Topsoil and subsoil seepage shall be protected from contamination. • To prevent storm water damage, the increase in storm water run-off resulting from clearing activities must be estimated and a drainage system assessed accordingly. Serious financial and environmental impacts can be caused by unmanaged storm water. • It is important to manage lead times effectively, as stripping vegetation immediately before site activities significantly reduces the risk of erosion. • No impediment to the natural water flow other than approved erosion control works is permitted. • Stormwater runoff must be appropriately channeled and discharged in a safe manner thus reducing environmental impacts to the vegetation and aquatic communities. • Solid waste is to be stored onsite in an appropriate manner until it can be disposed at the nearest water fill site. • Material spoiling shall not take place on site. • Location of the spoil-material shall be confirmed with the Engineer and ECO prior to disposal. • Contractor is to exercise strict care in the disposal of construction waste, with proof of disposal at an approved site provided after off-loading each waste load and this		

	logged/registered within the environmental file that must be maintained at the contractor's camp for the duration of construction. **Protection of Faunal** • Wild animals must not be fed, handled, removed, hunted, snared, captured, injured or killed or otherwise interfered with. The penalty cause associated with the needless destruction of wildlife is a fine and/or imprisonment. • The Contractor must ensure that the construction area is kept clean, tidy and free of litter/rubbish that would attract animal pests. • The Contractor must not use any pesticides, unless approved by the ECO. • Where open excavation pose a safety risk to animals, the Contractor must ensure that they adequately cordoned off. • The Contractor must report problems or injured wild animals to the ECO.		
Topsoil conservation			
Loss of top soil	• Ahead of all construction, where feasible and an existing topsoil layer is present, the topsoil layer must be stripped from all areas to be cleared, excavated, compacted or otherwise disturbed. • In the absence of a recognizable topsoil layer the upper most 300 mm soil must be stripped. • The topsoil must be stockpiled separately from overburden material (subsoil and rocky material).	Contractor	Construction phase

	• Construction works must be coordinated to limit unnecessary prolonged exposure of stripped areas and stockpiles. • Vegetation and soil must be retained in position for as long as possible, removing it immediately ahead of construction/earthworks in that area. • Herbaceous vegetation, along with overlying grass and other fine organic matter must be stripped and stockpiled. • The stockpile height of topsoil must not exceed 2 m unless approved by the ECO. • The stripped topsoil must be stored at an approved location and in an approved manner for later reuse in the rehabilitation process. • Topsoil stripped from different sites must be stockpiled separately, as re-application during rehabilitation must preferably be site specific. • Topsoil obtained from different sites must not be mixed.		
Protection of Cultural Heritage Resources			
Destruction of cultural heritage resources	If a cultural heritage artefact on site in uncovered, work in the immediate vicinity must be stopped immediately. The Contractor must take reasonable precautions to prevent any person from removing or damaging any such article and immediately inform the Environmental Manager or ECO of such a discovery. The provincial heritage authority of the Western Province must be contacted so that an archaeological/heritage resources consultant can be appointed to record the site and excavate if necessary. Work may only resume once clearance is given in writing by the Western Cape Provincial Heritage Authority also known as Heritage Western Cape (HWC)	Contractor	Construction phase
De-bushing and de-stumping			

Clearance of vegetation	• Prior to any disturbance/stockpiling and clearing of natural vegetation and soil (either within the construction servitude, working footprint or at designated or instructed areas outside the construction servitude). The Contractor must inform the ECO. • The contractor must only de-bush specified areas as indicated on the approved construction site layout plan. • Remaining plant material and stumps must be disposed as solid waste or left on site to decompose naturally as advised by the ECO. • DE-stumping must only be carried out in consultation with the ECO.	Contractor	Construction phase
SITE INFRASTRUCTURE			
Structures			
Erection of structures	• All buildings and structures, including offices, workshops, stores, etc., must be located as per the approved construction site layout plan. • Only security and emergency personnel may be housed on the construction site. • Accommodation for other construction personnel must be arranged in appropriate locations off site. • On site accommodation for security and emergency personnel must be securely fenced. These fences must remain in position for the duration of construction. • Essential services must be provided and maintained in a functional state and not overloaded. • Defects and inadequacies must be rectified immediately.	Contractor	Construction phase
Services			

	Water Supply • Permission from DWS must be obtained prior to abstracting water from any watercourse where the volumes abstracted require registration or licensing in terms of the National Water Act, 1998 (Act No, 36 of 1998) and any general authorization in terms of section 39(1) of the National Water Act. The point and method of abstraction must be approved by the ECO. ***Sanitation and Ablution Facilities*** • The contractor's intended methods for waste management and waste minimization must be implemented at the outset of the contract, and approved by the Project Engineer. • Adequate sanitation facilities must be provided and maintained for construction workers and all other personnel along the entire route of the project. • Sanitation facilities must be in the form of portable serviced toilets. • Separate sanitation facilities must be provided for male and female workers. • Outside toilets must be adequately secured to prevent them from blowing over and provided with locks and doors. • The facilities must be placed outside areas susceptible to flooding. • Grey water must not be discharged via French drains or directly into the surrounding environment where there is a high groundwater level and associated risk of contamination. ***Power Supply*** • The power supply to be used is to be approved by the Project Engineer or ECO.	Contractor	Construction phase

	• If generators are to be used, establish generators, motors and stored fuel on a hardened, bunded surface ensure any associated pollution is controlled • Noise from generators must be controlled		
Construction Camp, Material Storage Yard and Lay-Down Areas			
	• The construction camp will house administrative offices, construction plant, material stockpiles, fuels, storage facilities and security guard accommodation (if needed). • No construction workers may be accommodated at the construction camp. • All material storage yards, storage areas and material lay-down areas must be located within predetermined zones as per the approved construction site layout plan. • Additional areas required by the Contractor for material storage yards and lay-down area must be approved by the Project Engineer with input from the ECO, in the form of an amended construction site layout plan indicating the extent and anticipated utilization of the storage and lay-downs areas. • The construction camp, material storage yards and lay-down areas must be kept secure and neat at all times with appropriate access control measure employed during construction. • Security lighting must be positioned so that it does not pose a nuisance to neighboring properties or a danger to road users.	Contractor	Construction phase
Storm Water Control			

Stormwater or run-off rainy season	• Appropriate drainage measures must be taken to ensure that excessive run-off, and as a result, erosion, does not occur from construction site. • Where practical (sections traversing land with an intact topsoil layer), immediately following construction, all bare areas should be seeded with a locally occurring indigenous grass seed mix. • Where practical and important, SANRAL should consider implementing reclamation projects to stabilize and reclaim erosion gullies. • Where directly by the ECO, embankments must be grassed to minimize erosion. • Stormwater diversions must be constructed above the campsite to direct run-off away from the site. • Clearing activities must only be taken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts. • If possible construction activities should schedule to minimize the duration of exposure of bare soils on site, especially steep slopes. • A row of silt fences and sandbags must be established along the wetland buffer edge prior to construction commencement. These silt fences and sandbags must be regularly checked and maintained and should only be removed once vegetation has successfully colonized the embankments. • Any steep or large embankments expected to be exposed during rainy months should either be armoured with fascine like structures/silt fences or grassed immediately with	Contractor	Construction phase

	strip sods established at regular intervals (50- 100 cm) down the bank with hydro-seeding between the strip sods. • Where the bare surface of platforms slope towards the edge of an embankment, silt fences and sandbags must be established along the crest of the embankment. If preferential flow routes on the slopes site occur, these flow routes must be intercepted with a series of sandbags. • After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled with appropriate material and silt fences or fascine work must be established along the gulley for additional protection until grass has re-colonized the rehabilitated area. • It is important that all of the above listed mitigation measures are costed for in the construction phase financial planning and budget so that the Contractor and /or developer cannot give financial budget constrains as reasons for non-compliance, proof of financial provision of these mitigation measure must be submitted to the ECO prior to construction commencing. • The following soil stabilization practices are aimed at reducing the level of soil disturbances and the potential for the mobilization of sediments from bare areas: o Sloping of drainage line banks upstream and downstream of the road crossing; o Establishment of native/indigenous vegetation cover; and o Establishment of sediment blankets and mulching.		
Roads and Access			

	• As far as possible, existing roads must be used for access/haulage purposes, as per the construction site layout plan. • Adequate vehicle turning areas must be allowed for. • Alternative temporary access routes must be provided where construction will obstruct existing access. • Routes through drainage lines and riparian zones must be avoided wherever possible. When this is unavoidable, only one road is permitted, constructed perpendicular to the drainage line (use of existing crossing points is recommended). • Speed limits appropriate to the type and condition of road must be enforced at all times. • All access routes and roads must be adequately maintained in order to minimize erosion, undue surface damage and pollution. • Topsoil (and other material) that has accumulated inside drains of roadways must be regularly removed to keep these open and functional. • Gravel or cement spillage must be cleared immediately (both within and outside the construction site). • Damage to public or private roads caused by the contractor during the construction phase must be repaired immediately to the same or better state. • No off-road driving is permitted outside of the demarcated construction area or in sensitive areas. • Traffic disruptions along roads must be minimized and controlled.	Contractor, Engineer	Construction phase
SITE MANAGEMENT			

Effluent/Wastewater Management			
Waste Management (Ablution Facilities)	• Temporary chemical toilets must be provided by a company approved by the Applicant. These toilets must be made available to all staff, and must be no closer than 50m any water course. • One chemical toilet per 15 workers must stationed on site, within easy walking distance of the workers, with toilet/s to be serviced at least once a week by registered company. Toilet paper must be supplied, and the toilet/s and area around them is to be kept hygienically clean at all times. • Ensure that no spillage occur when the toilets are cleaned or emptied. Repeated incidents of spillage of chemicals and/or waste (i.e., more than one incident), will require toilets to be placed on a solid base with a sump. • Such facilities must comply with local authority regulations and their use must be strictly enforced. • These facilities must be placed on an impermeable surface to ensure that the ground surface/soil is not contaminated in any way. Care must be taken to avoid contamination of soils and water, pollution and nuisance to adjoining areas. • Sewage must be disposed at a licensed wastewater treatment site and may under no circumstances be dumped in the bush or buried. NB: The construction of longdrop toilets is forbidden.	Contractor	Construction phase
Solid Waste Management			

Solid Waste Management (littering or improper management of solid waste)	• The Contractor must ensure that personnel make use of the litter bins provided and the construction camp and outside the site are kept tidy and litter free at all times. • All domestic waste must be disposed in the litter bins. • Litter bins must be equipped with a closing mechanism to prevent their contents from blowing out and scavengers from getting in. • Litter bins must be emptied weekly (or as required before they reach capacity). • Domestic waste must be transported and disposed of at registered licensed landfill site. Waste must be transported responsibly, avoiding waster spills en-route. • Where necessary, a storage area must be dedicated onsite for the collection of construction waste. • No solid waste must be burned or buried onsite or disposed by any other method. • Where feasible, waste paper, glass and metal waste must be collected separately and arranged for collection by recycling contractors.	Contractor, ECO	Construction phase
Hazardous Waste			
Hazardous spillage	• Compliance with all national, regional and local legislation must be ensured with regard to the storage, handling and disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substance and materials. • Hazardous waste must be stored as indicated on the approved construction site layout plan. • Drip trays must be used where dispensing mechanisms or stored receptacles may leak.	Contractor, ECO	Construction phase

	• No spillage of hazardous products must be allowed on site. Special care must be taken to avoid contamination of surface or groundwater. • Under no circumstances shall the spillage of hazardous products be allowed on site. • Waste oils batteries must be retained for recycling by the supplier, whenever possible. • Used oils and lubricants must be collected in a holding tank and disposed of at a registered hazardous waste disposal site and disposal slips obtained • Hazardous waste not earmarked for reuse, recycle or resale must be disposed at a registered hazardous waste disposal site. • The repair and/or maintenance of vehicles and equipment onsite are not permitted. • Contaminated soils must either be excavated or treated on-site, depending on the nature and extent of the spill. • The ECO must determine the precise method of treatment of the polluted soil. This could involve the application of soil absorbent material or oil-digestive powders to the contaminated soil. • If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent materials. • Contaminated remediation materials must be carefully removed from the area of the spills as to prevent further release of petrochemicals to the environment, and stored in a suitable container until appropriate disposal. • Fuel tank capacity must not exceed 30 000L and must be marked. • Fuel tank must be placed within a concrete bunded wall (110% and above)		

Pollution Control			
Soil and Water Pollution	• The storage for any substance which causes or is likely to cause pollution must not be located within a horizontal distance of 100 m of a watercourse, drainage line or identified wetland. • Waste of foreign must not be dumped into any watercourse or wetland areas. • Watercourses and wetlands areas must not be used for swimming, bathing or the cleaning or clothing, tools or equipment. • The discharge of water containing pollution matter or visible suspended materials, fines and sediments directly into drainage lines or wetlands must be prevented. • Unpolluted water/runoff must be deflected away from any dirty area. • No stormwater must enter any drainage installation for the reception, conveyance, storage and/or treatment sewage. • Special care during rainy periods must be taken to prevent the contents of sumps and drip trays from overflowing. • Before any water is permitted to enter natural drainage lines, the quality of the water must comply with the South African Water Quality Guidance) Department of Water Affairs and Forestry, 1996) and the Standard Requirements for Effluent and Waste Water. • Watercourses must be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, wash water, organic materials, etc.	Contractor, ECO	Construction phase

	• The Contractor must ensure that an emergency preparedness plan is in place for implementation in the case of a spill or substances that can be harmful to an individual or the receiving environment. • The contractor must ensure that accidental oil or furl spills or leakages (other than classed as emergency) are immediately contained and cleaned up. • Oil or fuel spills must not be hosed into a storm water drain or sewer, or into the surrounding natural environment • Small oil or fuel spills must be cleaned with approved absorbent material, such as “Drizit or spill-sorb”. • Oil or fuel spills must be contained in water using an approved fiber. • Contaminated soil must be excavated to the depth of the contamination and either disposed of at a registered hazardous waste site or treated on-site using approved bioremediation techniques, as directed by the Environmental Control Officer (ECO)All on-site operations that involve the use of cement and concrete must be carefully controlled. • Cement and concrete mixing must be limited to single sites, where possible. • Plastic trays or liners must be used when mixing cement and concrete (cement and concrete must not be mixed directly on the ground). • All visible remains of excess cement and concrete must be disposed of after the completion of tasks. Solid waste concrete must be treated as inert construction rubble,		

	but wet cement and liquid slurry, as well as cement powder must be treated as hazardous waste. • Water and slurry from cement and concrete mixing operations must be contained and directed into a settlement pond or sludge dam for later disposal.		
	Air quality		
Dust generation	• Dust- suppression techniques (e.g., the use of water spray vehicles) must be employed on all exposed surfaces during periods of high wind. Potential methods include: o Remove only limited vegetation to accommodate construction activities. o Spray unpaved roads and construction areas, including stockpiles and spoil, with water routinely throughout construction to contain dust. If the area is water scarce dust on a construction site can be managed by applying dust suppression agents such as eco-friendly binding agents or polymers that create a crust on the soil surface, preventing dust particles from becoming airborne. Additionally, covering exposed areas with mulch, gravel, or geotextiles and using windbreaks like temporary fencing or vegetation barriers can effectively reduce dust movement without relying on water. o All surfaced public roads shall be cleaned within 50 meters of points if ingress and egress in order that mud and dust on the road on the road surface is minimized. o Implement traffic control measures to limit vehicle entrained dust from adjacent roads (by limiting construction vehicles speeds and by restricting traffic volumes). o Re-vegetate verges and cutting once all construction is complete, and when the lay down area/construction camp is vacated.	Contractor, ECO	Construction phase

	• Vehicles emitting black smoke and fumes must be repaired and maintained. • No burning of waste material shall be allowed anywhere on site.		
Noise control			

Elevated noise	• Compliance with the noise legislation is mandatory, as outlined in the Noise Control Regulations of the Environmental Conservtions Act, 1989 (Act No 73 of 1989) and the National Environmental Management Act (NEMA, 1998 (Act No. 107of 1998)
	• Noise control methods shall be employed where possible, these may include:
	  ○ Selecting quitter equipment where feasible;
	  ○ Maintaining all equipment in good working order;
	  ○ Retro-fit selected equipment with dampening measures;
	  ○ Employ improved technology where volume gains can be achieved.
	• Noisy construction activities close to residential and business areas, which include the movement of construction vehicles, should be restricted to daylight working hour, unless approval is obtained from the community to work later.
	• Adjacent landowners must be notified of after-hours construction work and of any other activity that is likely to cause nuisance.
	• Construction equipment must be kept in good working order.
	• Community complaints with regards to the noise generation must be responded to, that is, raking reasonable action to ameliorate the impact.
		Contractor, ECO	Construction phase

Fire control			

Fire Outbreak	• Adequate precautions must be taken to ensure that fires are not started as a result of construction. The Contractor will be held liable for any damage to property and adjacent lands as a results of any fire caused by one of the employees. • The construction camp must be equipped with adequate firefighting equipment • Immediate steps must be taken to extinguish any fire, which might break on the construction site. • No open fires are permitted anywhere on site. • Fuels or chemicals must not be stored under trees. • Gas and liquid fuel must not be stored in the same storage area. • Smoking must not be permitted within 3m of any fuel or chemical storage area, or refueling area.	Contractor, ECO	Construction phase
Earth works			
Excavations			
Excavated areas	• Excavations must be undertaken carefully, incorporating appropriate drainage. • The contractor must not have more than 500m of excavated areas open at any one time.	Contractor, ECO	Construction phase
	• Excavations must not stand open for longer than two days, where possible (maximum of four days). Excavations should preferably be opened and closed on the same day. • If de-watering is required where table is high, the Excavations should only be open for one day.		

	• Where excavations pose a risk to human or animal safety, they must be adequately cordoned off to prevent accidents. • Wild animals that are found trapped in excavations must be assisted provided there is no risk to workers' safety. • Excavations must be programmed to take place once the required materials are on site. • Where excavations through wetlands and drainage lines are required, the Contractor must restore the profile of these areas closely resemble their original condition to there-construction profile. No ridge or channel feature may remain. • During construction through a wetland, the majority of the flow of the wetland must be allowed to pass downstream (i.e., the damming must be allowed to take place). In-stream diversions must be used rather than the construction of new channel.		
Borrow Pits and Rock Quarries			
Borrow pit areas	• Where it is required to import material, this shall be from legal commercial sources or legal borrow areas. Sources of material are to be approved by the ECO, to ensure that no importation of alien invasive plant seeds or other potentially hazardous substances enters the project environment. • Do not commence with quarrying activities before necessary DMRE approvals are in place. • Comply with the provisions of the environmental management programme for the development, use the rehabilitation of the particular borrow pit. Of particular importance is to:	Contractor, ECO	Construction phase

	○ Remove the separately topsoil and overburden for use during rehabilitation, locating these in areas where they will not be disturbed by the progress of the gravel pit/quarry. ○ Avoid stripping materials to bedrock. This limits rehabilitation potential for these areas. ○ Minimize the flow of any surface water or floodwater into borrow areas. Where necessary, protect borrow areas by an earth berm or sandbag system to deflect clean surface runoff away from the excavations. ○ Allow for the natural free drainage of borrow areas. All borrow areas must be drained unless otherwise specified. ○ Bury coarse material incapable of supporting vegetation beneath the finer material.		
Stockpiles, Storage and Handling			
Top soil			
stockpiles	• If temporary stockpiling is required, stockpiles must be positioned as indicated on the approved construction site layout plan. • Any additional topsoil stockpile areas required by the Contractor must be approved by the ECO. • Topsoil is to be kept separate from subsoil and handled twice only – once to strip and stockpile, and once to replace the level.	Contractor, ECO	Construction phase

	• Topsoil stockpiles must be positioned on the higher side of a disturbed area, and above a 1:50 year flood line wherever possible. • Stockpile height must not exceed 2m unless approved by the ECO. • All topsoil must be stored in such a way and in such a place that will not cause the damming up of water, erosion gullies, or wash away itself. • Topsoil must not be stockpiled in drainage lines. • Topsoil must not be stockpiled in sensitive areas • Topsoil must be stockpiled in a suitable from in order to minimize visual impact. • Topsoil stockpiles must be protected from erosion by wind and water. • Topsoil must not be compacted in any way during storage. • Exotic/invasive plants and broad leaf weeds that emerge on topsoil stockpiles must be removed. • If topsoil is to be stockpiled for extended periods, especially during the wet season, the ECO must recommend one of the following measures: o The stockpiles must be re-vegetated with indigenous grasses as indicated by the ECO. o The stockpiles must be covered with protective materials, such as hessian mats. • Topsoil must be buried, mixed with spoil (excavated subsoil), rubble or building material, or subjected to compaction or contamination by vehicles or machinery. This will render the topsoil unsuitable for use during rehabilitation.		

	• The contractor will be held liable for the replacement of any topsoil rendered unsuitable for use during rehabilitation, for reasons due to his negligence or mismanagement on site.		
Spoil			
Spoiled material and spoil areas	• A photographic record (before construction and after rehabilitation) must be kept of all spoil sites for monitoring purposes. • The reinstated construction site, used as a spoil area for excess excavated material, must only have a net increase in ground level of less than 200 mm. The reinstated site must be lightly compacted and made free-draining. • The designated deposition site or burial site (approved by the Resident Engineer and ECO) must be utilized for construction rubble. • Spoil areas must not negatively affect surface drainage, and they must not alter the topography to the extent that they become visually intrusive. • Dumping of material over embankments is not permitted. • The use of spoil sites for the disposal of hazardous or toxic wastes is not permitted. • Spoil must be positioned on the higher side of a disturbed area, and above a 1:20 year flood line wherever possible. • Spoil must be stored in such a way and in such a place that will not cause the damming up of water, erosion gullies, or wash away itself. • No slopes steeper than 1:1 (Vertical to Horizontal)are permitted. • If required, additional spoil storage areas required by the Contractor must be approved by the ECO.	Contractor, ECO	Construction phase

	• Spoil areas must be re-vegetated and rehabilitated after the construction phase.		
Vehicles and Equipment			
Hydrocarbon spillages	• Vehicles used during construction must have the minimum impact on the environment and other road users. • Vehicles, machinery and equipment must be checked regularly to ensure that none have leaks or cause spills of oil, grease or hydraulic fluid. Problematic vehicles, machinery or equipment must be sent for repair or removed from the site immediately. • Drip trays must be provided for any machinery that will be in position for longer than one day. • Drip trays are to be watertight, and must be emptied regularly and before rain events. • All the necessary handling and safety equipment for vehicles, machinery and equipment must be provided by the Contractor and used or worn by staff.	Contractor, ECO	Construction phase
Fuel			
Fuel and oil spills	• Fuel stores must be positioned as indicated on the approved construction site layout plan. • Fuel depots must not be located within a horizontal distance of 100 m of a watercourse, drainage lines or identified wetland. • In the event the contractor has a diesel tank must be on a stand, within a bunded area, with a metal drip tray under the dispensing hose. The dispensing hose must have control pump with a valve, tap, hose and funnel. • All spills (within the bund and dispensing area) must be directed to a collection sump. • Spills and the contents of the sump must be treated as hazardous waste.	Contractor, ECO	Construction phase

	• All the necessary handling and safety equipment for fuels must be provided by the contractor and used or worn by staff.		
Hazardous substances			
Hazardous substances spillage	• Compliance with all national, regional and local legislation concerning the storage, transportation, and use of harmful and hazardous substances and materials must be ensured. • The Contractor must maintain a register of hazardous substance to be used on site and provide the Project Engineer with proof that relevant authorization for storing such substances has been obtained from the relevant authority. Furthermore, clear hazard signs indicating the nature of the stored materials must be prominently displayed on the storage facility or containment structure. • The Contractor must provide the Project Engineer with details of the emergency procedures to be implemented in the event of misuse or spillage of substances that will negatively impact on an individual or the environment. • Hazardous substances may only be stored under controlled conditions (in a secured, appointed area that is fenced, has restricted entry, has weatherproof facilities, and is underlain by a bunded concrete slab to protect against soil and water pollution). • Controlled loading/unloading areas must be provided which are underlain by an impervious paving or PVC sheet to protect against soil and water pollution. • Empty containers in which hazardous substances were kept must be treated as hazardous waste.	Contractor, ECO	Construction phase

	• The responsibility for spill treatment lies with the Contractor. The individual responsible for, or who discovered the hazardous waste spill must report the incident to the RE. The Contractor must evaluate the situation in consultation with the RE and take appropriate action as necessary. In all cases, the immediate response shall be tocontain the spill. The exact treatment of polluted soil/water must be determined by the ECOr in consultation with the Project Engineer. Areas cleared of hazardous waste must be re-vegetated according to the Environmental Manager's instructions. • Should the spill be serious and constitute an emergency, the emergency procedure must be applied in terms of Section 30 of NEMA. • Should water downstream of the spoil be polluted, and faunal and flora shows signs of deterioration or death, specialist hydrological or ecological advice must be sought for treatment and remedial procedures to be followed. The requirements for such input shall be agreed with the Environmental Control Officer (ECO). The costs of containment and rehabilitation shall be for the Contractor's account, including the costs of specialist input.		
Erosion Control			
Drainage systems			
Stormwater and Run-off	• Drainage must be controlled to ensure that run-off from the site will not culminate in off-site pollution or cause water damage to properties downstream of the site. • Drainage must be provided (e.g., mitre drains) in accordance with the local topography to accommodate storm water and to minimize soil erosion.	Contractor, ECO	Construction phase

	• Surface water or storm water must not be allowed to concentrated or flow down cut or fill slopes or along road routes, without erosion protection measures in place. • Wetlands, drainage lines and river banks must not be drained, filled or altered in any way, unless this forms part of construction or upon specific instruction by the ECO. • The extent of hardened or paved areas must be kept to a minimum. • Culvert design must encourage their use as underpass crossings for small to medium sized animals.		
6.6.2 Erosion Protection			
Run-off or Stormwater	• All areas susceptible to erosion must be protracted to ensure that there is no undue soil erosion resultant from activities within the adjacent to the construction camp and construction area. • Vehicular or pedestrian access must not be permitted into areas beyond the demarcated boundary of the construction area. • Only light equipment must be used for access the deliveries into areas of unstable soils, in areas where erosion is evident, and at stream and river embankments. • Shoring must occur where excavation is in loose sand and/or swamp areas. • Erosion donga crossings must be addressed as watercourse crossings, applying soil erosion control and bank stabilization procedures as specified by the ECO. • Erosion issues must be addressed on a progressive basic throughout the duration of thecontract.	Contractor, ECO	Construction phase

	• Slopes steeper than 1(V):3(H), or slopes where the soils are by nature dispersive or sandy, must be stabilized (in construction with the ECO). One or more of the following method may be required:
	  ○ Topsoil covered with a geotextile, plus a specified grass seed mixture;
	  ○ A 50:50 by volume rock: topsoil mix 200 mm thick, plus grass seed mixture.
	  ○ Logging or stepping (logs placed in continuous lines following the contours);
	  ○ Earth or rock-pack cut-off berms 10;
	  ○ Benches (sandbags);
	  ○ Packed branches;
	  ○ ripping and/or scarifying along the contours; and
	  ○ Storm water berms.
	• Slopes of watercourse diversions must be protected with one or more of the following (in consultation with the ECO):
	  ○ Sandbags;
	  ○ Reno mattresses;
	  ○ Plastic liners and/or coarse rock (undersize rip-rap).
	• During the course of construction, the ECO may identify additional slopes in need of stabilization and will specify actions in terms of the most appropriate approved method and technology.		

	• Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected clearing activities should be put on hold. In this regard, the Contractor must be aware of the weather forecasts. • If possible, construction activities should be scheduled to minimize the duration of exposure of bare soils on site, especially steep slopes. The full extent of works shall NOT be stripped of vegetation prior to commencing other activities. • A row of silt fences and sandbags must be established along the wetland buffer edge prior to construction commencing. These silt fences and sandbags must be regularly checked and maintained and should only be removed once vegetation has successfully colonized the embankments. • Any steep or large embankments expected to be exposed during the rainy months should either be amoured with fascine like structures/silt fences or grassed immediately with strip sods established at regular intervals (50-100 cm) down the bank with hydro-seeding between the strip sods. • Where the bare surface of platforms slope towards the edge of an embankment, silt fences and sandbags must be established along the crest of the embankment. If preferential flow routes on the sloped site occur, these flow must be intercepted with a series of sandbags. • After every rainfall event, the Contractor must check the site for erosion damage and rehabilitation this damage immediately. Erosion rills and gullies must be filled with		

	appropriate material and silt fences or fascine work must be establishment along the gully for additional protection until grass has re-colonized the rehabilitated area. • It is important that all of the above listed mitigation measure are costed in the construction phase financial planning and budget so that the Contractor and/or developer cannot give financial budget constrains as reasons for non-compliance. Proof of financial provision of these mitigation measures must be submitted to the ECO prior construction commencing.		
Nuisance Control			
Nuisance	• Disruptions to adjacent landowners and neighbours must be minimized and managed. • Private property, access roads and other existing services on and in the vicinity of the construction site must be treated with respect and protected against damage. • The Contractor must bear the cost of the repair of damage as a result of the Contractor's operations on site. • Ongoing liaison with affected land owners and/or neighbours and other parties must be undertaken to minimize disruption and interruptions to services. • Sufficient prior notice must be provided to any affected land owners and/or other parties of the disruption of access. • Construction activities must be restricted to within the construction site. • The movement of construction workers must be confined, as far as possible, to the construction area. • Access points must be clearly demarcated with Barrie tape and signage.	PM, Contractor, DEO, ECO	Construction phase

2 Operational Phase

The operational phase refers to the period during which the project will be actively in operation. This section of the EMPr outlines general environmental specifications that are required to be implemented by the employer.

RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
Operational Site			
Maintenance activities	• The employer must identify and demarcated the extent of the operational servitude and its access points, and indicate these on an operational site layout plan. • No movement or work outside the servitude is permitted other than activities involving gaining access to the site along approved access roads/tracks. • Any areas disturbed outside of the operational servitude by the employer, its staff or visitors will be subjected to reinstatement and rehabilitation at the employer's cost.	SANRAL	Operational Phase
Maintenance of Bridges and Access Road Infrastructure			
Maintenance activities	• The operational servitude may not be used for any purpose other than for the proper carrying out of operational activities. • A regular monitoring and maintenance program must be developed. • During maintenance activities, there must be minimal disruption to affected landowners or any other affected parties. • Maintenance staff should not create excess dust noise during maintenance activities.	SANRAL	Operational Phase
Alien Invasive Species Control			

Construction activities	• The employer is responsible for the control of weeds and invader plants. The employer must monitor all sites disturbed by operational activities for colonization by weeds, exotic or invasive plants, and these are to be controlled as they emerge. • The control involves eradicating the plants present, killing the seedling which emerge, and establishing and managing an alternative plant covers to limit re-growth and re-invasion. • The control process involves eradicating existing plants, eliminating emerging seedlings, and establishing and managing alternative plant cover to minimize regrowth and re-invasion • Weeds and invader plants will be controlled in the manner prescribed for that category by the Conservation of Agricultural Resources Act, 1983 (CARA, Act No 43 of 1983) or in terms of Working Water Guidelines. The following alien invasive species were found onsite Ricinus communis (CARA 2002 - Category 2 NEMBA - Category 2) and Opuntia Spp. (category 1 weed) • Removed vegetation must be disposed at a licensed waste disposal facility. • Only properly trained people must handle and make use of chemical herbicides and workers must wear protective clothing when applying the herbicides. • Spraying should be avoided under windy conditions to prevent herbicide drift onto healthy indigenous plants.	SANRAL	Operational Phase
Soil Erosion and Water Control			

Stormwater or Run-off	• Soils must be monitored for signs of erosion at regular intervals. Upon identification of a potential erosion problem, measures are to be put in place to prevent further soil loss. • All wetland and/or stream crossings that occur along the route must be checked to ensure no nick-point erosion develops in disturbed soils and that no undue sedimentation occurs downstream. • Run-off must not be canalized or concentrated in areas where sheet flow may occur, or where highly erodible soils occur. • Storm water drainage measures must be implemented where necessary to control run-off, prevent soil erosion and sedimentation of water bodies.	SANRAL	Operational Phase
Waste Management and Pollution Control			
Improper management of solid waste	• No litter or any other debris shall be left on site after the completion of monitoring or maintenance activities. • Watercourses and rivers must be protected and maintained free of any pollution as a result of operational activities.	SANRAL	Operational Phase
Protection of Faunal and Flora			
Maintenance activities	• Fauna and flora within the operational servitude and surrounding environment must not be disturbed unnecessarily. • Sensitive indigenous vegetation must be avoided, where possible, by operations staff. • The penalty clause associated with the needless destruction of wildlife is a fine and/or imprisonment.	SANRAL	Operational Phase

Emergency Preparedness			

Veld fires and collisions	• The SANRAL must compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to emergency incidents that will cause environmental impacts, such as:
	  o Accidental veld forest fires; and
	  o Collisions
	• The employers must report any incidents to the authorities and undertaken remedial actions as required terms of Section 28 of NEMA. Appropriate signage indicating speed limits and caution signs should be erected to control speeding on the roads and to warm road users of any sharp turns or hazards along the road.
		SANRAL	Operational Phase

Monitoring			

	• A monitoring pragramme, as we;; as services and maintenance schedule, must be put in place to monitor the project for any infrastructural problems, e.g., cracks, erosion, gullies.
	• The monitoring and maintenance programme must include the following:
	  o A monitoring schedule for alien invasive plant species.
	  o A regular monitoring schedule for damage to gravel roads and bridge crossing.
	  o A monitoring schedule for soil erosion.
	• Written records of monitoring programmes are to be maintained.
	• A photographic record must be maintained.
		SANRAL	Operational Phase

Liaison with Interested and Affected Parties			

	Liaison with stakeholders is to be undertaken by SANRAL as required and as appropriate. This must include liaison with adjacent landowners, neighbours, and relevant authorities. Complaints are queries received from stakeholders and actions taken to address complaints must be addressed in writing. Copies of all interactions and correspondence shall be kept as part of record keeping.	SANRAL	Operational Phase
Registers			
	The SANRAL must have registers for the following: • Emergency procedures. • Environmental incidents. • Complaints and action taken.	SANRAL	Operational Phase

5. CLOSURE PLANNING

Final site clearing- the contractor shall clear the site and ensure that everything not forming part of the permanent works is removed from the site before issuing the completion certificate or as otherwise agreed.

Rehabilitation- the contractor (landscape architect/horticulturist) shall be responsible for rehabilitating and re-vegetation of all areas disturbed /areas earmarked for conservation during construction to the satisfaction of the engineer and ECO.

5.1 Post – construction environmental audit

A post- construction environmental audit must be carried out and submitted to DFFE at the expense of the developer so as to fulfil conditions of the EMPr developed. Objectives should be to audit compliances with the key components of the EMPr,EA and other authority permits to identify main areas requiring attention and recommend priority actions. The audit should be undertaken annually and should cover a cross section of issues, including implementation of environmental controls, environmental management and environmental monitoring.

Results of the audit should inform changes require to the specifications of the EMPr or additional specifications to deal with any environmental issues which arise on site and have not been dealt with in the current document.

5.2 **Management review and revision of the EMPr**

This EMPr is to be reviewed annually for the first four years and then once every five years thereafter, by an independent environmental consultant, unless otherwise specified by the authorities. The auditor is to highlight issues to be addressed in the EMPr or changes required during the annual audit. These points are to be included as an annexure to the EMPr and to be considered during the reviews process. Recommended changes to the EMPr must be forwarded to DFFE for approval and comment, before subsequently being incorporated into the EMPr.

5.3 General review of EMPr

The EMPr will be reviewed by the ECO on an on-going basis. Based on observations during site inspections and issues raised at site meetings, the ECO will determine whether any procedures require modification to improve the efficiency and applicability of the EMPr on site.

Any such changes or updates will be registered in the ECO's record, as well as being included as an annexure to this document. Annexure of this nature must be distributed to all relevant parties.

6. CONCLUSION

All the issues set out in this EMPr document form a basis for the Environmental Management and Monitoring of the proposed development by the applicant. To achieve sustainable developments, mitigation measures must be discussed during the planning stage and must be implemented throughout the project. However, there may be instances where some aspects of the plan may need to be excluded and some to be added it can be concluded that in line with the National Environmental Management Act 107, 1998 of April 2017. The issues covered in this EMPr suffice to result in environmentally sustainable development as some of the mitigation measures incorporated in the document are from the specialised studies conducted for the proposed development such as the Biodiversity Impact Assessment, Aquatic, and wetland delineation, Agriculture Impact Assessment, Heritage Impact Assessment , Archaeological Impact Assessment and Visual Impact Assessment . Furthermore, the EMPr has provided a platform on which the planning, construction and the operational phase of EMPr can be founded by identifying the impacts, mitigation measures, performance indicators, responsibilities, available resources, potential schedule and verification responsibility.

APPENDIX A: BASIC RULES OF CONDUCTING ENVIRONMENTAL INDUCTION

The following list represents the basic Do's and Don'ts towards environmental awareness, which all participants in this project must consider whilst carry out their tasks. These are not exhaustive and serve as a quick reference aid.

NOTE: ALL new site personnel must attend an environmental awareness presentation. Please inform your foreman or manager if you have not attended such a presentation or contact the EO.

DO:

- Use the toilet facilities provided – report dirty or full facilities.
- Clear your work areas of litter and building rubbish at the end of each day – use the waste bins provided and ensure that litter will not blow away.
- Report all fuel or oil spills immediately & stop the spill from continuing.
- Dispose of cigarettes and matches carefully. (Littering is an offence.)
- Confine work and storage of equipment within the immediate work area.
- Use all safety equipment and comply with all safety procedures.
- Report any injury of an animal.
- Drive on designated routes only.
- Prevent excessive dust and noise.

Do not:

- Remove or damage vegetation without direct instruction.
- Make any fires.
- Injure, trap, feed or harm any animals – this includes birds, frogs, snakes, lizards etc.
- Enter any fenced off or marked area.
- Allow cement or cement bags to blow around.
- Speed or drive recklessly
- Litter or leave food laying around.

Notes:

If any animals such as snakes are encountered, then do not harm them. The ECO or Site Supervisor must be contacted to remove these safely. The harming of any animal will result in disciplinary action.

Construction and heavy machine operators must be particularly sensitive to staying within access routes and prevent unnecessary damage. Dust and noise are also of particular concern. Ensure that vehicles and machinery do not leak fuel or oils. Refueling or maintenance must be done within the maintenance camp area only. Alien plant clearing and control work teams must be closely supervised.

APPENDIX B: REHABILITATION PLAN

1. Principles of Rehabilitation

1.1. Best practices in rehabilitation planning and management

Use of rehabilitation planning and environmental management that aims for sustainability is encouraged in all aspects of reclamation planning, design and implementation. Environmental Guidelines by the Department of Water Affairs and Forestry (DWAF), 2005 aims to guide environmental management during all phases of a project lifecycle.

These Environmental Best Practice Guidelines for; Planning; Construction, Operation and Decommissioning Planning provide a scientific-based, comprehensive and integrated strategies to also perform rehabilitation for developments and therefore mitigate against safety hazards and environmental degradation.

1.2. Applied principles of ecological restoration

A central purpose in rehabilitation planning should be to promote the ecological integrity of each site and surrounding landscapes. The application of ecological restoration principles requires that plans are developed consistent with regional or landscape level ecological objectives. At the local scale, this involves an examination of surrounding landscapes, in combination with determining predicted successional trends of vegetation communities appropriate to enhance local and regional ecosystems.

At the site level, emphasis is placed on rehabilitation techniques such as land-form replication and planting species that will promote site stability and sustainability. Re-vegetation should use indigenous species that contribute most to the compatibility of the local ecology and increase biodiversity.

Ecological restoration with biodiversity benefits in mind must involve an orderly set of considerations that promote successful procedures and practices. Often these practices, although based on similar general considerations, will need to be innovative because of the unique set of circumstances each area and ecosystem to be restored represents. The restoration objectives must be formulated from a detailed knowledge of the basic structural and functional characteristics of natural ecosystems. Ecological restoration may implicitly want all attributes to be achieved (e.g., to claim close correspondence to the pre-construction ecosystem), but the practical context of any site restoration demands that the following are considered: speed of attainment, economics (or cost-benefit), achievability,

and long-term stability with on-going management at reasonable (low) cost (Bradshaw 1990). Such practical considerations are necessary for without them unrealistic objectives can be set both in ecological/biodiversity and economic terms.

The development of measurable criteria for judging restoration success has proved difficult but they are usually derived from the particular community and ecosystem characteristics desired as restoration objectives (Johnson and Putwain 1981; Hobbs and Norton 1996). Cairns (1993) provides three general success guidelines that the restored ecosystem should attain: (i) self- regulation for some set period of time, where self-regulation means the structural and functional attributes persist in the absence of whatever "subsidies" (fertilizer, seeding etc.) may have been necessary during the initial phases of implementation; (ii) the design criteria (restoration goal and objectives) established before restoration was undertaken; (iii) no observable adverse effects in the larger ecological landscape.

From these criteria, it can be seen that it is absolutely necessary to have restoration objectives that have unambiguous operational definitions (technically feasible), which are ecologically sound (scientifically valid) and socially relevant, and that are receptive to measurement and prediction (Cairns 2000). The ecosystem characteristics measured are usually those related to the composition, structure, and pattern of the vegetation as a key component of the biodiversity pool (Allen 1992). It is notable that some important structural measurements of biodiversity are usually omitted (Chambers et al. 1994). In particular, measurements concerning the soil biotic community and animal species numbers are not usually made, even though they can often provide important indications of long-term productivity and successional pathways (Chambers and Wade 1992). Ecosystem characteristics for consideration as ecological restoration objectives (adapted from Hobbs (1999).

- Composition: species presence and their relative abundance;
- Structure: vertical arrangement of vegetation and soil components;
- Pattern: horizontal arrangement of system components;
- Heterogeneity: a variable composing of characteristics 1-3;
- Function: performance of basic ecosystem processes (energy capture, water retention, nutrient cycling);
- Species Interactions, e.g., pollination, seed dispersal etc.;
- Dynamics and resilience: succession and state-transition processes, ability to recover from normal episodic disturbance events (e.g., floods, drought, fire).

The ecological considerations needed for practical restoration planning must be considered in some detail in relation to situations where topsoil has been lost or retained within the site during construction activities. In the restoration of sites where the topsoil has been lost, the major ecological challenges are still concerned with plant species-substrate interactions, i.e., re-vegetation.

Restoration practice where topsoil has been retained focuses less on vegetation establishment and more on the spatial and temporal factors affecting species colonization and establishment, the criteria for monitoring and assessing success, particularly in the longer term, and the restoration of natural indigenous ecosystems and biodiversity values.

1.3. Compatibility in land use, land cover and landscape design

Final rehabilitation plans and designs should ensure that the natural ecological land use system of the site is restored and maintained through a sustainable development solution. Landscape design and development plans should be incorporated into the rehabilitation planning process; including landforms, structures, planting pallet development and surrounding developments interface with the site and natural drainage system.

1.4. Landscape-architectural principles

- Rehabilitation is the conservation and restoration of the original cultural and aesthetic values and the creation of new values;
- New landscape should be characterized by high aesthetic value;
- The new approaches should take into account or, rather, emphasize recent positive landscape features, and eliminate (or at least visually mask) recent negative landscape features;
- The rehabilitation of each post-construction site should have a clearly defined landscape-architectural motive (e.g., landscape composition, dominant feature etc.);
- The rehabilitation of post-construction landscapes offers a unique opportunity for landscape architects to design a quite new landscape. There should be adequate participation of the general public, specialists and the responsible authorities in the process of planning and decision making. A competition is a suitable way to select the best proposal;
- A visualization of the proposed design is an integral part of the planning process. Clear visualization helps to formulate more design variants, and also facilitates participation of the general public in the decision-makina process.

1.5. Rehabilitation principles to be implemented for road D3775 upgrade

The Environmental Rehabilitation process at the site should form an integral part of site development, operation and post-construction activities. A Rehabilitation Specialist and/or Environmental Control Officer (ECO) should therefore be appointed, and be available on-site as part of the rehabilitation management / construction team. The ECO should form an integral part of the management team, attending regular site meetings, receiving Project Meeting Minutes and being kept fully updated regarding the closure plan and site rehabilitation process.

This information is vital in ensuring that the necessary preventative measures and Search and Rescue activities are affected timeously.

Rehabilitation measures that may be affected on site include systems such as soil terracing, berm creation, grass blocks, fascine work, gabion basket work, reno mattresses, retaining block mechanisms, sand bags, boulder and rock placement, stone pitching, and grading. Decisions pertaining to plant material choices and specific vegetation utilization for specific areas from an integral part of the process, as the hard landscape components work in conjunction with the soft landscape components. For example, the utilization of plants with substantial roots for bank stabilization purposes.

1.6. Identification and Protection of Environmentally Sensitive Areas

The on-site Environmental Control Officer and/or Rehabilitation Specialist should be fully aware of the scale and extent of the rehabilitation operations. No further vegetation clearing, levelling, excavation, topsoil removal or plant material removal is to be permitted without prior consent from the ECO and Rehabilitation Specialist based on the rehabilitation plan for the site unless instructed by them. Care must be taken during rehabilitation to avoid the natural drainage areas adjacent to the site. No vegetation clearance, topsoil collection or movement of machinery and vehicles should be allowed here as to keep the ecological integrity of the drainage areas and banks intact.

1.7. Comprehensive Photographic Record

In order for practical and attainable rehabilitation goals to be defined, it is recommended that a comprehensive photographic record of the entire property be created. Video footage may also be useful in compiling such a record. A photographic record of the entire property should be kept as it could become a very valuable tool for the Rehabilitation Works in future. It would serve as the basis for rehabilitation requirements, informing decisions on drainage,

soil shaping, levels, plant choices and rehabilitation in general. It can also serve as a verification report to authorities and land administrators regarding the legislative processes, sustainable approach and progressive improvement.

1.8. Search and Rescue Activities

Search and Rescue activities could be initiated as part of the Rehabilitation process. Where rehabilitation actions will commence, viable, transplantable plant species could be identified by the ECO / Rehabilitation Specialist, removed and stored in a potential 'on-site', self-sustaining nursery, to be re-used in rehabilitation activities in future.

Plant material that is to be "rescued" must be potted up into bags. Adequate root systems per plant material type must be carefully excavated and retained in order for plant material to remain viable.

Search and Rescue activities would include the removal of grass clumps, smaller transplantable shrubs and trees and endangered species such as geophytes and succulents should be placed into bags using local soil.

Animals like small mammals, reptiles and birds encountered during rehabilitation operations should be captured or moved by a specialist and released in a safe area. No animals may be poached at the property or adjacent areas. Many animals are protected by law and poaching or other interference could result in a fine or jail term.

1.9. Cleared Indigenous Plant Material

Where construction or rehabilitation activities are to commence in a specific area, certain indigenous plant material from the construction footprint area could be collected and bagged to be used in re-vegetation or as mulch during rehabilitation. To protect drainage areas and small streams as well as erosion prone areas, encroachers such as sickle bush could be cut and used to"brush pack" these problem areas to protect it. This will also restrict movement of animals and humans over sensitive erosion prone areas until pioneer vegetation has established.

1.10. Removal of Overburden

Removal of Overburden (or spoil material) means the total removal of soil and rock material from the site up to natural surrounding ground level. Overburden may be used to backfill excavated areas.

Where overburden remains after backfilling excavated areas to natural ground level, this needs to be transported off-site by the contractor to a location approved by the Engineers.

In addition to the removal of excess rock and soil from the site, all other construction-related materials (bricks, concrete, steel rods, machinery etc.) also have to be taken off-site after cessation of construction activities.

1.11. Stormwater management and objectives

It is widely recognized that developments impact negatively on natural drainage systems in several ways, including:

- Reduced permeability of catchment areas by introduction of impervious surfaces such as streets and buildings. This results in increased catchment runoff volumes.
- The introduction of efficient stormwater drainage results in reduced catchment response times with concomitant increased downstream flow peaks.
- Manipulation of groundwater tables, which can have severe effects on wetland functioning and the survival of many terrestrial plant communities.
- Alteration to the natural flow regimes in river systems resulting in both geomorphologic (e.g., channel / bank erosion) and aquatic ecosystem changes over time.
- Deteriorating water quality as a result of industrial fallout, fertilizers and other pollutants that are conveyed by stormwater systems directly to receiving water bodies, without any attempt to ameliorate en route.

These guidelines require greater cognisance to be taken of natural hydrological patterns and systems in the development of stormwater management systems and that the potential negative impacts highlighted above are reduced as far as is practically possible. This is illustrated by means of Figures below, depicting both the traditional and recommended approaches to stormwater management within the urban context.

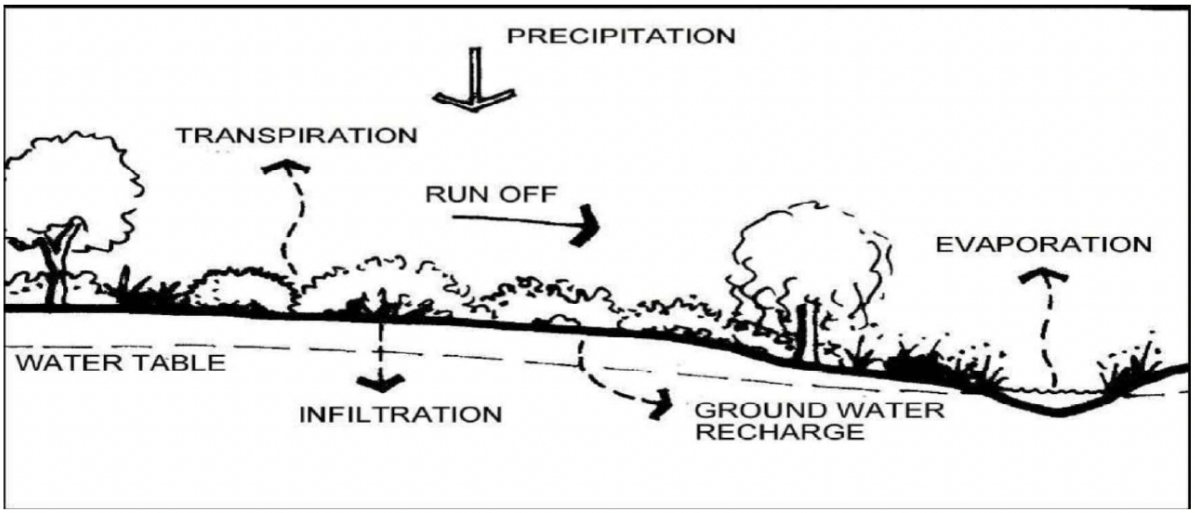

Figure 2: Natural Hydrological System

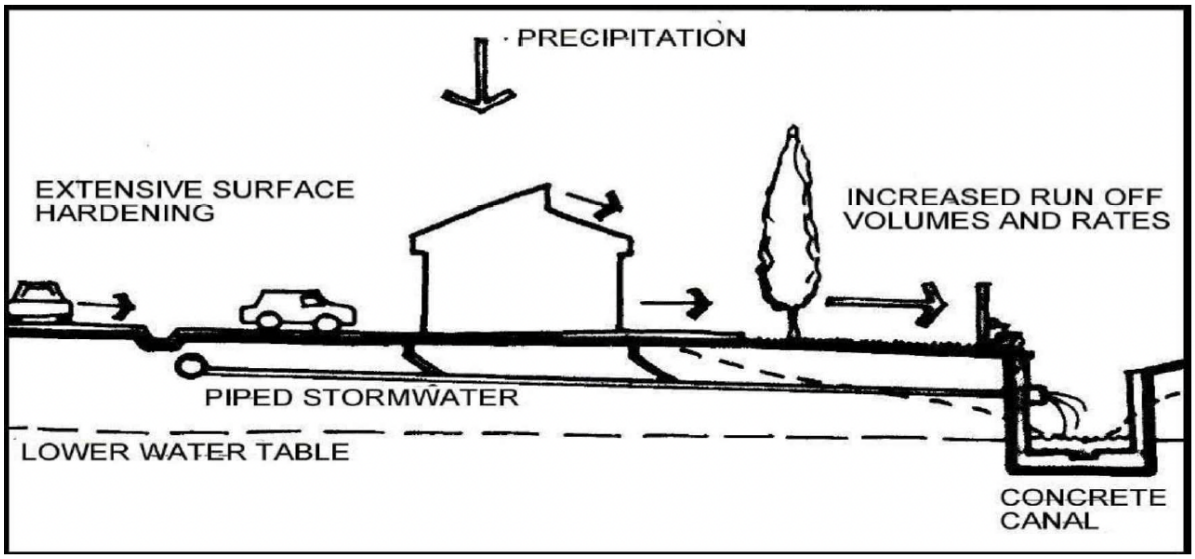

Figure 3: Stormwater Management approach with little concern for natural environment

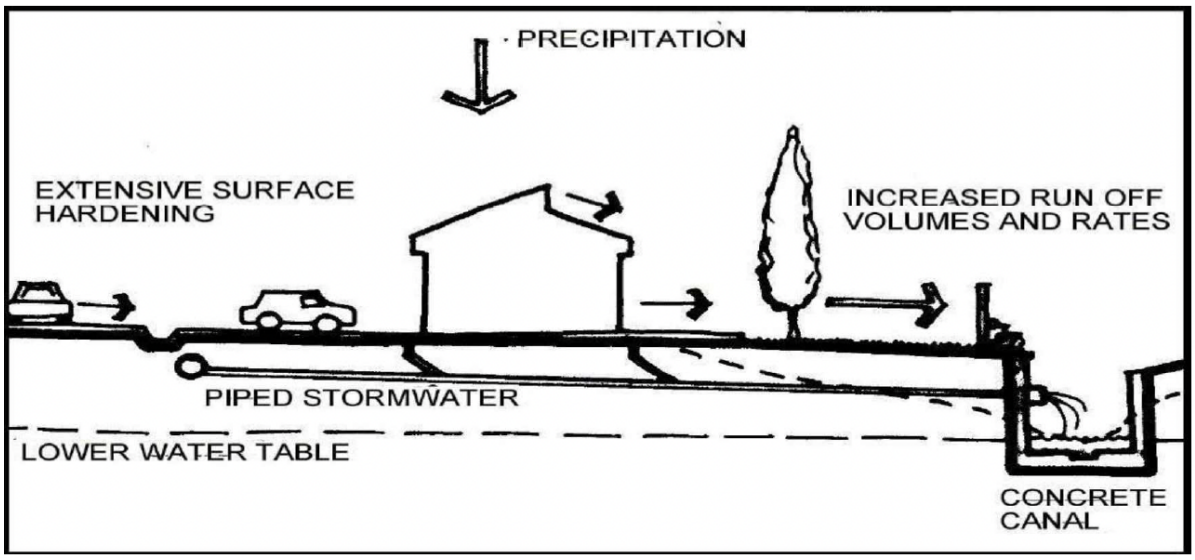

Figure 4: Responsible approach to stormwater management

Stormwater management objectives should include the following:

- Minimize the Threat of Flooding: This remains a key objective of any stormwater management system. However, the challenge when contemplating design of stormwater management systems is to consider the following:
- To mimic pre-development responses to storms
- To reduce the volume of runoff by promoting infiltration
- To reduce the peak flows and increase the time-to-peak through detaining the runoff and releasing it at a gradual rate
- Where necessary, to construct means to contain flood waters and safely convey theamout of the urban area
- Protection of Receiving Water Bodies: Receiving water bodies include the following:

Rivers / streams;

Groundwater;

Wetlands;

It should be noted that the "receiving water body" is not necessarily the system into which stormwater is discharged directly, but can also be a natural system located further downstream in the catchment. Every endeavour should be made to achieve the following as far as possible:

- Maintain natural flow regimes and seasonality
- Prevent deterioration in water quality
- Prevent erosion or sedimentation of natural wetlands or rivers
- Preserve natural river channels, wetlands and vegetation, and preclude engineering interventions that may alter their physical and ecological characteristics.

The need to design appropriate stormwater management systems for new developments should be seen as an opportunity to preserve or, if possible, improve natural freshwater ecosystems that have suffered degradation as a result of past activities, and in some cases, to create additional freshwater habitats that will contribute to the availability of appropriate, high quality river and wetland habitat that mimics the natural condition.

- Promote Multi-Functional Use of Stormwater Management Systems: Resources such as land and water are becoming increasingly scarce and multiple use of these must be strived for. Stormwater systems provide a wide range of opportunities for multi-functionality.
- Development of Sustainable Environments: Developers should think beyond their short-term involvement with the project and consider the sustainability of the stormwater management system that is to be implemented. All relevant factors that will impact on future operation and maintenance should be taken into account. Maintenance requirements should be minimized as far as possible in order to maximize the available local authority funding, personnel and equipment. Responsibilities for maintenance must be resolved with the relevant local authority department at an early stage of the design. The possibility of developing public/private partnerships should be explored with local authorities (e.g. division of funding of capital versus maintenance costs between public and private sectors). Environmental policies such as promoting the use of locally indigenous vegetation in planting programmes will also reduce the long-term maintenance requirements of the development.

1.12. Compaction Rehabilitation Measures (ripping and / or scarifying)

Soil compaction is often an effect of high traffic areas on development sites. It can become a major problem and can be recognized by:

- Excess surface moisture and slow drying soils due to deeper compaction preventing the percolation of water through the soil profile;
- Water runoff due to surface compaction preventing penetration and absorption (ponding of water), especially on banks and sloping surfaces;
- Large clear or sparsely covered areas devoid of a good vegetative cover due to hardened topsoil layers.

Ripping and / or Scarifying means the loosening of compacted soils by hand or appropriate machinery. The removal of overburden by excavator will loosen some of the upper compacted soils to some degree. Soils are to be loosened to a depth not less than 500mm. Slope angles should not exceed 18° incline angles (unless where specifically required in which case slope stabilization methods have to be implemented). Re-shaped land must resemble the pre-construction landscape as closely as possible. Ripping/Scarifying should preferably be done before the rainy season. Do not rip and/or scarify areas under wet conditions, as the soil will not loosen.

Compacted soil can also be decompacted by "Rotary Decompactors" to effectively aerate soils for vegetation establishment.

1.13. Erosion rehabilitation measures

Water has the gift to sustain life, but also the potential to maim, damage and destroy if not managed correctly. Erosion is unfortunately often associated with development as areas become disturbed or as stormwater runoff is concentrated at outlets. In order to avoid these problems, options such as stabilization, energy dissipation and the design of stormwater management systems, which do not concentrate flows, are recommended. A number of structures incorporated into stormwater design play a role in the dissipation of energy required to prevent erosion at outlet and inlet points, and at various points in different conveyance structures.

Remedial actions must be established to ensure that potential erosion on site is addressed with an erosion control strategy towards rehabilitation. It is important to take note of the following generic points regarding erosion risks in the study area:

- Soil loss will be greater during wetter periods. However, the provision of erosion control measures for the drier months of the year is equally as important;
- Soil loss from the site is proportionally related to the time the soils are exposed, prior to rehabilitation. The time from commencement of rehabilitation activities to finalization thereof should be limited. Rehabilitation efforts should commence as soon as practical;
- Construction staging and progressive/concurrent rehabilitation is important;
- The extent of the disturbance that will take place will influence the risk and consequences oferosion on the site;
- Avoid over-wetting, saturation and unnecessary run-off during dust control activities and irrigation;
- Retain natural indigenous grass and shrubs and re-vegetate bare areas as soon as possible.
- Reprofiling of the banks of disturbed drainage areas to a maximum gradient of 1:3 to ensure bank stability;
- Reinforce banks and drainage features where necessary with gabions, reno mattresses and geotextiles. This is especially relevant for the stormwater outlet area;
- Reseed any areas where earthworks have taken place with indigenous grasses to prevent further erosion;
- Erosion control mechanisms must be established as soon as possible. Further financial provision should be continued over the subsequent years to allow for maintenance of the gabions, reno mattresses, and associated structures;
- A stormwater plan must be developed with the aid of an engineer to ensure that water runoff is diverted off the site without pooling and stagnation or erosion. Financial provision for closure will include the estimated costs for erosion control post-construction;
- Topsoil stockpiles should be vegetated to control loss from erosion and should have berms on top to reduce erosion from surface runoff. In areas where soil

stockpiles are greater than 2 m high, soils should be ameliorated during closure to ensure their suitability for use in rehabilitation;

- If compaction occurs, rectification can be done by application and mixing of manure, vegetation mulch or any other organic material into the area. Use of well cured manure is preferable as it will not be associated with the nitrogen negative period associated with organic material that is not composted;
- Vehicle traffic should not be allowed on the rehabilitated areas, except on allocated roads. It will have a negative impact due to the dispersive/compaction characteristics of soils and its implications on the long term;
- Foot action should be prevented by brush-packing the area during the establishment phase of vegetation on the rehabilitated areas, especially the first two seasons.

1.14. Stormwater infrastructure maintenance

All stormwater management infrastructure on site should be inspected at least twice per year, ideally just before the start of the rain season and then again during the middle of the rainy season, for any damage or obstructions. Obstructions should be cleared and damage repaired immediately to ensure optimal operation of the infrastructure. All discharge points should also be inspected for signs of erosion and any erosion damage repaired immediately and corrective measures implemented as required.

1.15. Re-vegetation

Revegetation is the process of vegetation establishment and care, as part of the process of reclamation, rehabilitation or restoration. The biggest challenge of rehabilitation is to establish a sustainable ecosystem that is self-productive and able to survive without continued anthropogenic interventions (irrigation, fertilization or re-seeding). After the construction on a landscape has ceased, processes of self-restoration are often slow (decades) and the final community of plants may not be the most desirable. Re-vegetation may be achieved by three main techniques, namely planting of trees and shrubs, direct seeding, or by self-regeneration.

Topsoil needs to be used wisely to achieve successful re-vegetation. Analyzing the chemical properties of the soil can be helpful in directing possible soil amendments and guiding species selection. A well-prepared site will provide the most suitable conditions for plant germination, survival and to promote long-term re-vegetation success.

Plant species that have been rescued or removed and relocated to the temporary nursery could be used in replanting rehabilitation areas. Additional plant material (indigenous trees) as required should be sourced from local indigenous nurseries and specifications regarding plant sizes, heights and the installation process of these plants should be developed by the on-site ECO and Rehabilitation Specialist. Standard horticultural best practice would apply, with specific reference to the fact that the plant material would have to be in good condition, free from pests and diseases (any such plant would have to be removed from the site), well-formed and well rooted, potting materials are weed free and with sufficient root cover. Groundcovers and sedges are often supplied in trays, and the same standards would apply.

- A grass seed specification for reseeding the rehabilitated areas is included below. Re-grassing should be undertaken (as far as possible) during the summer months, as germination and establishment is best at this time of year. Spring rains are also conducive to good germination results, and as such rehabilitation programmes should take these factors into consideration;
- There are two methods for seeding, hand broadcasting and hydro-seeding. The methods utilized will be site specific and the on-site ECO and Rehabilitation Specialist will determine them;
- In certain areas grass runners may be required, and grass sods where instant cover is necessary;
- A typical grass seed mixture (hand sowing) that could be implemented for rehabilitation activities will include: (specification 4-5kg/ha);
    - *Eragrostis tef (Tef);*
    - *Eragrostis curvula (Weeping Love Grass);*
    - *Digitaria eriantha (Smutsvinger);*
    - *Cynodon spp. (Bermuda kweek);*

- *Panicum maximum (Witbuffel);*
- *Chloris gayana (Rhodes grass);*
- *Paspalum notatum (Bahia Grass).*

Re-vegetation (grassing) should occur immediately after topsoil reinstatement. Seeding on the site can in most cases be done by hand. The contractor is to guarantee a success rate of 80% for all reseeded areas, and follow up will be conducted monthly until such time as 80% success of vegetation cover has been achieved.

1.16. Control of alien invasive plant species (AIS)

The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) holds landowners legally responsible for the control of invasive alien plants on their properties.

Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Weeds and invader plants will be controlled in the manner prescribed for that category by the Conservation of Agricultural Resources Act or in terms of Working for Water guidelines.

Goals for addressing the problem of Invasive Alien Species (IAS) on the construction site should include:

- Prevention: Keeping an AS from being introduced onto the ecosystem. ideally, this usually means keeping alien plants from entering the site;
- Early detection: Locating IAS before they have a chance to establish and spread. This usually requires effective, site-based inventory and monitoring programmes;
- Eradication: Killing the entire population of IAS. Typically, this can only be accomplished when the organisms are detected early;
- Control: The process of long-term management of the lAS' population size and distribution when eradication is no longer feasible.

Weed control begins with preventing their spread. Ensure that rehabilitation works do not contribute to the distribution of weeds by:

- Limiting the area of soil disturbed to minimize the exposure of bare ground;
- Using mulches and establishing plant growth as quickly as possible to protect bare ground;
- Avoiding the importation or movement of soils or plant matter that could contain weed seeds, for example using straw mulch;
- Avoid re-using weed infested topsoils if possible;
- Ensure that all materials and equipment are clean and weed free. This may mean that equipment needs to be washed when it is moved from one site to another, and even between different parts of one site when weeds grow in just one part of the site. This is particularly important for trenching operations, to ensure weeds are not spread along the length of the trench;
- Use fertilizers conservatively to avoid creating the conditions for weed establishment by over- fertilizing.

Scientists and field workers use a range of methods to control invasive alien plants. These include:

- Mechanical methods - felling, removing or burning invading alien plants;
- Chemical methods - using environmentally safe herbicides;
- Biological control - using species-specific insects and diseases from the alien plant's country of origin. To date 76 bio-control agents have been released in South Africa against 40 weed species;
- Integrated control - combinations of the above three approaches. Often an integrated approach is required in order to prevent enormous impacts.

The following basic principles apply to the control of AlS on the Lock & Store site during the rehabilitation process:

- The Developer is responsible for the control of weeds and invader plants within the site for the duration of the rehabilitation phase. Alien invasive tree species and weeds should be eradicated;

- Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented;
- Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish:
- Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds;
- During the site visit it was noted several exotic weeds have established on site. These invasive plants should be monitored and eradicated as soon as they appear on the property.

1.17. Pollution control

For the health of the wetland, a programme is suggested to clean up the litter especially near the streams. Litter, sewage and the washing of humans in the streams allows chemicals into the wetland, decreasing the health in the wetland which will lead to lower biodiversity. Specific measures to be implemented for the site during the construction phase of the road should include:

- Ensure that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. Regularly inspect all vehicles for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil (SAS,2012);
- No dumping of waste should take place within the wetland and associated buffer zone. If any spills occur, they should be immediately cleaned up (SAS, 2012);
- Contain all dirty water in the dirty water system and contain all dirty storm water up to a 1:50 year flood event as a minimum. Ensure that all activities impacting on ground water resources of the subject property are managed according to the relevant DWA Licensing regulations and ground water monitoring and management requirements (SAS, 2012).

2. MONITORING PLAN

Several methods exist to monitor rehabilitated areas to scientifically prove that a self-sustainable ecosystem has developed or show a positive trend towards successful rehabilitation. This will prove that environmental degradation and biological diversity have been mitigated and restored where it has been negatively impacted upon. The important aspect to keep in mind is that it is not only a visual inspection, but measurable information gathering e.g. soil samples, vegetation diversity, biomass, basal cover, species composition etc. The monitoring data must be of such a standard that meaningful conclusions can be made and a trend indicated. Good record keeping is essential. All illegal invader plants and weeds shall be eradicated as required in terms of Sections 119 to 126 of The Environmental Management Act. Monitoring should also take place on regular time intervals to establish if the re-vegetation strategy was successful.

APPENDIX C: PROFORMA PROTECTION OF THE ENVIRONMENT

PROFORMA

Employer	
Contract No	
Contract Tittle	**PROPOSED UPGRADE OF NATIONAL ROAD (N1) SECTION 4 BETWEEN DOORNFONTEIN (KM 63.0) AND LAINGSBURG (KM 81.7) WITHIN LAINGSBURG LOCAL MUNICIPALITY OF CENTRAL KAROO DISTRICT MUNICIPALITY, WESTERN CAPE PROVINCE**

PROTECTION OF THE ENVIRONMENT

The contractor will not be given right of access to the site until this form has been signed.

I/We,_____

contractor records as follows

1. I/We, the undersigned, do hereby declare that I/We am/are aware of the increasing requirement by society that construction activities shall be carried out with due regard to their impact on the environment.
2. In view of this requirement of society and corresponding requirement by the Employer with regard to this contract, I/We will, in addition to complying with the letter of the terms of the contract dealing with protection of the Environment, also take into consideration the spirit of such requirements and will, in selecting appropriate employees, plant, material and methods of construction, in so far as I/We have the choice, include in the analysis not only the Technical and Economic (both financial and with regard to time) aspects but also the impact on the Environment of the options. In this regard, I/We recognise and accept the need to abide by the "precautionary principle" which aims to ensure protection of the Environment by the adoption of the most environmentally sensitive construction approach in the face of uncertainty with regard to the Environmental implications of construction.
3. I/We acknowledge and accept the right of .....to deduct, should they so wish, from any amounts due to me/us, such amounts (hereinafter referred to as fines) as the Resident Engineer and Environmental Site Officer shall certify as being warranted in view of my/our failure to comply with the terms of the contract dealing with protection of the Environment, subject to the following:

3.1 The Resident Engineer and Environmental Officer, in determining the amount of such fine, shall take into account inter alia, the nature of the offence, the seriousness of its impact on the environment, the degree of prior compliance/non-compliance, the extent of the Contractor's overall compliance with Environmental Protection requirements and, in particular, the extent to which he considers it necessary to impose a sanction in order to Eliminate/reduce future occurrences.

3.2 The Resident Engineer and Environmental Officer shall, with respect to any fine imposed, provide me/us with a written statement giving details of the offence, the facts on which the Resident Engineer and Environmental Officer has based his assessment and the terms of the Contract (by reference to the specific clause) which has been contravened.

Signed	
Contractor	
Date	

APPENDIX D: SOUTH AFRICAN WATER QUALITY GUIDANCE

APPENDIX E: ENVIRONMENTAL TRAINING SESSION RECORD TEMPLATE EXAMPLE

Project Name: PROPOSED UPGRADE OF NATIONAL ROAD (N1) SECTION 4 BETWEEN DOORNFONTEIN (KM 63.0) AND LAINGSBURG (KM 81.7) WITHIN LAINGSBURG LOCAL MUNICIPALITY OF CENTRAL KAROO DISTRICT MUNICIPALITY, WESTERN CAPE PROVINCE

Contractor Name:

Training Session Date:

Location:

Session Title	Date	Attendees	Information Presented	Trainer (s)	Signatures

APPENDIX F: EXAMPLE OF METHOD STATEMENT FOR MANAGEMENT OF GENERAL WASTE

Project Name: PROPOSED UPGRADE OF NATIONAL ROAD (N1) SECTION 4 BETWEEN DOORNFONTEIN (KM 63.0) AND LAINGSBURG (KM 81.7) WITHIN LAINGSBURG LOCAL MUNICIPALITY OF CENTRAL KAROO DISTRICT MUNICIPALITY, WESTERN CAPE PROVINCE
Project Location:
Prepared By:
Date:

1. Purpose

This method statement outlines the procedures for the effective management of general waste generated during the upgrade of N1 Section 4 to minimize environmental impacts and ensure compliance with applicable regulations.

2. Scope of Work

This method statement applies to all personnel involved in the project and covers the handling, storage, transport, and disposal of general waste generated during the upgrade activities.

3. Definitions

- General Waste: Waste that is not classified as hazardous, including packaging materials, non-hazardous construction debris, and office waste.

4. Responsibilities

- Project Manager: Overall responsibility for waste management and ensuring compliance with waste management regulations.
- Site Environmental Officer: Monitoring waste management practices and reporting compliance status.
- Site Foreman: Ensuring that all workers are aware of and follow waste management procedures.
- All Personnel: Responsible for proper waste segregation and adherence to waste management practices.

5. Waste Management Procedures

5.1 Waste Segregation

- Waste shall be segregated at the source into the following categories:
- General Waste
- Recyclables (e.g., metals, plastics, paper)
- Organic Waste (e.g., food scraps, vegetation)

5.2 Storage of Waste

- Waste will be stored in clearly marked bins or containers designated for each waste type.
- General waste bins will be located at strategic points around the site to encourage proper disposal.
- Bins must be emptied regularly to prevent overflow and maintain site hygiene.

5.3 Transport of Waste

- Waste will be transported in covered vehicles to prevent spillage during transit.
- All waste transportation must adhere to local regulations regarding waste handling and transport.

5.4 Disposal of Waste

- General waste will be disposed of at an approved waste disposal facility as per local regulations.
- Documentation of waste disposal (e.g., waste transfer notes, disposal receipts) will be maintained and submitted for record-keeping.

6. Training

- All personnel involved in waste management will receive training on proper waste segregation, handling, and disposal procedures.
- Refresher training will be conducted periodically to ensure ongoing compliance.

7. Monitoring and Reporting

- Regular audits will be conducted to assess compliance with the waste management procedures and identify areas for improvement.
- Any incidents of non-compliance or waste management issues will be reported to the Project Manager immediately for corrective action.

8. Emergency Procedures

- In the event of a waste spill or incident, the site's emergency response plan will be followed. The Site Environmental Officer will be notified immediately to manage the situation.

9. Review and Revision

This method statement will be reviewed and revised as necessary to ensure ongoing compliance with regulatory requirements and best practices throughout the project duration.

Signature:
Date: