

# APPENDIX G

## ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

# PROPOSED KRIEL-MATLA ASH TRANSFER LINK

## Environmental Management Programme (EMPr)

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Final

Prepared for: Eskom Holdings SOC Ltd



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# List of Abbreviations

BA	Basic Assessment
BAR	Basic Assessment Report
CA	Competent Authority
DEA	Department of Environmental Affairs
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
GN	Government Notice
IAP	Interested and Affected Party
km	Kilometre
m	Meter
MSDS	Material Safety Data Sheets
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
RE	Resident Engineer
WUL	Water Use License
WULA	Water Use License Application

# Definitions

<b>Auditing</b>	A systematic and objective assessment of an organization's activities and services conducted and documented on a periodic basis.
<b>Environment</b>	The surroundings in which humans exist and which comprise: <ul style="list-style-type: none"><li>• The land, water and atmosphere of the earth.</li><li>• Micro-organisms, plant and animal life.</li><li>• Any part or combination of a) and b) and the interrelationships among and between them.</li><li>• The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that can influence human health and well-being.</li></ul>
<b>Environmental Aspect</b>	Those components of the company's activities, products and services that are likely to interact with the environment.
<b>Environmental Authorisation</b>	The written statement from the relevant environmental authority in terms of the National Environmental Management Act (Act 107 of 1998), with or without conditions, that records its approval of a planned activity and the implementation thereof and the mitigating measures required to prevent or reduce the effects of environmental impacts during the life of a contract.
<b>Environmental Feature</b>	Elements and attributes of the biophysical, economic and social environment.
<b>Environmental Impact</b>	The change to the environment resulting from an environmental aspect, whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.
<b>Environmental Impact Assessment (EIA)</b>	The process of examining the environmental effects of a development in terms of the National Environmental Management Act (Act 107 of 1998) and the Environmental Impact Assessment (EIA) Regulations.
<b>Environmental Management Programme (EMPr)</b>	A detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.
<b>Environmental Objective</b>	Overall environmental goal pertaining to the management of environmental features.
<b>Environmental Target</b>	Performance requirement that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
<b>Floodplain</b>	A flat expanse of land bordering a river channel, formed through sediment deposition and other alluvial processes, and often characterized by frequent flooding as a result of bank overspill from the river channel.

<b>Groundwater</b>	Sub-surface water in the zone in which permeable rocks, and often the overlying soil, are saturated.
<b>Hazardous waste</b>	Waste that are proven to be toxic, corrosive, explosive, flammable, carcinogenic, radioactive, poisonous or classified as such in legal terms.
<b>Heritage Resource</b>	Any place or object of cultural significance including buildings, structures, landscapes, graves and geological, archaeological and palaeontological sites.
<b>Landscape</b>	Land modified for human use and occupation, embracing both the natural (wilderness) environment and the urban.
<b>Management Actions</b>	Practical actions aimed at achieving management objectives and targets.
<b>Management Objectives</b>	Desired outcome of management measures for mitigating negative impacts and enhancing the positive impacts related to project activities and aspects (i.e. risk sources).
<b>Monitoring</b>	A systematic and objective observation of an organization's activities and services conducted and reported on regularly.
<b>Natural Vegetation</b>	All existing vegetation species, indigenous or otherwise, of trees, shrubs, groundcover, grasses and all other plants found growing on the site.
<b>Pollution</b>	Any change in the environment caused by substances, radioactive or other waves, or noise, odours, dust or heat, emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future. Furthermore, pollution can also be regarded as an undesirable state of the natural environment being contaminated with harmful substances as a consequence of human activities.
<b>Protected Plants</b>	Plant species officially listed on the Protected Plants List (each province has one), and which may not be removed or transported without a permit to do so from the relevant provincial authority.
<b>Reinstatement</b>	Reinstatement is defined as the return of a disturbed area to a state, which approximates the state (where possible), which it was before disruption.
<b>Runoff</b>	The total water yield from a catchment including surface and subsurface flow.
<b>Riparian Habitat</b>	The physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from



	those of adjacent land areas.
<b>Sensitive Environmental Features</b>	Environmental features protected by legislation (e.g. heritage resources), or identified during the EIA as sensitive through specialists' findings and input received from Interested and Affected Parties.
<b>Subsoil</b>	The soil horizons between the topsoil horizon and the underlying parent rock.
<b>Topsoil</b>	Topsoil can be regarded as the fertile upper part or surface of the soil.
<b>Transplanting</b>	The removal of plant material and replanting the same plants in another designated position.
<b>Wastewater</b>	Means water contaminated by the project activities.
<b>Watercourse</b>	A geomorphological feature characterized by the presence of a streamflow channel, a floodplain and a transitional upland fringe seasonally or permanently conveying surface water.
<b>Weeds and Invader Plants</b>	Weeds and invader plants are defined as undesirable plant growth that shall include, but not be limited to all declared category 1, 2 and 3 listed invader species as set out in the Conservation of Agricultural Resources Act (No 43 of 1983) regulations. Other vegetation deemed to be invasive should be those plant species that show the potential to occupy in number, any area within the defined construction area.
<b>Wetland</b>	Land where a surplus of water (i.e. waterlogging) is the key factor determining the nature of the soil development as well as the types of plants and animals living at the soil surface.

## 1 DOCUMENT ROADMAP

The information documented serves as the Final Environmental Management Programme (EMPr) for the Proposed Kriel-Matla Ash Transfer Link. The EMPr is intended to meet all requirements as stipulated in Government Notice (GN) No.982 (04 December 2014), Appendix 4 and also forms part of the Basic Assessment (BA) process. **Table 1** presents the document's composition in terms of the aforementioned regulatory requirements.

**Table 1: EMPr Document Roadmap**

Chapter	Title	Correlation with G.N. No. R982	
1	<b>Document Roadmap</b>		
2	<b>Project Overview</b>		
3	<b>Scope and Overview of the EMPr</b>		
4	<b>Environmental Assessment Practitioners</b>	1(a)	Details of – (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including curriculum vitae.
5	<b>Environmental Governance Framework</b>		
6	<b>Roles &amp; Responsibilities</b>	1(i)	An indication of the persons who will be responsible for the implementation of the impact management actions contemplated in paragraph (f).
7	<b>Monitoring</b>	1(g)	The method of monitoring the implementation of the impact management actions contemplated in paragraph (f).
		1(h)	The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f).
		1(k)	The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f).

8	<b>Environmental Training &amp; Awareness Creation</b>	1(m)	An environmental awareness plan describing the manner in which - (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.
8	<b>Project Lifecycle</b>		
9	<b>EMPr Review</b>		
10	<b>Environmental Activities, Aspects and Impacts</b>	1(b)	A detailed description of the aspects of the activity that are covered by the final environmental management plan.
		1(c)	A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers.
		1(e)	A description and identification of impact management outcomes required for the aspects contemplated in paragraph (d).
11	<b>Implementation Programme</b>		
12	<b>Impact Management</b>	1(d)	Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by the EIA Regulations, including environmental impacts or objectives in respect of –  (i) planning and design; (ii) pre-construction activities; (iii) construction activities;  (iv) rehabilitation of the environment after construction and where applicable post closure; and  (iv) where relevant, operation activities.
		1(f)	A description of proposed impact management sections, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and € will be

			<p>achieved, and must, where applicable, include actions to -</p> <p>(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;</p> <p>(ii) comply with any prescribed environmental management standards or practices;</p> <p>(iv) comply with any applicable provisions of the Act regarding closure, where applicable; and</p> <p>(v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.</p>
		1(j)	The time periods within which the impact management actions contemplated in paragraph (f) must be implemented.
		1(l)	A programme for reporting on compliance, taking into account the requirements as prescribed by the Regulations.
13	<b>References</b>		

## 2 PROJECT OVERVIEW

Eskom has appointed Nemai Consulting as its Independent Environmental Consultant to undertake Environmental Impact Assessment for the Proposed Kriel-Matla Ash Transfer Link.

Kriel Power Station (KPS) is a coal fired power station comprising of six units which produce a combined base load of 3 000 MW. The power station has a remaining operating life of 26 years and is scheduled to be decommissioned in 2039. To generate 3 000 MW of electricity coal is burnt by the boilers which produces ash as a waste product.

The ash is then disposed of and stored on the Ash Dam. Kriel Power Station Ash Dam will reach its maximum capacity in approximately June 2017 and Eskom is currently in the process of designing and undertaking the environmental Impact Assessment for a new Ash Dam. However, according to the latest schedule a new ash dam will only be commissioned in September 2020, thus Kriel will not have sufficient capacity to deal with the ash generated between 2017 and 2020.

Eskom proposed the Kriel-Matla Ash Transfer Link which will involve the following, as an intermediate solution for a period of approximately 3.5 - 4 years until the new Kriel Ash Dam is developed:

- The transferring of 100% of Kriel Power Station Ash to Matla Power Station Ash Dam.

- The return of all Kriel Ash Water from the Matla Power Station (MPS) Ash Dam to Kriel Power Station.

The proposed project will involve the development of four new ash pipelines from Kriel to Matla as well as an Ash Water Return (AWR) System comprising of three AWR pipelines.

In addition, a new Booster Pump House for Kriels AWR will be constructed adjacent to the existing Matla Booster Pump House, which will accommodate three new booster pumps.

KPS and MPS are both situated within the Mpumalanga Province of South Africa between the towns of Bethal and Ogies on the R545 road. It is located approximately 8 km west of Kriel, 27 km south of Ogies and 34 km north-west of Bethal. The two power stations are located within 3 km of one another. The closest human settlements (excluding nearby towns) to the proposed Project are Redstream Park and Thubelihle, which is situated approximately 10 km north and 9 km north east of the power stations, respectively. The power stations fall within the Emalahleni Local Municipality (ELM) and the Nkangala District Municipality (NDM).



*Figure 1: Google Earth image of the site location.*

### 3 SCOPE AND OVERVIEW OF THE EMPR

This EMPr provides the management actions required to reduce environmental impacts generated during the pre-construction, construction, operational and decommissioning activities for this proposed project, as well as gives recommendations for the rehabilitation of impacted areas.

The primary objectives of the EMPr are to:

- Describe actions that when implemented will achieve mitigation of environmental impacts, or result in improved management of activities thereby reducing the probability of impacts occurring;
- Define organisational and administrative arrangements for environmental management and monitoring of the work contract, including defining the responsibilities of staff and co-ordination, liaison and reporting procedures;
- Ensure that discussions are held with site supervision staff, regarding pro-active environmental management, such that potential problems can be identified and mitigation measures adopted prior to rehabilitation work being carried out;
- Define procedures for environmental control, in the event of pollution (spillage) or similar events requiring action;
- Preserve the topsoil, flora and fauna on the proposed area to be affected;
- Ensure for the control of invasive plants in the construction footprint; and
- To leave the site in such a state that will allow for easy site rehabilitation.

The Draft EMPr which was subjected to a 30 day authority review period. Following the conclusion of the authority review period, this documents serves as the Final EMPr along with the Final BAR which will be submitted to the Competent Authority (CA), Department of Environmental Affairs (DEA), for review and decision making. The Final EMPr contains recommendations as well as mitigation measures emanating from the review period.

### 4 ENVIRONMENTAL ASSESSMENT PRACTITIONERS

Eskom has appointed Nemaï Consulting as the independent Environmental Assessment Practitioner (EAP) to complete all requisite environmental processes and seek environmental authorisation for the Proposed Kriel-Matla Ash Transfer Link. The members of Nemaï Consulting that were involved with compiling the EMPr are:

- Vanessa Stippel (MSc. Ecology, Environment and Conservation); and

- Angelique Daniell (MSc. in Environmental Sciences)

Please see **Appendix H** for copies of relevant Curricula Vitae.

## 5 ENVIRONMENTAL GOVERNANCE FRAMEWORK

### 5.1 Legal Framework

It must be ensured that all legislation relating to the protection of the environment and prevention of pollution is adhered to. This EMPr must form part of the contractual obligations of all contractors and sub-contractors engaged in the project. The EMPr, including a copy of all other environmental approvals must be kept on site. The obligations imposed by the EMPr are legally binding in terms of environmental statutory legislation. All employees working on the project must therefore be given an induction presentation on environmental awareness and specific requirements of the EMPr.

Construction will be undertaken according to recognised best industry practices and will include measures prescribed within this EMPr.

All project activities must comply with relevant South African legislation and regulations. All environmental statutory requirements should be included in the Contractors' conditions.

Specific legislation that must be complied with includes, but is not necessarily limited to:

- National Environmental Management Act (Act No. 107 of 1998);
- Environmental Conservation Act (Act No. 73 of 1989);
- National Water Act (Act No. 36 of 1998);
- Atmospheric Pollution Prevention Act (Act No. 45 of 1965);
- Conservation of Agricultural Resources Act (Act No. 43 of 1983)
- Constitution of South Africa (Act No. 108 of 1996);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004);
- National Heritage Resources Act (Act No. 25 of 1999);
- National Veld and Forest Fire Act (Act No. 101 of 1998); and
- Occupational Health and Safety Act (Act No. 85 of 1993).

### 5.2 Water Use License Application (WULA)

The Water Use License Application (WULA) was done by Digby Wells Environmental and not by Nema Consulting, however sections was taken from the reports in order to complete the EMPr.

The proposed development necessitates the application for a Water Use Authorisation in terms of Section 21 (c) (impeding or diverting the flow in a watercourse) and Section 21(i) (altering the beds, banks, course or characteristics of a watercourse) as the site is within 500 m of a wetland.

These uses relate to the fact that the envisaged pipelines will cross certain watercourses, as defined by the NWA. The NWA defines watercourses as “a) a river or spring; b) a natural channel in which water flows regularly or intermittently; c) a wetland, lake or dam into which, or from which, water flows; and d) any collection of water which the Minister may, by Notice in the Gazette, declare to be a watercourse.”.

### 5.3 Method Statements

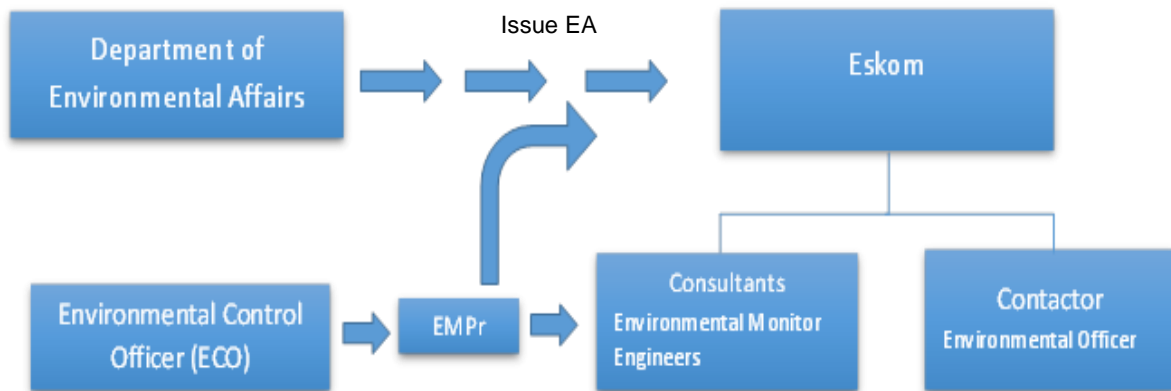
The Method Statements must be project and site specific and should explain in detail the following:

- The manner in which the work is to be undertaken;
- The estimated schedule for the works (timing);
- The area where the works will be executed (location);
- The materials and plant / equipment needed for the works;
- The necessary mitigation measures that need to be implemented to adequately safeguard the environment, construction workers and the public (where applicable);
- Training of employees, where relevant;
- Roles and responsibilities; and
- Monitoring and reporting requirements.

## 6 ROLES AND RESPONSIBILITIES

The implementation and enforcement of the EMP will require the input of numerous parties, including but not limited to the proponent DEA, Environmental Monitor, Engineer, Environmental Control Officer (ECO) as well as the Contractor.





**Figure 2: Institutional arrangement: roles and responsibility**

### 6.1 DEA

The DEA is the mandated authority in terms of the National Environmental Management Act (Act No. 107 of 1998) and thus is responsible for approving the Environmental Authorisation (EA) following a decision-making process conducted as part of the BA. The EA will include project specific conditions. The EMPr should be updated to include these conditions should the EA be granted.

DEA also fulfils a compliance and enforcement role with regards to the authorisation. The Department may perform random inspections to checks compliance. DEA will also serve as an active member of the Environmental Monitoring Committee (EMC) and will review the monitoring and auditing reports compiled by the Environmental Control Officer (ECO).

### 6.2 Project Proponent

Eskom is the applicant in terms of NEMA (Act No. 107 of 1998) and will be the Project Proponent for all components of the work related to the development. Ultimately, the liability associated with environmental non-compliance rests with the Project Proponent. Eskom is committed to responsible occupational health, safety and environmental management. This commitment is essential to protect the environment, employees, Mandatories, visitors and provide a work environment conducive to health and safety.

### 6.3 Environmental Control Officer

The Environmental Control Officer (ECO) is an independent party, who conducts independent audits.

The ECO will undertake weekly inspections of the site and at least 6 monthly, full compliance auditing against the EMPr and environmental authorisation. The Audit reports will also be made available to the relevant authorities, on their request.

Further duties of the ECO will be the following:

- Monitoring of compliance with the EMPr and the Project Specification.
- Make recommendations on how to best apply the environmental requirements on site and advise the Chief Resident Engineer on the site instructions required to facilitate effective environmental compliance.
- Participate in the quality management system by issuing non-conformances when there are areas of the project environmental requirements that are not being met.

#### **6.4 Engineer Consultant**

The Engineer will be responsible for managing the planning, design and construction phases of the project. The Engineer shall appoint a Resident Engineer (RE) to act as the onsite implementing agent. The Engineer will furthermore also be required to tend to any environmental matters at the request of the RE and/or the ECO. The Engineer shall assist the ECO where necessary and shall have the following responsibilities in terms of the implementation of the EMPr:

- Regular site inspections;
- Reviewing and approving the Contractor's Method Statements;
- Monitoring and verifying that the EMPr and Method Statements are adhered to;
- Keeping a photographic record of construction activities on site.
- Assisting the Contractor in finding environmentally responsible solutions to problems with input from the ECO where necessary; and
- Communicating all environmental issues to the ECO.

#### **6.5 Contractor's Environmental Officer**

The primary role of the competent Environmental Officer is to coordinate the environmental management activities of the Contractor on site.

Specific responsibilities of the Environmental Officer, who will be on site, will include the following:

- Aiding the Contractor to comply with all the project's environmental management requirements;
- Assisting the Contractor in compiling Method Statements;
- Facilitating environmental activities and environmental awareness training of relevant persons on site;

- Exercise an internal compliance management system on behalf of the Contractor;
- Inspect the site as required to ensure adherence to the management actions of the EMPr and the Method Statements;
- Provide inputs to the regular environment report to be prepared by the ECO (as required);
- Liaise with the construction team on issues related to implementation of, and compliance with, the EMPr;
- Maintain a record of environmental incidents (such as spills, impacts, legal transgressions) as well as corrective and preventive actions taken; and
- Maintain a public complaints register in which all complaints are recorded, as well as action taken.

## 7 MONITORING

Monitoring is required to ensure that the receiving environment at the study area is suitably safeguarded against the identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project.

### 7.1 **Baseline Monitoring**

Baseline monitoring will be undertaken to determine the pre-construction state of the receiving environment, and it is discussed further in the pre-construction phase of the EMPr.

### 7.2 **Environmental Monitoring**

Environmental monitoring entails checking, at pre-determined frequencies, whether thresholds and baseline values for certain environmental parameters are being exceeded. The parameters and sampling localities used during the baseline monitoring will form the basis of the environmental monitoring programme.

Note that the specifications will include more detailed requirements in terms of environmental monitoring.

### 7.3 **Compliance Monitoring and Auditing**

The ECO will undertake monthly inspection of the site and a full compliance auditing against the EMPr and Environmental Impact Assessment will be implemented. The aforementioned reports will be submitted to the Project Manager, Environmental Monitor and DEA for their records.

A document handling system must be established to ensure accurate updating of EMPr documents, and availability of all documents required for the effective functioning of the EMPr. Supplementary EMPr documentation could include:

- Method Statements;
- Site instructions;
- Emergency preparedness and response procedures;
- Record of environmental incidents;
- Non-conformance register
- Training records;
- Site inspection reports;
- Monitoring reports;
- Auditing reports; and
- Public complaints register (single register for maintained for overall site).

## 8 ENVIRONMENTAL TRAINING AND AWARENESS CREATION

Training aims to create an understanding of environmental management obligations and prescriptive measures governing the execution of the project. It is generally geared towards project team members that require a higher-level of appreciation of the environmental management context and implementation framework for the project.

Awareness creation strives to foster a general attentiveness amongst the construction workforce to sensitive environmental features and an understanding of implementing environmental best practices. The various means of creating environmental awareness during the construction phase of the project may include:

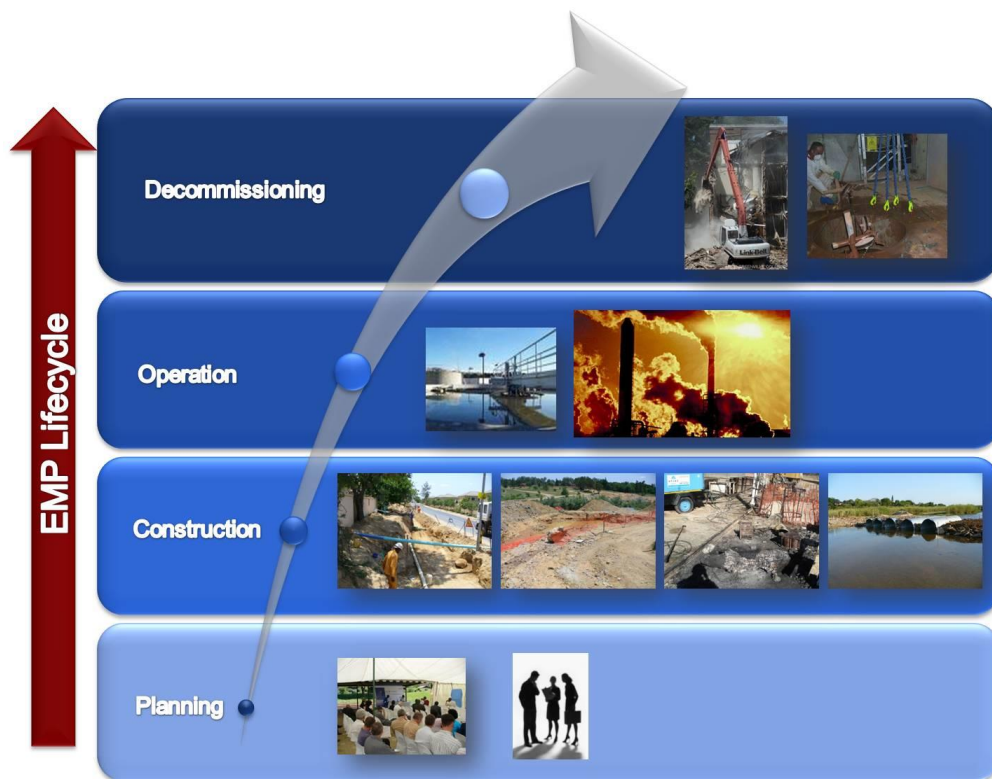
- Induction course for all workers before commencing work on site;
- Refresher courses (as and when required); (e.g. should the ECO note that there are issues with waste handling and soil stockpiles and/or litter, a refresher course can be suggested in addition to the various toolbox talks).
- Daily / weekly toolbox talks, focusing on particular environmental issues (task- and area specific);

- Courses must be provided by suitably qualified persons and in a language and medium understood by the workers. It is noted that Zulu is the dominant language in the area;
- Erect signage and barricading (where necessary) at appropriate points in the construction domain, highlighting sensitive environmental features (e.g. grave sites, protected trees); and
- Place posters containing environmental information at areas frequented by the construction workers (e.g. eating facilities).

Training and awareness creation will be tailored to the audience, based on their designated roles and responsibilities. Records will be kept of the type of training and awareness creation provided, as well as containing the details of the attendees.

## 9 PROJECT LIFECYCLE

During its lifecycle, projects journey through four distinctive phases, as presented in **Figure 3**.



**Figure 3: Four Generic Phases of a Project Lifecycle.**

Due to this project incorporating the construction of an Ash Transfer and Return Water pipeline, its life cycle is characterised by the following phases:

- Planning (selection of construction method);
- Construction Phase (construction of the pipeline);
- Operational Phase (transferring ash slurry and return water); and
- Decommissioning (not applicable for this project).

## 10 EMPR REVIEW

Due to its dynamic nature, the EMPr for The Proposed Kriel-Matla Ash Transfer Link will be reviewed and revised when necessary to ensure continued environmental improvement. Changes to the EMPr shall be required where the existing system:

- Does not make adequate provision for protecting the environment against the construction activities;
- Needs to be modified to meet conditions of statutory approval;
- It is not achieving acceptable environmental performance;
- Requires changes due to the outcome of a monitoring or auditing event or management review; and
- Provides redundant, impracticable or ineffective management measures.

## 11 ENVIRONMENTAL ACTIVITIES, ASPECTS AND IMPACTS

In order to establish best management practices and prescribe mitigation measures, the following project-related information needs to be adequately understood:

- **Activities** associated with the proposed project;
- **Environmental aspects** associated with the project activities;
- **Environmental impacts** resulting from the environmental aspects; and
- The nature of the surrounding **receiving environment**.

### 11.1 Project Activities

For the purposes of effective and efficient monitoring, the aspects of construction are outlined separately for pre-construction, construction and operational phases.

In order to understand the impacts related to the project it is necessary to unpack the activities associated with the project life-cycle, as shown below in Table 2:

**Table 2: Pre-construction activities associated with the Proposed Kriel-Matla Ash Transfer Link.**

PRE-CONSTRUCTION PHASE	
Project Activities	
	Detailed engineering design
	Detailed geotechnical design
	Aquatic, Wetland and Ecological studies
	Heritage Impact Assessment (HIA)
	Construction site planning, access and layout
	Procurement process for contractors
	Site survey
	Development and approval of method statements
	Development and approval of construction plans
	On-going consultation with affected parties

**Table 3: Construction activities associated with the Proposed Kriel-Matla Ash Transfer Link.**

CONSTRUCTION PHASE	
Project Activities	
	Fencing of the construction camp area
	Demarcation of buffers around sensitive areas
	Environmental awareness training
	Site clearance
	Vegetation clearance for construction
	Site establishment (including site camp and labour camp)
	Construction employment
	Delivery of construction material
	Transportation of equipment, materials and personnel
	Storage and handling of material
	Excavation

Project Activities
Storm water management plan
Management of topsoil and spoil
Waste and wastewater management
Temporary site roads
Permanent storm water control mechanisms
Site security
Road surface finishes
Reinstatement and rehabilitation of construction domain

*Table 4: Operational activities associated with the Proposed Kriel-Matla Ash Transfer Link.*

OPERATIONAL PHASE
Project Activities
Access arrangements and requirements
Maintenance of services infrastructure
Waste management
Storm water control (Channels and Trenches are to be build)
Routine maintenance inspections
Repair and maintenance works
Management of sensitive areas or buffered areas

## 11.2 Environmental Aspects

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment and cause an impact.

The following environmental aspects have been identified for the proposed development, which are linked to the project activities (note that only high-level aspects are provided):

*Table 5: Environmental Aspects associated with pre-construction phase of the Proposed Kriel-Matla Ash Transfer Link.*

PRE-CONSTRUCTION PHASE
Environmental Aspects



Environmental Aspects
Insufficient planning
Planners not fully sensitised to site-specific environmental issues
Poor management of employment
Poor consultation with affected parties

**Table 6: Environmental Aspects associated with construction phase of the Proposed Kriel-Matla Ash Transfer Link.**

CONSTRUCTION PHASE
Environmental Aspects
Lack of environmental awareness creation
Construction starting without or inadequate search and rescue
Poor management of access and use of access roads
Poor traffic management
Poor transportation practices
Disturbance of topsoil
Poor management of water
Poor management of construction camp and eating areas
Inadequate storage and handling of material
Inadequate storage and handling of hazardous material
Lack of equipment maintenance
Poor management of labour force
Pollution from ablution facilities
Poor waste management practices
Damage to significant fauna and flora
Environmental damage of sensitive areas
Disruption of archaeological and culturally significant features
Poor site security
Noise nuisance due to construction activities
Dust and emissions
Poor reinstatement and rehabilitation
Erosion
Obstruction to animal movement corridors

**Table 7: Environmental Aspects associated with the operational phase of the Proposed Kriel-Matla Ash Transfer Link.**

OPERATIONAL PHASE
Environmental Aspects
Lack of on-going storm water management
Lack of on-going waste management
Obstruction to animal movement corridors
Increased traffic on surrounding roads

### 11.3 Potential Significant Environmental Impacts

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable. Refer to **Table 8** for the potential significant impacts associated with the development.

**Table 8: Potential Significant Environmental Impacts associated with the development.**

Feature	Potential Impact
Geology and Soil	<ul style="list-style-type: none"> <li>Impacts associated with the sourcing of construction material and loss of topsoil</li> <li>Soil erosion (land clearance and construction activities)</li> <li>Destruction and/or altering of wetland soils</li> <li>Soil pollution e.g. hydrocarbon and cement spillages</li> </ul>
Flora	<ul style="list-style-type: none"> <li>Damage and loss of vegetation of conservation significance</li> <li>Proliferation of exotic vegetation in disturbed areas</li> </ul>
Fauna	<ul style="list-style-type: none"> <li>Damage / clearance of habitat of conservation importance</li> <li>Loss of fauna species of conservation significance</li> <li>Obstruction to animal movement corridors</li> </ul>
Air Quality	<ul style="list-style-type: none"> <li>Dust generation and emissions</li> </ul>
Aesthetics	<ul style="list-style-type: none"> <li>There are no aesthetical value to this site as it is a disposal facility</li> </ul>
Transportation	<ul style="list-style-type: none"> <li>Construction-related traffic from main roads and on the mine haul road</li> </ul>
Noise	<ul style="list-style-type: none"> <li>Noise nuisance of the construction phase</li> </ul>
Safety & Security	<ul style="list-style-type: none"> <li>Safety risk to local community</li> </ul>
Waste Management	<ul style="list-style-type: none"> <li>Land, air and water pollution through poor waste management practices</li> <li>Management of excess spoil material</li> </ul>

Feature	Potential Impact
Socio – Economic	<ul style="list-style-type: none"> <li>• <i>Contribution to local economy*</i></li> <li>• Nuisance from dust and noise</li> <li>• <i>Use of local goods and services*</i></li> </ul>
Heritage resources	<ul style="list-style-type: none"> <li>• No Heritage resources found on the site</li> </ul>
Water Resource Quality – <i>Aquatic Biota</i>	<ul style="list-style-type: none"> <li>• Alteration of habitat</li> <li>• Loss of aquatic-dependent biodiversity</li> </ul>
Water Resource Quality – <i>Flow Regime</i>	<ul style="list-style-type: none"> <li>• Alteration of flow</li> <li>• Affect aquatic biodiversity</li> </ul>
Water Resource Quality – <i>Water Quality</i>	<ul style="list-style-type: none"> <li>• Impacts on water quality through siltation and pollution.</li> </ul>
Water Resource Quality – <i>Riparian habitat</i>	<ul style="list-style-type: none"> <li>• Wetland/aquatic habitat unit destruction</li> <li>• Soil erosion</li> </ul>

*\*Positive Impacts*

#### 11.4 Sensitive Environmental Features

Refer to Sensitivity Map in **Appendix A** of the BAR. The following was noted for the sensitive environmental features for the proposed study site:

- The route does not occur within a Critical biodiversity Area (CBA) and Ecological Support Area (ESA) identified by the Mpumalanga C-Plan.
- The Proposed Kriel-Matla Ash Transfer Link pipelines do not cross or is in approximation to any protected areas.
- The majority of the pipelines will be on heavily modified areas with only a small portion of the pipelines moderately modified and other natural areas.
- No heritage resources were found along the pipeline route-It should be noted that the sub-surface archaeological and/or historical deposits and graves are always a possibility. Care should be taken during any work in the entire area and if any of the above is discovered, an archaeologist/heritage practitioner should be commissioned to investigate.
- No pre-colonial heritage sites evident on route.
- No historical period sites situated on route.
- The Route 2 Alternative pipelines fall within 500 m radius of a Wetland, Route 1 (preferred route) is further away from the wetland.
- No specific sensitive fauna species were recorded on site.
- No threatened flora species were observed on site.
- Species of conservation concern was noted, namely *Hypoxis hemerocallidea* (Star flower/African potato) and this species is listed as Declining.

- Wetland/watercourses was found during the Aquatic specialist study.

## 12 IMPACT MANAGEMENT

The impact assessment carried out for each environmental impact that may result from the proposed project, forms the basis for determining which management measures are required to prevent or minimise these impacts. The management measures are furthermore a means by which the mitigation measures, determined in the impact assessment are translated to action items required to prevent or keep those impacts that cannot be prevented within acceptable levels.

Mitigation should strive to abide by the following hierarchy (1) prevent; (2) reduce; (3) rehabilitate; and/or (4) compensate for the environmental impacts.



*Figure 4: Mitigation Hierarchy*

Prevention mitigation measures (1) are the first preference for developments and are usually measures that avoid impacts completely. The impacts for the mitigation measures listed below will mostly fall under the reduction hierarchy (2). This involves mitigation measures that minimise impacts. This EMPr also includes remediation and rehabilitation measures (hierarchy 3) for environmental impacts. Compensation (4) involves compensating the loss of an entire feature. In the case for the environment, this usually means consideration of an off-set associated with rehabilitation and mitigation.

The basis for the management measures which follow below comprise of the following:

- **Management objectives** – i.e. desired outcome of management measures for mitigating negative impacts and enhancing the positive impacts related to project activities and aspects (i.e. risk sources);
- **Targets** – i.e. level of performance to accomplish management objectives; and
- **Management actions**– i.e. practical actions aimed at achieving management objectives and targets;
- **Responsibilities**; and

- **Monitoring requirements.**

## 12.1 Pre-construction Phase

The planning or pre-construction phase largely entailed conducting the necessary specialist studies, determining the site layout and carrying out the requisite environmental processes (i.e. BA Process) to obtain authorisation.

General requirements during the pre-construction phase include the following:

- Design to consider and incorporate environmental requirements.
- Define and communicate roles and responsibilities for the implementation of the EMPr.
- Develop and implement an environmental awareness programme.
- Compile and implement an employment strategy construction labour.

### 12.1.1 Construction Site Planning and Layout

#### **Management Objective:**

Appropriate planning and layout of construction site to ensure environmental protection.

#### **Target:**

No impacts to sensitive environmental features as a result of construction site planning and layout.

#### **Management Actions:**

- Suitable specialist(s) to identify sensitive environmental features (including watercourses, fauna, and flora) where special care needs to be taken and implement suitable mitigation measures to safeguard these features (e.g. barricading, signage and awareness creation).
- A qualified and / or appropriately experienced Botanist or an experienced person who knows specific vegetation types well should embark on a walk-down survey and survey any species of conservation importance that could occur. If any red data species are found, proper mitigation measures should be employed.
- Should any Orange data listed species be found, these species must be removed prior construction and replanted during rehabilitation process.
- A qualified professional should be on site prior to construction to identify other species of conservation importance which may occur on site.
- During site preparation, topsoil and subsoil are stripped separately from each other and must be stored separately from spoil material for use in the rehabilitation phase. It should be protected from wind and rain, as well as contamination from diesel, concrete or wastewater.

- Records of all environmental incidents must be maintained and a copy of these records must be made available to authorities on request throughout the project execution.
- Training of construction workers to recognise threatened animal species will reduce the probability of fauna being harmed unnecessarily.
- Posters should be displayed on site to sensitise workers to fauna in the region.
- During site preparation, special care must be taken during the clearing of the works area to minimise damage or disturbance of roosting and nesting sites.
- No access to no-go areas without the permission of the Project Manager.
- Contractor to develop method statements to be approved by the Project Manager prior to construction taking place. The plan must show the following (as relevant), as a minimum:
  - Buildings and structures;
  - Contractors' camp and lay down areas;
  - Site offices;
  - Roads and access routes;
  - Gates and fences of the construction camp;
  - Essential services (permanent and temporary water, electricity and sewage);
  - Rubble and waste rock storage and disposal sites;
  - Solid waste storage and disposal sites;
  - Site toilets and ablutions;
  - Topsoil stockpiles;
  - Construction materials stores;
  - Vehicle and equipment stores;
  - Sensitive environmental features; and
  - Any other activities, facilities and structures deemed relevant.
- Design to consider and incorporate environmental requirements.
- Define and communicate roles and responsibilities for the implementation of the EMP.
- Conduct appropriate environmental baseline studies.
- All test pits created as part of geotechnical investigations are to be filled and rehabilitated.
- Determining and documenting the road conditions for all identified haul roads.
- Develop and implement an environmental awareness plan.
- The appointment of an ECO.
- Before construction commences, all the sensitive areas (i.e. area where moles were found) must be clearly demarcated with fencing, a normal stock fence can be utilised, either diamond or rectangular fencing. However the barricading measures to be utilised should restrict the movement of the fauna in the area from falling into open trenches.
- Records of compliance / non-compliance must be kept on site at all times for DEA on request.
- Records of all environmental incidents must be maintained and a copy of these records be made available to DEA on request throughout the project execution.

- During site preparation special care must be taken during the clearing of the works area where organic material must be stored separately from the topsoil and spoil material. Further, the topsoil must also be stored separately from the spoil material to ensure for the protection thereof and that it can be reused during the rehabilitation phase.
- A suitable position for the construction camp to be selected, in consultation with the ECO.
- Prior to establishment of the site camp(s), the Contractor shall produce a plan showing the positions of all buildings, lay down yards, batch plants, vehicle wash areas, vehicle repair area, batching areas and infrastructure for approval by the Resident Engineer.
- Project Management shall allocate a laydown area for Contractor-supplied items. At all times, the Contractor shall be responsible for the safe and adequate storage of all materials and equipment on site which he is to install, whether they are supplied by himself or others. The safe handling, unloading and loading of material receipts and dispatches at site or storage areas shall be the Contractors' responsibility.

**Responsibilities:**

- Proponent - acquire permits.
- Project Manager and ECO – to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Approved site plan.
- Barricading and signage.
- Records of awareness creation.
- Plant rescue and protection.

**12.1.2 Environmental Awareness Creation****Management Objective:**

- Ensure that the Contractor, construction workers and site personnel are aware of the relevant provisions of the EMP.

**Target:**

- All construction workers and employees to have completed appropriate environmental training.
- A record of environmental training undertaken to be kept on site.

**Management Actions:**

- The Contractor must arrange that all of his employees and those of his sub-contractor go through the project specific environmental awareness training courses before the commencement of construction and as and when new staff or sub-contractors are brought on site.
- The environmental training is compulsory for all employees and structured in accordance with their relevant rank, level and responsibility, as well as the Environmental Specification as they apply to the works and site.

**Responsibilities:**

- Project Manager and ECO - to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Public complaints register.
- Records of environmental training and awareness creation.

**12.2 Construction Phase****12.2.1 Site Clearing****Management Objective:**

- Manage environmental impacts associated with site clearing.
- Ensure that only areas that are specifically required for the construction purposes are cleared.

**Target:**

- No damage to sensitive environmental features outside of construction area, including marked and barricaded watercourses, structures and infrastructure.

**Management Actions:**

- Restrict site clearing activities to construction area / domain.
- Clearing of vegetation to be conducted in a phased manner (where possible).
- Vegetative cover for sensitive areas is to remain for as long as possible.

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.



**Monitoring Requirements:**

- No clearing outside of construction domain.

**12.2.2 Site Establishment****Management Objective:**

- Minimise environmental impacts associated with site establishment.

**Target:**

- No damage to the environment outside construction area during site establishment.
- No access or encroachment into no-go areas.
- No justifiable complaints regarding general disturbance and nuisance received from the affected landowners and community members.

**Management Actions:**

- Contractor to produce a site plan for the approval by the Project Manager prior to the establishment of the site.
- Facilities and structures shall be located according to the terrain and geographical features of the project site.
- Positioning of the storage and lay-down areas should aim to minimise visual impacts.
- Control the movement of all vehicles and plant (including suppliers), such that they remain on designated routes and comply with relevant agreements.
- Ensure noise levels are within their lawfully acceptable limits as per SANS 10103.
- Minimise disturbance from lighting of the construction camp and site.
- The extent of the site should by all means be limited, to avoid any additional clearance of vegetation.
- Every precaution should be taken, to prevent pollution of air, soil, ground and surface water as a result of construction or associated activities at the construction site.
- The Contractor shall ensure that the Contractors camp and working areas are kept clean and tidy at all times. The Engineer or/and the Environmental Control Officer shall inspect these areas on a regular basis.
- The Contractor shall provide eating areas for all staff. Eating areas be cleaned on a daily basis and shall provide adequate temporary shade.
- Refuse bins must be placed at all eating areas.
- The Contractor shall ensure that the risk of fire at any location on the site is kept to a minimum.
- The contractor shall comply with all safety requirements enforced; these include emergency evacuation procedures, fire preventative measures, etc.

- The Contractor shall supply firefighting equipment in proportion to the fire risk presented by the type of construction and other on-site activities and materials used on site. This equipment shall be kept in good operating order. This particularly applies to welding activities, etc.
- No smoking allowed on the site. The contractor is to provide designated safe smoking areas.
- Fuel, lubricants, transmission and hydraulic fluids shall only be stored in the designated areas that comply with the OHS Act.

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Contractor's method statement.
- Public complaints register.

**12.2.3 Management of Construction Camp and Eating Areas****Management Objective:**

- Minimise environmental impacts associated with the construction camp and eating areas.

**Target:**

- No environmental contamination associated with the construction camp.
- No complaints regarding the construction camp.
- Minimise visual impact associated with the construction camp.

**Management Actions:**

- Labour camp to be screened to minimise the visual impact, where practicable.
- Open uncontrolled fires will be forbidden at the site camp. Rather, 'contained' cooking mechanisms will be used (e.g. gas stoves or an enclosed braai facility).
- All cooking to be undertaken in designated cooking and eating areas. The cooking area will be positioned such that no vegetation is in close proximity thereto, including overhanging trees. An area around the cooking area will be cleared such that any escaping embers will not start an uncontrolled fire.
- Eating areas will be designated and demarcated.
- The feeding, or leaving of food for animals, is strictly prohibited.
- Sufficient vermin / weather-proof bins will be present in this area for all waste material.
- Dish washing facilities will be provided to ensure that wastewater is disposed of appropriately.

- Failure to comply with the general code of conduct, or the rules and procedures implemented at the construction camp will result in disciplinary actions.
- Provide safe potable water for food preparation, drinking and bathing.
- Prohibit the felling of trees for firewood.
- Provide medical and first aid facilities at the camp area.

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Public complaints register.
- Contractor's method statement.
- Disposal certificates.

**12.2.4 Management of Ablution Facilities****Management Objective:**

- Minimise environmental impacts associated with ablution facilities.

**Target:**

- No environmental contamination associated with ablution facilities.
- Minimise visual impact associated with ablution facilities.

**Management Actions:**

- The provision of toilets for each sex is required in terms of the National Building Regulations and Construction Regulation 28. Chemical toilets are allowed instead of the water borne sewerage type. Toilets have to be provided at a ratio of 1 toilet per 30 workers. The Principal Contractor shall provide flushing toilets on the construction premises.
- At least cold-water showers for each sex have to be provided at a ratio of 1 shower per 15 workers.
- Some form of screened off changing facility must be provided separately for each sex.
- Contractor to ensure adequate number of ablution facilities are available and not further than 200m from the construction working area, except when within the 32 m riparian buffer zone.
- All staff to use the provided toilets at all times.
- All sanitary fees that may be payable to any local authority shall be paid by the Contractor.

- Ablutions are to be cleaned/ emptied on a regular basis, before they are full and contaminate the environment.
- Ensure that no spillages occur when ablution facilities are emptied.
- Informal ablutions within the all riparian areas must be prohibited.
- Provide sufficient ablution facilities (e.g. mobile / portable / VIP toilets), at the construction camp and along construction sites, which conform to all relevant health and safety standards and codes.
- No pit latrines, trench drain systems or soak away systems shall be allowed.
- All temporary / portable / mobile toilets shall be secured to the ground to prevent them from toppling over due to wind or any other cause.
- Ensure utilisation, maintenance and management of toilet, wash and waste facilities.
- The entrances to the toilets will be adequately screened from public view.
- These facilities will be maintained in a hygienic state and serviced regularly.
- Toilet paper will be provided.
- Sanitary hygiene bins will be provided for female staff.
- The Contractor will ensure that no spillage occurs when the toilets are cleaned or emptied and that a licensed service provider removes the contents from site. Disposal of such waste is only acceptable at a licensed waste disposal facility.
- Should shower facilities be provided for use by staff staying on site, the following controls must be imposed:
  - All discharge from the shower and other washing facilities must be managed to prevent environmental contamination.
  - Use of the shower facilities must be limited to staff or authorised persons only

**Responsibilities:**

- Project Manager and ECO - to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Public complaints register.
- Maintenance register for ablution facilities.
- Disposal certificates.
- Contractor's method statement.

**12.2.5 Management of Workshop and Equipment****Management Objective:**

- Minimise environmental impacts associated with workshops and equipment use.

**Target:**

- No environmental contamination associated with workshops and equipment use.

**Management Actions:**

- Vehicles must be maintained and serviced according to the manufacturers' standards
- Daily checklists must be completed by drivers and operators before the vehicles and equipment are used.
- Vehicles and equipment must be turned off when not in use.
- Maintenance of equipment and vehicles will be performed in such a manner so as to avoid any environmental contamination (e.g. use of drip trays).
- No washing of plant may occur on the construction site. Plant to be washed in dedicated areas.
- Drip trays will be provided for the stationary plant and for the "parked" plant.
- All vehicles and equipment will be kept in good working order and serviced regularly. Leaking equipment will be repaired immediately or removed from the site.
- Suitable storage and disposal of hydraulic fluids and other vehicle oils (see section on *Management of Storage and Handling of Hazardous Material*).

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Recorded evidence of spillages.
- Vehicle and equipment checklists
- Training register.
- Contractor's method statement.

**12.2.6 Fencing and Barricades****Management Objective:**

- To ensure and assist with controlled fencing and barricades in the working environment.

**Management Actions:**

- No pedestrian or vehicular access shall be allowed to such fenced areas.

- In places where temporary fencing is required the Contractor shall erect such fencing when and where required and re-erect and maintain temporary fencing as necessary. Temporary fencing shall remain in position either until it is replaced by permanent fencing or until completion of the works.
- Any fences damaged by the Contractor shall be repaired as soon as possible at his/her cost, and shall be of the standard of the original fence.
- Fencing/ Barricades to make safe the area will be installed where required.

#### 12.2.7 Management of Labour Force

##### Management Objective:

- Ensure suitable management of labour force to prevent security-related issues.
- Provide a work environment that is conducive to effective labour relations.

##### Target:

- No complaints from landowners and community members regarding trespassing or misconduct by construction workers.

##### Management Actions:

- Prevent trespassing of construction workers on private property.
- Workers should be provided with identity cards and should wear identifiable clothing.
- Creating nuisances and disturbances in or near communities shall be prohibited.
- Machine / vehicle operators shall receive clear instructions to remain within demarcated access routes and construction areas.
- Designated and demarcated smoking areas should be provided, with special bins for discarding of cigarette butts.

##### Responsibilities:

- Project Manager and ECO – to check.
- Contractor to implement management actions.

##### Monitoring Requirements:

- Public complaints register.

#### 12.2.8 Management of Health and Safety

##### Management Objective:

- Provide a safe working environment to construction workers and the public.

**Target:**

- Approved Health and Safety Plan.
- No incidents.
- Compliance with the Occupational Health and Safety Act (Act No. 85 of 1993), Construction Regulations (2003) and other relevant regulations.

**Management Actions:**

- Where works are carried out (close to inhabited areas), all necessary precautions shall be taken to safeguard the lives and property of the local residents. Precautions shall also be taken to safeguard the construction site:
- When working in the area of encroachment is prevalent all open excavated trenches and foundations should be clearly marked and secured to keep people and fauna from falling in.
- Storage areas, assembling areas where construction material is stored on site should similarly be secured. No stacking and storing of material will be allowed underneath any operational power lines.
- The Principal Contractor must establish site access rules and implement and maintain these throughout the construction period. Access control must, amongst other, include the rule that non-employees will not be allowed on site unaccompanied.
- Access by non - construction staff into any construction related sites should be restricted and clearly indicated as such by signposts.
- Maintain access control to prevent access of the public to the construction areas.
- The requirements of the Occupational Health and Safety Act (Act 85 of 1993) and related regulations shall be adhered to.
- Speed limits shall be enforced in all areas, including public roads and private properties. All drivers of the construction teams shall be sensitised to this effect and courteous behaviour is expected from everybody in this regard.
- Fencing and barriers will be in place in accordance with the Occupational Health and Safety Act (Act No. 85 of 1993).
- Comply with the provisions of the Fencing Act (Act No. 31 of 1963).
- Applicable notice boards and hazard warning notices will be put in place and secured. Night hazards will be indicated suitably (e.g. reflectors, lighting, and traffic signage).
- Emergency contact details will be prominently displayed.
- All construction personnel must be clearly identifiable. All employees must also be issued with employee cards for identification purposes.
- All workers will be supplied with the required Personal Protective Equipment as per the Occupational Health and Safety Act (Act No. 85 of 1993).
- Appropriate signage must be posted to this effect and all employees on site must be instructed to ensure that non-employees are protected at all times. All non-employees entering the site must receive induction into the hazards and risks of the site and the control measures to be observed.

- The relevant authorities must be notified of any interruptions of services, especially the Local Municipality, National Road Agency, Spoornet, TELKOM and ESKOM etc. In addition, care must be taken to avoid damaging major and minor pipelines and other services.
- No telephone lines must be dropped during the construction operations, except where prior agreement by relevant parties is obtained. All crossings must be protected, raised or relocated as necessary.
- All complaints and/or problems related to impacts on man-made facilities and activities must be promptly addressed by the Contractor and documented.

**Responsibilities:**

- Project Manager and ECO – to check.
- Dedicated Occupational Health and Safety system to be implemented by Contractor's Safety Officer. To be monitored and audited by the Client's Safety Agent, in terms of the Construction Regulations (2003).
- Contractor to implement management actions.

**Monitoring Requirements:**

- Occupational Health and Safety system – checked by Safety Agent.

**12.2.9 Management of Emergency Procedures****Management Objective:**

- Minimise environmental impacts associated with emergency procedures.

**Target:**

- No site fires to be caused by construction activities and workers.
- Approved emergency response procedures, where relevant.

**Management Actions:****Fire –**

- Comply with the National Veld and Forest Fire Act (No. 101 of 1998).
- Proper emergency response procedure to be in place for dealing with fires.
- Burning of waste is not permitted.
- Suitable precautions will be taken (e.g. suitable fire extinguishers, water bowsers, welding curtains) when working with welding or grinding equipment.
- All fire control mechanisms (firefighting equipment) will be routinely inspected by a qualified investigator for efficacy thereof and be approved by local fire services.
- All staff on site will be made aware of general fire prevention and control methods, and the name of the responsible person to alert to the presence of a fire.



- No fires are allowed on site, unless in dedicated areas approved by the Project Manager.
- Dedicated smoking areas to be provided. Cigarette butts may not be disposed of onsite.

**Accidental Leaks and Spillages –**

- Proper emergency response procedure to be in place for dealing with spills and leaks.
- Ensure that the necessary materials and equipment for dealing with spills and leaks are available on site, where practicable.
- Remediation of the spill areas will be undertaken to the satisfaction of the Project Manager and ECO.
- In the event of a hydrocarbon spill, the source of the spillage will be isolated and contained. The area will be cordoned off and secured. The Contractor will ensure that there is always a supply of an appropriate absorbent material readily available to absorb, breakdown and where possible, encapsulate a minor hydrocarbon spillage.
- All staff on site will be made aware of actions to be taken in case of a spillage.
- Provide contact details of person to be notified in a case of spillages – signage to be displayed at strategic points within the construction domain (e.g. workshop, fuel storage area, hazardous material containers).

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Approved Emergency Response Plan.
- Training and awareness creation records.
- Signage displayed.
- Contractor's method statement.

**12.2.10 Management of Access and Traffic****Management Objective:**

- Ensure that all construction vehicles use only dedicated access routes to construction sites
- Ensure proper access control.
- Prevent unlawful access to construction domain.

**Target:**

- No reports of construction vehicles using other unauthorised routes.
- No speeding.
- No accidents.

**Management Actions:**

- Ensure appropriate traffic safety measures are implemented.
- The Contractor must comply with all driving, vehicle, licensing and driver ability requirements.
- Permission required from the Project Manager for the movement of any vehicles and/or personnel outside of designated working areas.
- No new access permanent roads shall be developed by the Contractor other than those determined or approved by the Engineer.
- Existing roads shall be used as far as possible for construction purposes.
- Contractor to ensure safe access for landowners on all roads.
- The Principal Contractor shall organise the site in such a manner that pedestrians and vehicles can move safely and without risks to health, including sufficient and suitable traffic routes and safe walkways with relevant signage.
- Access roads to be maintained in a suitable condition.
- Suitable erosion protective measures to be implemented for access roads during the construction phase.
- Provision for animal movement corridors must be made in the construction of access roads. Permanent access roads must include terrestrial underpasses of at least 1.5 m high and 1.0 m wide to facilitate animal crossing. Barriers must be placed on either side of the roads to prevent animals from crossing the road surface, and precautionary signs to warn motorists to slow down must be placed along roads adjoining sensitive environmental areas.
- Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented.
- Clearly demarcate all access roads.
- All fences erected for construction purposes (e.g. fences around camp sites, fencing around trenches, etc.) should be inspected on a daily basis to detect whether any damage has occurred. Damaged fences / barricading to be repaired immediately.
- Temporary access roads must not be opened until required and must be restored to its former state as soon as the road is no longer needed.
- All reasonable precautions must be taken during construction to avoid severely interrupting the traffic flow on existing roads, especially during peak periods.
- Before any work can start, the Local Traffic Department must be consulted about measures to be taken regarding pedestrian and vehicular traffic control.

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Signage displayed.
- Contractor's method statement.

**12.2.11 Management of Waste****Management Objective:**

- Minimise environmental impacts associated with waste.
- Apply waste management principles of prevent, minimise, recycle or re-use, with disposal as a last option.

**Target:**

- No littering on construction site.
- Maintain a clean and tidy construction site.
- 100% record of all waste generated and disposed at waste disposal facilities.
- Valid disposal certificates for all waste disposed.
- Provision of adequate waste containers that are easily accessible and maintained.
- Waste bins to be removed and cleaned weekly.

**Management Actions:**

- Waste management activities must comply with the National Environmental Management: Waste Act (No. 59 of 2008).
- Vermin / weather-proof bins will be provided in sufficient numbers and capacity to store domestic waste. These bins must be kept closed to reduce odour build-up and emptied regularly to avoid overfilling and other associated nuisances.
- Where possible, waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes).
- Provide waste skips at the construction areas. These skips should be sufficient in number, the skip storage area should be kept clean, skips should be emptied and replaced before overflowing or spillage occurs.
- Ensure daily site clean-ups to prevent the build-up of litter
- The Contractor will ensure that no burying, dumping or burning of waste materials, vegetation, litter or refuse occurs. All waste will be disposed of at suitable licensed disposal sites, based on the waste type (general versus hazardous).
- Ensure that solid waste is transported so as to avoid waste spills en-route.
- The following requirements shall be incorporated into the waste management programme:

- Solid Waste:
  - Littering on site and the surrounding areas is prohibited.
  - Clearly marked litterbins must be provided on site. The Contractor must monitor the presence of litter on the work sites as well as the construction campsite.
  - All bins must be cleaned of litter regularly.
  - All waste removed from site must be disposed at a municipal/permitted waste disposal site.
  - Excess concrete, building rubble or other material must be disposed of in areas designated specifically for this purpose and not indiscriminately over the construction site.
  - The entire works area and all construction sites must be swept of all pieces of wire, metal, wood or other material foreign to the natural environment.
  - Contaminated soil must be treated and disposed of at a permitted waste disposal site, or be removed and the area rehabilitated immediately.
  - Waste must be recycled wherever possible.
- Liquid Waste
  - The Principal Contractor must install and maintain mobile toilets at work sites.
  - The Principal Contractor must provide adequate and approved facilities for the storage and recycling of used oil and contaminated hydrocarbons. Such facilities must be designed and sited with the intention of preventing pollution of the surrounding area and environment.
  - All vehicles must be regularly serviced in designated area within the Contractors camp such that they do not drip oil. Where required, vehicles will be serviced in bunded areas and drip trays will be provided.
  - All chemical spills must be contained and cleaned up by the supplier or professional pollution control personnel. Run-off from wash bays must be intercepted.
- Hazardous Waste:
  - No hazardous materials must be disposed of in the veld or anyplace other than a registered landfill for hazardous material. Hazardous waste must be stored in containers with tight lids that must be sealed and must be disposed at an appropriately permitted hazardous waste disposal site. Such containers must not be used for purposes other than those originally designed for.
  - The Principal Contractor must maintain a hazardous material register.

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Public complaints register.
- Waste register.
- Recycling targets.
- Disposal certificates.
- Contractor's method statement.

**12.2.12 Management of Pollution Generation Potential****Management Objective:**

- Ensure that all possible causes of pollution are mitigated as far as possible to minimise impacts to the surrounding environment.

**Target:**

- No complaints regarding pollution.
- No measurable signs of pollution.
- Noise - Comply with SANS 10103:2008.
- All water discharges to comply with legal requirements associated with the National Water Act (Act No. 36 of 1998).

**Management Actions:****General –**

- No waste of a solid, liquid or gaseous nature shall be emitted from the site without approval by the Engineer.
- Accidental pollution incidents shall be reported to the ECO immediately they occur and shall be cleaned-up (to the satisfaction of the Co-ordinator Environmental Rehabilitation or Environmental Control Officer) by the Contractor or a nominated clean-up organization at the expense of the Contractor.

**Water –**

The following requirements for water pollution management shall apply:

- Adequate sedimentation control measures must be instituted at any river crossings when excavations or disturbance of a riverbanks or riverbeds takes place.

- Adequate sedimentation control measures must be implemented where excavations or disturbance of drainage lines of a wetland may take place.
- All fuel, chemical, oil, etc. spills must be confined to areas where the drainage of water can be controlled. Use appropriate structures and methods to confine spillages such as the construction of berms and pans, or through the application of surface treatments that neutralise the toxic effects prior to the entry into a watercourse.
- Oil absorbent fibres must be used to contain oil spilt in water.
- During construction through a wetland, the majority of the flow of the wetland should be allowed to pass downstream.
- Vehicular traffic across wetland areas must be avoided.
- No dumping of foreign material in streams, rivers and/or wetland areas is allowed.
- The wetland area and/or river must not be drained, filled or altered in any way including alteration of a bed and/or, banks, without prior consent from the DWA. The necessary licenses must be obtained in terms of Section 21 and 22 of the National Water Act, 36 of 1998 from DWAF.
- No fires or open flames are allowed in the vicinity of the wetland, especially during the dry season.
- No swimming, washing (including vehicles and equipment), fishing or related activity is permitted in a wetland or river without written permission from the Project Manager.
- Disturbances to nesting, breeding and roaming sites of animals in or adjacent to wetland areas must be minimized.

#### **Air –**

The following requirements for air pollution management shall apply:

- Speed limits must be implemented in all areas, including public roads and private property to limit the levels of dust pollution.
- Dust must be suppressed on access roads and construction sites during dry periods by the regular application of water or a biodegradable soil stabilisation agent. Water used for this purpose must be used in quantities that must not result in the generation of run-off.
- The site-specific investigation will quantify the impact of dust on nearby wetlands, rivers and dams in terms of sedimentation. Mitigation measures identified during the site specific study must be implemented.
- The Contractor must notify the Principal of all schools within 50m of the site of proposed activities. The Principal must in turn ensure that children with allergies and respiratory ailments take the necessary precautionary measures during the construction period. The Contractor must ensure that construction activities do not disturb school activities e.g. dust clouds may reduce visibility affecting sports activities.

- Waste must be disposed of, as soon as possible at a municipal transfer station, skip or on a permitted landfill site. Waste must not be allowed to stand on site to decay, resulting in malodours.
- Noise control measures must be implemented. All noise levels must be controlled at the source. All employees must be given the necessary ear protection gear. Interested and affected parties must be informed of the excessive noise factors.
- The Contractor must inform all adjacent landowners of any after-hour construction activities and any other activity that could cause a nuisance e.g. the application of chemicals to the work surface. Normal working hours must be clearly indicated to adjacent landowners.
- No loud music is allowed on site and in construction camps.
- No fires are allowed if smoke from such fires will cause a nuisance to IAPs.

#### **Soil –**

The following requirements for soil pollution management shall apply:

- Topsoil should be temporarily stockpiled, separately from (clay) subsoil and rocky material, when areas are cleared. If mixed with clay sub-soil the usefulness of the topsoil for rehabilitation of the site will be lost.
- Stockpiled topsoil should not be compacted and should be replaced as the final soil layer. No vehicles are allowed access onto the stockpiles after they have been placed.
- Stockpiled soil should be protected by erosion-control berms if exposed for a period of greater than 14 days during the wet season. The need for such measures will be indicated in the site-specific report.
- Topsoil stripped from different sites must be stockpiled separately and clearly identified as such. Topsoil obtained from sites with different soil types must not be mixed.
- Topsoil stockpiles must not be contaminated with oil, diesel, petrol, waste or any other foreign matter, which may inhibit the later growth of vegetation and microorganisms in the soil.
- Soil must not be stockpiled on drainage lines or near watercourses without prior consent from the Project Manager.
- Soil should be exposed for the minimum time possible once cleared of invasive vegetation, that is the timing of clearing and grubbing should be co-ordinated as much as possible to avoid prolonged exposure of soils to wind and water erosion. Stockpiled topsoil must be either vegetated with indigenous grasses or covered with a suitable fabric to prevent erosion and invasion by weeds.
- Limited vehicular access is allowed across rocky outcrops and ridges.
- All cut and fill surfaces need to be stabilized with appropriate material or measures when major civil works are complete.

- Erosion and donga crossings must be dealt with as river crossings. Appropriate soil erosion and control procedures must be applied to all embankments that are disturbed and destabilized.
- All equipment must be inspected regularly for oil or fuel leaks before it is operated. Leakages must be repaired on mobile equipment or containment trays placed underneath immobile equipment until such leakage has been repaired.
- Soil contaminated with oil must be appropriately treated and disposed of at a permitted landfill site or the soil can be regenerated using bio-remediation methods.
- Channelling water into existing surface drainage system must reduce runoff.

**Noise –**

- The provisions of SANS 10103:2008 will apply to all areas at the perimeter of the site, within audible distance of residents.
- Working hours to be agreed upon with Project Manager, so as to minimise disturbance to landowners and community members.
- No amplified music will be allowed on the site. The use of radios, tape recorders, compact disc players, television sets etc. will not be permitted unless at a level that does not serve as an intrusion to adjacent land-owners.
- Construction activities generating output levels of 85 dB or more will be confined to the hours during normal working hours.
- The Contractor will take preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to minimise complaints regarding noise and vibration nuisances from sources such as power tools.

**Dust –**

- Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas, including construction area, access roads, borrow pits, site yard, etc.
- Fine materials must be covered during transportation
- Speed limits to be strictly adhered to.
- The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, and pre-notification of affected parties).

**Lights –**

- Prior to construction the position and type of lighting will be planned to ensure unnecessary light pollution will be eliminated.
- All lighting installed on site must not lead to unacceptable light pollution to the surrounding community and natural environment (e.g. use of down-lighters).

**Erosion–**



- Protect areas of the construction site that are susceptible to erosion through suitable measures (e.g. watering, planting, retaining structures, commercial anti-erosion compounds).
- Particular care must be taken to prevent carrying of sediment onto roadways.
- Any erosion channels caused by construction activities to be suitably stabilised and rehabilitated.
- All efforts to prohibit ponding on surface and ensure stormwater runoff is channelled from the site must be made. The method used will be appropriate to the expected stormwater flows and the topography and geology of the site.

#### **Cement and Concrete Batching –**

- Cement mixing to take place on an impervious surface (e.g. cement mixing pit).
- Batching operations to take place in a designated area, which will be kept clean at all times.
- Location of batching plant to be approved by the Project Manager, with due consideration of the relevant management measures.
- Ensure separation of clean and dirty water from batching plant.
- Wastewater from batching operations to be suitably disposed of.
- Waste concrete and cement sludge to be removed on a regular basis (to prevent overflowing) and to be disposed of at a suitable facility.
- Unused cement bags will be stored in an area not exposed to the weather and packed neatly to prevent hardening or leakage of cement.
- Used cement bags will be stored so as to prevent windblown dust and potential water contamination. Used bags will be disposed of adequately at a licenced waste disposal facility.
- Limit concrete batching to single sites where possible.
- Concrete transportation will not result in spillage.
- Cleaning of equipment and flushing of mixers will not result in pollution, with all contaminated wash water entering the waste water collection system.
- To prevent spillage onto roads, ready mix trucks will rinse off the delivery shoot into a suitable sump prior to leaving the site.
- Suitable screening and containment will be in place to prevent windblown contamination from cement storage, mixing, loading and batching operations.
- All contaminated water and fines from exposed aggregate finishes will be collected and stored in sumps and will be adequately disposed of.
- All visible remains of excess concrete will be physically removed on completion of the plastering or concrete pouring and disposed of in an acceptable manner.
- Any spilled concrete to be cleaned up immediately.

*In practice all wastes arising from construction activities are to be handled; transported and disposed of in accordance with the relevant regulations. All efforts should be made to minimise, reclaim or recycle waste, and failing that, dispose of it in a manner licensed by the government for that purpose.*

**Pollution control –**

- Remove from site all pollution containment structures.
- Remove from site all temporary sanitary infrastructure and waste water disposal systems. Take care to avoid leaks, overflows and spills and dispose of any waste in the approved manner.

**Sewage –**

- The Contractor shall provide sanitation facilities at all camps, offices, workshops and construction sites for staff and visitors. No other form of sanitation will be permitted unless a connection with a local sewer main is possible.

**Wastewater –**

- All runoff from fuel depots, workshops, truck washing areas and wash water from concreting vehicles and other equipment shall be collected and directed through oil traps to settlement ponds. The settlement ponds shall be suitably lined at the Contractor's expense if required in the opinion of the Environmental Officer.
- The Contractor shall provide suitable retention and filtration structures (which shall be properly maintained) for the collection of wastewater.

**Solid waste –**

*Definition: "Refuse" refers to all construction waste (such as rubble, cement bags, waste cement, timber, can, other containers, wire and nails), household and office waste.*

- Refuse shall be collected and stored in demarcated, fenced areas in skips and/or bins. The fenced areas or containers should be designed to prevent refuse from being blown out by wind and should be strategically and conspicuously placed throughout the site.
- Wherever possible waste that is recyclable is to be recycled.
- Refuse which cannot be recycled shall be disposed of at a landfill site approved by the Environmental Officer. Refuse may not be burned nor buried on site.
- Construction rubble shall be disposed of in demarcated spoil dumps or at disposal sites approved by the Environmental Officer.

**Hazardous substances –**

The Principal Contractor must ensure that:

- Employees receive the necessary information and training to be able to use and store hazardous chemical substances safely.
- Employees obey lawful instructions regarding:
  - The wearing and use of protective equipment
  - The use and storage of hazardous chemical substances
  - The prevention of the release of hazardous chemical substances
  - The wearing of exposure monitoring and measuring equipment

- The cleaning up and disposal of materials containing hazardous chemical substances
- Housekeeping, personal hygiene and the protection of the environment
- The risk assessments required in terms of Construction Regulation include employee exposure to hazardous chemical substances and that the necessary measures be taken to protect persons from being detrimentally affected by hazardous chemical substances present or used in the workplace.
- Suppliers provide the necessary information in the form of a material safety data sheet regarding hazardous chemical substances required to ensure the safe use and storage of that substances.
- An up-to-date list is kept on site of hazardous chemical substances stored and used together with the material safety data sheet of the hazardous chemical substances.
- Hazardous chemical substances containers be clearly marked with the contents and main hazardous category e.g. “Flammable” or “Corrosive” and the reference number of the hazardous chemical substances on the list indicated above.
- Hazardous chemical substances, for example asbestos dust, are not cleared by using compressed air but should be vacuumed.
- No person eats or drinks in a hazardous chemical substances workplace.
- Hazardous chemical substances waste is disposed of safely in terms of hazardous waste disposal requirements.

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.
- Contractor to conduct environmental monitoring for air quality (dust), noise and water quality.

**Monitoring Requirements:**

- Public complaints register.
- Evidence of pollution.
- Contractor’s method statement.

**12.2.13 Management of Topsoil****Management Objective:**

- Ensure suitable removal, storage, transportation of topsoil for reuse during rehabilitation.

**Target:**

- >95% of recovered topsoil from disturbed areas to be stored for future use.
- No visual evidence of erosion from topsoil stockpiles.

- No visual evidence of erosion from areas where topsoil has been reinstated.

**Management Actions:**

- Determine the average depth of the topsoil prior to excavations.
- Identify suitable areas to store topsoil.
- Remove topsoil from areas to be affected by construction activities.
- Prevent mixing of topsoil with subsoil.
- Topsoil to be adequately protected from contamination from construction activities and material.
- Protect stored topsoil from compaction.
- Wind and water erosion-control measures to be implemented to prevent loss of topsoil.
- Do not store topsoil in drainage lines or areas exposed to strong winds or heavy rain
- Following the construction phase, the topsoil should be used in rehabilitation of affected areas and landscaping around the development

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Topsoil stockpiles.
- Dust monitoring.
- Rehabilitated areas.
- Contractor's method statement.

**12.2.14 Management of Excavations****Management Objective:**

- Minimise environmental impacts associated with excavations.

**Target:**

- No damage to sensitive environmental features outside construction area during excavations.

**Management Actions:**

- Construction activities to remain within the designated construction areas.
- Subsoil and overburden should be stockpiled separately to be returned for backfilling in the correct soil horizon order.

- Suitable barricading to be erected around open excavations / trenches, as per the Construction Regulations (2003). Provide signage as a warning of open excavations.
- Divert runoff away from excavations, where necessary.
- Trench lengths will be kept as short as practically possible.
- Trench walls are to be stabilised using battering, shoring and bracing or similar techniques depending on the stability of the trench sides (where relevant).
- Inspect open trenches at least daily basis to ensure that animals have not become trapped. Such animals will be safely removed and released, where possible. Special equipment for handling of venomous snakes should be available on site to ensure safe removal.
- Filing of trenches to make provision for subsidence.

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Barricading of excavations.
- Excavation register.
- Contractor's method statement.

**12.2.15 Management of Flora****Management Objective:**

- Preserve protected flora species outside of construction areas.
- Control alien plants and noxious weeds.

**Target:**

- No unpermitted disturbance to protected flora species.
- On-going eradication of alien plants and noxious weeds.

**Management Actions:**

- Comply with the requirements of the National Environmental Management: Biodiversity Act (No. 10 of 2004), National Forests Act (No. 84 of 1998) and National Veld and Forest Fire Act (No. 101 of 1998).
- Employ on site personnel responsible for preventing and controlling potential soil pollution through fuel and oil leaks and spills.
- Make sure construction vehicles are maintained and serviced to prevent oil and fuel leaks.

- Emergency on-site maintenance should be done over appropriate drip trays and all oil or fuel must be disposed of according to waste regulations. Drip-trays must be placed under vehicles and equipment when not in use.
- Require the suitable establishment of erosion control mechanisms
- Promote awareness to all personnel.
- During construction activities, monitoring and control of alien weeds and invaders through hand removal; slashing (annuals) or chemical control (perennials). Chemical control may only be done upon approval from the Environmental Control Officer (ECO).
- The Contractor should employ personnel on site responsible for preventing and controlling of litter. Promote housekeeping with daily clean-ups on site.
- Before construction commences, construction workers should be educated with regards to littering, ad hoc veld fires, and dumping.
- No fires are allowed on site.
- Construction activities should be restricted to the footprint area. All workers must be trained before construction commences.
- Retain vegetation within the construction site, wherever possible.
- Rehabilitation Management Plan to be developed for the proposed development. Particular care must be taken to address mitigation of edge effects emanating from the development.
- No trees to be felled for fuel purposes.
- Inspect rehabilitated area at three monthly intervals during the first and second growing season to determine the efficacy of rehabilitation measures.

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Encroachment of alien invasive plants and noxious weeds.
- Successful rehabilitation.
- Contractor's method statement.

**12.2.16 Management of Fauna****Management Objective:**

- Ensure the protection of animals

**Target:**

- No direct / indirect harm to animals from construction activities.

**Management Actions:**

- Comply with the requirements of the National Environmental Management: Biodiversity Act (No. 10 of 2004), Natal Nature Conservation Ordinance 15 of 1974 and Animal Protection Act (No. 71 of 1962).
- No wilful harm to any animals, unless a direct threat is posed to a worker's health or safety.
- Animals residing within the designated area shall not be unnecessarily disturbed.
- Before construction starts, construction workers must be educated with regards to littering and poaching.
- The Contractor and his/her employees shall not bring any domestic animals onto site.
- Toolbox talks should be provided to contractors regarding disturbance to animals. Particular emphasis should be placed on talks regarding snakes.
- Construction areas must be demarcated but should allow for the migration of small faunal species out of the construction zone. Fencing types must be selected for minimal disturbance to animal movement corridors (e.g. palisade fencing is preferable to diamond-mesh fencing).

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Contractor's method statement.

**12.2.17 Management of Water****Management Objective:**

- Minimise environmental impacts associated with storm water as well as water services for construction workers.
- Minimise storm water runoff from the site onto neighbouring roads.
- Minimise water use through recycling and water efficient practices.

**Target:**

- No visual evidence of erosion caused by wastewater or storm water practices.
- No environmental contamination associated with wastewater or storm water practices.

**Management Actions:**

- All construction activities to comply with the National Water Act (Act No. 36 of 1998).

- The design of the development must incorporate the SANS 0306:1999 code of practice for the managing of potable water in distribution systems.
- Manage storm water from construction site to avoid environmental contamination and erosion.
- Prevent leakages from pipes or taps.
- Establish a dedicated vehicle maintenance area and wash-bay, where suitable storm water management measures are in place to prevent pollution.
- Manage storm water from construction site to avoid environmental contamination and erosion. Settling will be allowed for in a high-capacity attenuation pond downstream of the site.
- Storm water runoff from workshops, vehicle maintenance area, wash-bays and other potential pollution sources shall be collected and treated in hydrocarbon separation pits/tanks before discharged to drains and waterways.
- Measures must be taken to divert unpolluted water and runoff away from the site.
- All discharges to comply with legal requirements associated with the National Water Act (Act No. 36 of 1998).
- Prevent erosion on access roads due to construction traffic.
- No waste water to be released to natural drainage lines.
- Ensure proper storage of material (including fuel, paint) that could cause water pollution. Ensure proper storage and careful handling of hazardous substances with spill prevention materials at hand.
- Reduce sediment loads in water from dewatering operations. All dewatering should be done through temporary sediment traps (e.g. straw bales). These are to be serviced regularly and removed when no longer in use. Materials can be re-used.

**Responsibilities:**

- Project Manager and ECO – to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

- Public complaints register.
- Water monitoring programme – discharges.
- Disposal certificates
- Contractor's method statement.

**12.2.18 Management of Watercourses****Management Objective:**



- Ensure that the wetlands and other water bodies on and nearby the site are protected and incur minimal negative impact to resource quality.

**Target:**

- Minimise the habitat unit destruction and potential loss of wetland/aquatic-dependent biodiversity.
- The water quality of the river and wetlands must not be altered as a result of construction related activities.

**Management Actions:****Rivers**

- The construction phase should be limited to the dry months of the year (May-October) where possible to limit mobilisation of sediments or hydrocarbon runoff;
- Engineered solutions such as sediment fences or silt traps should be used where appropriate to limit increased sedimentation of surface water resources during construction;
- Minimise the removal of vegetation in the infrastructure footprint area;
- Re-vegetation of the construction footprint as soon as possible;
- Existing access roads must be prioritized to avoid construction of new access roads in the area; and
- The river must not be utilised for abstraction, or washing of equipment, etc., in order to minimise the risk of water pollution during construction activities. All necessary water abstractions from any surface water resource must be authorised as prescribed by the NWA and be subject to the provisions of a water use license and general authorisation
- A spill containment plan is required to be in place prior to construction to minimize the potential impacts of spills or leaks of hazardous substances.
- Quarterly rehabilitation surveys need to be conducted of the vegetation on the riverbanks for a period of at least a year after construction has been completed to assess vegetation regrowth and recovery.
- An alien invasive plant management plan needs to be compiled and implemented post construction to prevent the growth of invasive on cleared areas.
- Contamination of the river system with unset cement or cement powder should be negated as it is detrimental to aquatic biota.

**Wetlands**

- To prevent soil compaction in the wetland, the surface sediments should be lightly loosened after heavy machinery and vehicles have passed through the wetland areas;
- Areas of bare soil should be revegetated with plugs or mats of *Cynodon dactylon* (Couch Grass) and *Imperata cylindrica* (Cottonwool Grass) to prevent erosion during floods;

- Steel containment structures should be fitted along the length of the section of pipeline that crosses the wetland and
- Diesel/oil spills should be reported within 24 hours and a spillkit should be readily available within proximity to the site to clean up the spill.
- Excavated soil should be stored and separated by means of top soil and sub soils so that the soil profile could be replicated (to some extent) for backfilling of the trenches;
- All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the wetland areas.
- No equipment may be washed within the watercourse, nor may dumping of construction material into the drainage system take place.
- Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel. It may lead to the direct.
- Make use of existing access routes, or where required, limit the number and extent of access routes for construction traffic across watercourses that may lead to the erosion of banks and disturbances of riparian vegetation.
- Prevent uncontrolled access of vehicles through wetlands that can cause a significant adverse impact on the hydrology and soil structure of these areas through rutting (which can act as flow conduits) and through the compaction of soils.
- For wetland / riparian crossings, pipe should span these areas as much as possible, making use of existing structures (i.e. bridges).
- Excavated material/sediments/spoil from the construction zone (including any foreign materials) should not be placed or stockpiled within wetlands, including the riparian zone of streams/rivers.
- During trenching, flows should be diverted around active work areas where required. Water diversion needs to be temporary and re-directed flow must not be diverted towards any stream banks that could cause erosion.
- The DWS must approve any abstraction of water from rivers/wetlands for construction purposes.
- Construction activities in wetlands (including trenching, pipe installation, backfill, and restoration of the wetland surface) must be completed within 24 hours where possible.

#### 12.2.19 Management of Archaeological and Cultural Features

##### Management Objective:

- To have no adverse impact on the historical inheritance of the area.
- The protection of land considered to be of traditional cultural value.
- The protection of known archaeological sites against vandalism, destruction and theft during the construction phase.
- To avoid damage to or destruction of previously unknown or excavated archaeological artefacts during construction.

- The preservation and appropriate management of new findings should these be discovered during construction.

**Management Target:**

- No archaeological and cultural resources or graves to be damaged during construction.

**Actions:**

- For any chance finds, all work will cease in the area affected and the Contractor will immediately inform the Project Manager. A registered heritage specialist must be called to site for inspection. The relevant heritage resource agency must be informed about the finding.
- Permits to be obtained in terms of the National Heritage Resources Act (No. 25 of 1999) if heritage resources are to be impacted on and for the removal of graves.
- Should any remains be found on site that is potentially human remains, the South African Police Service and archaeologist should also be contacted.
- All archaeological, palaeontological and historical sites older than 50 years are protected in terms of the National Heritage Resources Act No 25 of 1999. In terms of this Act it is an offence to disturb any part of such site or material without a permit, should an archaeological or other such discovery be made during any excavations.
- Under no circumstances shall archaeological artefacts be removed, destroyed or interfered with by the Contractor, his employees, his sub-contractors or his sub - contractors' employees. Any person who causes intentional damage to archaeological or historical sites and artefacts could be penalised or legally prosecuted in terms on the Act.

**Responsibilities:**

- Project Manager and ECO - to check.
- Contractor to implement management actions.

**Monitoring Requirements:**

Contractor's method statement.

**12.2.20 Clearance of site on completion****Management Objective:**

Minimise negative impacts on environment during the various project phases. As a result less work will be required on completion.

**Management Actions:**

- All waste (domestic and construction) to be removed from site on a regular basis to prevent storage of excess waste and its associated risks.

- On completion of the works the Contractor shall clear away and remove from the site all constructional plants, surplus of materials, foundations, plumbing and other fixtures, rubbish, waste, and temporary works of every kind.
- Areas thus cleared shall be graded and scarified to restore the ground to its original profile as near as practicable before topsoil placement.
- All waste and rubble is to be disposed of at a designated refuse site.
- Proof of final dumping waste disposal will need to be kept on file for possible audit purposes.

#### 12.2.21 Management of Rehabilitation and Operation

##### Management Objective:

- Adequate reinstatement and rehabilitation of construction areas
- Conduct concurrent or progressive rehabilitation of areas affected by construction activities that are situated outside of the construction footprint.
- Sustainable management of the operational shopping centre to be promoted and enforced.

##### Target:

- Complete site clean-up.
- Reinstatement and rehabilitate areas disturbed by construction activities that are located outside of the construction area.
- Landscaping of the finished development to complement the surrounding area.

##### Management Actions:

###### Removal of structures and infrastructure

- After the construction phase, the area outside of the construction area must be rehabilitated by appropriate landscaping, levelling, topsoil dressing, land preparation, alien plant eradication and vegetation establishment. This includes areas that were indirectly affected by construction.
- Clear and completely remove from site all construction plant, equipment, storage containers, temporary fencing, temporary services, and fixtures.
- Ensure that all access roads utilised during construction which are outside of the development and not earmarked for use during the operational phase, are returned to a state no worse than prior to construction.

###### Inert waste and rubble

- Clear the site of all inert waste and rubble, including surplus rock, foundations and batching plant aggregates. After the material has been removed, the site shall be re-instated and rehabilitated.
- Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal site, or with a registered service provider.

###### Hazardous waste and pollution control

- Remove from site all pollution containment structures.
- Remove from site all temporary sanitary infrastructure and waste water disposal systems. Take care to avoid leaks, overflows and spills and dispose of any waste in the approved manner.

**Landscaping**

- Make safe all excavations outside of the construction area by backfilling and grading, as required.
- In general, no slopes steeper than 1(V):3(H) are permitted in cut-and-fill areas, unless otherwise specified by the Project Manager.
- Programme the backfill of excavations so that subsoil is deposited first, followed by the topsoil. Compact in layers for best results.
- Monitor backfilled areas for subsidence (as the backfill settles) and fill depressions using available material.
- Shape the area surrounding the development to blend in with the surrounding landscape, where possible. Landscaping shall be done through the use of indigenous plant species, following water-conscious design principles.
- Ensure that no excavated material or stockpiles are left on site and that all material remaining after backfill is landscaped to blend in with the surrounding landscape.

**Topsoil replacement and soil amelioration**

- Execute top soiling activity prior to the rainy season or any expected wet weather conditions.
- Execute topsoil placement only after all construction work has ceased.
- Replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas of the construction site, including temporary access routes. Replace topsoil to the original depth.
- Place topsoil in the same area from where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality.
- The suitability of substitute material will be determined by means of a soil analysis addressing soil fraction, fertility, pH and drainage.
- Do not use topsoil suspected to be contaminated with the seed of alien vegetation (e.g. black wattle). Alternatively, the soil is to be appropriately treated.
- Ensure that storm water run-off is not channelled alongside the gentle mounding, but that it is taken diagonally across it.
- Shape remaining stockpiled topsoil not utilised elsewhere in an acceptable manner so as to blend in with the local surrounding area.
- After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.

**Ripping and scarifying**

- Rip and/or scarify all areas following the application of topsoil to facilitate mixing of the upper most layers. Whether ripping and/or scarifying is necessary will be determined based on the site conditions immediately before these works begin.
- Rip and/or scarify all disturbed (and other specified) areas of the construction site, including temporary access routes and roads, compacted during the execution of the works.
- Rip and/or scarify along the contour to prevent the creation of down-slope channels.
- Do not rip and/or scarify areas under wet conditions, as the soil will not break up.

#### **Planting Trees**

- All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
- Tree seedling material should be fresh and of local origin. Resist using plants from far afield as they may not be best suited to local climatic or soil conditions.
- Small seedlings are likely to transplant more successfully than will large ones. These should be potted and kept under nursery conditions until they are large enough to plant out.
- Establish further specifications for seeds and seedlings.

#### **Grassing**

- Suitably trained personnel must undertake grassing by making use of the appropriate equipment and grass species as specified by the terrestrial ecologist.
- Sodding may be done at any time of the year, but seeding must be done during the summer when the germination rate is better.
- Hydroseeding with a winter mix will only be specified where regrassing is urgent, and cannot wait for the summer.
- Establish further specifications for sods, runners and hand seeding.

### **12.3 Operational Phase**

#### **12.3.1 General Environmental Management**

Note that where any activity and aspect associated with the operational phase of the project coincides with the receiving environment and activities of the construction phase (see **Section 12.2**), the same management requirements will apply.

#### **12.3.2 Vegetation**

- Monitor the re-growth of invasive vegetative material.
- Cordon off areas that are under rehabilitation as no-go areas.
- Control invasive plant species and noxious weeds by means of extraction, cutting or other approved methods.

- For planted areas that have failed to establish, replace plants with the same species as originally specified.
- Establish further specifications for maintenance.

### 12.3.3 Waste Management

- Develop and implement a waste management system, based on the waste management hierarchy of reduce, re-use, recycle, treatment and disposal.
- All residents must be encouraged to apply best practice in terms of waste management.
- Recycling opportunities to be provided at the centre (e.g. bins).

### 12.3.4 Water Conservation

- Investigate water efficient systems.
- Ensure that water is used sparingly.
- Irrigation systems to function optimally to avoid water wastage.
- Repair leaks timeously.

### 12.3.5 Spillages

- Spillages of hazardous material (e.g. hydrocarbons) to be appropriately cleaned.
- Large spillages of hazardous material (>15litres depending on the nature of the material and the receiving environment), to be cleaned and remediated by a competent service provider.
- Hazardous waste to be appropriately disposed of.

### 12.3.6 Stormwater Management

- Implement stormwater management plan for the development.
- Prevent water quality deterioration of the receiving watercourse from stormwater discharges.
- Prevent erosion associated with stormwater runoff.
- No illegal discharges into the stormwater system to be allowed.

## 13 REFERENCES

DEAT (2004) Environmental Management Plans. Integrated Environmental Management, Information Series 12, Department of Environmental Affairs and Tourism (DEAT), Pretoria.

Lochner, P. 2005. Guideline for Environmental Management Plans. CSIR Report No ENV-S-C 2005-053H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.