

PROPOSED BARBERTON CROSSING COMMERCIAL AND RESIDENTIAL DEVELOPMENT

ENVIRONMENTAL MANAGEMENT PLAN REPORT
MDALA Ref No: 17/2/2/2 MP 19



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EARTH SCIENCE SOLUTIONS (Pty) Ltd

ENVIRONMENTAL MANAGEMENT PLAN:

ENVIRONMENTAL MANAGEMENT PLAN FOR THE PROPOSED BARBERTON CROSSING COMMERCIAL AND RESIDENTIAL DEVELOPMENT

Submitted in terms of Section 24(2)(A) and (D) of the National Environmental Management Act, 1998 (Act no. 107 of 1998) and in terms of Regulation 29 and 32 of Government Notice No. R385 under Section 24(5) of the National Environmental Management Act, 1998 (Act no. 107 of 1998), as amended.

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1. SUMMARY

1.1 Introduction

Barberton's vibrant tourism potential has not been optimally utilized to date. Barberton is not only completely surrounded by rugged mountains and permanent rivulets, but is also situated within the majestic De Kaap Valley and is located on the edge of the magnificent Songimvelo Circle.

The Barberton Mountainland, consisting of the oldest rock types known to man – the Archean Complex- provides a natural environment for the outdoor enthusiast. Activities include geological field trips, hiking in the rugged mountain terrain, paragliding and off-road driving for nature lovers. With Swaziland only 50km away and the Kruger Park about 60km north, Barberton is a natural choice for a holiday adventure for the whole family. The Maputo Corridor also enhances the tourism potential of Barberton.

Development proposals were called for by the Umjindi Municipality during March 2006 (Notice: 14/2006; Tender:7/2006) from prospective developers for the acquisition and development of a portion of the remaining extent of the farm Barberton Townlands 369JU . Together with the calling for development proposals, Umjindi Municipality notified the proposed alienation of prime municipal land for Commercial, Business and other business related activities as stipulated **by section 79(18) of the Ordinance on Local Government, 1939 (Ordinance 17 of 1939, as amended)** and resolved by Council per resolution A.237 of 27 May 2003 and A.211 of August 2005. This area referred to is situated directly north of the intersection on the Nelspruit/Bulembu and Barberton/Kaapmuiden Routes.

The successful developer/buyer will further be liable for all costs incurred in respect of valuation, public notices, surveying, environmental impact assessment process, the provision of link and internal services and town planning procedures with regard to the property.

Therefore, an opportunity existed to become part of the exciting “Songimvelo Circle” tourism growth point identified on both provincial and national level. With the planned “Royal Route” to the sea, a tourism bio-diversity corridor via Barberton and Swaziland to Mozambique, this attractive historical town will become a focal point for tourists.

There was also a period given for civil society, authorities, businesses, etc to object to the exercise of the Municipality's power to alienate the property and was called upon to lodge such objection in writing with the Municipality within a period of fourteen (14) days from date of the publication.

Tautoni Property development was the successful developer and was awarded the development proposal.

1.2 Project description

The proposed Barberton Crossing Development entails the development of commercial and residential properties to promote business, job creation, tourism and housing on a portion of Portion 14 of the farm Barberton Townlands 369JU. The residential component will consist of 180 residential units (30 units per hectare). The envisaged development area will be 18 hectares. The commercial component will consist of retail stores, value mart, restaurants, tourism shops, hotel, filling station and motor show room for new vehicles.

The total size of Portion 14 of the farm Barberton Townlands 369 JU is about 346,8ha in extent.

2. OBJECTIVES OF THE ENVIRONMENTAL MANANAGMENT PLAN (EMP)

This document provides the appropriate mitigation measures designed to minimise or to eliminate significant adverse impacts that may result from the construction, operational, decommissioning and operational activities.

The primary objectives of the EMP are to:

- Describe actions for achieving the mitigation measures prescribed, inter alia, by the EIA
- Define organisational and administrative arrangements for environmental management and monitoring of the work contract, including defining co-ordination, liaison and reporting procedures and responsibilities of staff.
- Ensure that site supervision staff understand the recommended pro-active environmental management measures, so that potential problems can be identified and mitigation measures adopted prior to rehabilitation work being carried out, and to
- Define actions for environmental control, in the event of pollution or similar events requiring action.

3. ENVIRONMENTAL ASPECTS ANDF IMPACTS

3.1 Environmental aspects

Environmental aspects are defined as ‘those components of the development’s activities, products and services that are likely to interact with or change the environment’. Examples of environmental aspects are:

- waste generation and disposal (both general and hazardous)
- storm water discharge
- chemical use operational
- use of natural resources
- product disposal, etc

3.2 Environmental impacts

Environmental impacts are defined as ‘any change to the environment, whether adverse or beneficial, resulting from an environmental aspect’. Listed below are some environmental impacts that could adversely affect the environment:

- pollution of surface and groundwater resources by contaminated runoff
- emission of harmful gases and/or particulates into the atmosphere
- reduction of biodiversity in an ecosystem
- loss or degradation of conservation importance land and the occurrence of erosion

Primarily the aim of the EMP, is to recognise the environmental aspects associated with each activity, as well as its environmental effects, and plan the activity in such a way that adverse impacts are minimised or prevented, but benefits are enhanced. An EMP is a dynamic plan that must be adapted as and when necessary. In the event that the planned results are not achieved because of misapplication or inadequacy of the measures applied, the situation should be analysed and assessed critically, by specialists if deemed necessary, with the objective of developing effective measures.

4. LEGAL REQUIREMENTS

This EMP, once approved by MDALA, becomes a legally enforceable commitment that must be honoured by Tautoni Property Development.

With reference to any construction or service work performed by a contractor to Tautoni Property Development, the EMP must form an integral part of the contract documents, informing the contractor about his duties and obligations in the fulfilment of the project objectives, with particular reference to the prevention of adverse environmental impacts associated with the contractor’s activities. The contractor shall note that obligations imposed by the EMP are legally binding in terms of environmental statutory legislation and in terms of amendments to the Particular Conditions of Contract that pertain to the services provided by the contractor. If any rights and obligations contained in this document contradict those specified in the standard or project specifications, then it is the responsibility of the contractor to bring such contradictions to the attention of Tautoni Property Development. The responsible Tautoni Property Development Project Manager(s) must resolve such contradictions appropriately without detracting from the objectives of the EMP.

The responsible project manager of Tautoni Property Development and all Contractors providing services pertaining to the envisaged development, must be conversant with all relevant environmental and safety legislation. In addition, they must also take cognisance of Provincial and Local Government Ordinances that may be applicable to this development.

5. DOCUMENT LAYOUT

This EMP is divided into the following sections:

1. Management guidelines: forms the basis for environmental management on site
2. General mitigation measures: pre-construction, construction, operational and rehabilitation activities- which involves those environmental issues, procedures and controls that relate to projects of this nature in general
3. Specific mitigation measures: construction, operational and rehabilitation activities- which are those specific environmental issues, procedures and controls, that are relevant to the envisaged development coming from the specialists studies.

6. MANAGEMENT GUIDELINES

These guidelines form the basis for environmental management on site. An EMP should be viewed as a dynamic document that must be updated from time to time, e.g. after obtaining comment from regulating authorities and other stakeholders, during construction and throughout the operational life of the activities.

It must also be a living document in the sense that environmental management must be integrated and sustainable, along with health and safety and general management of the activities.

Should these guidelines require modification or additions during the project, this shall be done at the discretion of the Environmental Control Officer (ECO). The ECO shall ensure that any modifications are communicated, explained to and discussed with all affected parties (i.e. the authorities, proponent the contractors and the operational personnel).

6.1 Resource allocation

In order to ensure that this EMP is implemented, the following staff resources shall be made available:

1. An Environmental Control Officer (ECO) is appointed by Tautoni Property Development (TPD) to assume responsibility for ensuring the environmental management measures contained in this document are implemented during construction and operational of activities.
2. A Project Manager, appointed by Tautoni Property Development to manage construction of activities as per envisaged development. The project manager also has over-all responsibility for managing the project, Contractors and consultants and for ensuring that the environmental management requirements are met. The Consulting Engineer may also act as the Project manager. The project manager has the authority to stop any construction activity in contravention of the EMP in accordance with an agreed warning procedure.

3. Resident Engineer, is the consulting engineer's representative on site. Has the power/mandate to issue site instructions and in some instances, variation orders to the contractor, following request by the ECO. The Resident Engineer oversees site works, liaison with the contractors and the ECO.
4. Other roles as deemed necessary

6.1.1 *Specific duties of the ECO with respect to environmental management*

The ECO must:

- Know the background to the project and monitor the implementation of the EMP
- Act as a guide, advisor and consultant to the project manager and contractors on environmental issues during construction, implementation and rehabilitation
- Arrange for a post-construction audit, followed by regular auditing of environmental performance to ensure continued compliance with the EMP
- Identify non-compliances and problem areas, and provide action plans to avoid costly stoppages and / or further environmental damage
- Ensure that open communication lines exist for reporting of any significant environmental incidents to the MDALA and to resolve any problems or complaints from the public rapidly
- Propose changes (for approval) to the EMP as necessary. Update the EMP on a regular basis in consultation with the neighbouring property owners and all affected stakeholders
- Ensure that all environmental permitting requirements are met

6.1.2 *Training*

The Project Manager, together with the ECO shall ensure that adequate environmental training of all Contractors and labourers, as well as Tautoni Property Development operating personnel, takes place. All employees / Contractors shall have an induction presentation on environmental awareness. The cost, venue and logistics shall be Tautoni Property Development's responsibility. Where possible, the presentation needs to be conducted in the language of the employees / contractors. The environmental training shall, as a minimum, include the following:

- Sensitive and no go areas on site
- The importance of conformance to the EMP
- The significant environmental impacts, actual or potential, of their work activities
- The environmental benefits of improved personnel performance
- Their roles and responsibilities in achieving conformance with the EMP, including emergency preparedness and response requirements
- The potential consequences of departure from specified operating procedures
- The mitigation measures required to be implemented when carrying out their work activities

6.1.3 *Responsible parties*

- Responsibility for the implementation of the EMP lies with Tautoni Property Development . This responsibility shall be delegated to contractors for practical purposes, but Tautoni Property Development shall retain legal responsibility
- On-site assistance, monitoring of construction (to ensure compliance with this EMP) and environmental reporting shall be the responsibility of Tautoni Property Development by way of an appointed ECO, employed by Tautoni Property Development. Should there be inadequate on-site experience; the assistance of external consultants shall be sourced.

6.1.4 *Monitoring and compliance by the Contractors*

The ECO shall review the environmental management performance of the Contractors on a regular basis. The Contractors shall be deemed not to have complied with the environmental mitigation measures if:

- The measures of the EMP have not been met;
- There is evidence of negligence or recklessness resulting in the contravention of any of the clauses, both within and outside the boundaries of the construction site;
- The contractor fails to comply with corrective action or other instructions from the ECO or project manager
- The contractor fails to respond to complaints from the public. These complaints will be communicated to the contractor via the ECO or project manager;
- The contractor's staff found poaching, harvesting plants or entering neighbouring areas.

ENVIRONMENTAL MANAGEMENT PLAN: BARBERTON CROSSINGS RESIDENTIAL AND COMMERCIAL DEVELOPMENT

NO	ASPECT (of Activity, Service or Product)	POTENTIAL IMPACT	MITIGATION MEASURE(S)	RESPONSIBLE PERSON / PARTY	TIME-FRAME (Construction, Operational and Rehabilitation phases unless stated otherwise)	For ECO Monitoring Purposes only – Successfully Implemented / Corrective action required (To be completed by ECO)
7.1	Initial planning	Water pollution, air pollution, etc.	<ul style="list-style-type: none"> Prepare and submit a detailed master plan 3 months prior to Site Establishment, to TPD for approval 	Planners/ designers	Pre- construction	
			<ul style="list-style-type: none"> Landscape design of the construction site to be undertaken in conjunction with TPD 	Proponent	Pre- construction	
			<ul style="list-style-type: none"> Demarcate all work areas on site 	Planners designers /	Pre- construction	
			<ul style="list-style-type: none"> Submit a construction programme to TPD and include all environmental work / issues to be done and addressed on the site 	Contractor	Pre- construction	
			<ul style="list-style-type: none"> Develop a monitoring and auditing protocol for the Construction and operational phase operations 	ECO / Proponent	Pre- construction	
			<ul style="list-style-type: none"> The responsible parties shall ensure that all equity regulations are adhered to 	Contractor / Proponent	Pre- construction	
			<ul style="list-style-type: none"> All compensation policies to be addressed before construction starts 	Contractor / Proponent	Pre- construction	
			<ul style="list-style-type: none"> Monitor the construction site at least every month during the construction phases and maintenance periods and for 1 year after the completion of the 12 months maintenance period (if applicable),for record purposes. Monitoring reports shall be recorded via the construction site meetings to the Contractor or ECO 	Resident Engineer / ECO	construction	
			<ul style="list-style-type: none"> Auditing environment 	ECO	Construction	
<ul style="list-style-type: none"> EMP enforcement / implementation 	ECO / Resident Engineer	Construction				

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			<ul style="list-style-type: none"> • Compliance to relevant applicable legislation (keeping and updating a legal register) 	ECO / Resident Engineer	Construction	
			<ul style="list-style-type: none"> • Make provision on the Site construction meeting’s agenda for: <ul style="list-style-type: none"> - Environmental planning - Rehabilitation - Site management - Access - Conservation - Social - Compensation - Monthly monitoring - Interaction with communities - Reports and records - Incidents and complaints 	ECO / Resident Engineer	Pre-construction, construction	
			<ul style="list-style-type: none"> • The locality map of the proposed development showing the 1:100 year flood line in terms of the National Water Act to be submitted to the Department of Water Affairs and Forestry (DWAF) prior to the establishment of the development. The storm water engineering design plans should also be submitted to DWAF prior to construction activities commencing. The relevant final service agreement pertaining to bulk water supply, sewage connection and waste disposal services should also to be submitted to DWAF 	Proponent	Pre-construction	

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8.1	<u>Site Establishment:</u>	Water pollution, air pollution, etc. The contractor to establish himself with due cognition of the environmental risks associated with the activity	<ul style="list-style-type: none"> The Contractor shall submit as part of the technical Report submitted with his Tender, and environmental management plan approach by which any possible environmental degradation / impact is controlled (mitigated) and prevented. The contractor must also provide a method statement on protocols to be followed, and contingencies to be put in place for the following potential incidents before construction may begin: contamination of natural water resources from spills; contamination of soils from spills; and fire ; waste management 	Contractor / Resident Engineer /ECO	Pre-construction	
			<ul style="list-style-type: none"> Contractor to provide the ECO / Resident Engineer with a complete construction works programme for their approval, prior to construction 	Contractor / Resident Engineer /ECO	Pre-construction	
			<ul style="list-style-type: none"> Identify, map, mark in an approved manner and monitor all specified trees, transplantable specimen trees and all other relevant plant materials to protect against construction work / activities adjacent to and within the work areas. The proponent to obtain permission from the Department of Water Affairs and Forestry (DWAF) and / or the Mpumalanga Tourism and Parks Agency (MTPA) prior to the removal of any protected tree or other protected plant species 	Contractor / Resident Engineer /ECO	Pre-construction	
			<ul style="list-style-type: none"> Ensure that all social related issues / policies and structures is in place before construction commences 	Contractor / proponent	Pre-construction	
			<ul style="list-style-type: none"> The contractor shall ensure that all works are undertaken in such a manner that vegetation and aquatic environments outside the development area is not damaged under any circumstances 	Contractor	Pre-construction and construction	

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			<ul style="list-style-type: none"> Trees that have been selected for conservation by the ECO / Resident Engineer shall be fenced around their crown drip lines. The fence shall be clearly marked with danger tape. No open fires shall be allowed within this fenced area, nor shall vehicles be parked underneath these trees. The area shall not be used for material storage or as allocation for temporary buildings. No heavy equipment, machinery and vehicles may be parked under any tree 	Contractor / Resident Engineer / ECO	Pre-construction	
			<ul style="list-style-type: none"> The contractor shall place any camps that may be required for himself and his employees only at sites approved by the project manager / ECO. No trees or bushes shall be damaged or cut down by anyone for use on the works or otherwise, without the written consent of the ECO / Project manager and then only where and in the manner as they may direct 	Contractor / Resident Engineer/ Project manager /ECO	Pre-construction	
			<ul style="list-style-type: none"> Identify all areas likely to be affected by construction and produce a plan showing the positions of all buildings, lay down yards, vehicle wash and service areas, fuel storage areas, batching areas and other infrastructure for the approval by the ECO/ Resident Engineer / project manager. During the site clearance the ECO will ensure and monitor compliance according to the EMP. 	Resident Engineer / ECO/ Project manager	Pre-construction and construction	

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			<ul style="list-style-type: none"> • Establish special protective measures for sensitive areas and species, implement and thereafter monitor compliance: <ul style="list-style-type: none"> - Retain natural trees and grass species as far as possible - Retain trees up to a (safe) distance from road verges and future structures (do not clear liberally) - Where tree and woody material has to be felled, stockpile material for later redistribution over reinstated topsoiled areas - No vegetative matter shall be randomly burnt on site 	Contractor, ECO	Pre-construction	
			<ul style="list-style-type: none"> • The contractor shall arrange for Environmental Awareness / Training programme for the personnel on site, to the satisfaction of the ECO / proponent 	Contractor / ECO	Pre-construction	
			<ul style="list-style-type: none"> • The development zone to be demarcated with danger tape or be barricaded with a temporary fence for public safety and environmental protection purposes. Contractors to be informed that no access to areas outside of the development zone is allowed. 	ECO	Pre-construction and construction	

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9.1	Workshops, storage areas and materials handling	Water pollution, air pollution, etc.	<ul style="list-style-type: none"> Storage areas for potentially contaminating materials shall be roofed with impervious material. The ingress of wind-blown rain shall be avoided by sufficient roof overhang or sides of sufficient height 	Contractors		
			<ul style="list-style-type: none"> Storm water shall be diverted around the storage area. No storm water will be discharged directly to receiving streams and aquatic environments. Storm water shall be routed to the storm water drains 	Contractors		
			<ul style="list-style-type: none"> Proper storage facilities, placed on an impermeable surface, shall be provided for the storage of oils, grease, fuels, chemicals and other hazardous materials to be used during the construction phase of the activities. Fuel shall be stored in a secure area in a steel tank supplied and maintained by the fuel suppliers. Leakage of fuel shall be avoided. An adequate bund wall, 125% of volume, shall be provided for fuel and diesel areas to accommodate any spillage or overflow from these substances. The area inside the bund wall shall be lined with an impervious lining to prevent infiltration of the fuel into the soil 	Contractors		
			<ul style="list-style-type: none"> Hazard signs indicating the nature of stored materials shall be displayed on the storage facility or container. The MSDS's of all stored materials to be kept on site. Before containers or storage facilities are erected, the contractor shall furnish the ECO with details of the preventative measures he proposes to instate in order to mitigate pollution of the surrounding environment from leaks or spillage. The preferred method is a concrete floor that is bunded. The proposal shall also indicate the emergency procedures in the event of misuse or spillage that may negatively affect an individual or the environment 	Contractors		
			<ul style="list-style-type: none"> The storage facilities (including any tanks) shall be surrounded by a bund wall, in order to ensure that accidental spillage does not pollute local soil or water resources 	Contractors		
			<ul style="list-style-type: none"> The storage areas shall not be utilised for accommodation purposes 	Contractors		
			<ul style="list-style-type: none"> The storage areas shall be kept tidy and the area shall be rehabilitated after use 	Contractors		

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			<ul style="list-style-type: none"> An inventory of any hazardous chemicals/substances (including that within equipment) kept on site (together with all MSDS's), along with a description of possible ill effects and treatment of health-related afflictions resulting from accidents, shall be kept in the storage area as well as by the appropriate manager. These areas shall be securely fenced 	Contractors		
			<ul style="list-style-type: none"> Gas welding cylinders and LPG cylinders shall be stored in a secure, well-ventilated area 	Contractors		
			<ul style="list-style-type: none"> A notice board with the contact details of the responsible party shall be displayed at the gate to the storage area 	Contractors		
			<ul style="list-style-type: none"> The contact details for the ECO and RE shall be kept on site 	Contractors / ECO		
			<ul style="list-style-type: none"> The contractor shall ensure that any delivery drivers are informed of all procedures and restrictions required to comply with the EMP. Delivery drivers shall be supervised during off loading by someone with an adequate understanding of the EMP. 	Contractors		
			<ul style="list-style-type: none"> Any new facilities shall be constructed as far as possible in areas that are already disturbed 	Contractors		
			<ul style="list-style-type: none"> Refuelling and maintenance of vehicles shall occur within specified depots only. Working / fuel transfer areas within these depots shall be underlain by an impermeable surface and shall have grease traps to ensure that no spillage of greases, oils or fuels occurs into local soil or water resources 	Contractors		
			<ul style="list-style-type: none"> All repairs done on machinery that makes use of hydrocarbons as fuels or lubricants shall be carried out on a concreted surface, and will make use of a drip tray placed strategically to avoid incidental spillage 	Contractors		
			<ul style="list-style-type: none"> Drip trays shall be inspected and emptied daily and serviced when necessary. In particular drip trays shall be closely monitored during rain events to ensure that they do not overflow. The contractor shall maintain a used oil storage container that will be within an appropriately bunded area 	Contractors		

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			<ul style="list-style-type: none"> Workers shall be made aware of the health risks associated with any hazardous substances used (e.g. smoking near refuelling depots), and shall be provided with appropriate protective clothing / equipment in case of spillages or accidents Cement and other potential environmental pollutants shall be stored and mixed on an impermeable substratum. There shall be no opportunity for environmental contamination 	Contractors		
9.2	Contaminated water	Water pollution	<ul style="list-style-type: none"> The contractor shall prevent discharge of any pollutants, such as cement, concrete, lime, fertiliser, chemicals and fuels into any water sources or soils “Grey water” from kitchens, showers, sinks, etc. shall be diverted to the applicable sewage treatment facility Runoff from fuel depots, workshops, truck washing areas and concrete swills shall be routed through an oil trap equipped with oil recovery equipment. The remaining water will be discharged, through a sediment trap, as agreed with the ECO and Resident Engineer 	Contractors		
				Contractors		
9.3	Waste management	Solid waste	<ul style="list-style-type: none"> Solid waste shall be stored in an approved area in covered, tip and animal-proof metal drums, preferably skip containers, for collection and disposal The waste collection point shall be fenced off with diamond mesh wire with a minimum height of 1, 8 meter. The fence needs to keep out all animals and waste pickers, above and below ground level A waste control system shall be established for the collection and removal of waste to the satisfaction of the ECO and complying to relevant legislation. Any illegal dumping of waste will not be tolerated, this action will result in a fine and if required further legal action will be taken. This aspect will be closely monitored and reported on; proof of legal waste disposal must be able to be produced on request 	Contractors		
				Proponent and ECO		
				Proponent and contractors		

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			<ul style="list-style-type: none"> Disposal of solid waste shall be at a Department of Environmental Affairs and Tourism (DEAT) permitted landfill site or at a site approved by DEAT in the event that an existing operating landfill site is not within reasonable distance from the site. No waste to be disposed of elsewhere than at a permitted landfill site during the lifecycle of the development 	Contractors / proponent	Including operational phase	
			<ul style="list-style-type: none"> No waste shall be burned at the site offices or anywhere else on the site, including the approved solid waste disposal site 	Contractors		
			<ul style="list-style-type: none"> All building rubble shall be a) removed from the site and disposed of at an appropriate disposal site, or b) temporarily stored (no longer than 90 days) in a clearly demarcated area on site for future use 	Contractors		
		Litter	<ul style="list-style-type: none"> No littering by construction workers shall be allowed. During the construction period, the facilities shall be maintained in a neat and tidy condition and the site shall be kept free of litter 	Contractors		
		<ul style="list-style-type: none"> The contractor shall provide enough disposal bins / skips for later safe disposal at approved sites. Domestic waste thus generated on the construction site shall be transported to a permitted waste disposal site and in such a manner as not to cause any nuisance or pollution to any environmental media 	Contractors			
		<ul style="list-style-type: none"> Littering, discarding or burying of any materials shall not be allowed on site 	Contractors			
		Hazardous waste	<ul style="list-style-type: none"> Hazardous waste, such as tar and oil, shall be disposed of at a DEAT approved hazardous waste site, or through a registered hazardous waste management company. Should a registered hazardous waste management company be used to dispose of the tar and oil, such an agreement should then be submitted to the Department of Water Affairs and Forestry. A copy of this agreement to also be kept at the site office. Special care shall be taken to avoid spillage of tar products such as tar prime or pre-coating fluid to avoid water-soluble phenols from entering the ground or contaminating water 	Contractors, ECO		

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			<ul style="list-style-type: none"> Used oil, lubricants and cleaning materials from the maintenance of vehicles and machinery shall be collected in a holding tank and returned to the supplier. Water and oil shall be separated in an oil trap. Oils collected in this manner shall be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at an approved / permitted hazardous waste disposal site. Oil collected by a mobile servicing unit shall be stored in the service unit’s sludge tank and discharged into the safe holding tank for collection by the specialist oil recycling company 	Contractors		
			<ul style="list-style-type: none"> Hazardous waste shall be removed from the site and adequately disposed of 	Contractors/ ECO		
		Recycling	<ul style="list-style-type: none"> Wherever possible, materials used or generated by construction shall be minimised, recycled or reused 	Contractors		
			<ul style="list-style-type: none"> Where possible and practical, such as at stores and offices, waste shall be sorted for recycling purposes, into the following categories: paper, aluminium, metals (other than aluminium), organic waste and glass 	Contractors		
			<ul style="list-style-type: none"> Separate containers for glass, paper, metals and plastics shall be provided where applicable, including in the operational phase of the development. Office, shop and residential areas are particularly suited to this form of recycling process 	Contractors, proponent		
9.4	Soil management	Topsoil	<ul style="list-style-type: none"> Topsoil comprises the natural soil-covering, including all the vegetation and organic matter within the upper soil layer. For the purposes of the EMP, topsoil will refer to all usable soil within the A and B soil horizons. The depth of the topsoil may vary at each site. Wherever possible all usable topsoil shall be stripped. Topsoil shall be removed from all areas where physical disturbance of the surface will occur. Topsoil shall be stripped and stockpiled for later re-use. Soil stripping should be done in a phased manner to retain the vegetation cover for as long as possible 	Contractors	Vegetation clearing phase (pre-construction)	

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			<ul style="list-style-type: none"> All topsoil stockpiles shall be maintained in a weed-free condition throughout the contract period. Weeds appearing on the stockpiled topsoil shall be removed by hand before the weeds seed 	Contractors		
			<ul style="list-style-type: none"> All stockpiles shall be hand seeded within 3 weeks with a specified grass seed mixture 	Contractors and ECO		
			<ul style="list-style-type: none"> No large vegetation (trees and large shrubs) to be damaged or removed to allow for the stockpiling 	Contractors		
			<ul style="list-style-type: none"> Should any fuel, oil or hydraulic fluids be spilled onto the soils, the extent of soil contamination shall be determined and polluted soil shall be removed to an approved disposal site and the area shall be rehabilitated 	Contractors, ECO		
			<ul style="list-style-type: none"> Ensure all usable soil is stripped and correctly stockpiled for later use in rehabilitation and specific landscape needs 	Contractors, ECO	Vegetation clearing phase (pre-construction and construction phase included)	
			<ul style="list-style-type: none"> All soil stockpiles shall be located at a suitable site defined by the ECO 	Contractors		
			<ul style="list-style-type: none"> Stockpiled soil shall be located away from drainage lines and areas of temporary inundation by water. No material to be stored within the riparian zone. It may also not be stored in such a way that will cause damming of water or wash-away 	Contractors, ECO		
			<ul style="list-style-type: none"> Soil contaminated by hazardous substances shall be disposed of at an approved / permitted DEAT waste disposal site 	Contractors, ECO		

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			<ul style="list-style-type: none"> Topsoil stockpiles shall be stored, shaped and sited so that they do not interfere with the flow of water to cause damming or erosion, or be eroded by water. The contractor shall ensure that no, or minimal topsoil is lost due to erosion. Topsoil stockpiles shall not exceed a height of 2m. If soil is stored for longer than six months, a full analysis of the soil chemical properties shall be undertaken on soil fertility status amended as required, under direction of a soil scientist 	Contractors and ECO		
			<ul style="list-style-type: none"> Areas shall be systematically rehabilitated with topsoil and grassed to allow for quick cover. The contractor will be held responsible for the replacement, at his own cost, of any unnecessary loss of topsoil. The contractor will also be responsible for the clearing of drainage or water systems within and beyond the boundaries of internal roads that may have been affected by such negligence 	Contractors		
			<ul style="list-style-type: none"> Topsoil shall either be used to stabilise road verges, for landscaping purposes or be disposed of appropriately 	Contractors		
			<ul style="list-style-type: none"> All topsoil stockpiles shall be located in a designated area. Repeated handling of the soil must be avoided, and soil should not be handled when wet as this will precipitate compaction 	Contractors		
		Subsoil	<ul style="list-style-type: none"> The subsoil is the layer of soil immediately beneath the upper usable soil layer (the A and B soil horizon). This layer is typically C Horizon material. The subsoil shall be removed to a depth instructed by the ECO, and stored separately from the topsoil. The subsoil shall be replaced in the original order it was removed for rehabilitation purposes 	Contractors		
		Soil erosion	<ul style="list-style-type: none"> Areas that may be prone to erosion or where signs of erosion are evident (e.g. water trenches) shall be stabilised. Methods of stabilisation include: brush-cut packing, mulch or chip cover, straw stabilising, sodding, hydro-seeding, soil binders and physical stabilisation methods including gabions, reno-mattresses, armour flex or retaining walls. Soil erosion also to be avoided through professionally designed cut-off storm water drains diverting water run-off 	Contractors, ECO	Including the pre-construction phase	

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			<ul style="list-style-type: none"> • Traffic and movement over stabilised areas shall be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the ECO • All presently eroded areas within the construction site shall be rehabilitated to a state comparable to the surrounding vegetation • To prevent soil erosion, ensure storm water is diverted away from exposed areas and soil stockpiles. Ensure storm water runoff from exposed areas and un-vegetated soil stockpiled passes through settling ponds to trap sediment prior to the water flowing off site 	Contractors		
9.5	Drainage	Water pollution and soil erosion	<ul style="list-style-type: none"> • The quality, quantity and flow direction of any surface water runoff shall be established before disturbing any area for construction purposes. Cognisance shall be taken of these aspects and be incorporated into the planning of all construction activities. Before the commencement of any activities, it shall be established how the activities will affect the drainage pattern. Recognised water users / receivers shall not be adversely affected by the activities. No water source shall be polluted by the construction activities, including the release of sediment into water courses • Streams, rivers, pans, wetlands, dams, and their catchments shall be protected from erosion, direct or indirect spillage of pollutants such as waste, cement, concrete, sewage, chemicals, fuels, oils and other hydrocarbons, aggregate, wash water, organic materials and bituminous products • Storm water falling on the denuded area shall be directed off the area in a manner that minimises erosion • Storm water falling on denuded areas shall be directed through sediment control areas. The sediment control areas shall be cleared on a regular basis to ensure that they have adequate sediment trap capacity • “Clean” storm water shall be diverted around the area so that it does not become contaminated 	Contractors, ECO		
			<ul style="list-style-type: none"> • Streams, rivers, pans, wetlands, dams, and their catchments shall be protected from erosion, direct or indirect spillage of pollutants such as waste, cement, concrete, sewage, chemicals, fuels, oils and other hydrocarbons, aggregate, wash water, organic materials and bituminous products 	Contractors, ECO		
			<ul style="list-style-type: none"> • Storm water falling on the denuded area shall be directed off the area in a manner that minimises erosion 	Contractors		
			<ul style="list-style-type: none"> • Storm water falling on denuded areas shall be directed through sediment control areas. The sediment control areas shall be cleared on a regular basis to ensure that they have adequate sediment trap capacity 	Contractors and ECO		
			<ul style="list-style-type: none"> • “Clean” storm water shall be diverted around the area so that it does not become contaminated 	Contractors		

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			<ul style="list-style-type: none"> Contaminated water discharged from the construction site shall meet the required DWAF water quality standards 	Contractors, ECO		
9.6	Spillages	Water, surface and air pollution	<ul style="list-style-type: none"> Streams, rivers, wetlands and dams shall be protected from direct or indirect spillage of pollutants. Pollutants could include the following: waste, cement, concrete, sewage, chemicals, fuels, oils and other hydrocarbons, aggregate, wash water, organic materials and bituminous products. In the event of a spillage, the contractor (and ECO) shall arrange to clean the affected area properly 	Contractors, ECO		
			<ul style="list-style-type: none"> Should water downstream of the spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice shall be sought for appropriate treatment and remedial procedures to be followed. The requirement for such input will be agreed with the ECO. The costs of containment and rehabilitation will be for the contractor's account, including the costs of specialist input 	Contractors, ECO		
			<ul style="list-style-type: none"> Spilt material shall be removed and disposed of in an acceptable manner 	Contractors		
			<ul style="list-style-type: none"> The Contractor is responsible for spill treatment. The individual responsible for, or who discovers a hazardous waste spill, shall report the incident to the ECO. The ECO will assess the situation and act as required. In all cases, the immediate response will be to contain the spill. The exact treatment of polluted soil / water shall be determined by the contractor in consultation with the ECO. Areas cleared of hazardous waste shall be re-vegetated according to the ECO's instructions. Spill kits to be made available on site for minor spill treatment and also containment. <p>The contractor shall report spill incidents to the ECO within 3 hours of its occurrence and the ECO shall report it to DWAF / DEAT within one working day</p>	Contractors and ECO		
9.7	Areas of specific importance	Depletion of natural resources	<ul style="list-style-type: none"> Any sensitive areas shall be adequately demarcated during pre-construction and the construction phase and shall not be disturbed in any way. Penalties shall apply for the non adherence of any of these areas 	ECO and Contractors		

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			<ul style="list-style-type: none"> The specific construction area shall be clearly demarcated, preferably with danger tape. All vehicles and activity shall be confined to these demarcated construction areas, in order to minimise environmental damage to the surrounding natural vegetation. <p>Sensitive and no-go areas (including areas outside of the development zone) will be clearly explained to workers during the induction programme. Construction workers shall be instructed to stay clear of these sensitive and no-go areas</p>	ECO and Contractors		
9.8	Rivers and dams	Depletion of natural resources and water pollution	<ul style="list-style-type: none"> Due to the sensitivity of wetlands, rivers and dams, disturbance in the vicinity of these areas shall be restricted. Pollution of any watercourse by an on-site activity shall be confined and cleaned up by the contractor or a clean-up organisation, to the satisfaction of the ECO. The costs, in terms of the National Water Act will be the responsibility of the contractor 	Construction and ECO		
			<ul style="list-style-type: none"> Adequate sedimentation and flow control measures, e.g. reno mattresses or stone baskets, shall be enforced where excavations or disturbance of drainage lines may occur 	ECO and Contractors		
			<ul style="list-style-type: none"> Impediments to natural water flow at drainage lines shall be avoided, or, if unavoidable, drains or culverts shall be constructed to avoid damming or ponding 	Contractors		
			<ul style="list-style-type: none"> Water for construction and drinking purposes shall be obtained from a sustainable source. The ECO shall indicate to the contractor which sources of water may be used for potable usage and washing. The contractor shall ensure that water is obtained from a sustainable source that shall not result in depletion of existing water supply to the aquatic ecosystem 	Contractors		
			<ul style="list-style-type: none"> The contractor shall not cause any physical damage to any aspects of a watercourse, other than that necessary to complete the works as specified 	Contractors		

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			<ul style="list-style-type: none"> The ECO shall define baseline water quality of rivers (Rimer’s Creek), streams and wetlands on the site. The ECO shall monitor the quality of water bodies on a monthly basis. These baseline values shall not be adversely affected by construction-related and operational activities 	ECO and contractor, proponent	Immediately after approval of EMP and thereafter	
9.9	Noise control	Noise pollution	<ul style="list-style-type: none"> The contractor shall endeavour to keep noise and vibration generating activities to a minimum. The 45dBA noise contour (measured from the property boundary) as determined for rural districts in terms of SANS:10103, Table 2, may not be exceeded. Noise levels at possible sensitive receptors (e.g. neighbouring houses) should be measured frequently and should stay within acceptable levels. Noisy activities that could cause a major disturbance, for example, blasting, shall only be done during daylight hours, or unless otherwise approved by the ECO. Should noise-generating activities have to occur at night, for example drilling, people living in the vicinity of the site shall be warned about the activity well in advance. Compliance with the appropriate noise legislation is mandatory 	ECO and Contractors		
			<ul style="list-style-type: none"> All construction vehicles and machinery used on site shall be kept in good repair to prevent unnecessary noise 	Contractors		
			<ul style="list-style-type: none"> Construction activities shall be restricted to working hours (06h00 – 18h00) seven days a week, unless otherwise approved by the ECO in consultation with the affected landowner(s) and neighbouring residents 	Contractors		
10.10	Dust control	Air pollution	<ul style="list-style-type: none"> The contractor shall be responsible for the control of dust arising from the construction activities and for any costs claimed by parties for damages resulting from the dust The contractor shall take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the ECO 	Contractors		
				Contractors		

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			<ul style="list-style-type: none"> • Dust on all roads on site shall be controlled by implementing dust suppression, such as using water spray vehicles, the use of a Rain Bird or similar water spray method • Water used for dust suppression shall be used in quantities small enough not to generate run-off and cause erosion. Wherever possible water that has been captured in sediment control areas/silt traps will be used for dust suppression in preference to using clean water from streams in the area • The removal of vegetation shall be avoided until such time as soil stripping is required and similarly exposed surfaces shall be re-vegetated or stabilised as soon as is practically possible • Excavation, handling and transport of erodible materials shall be avoided under high wind conditions • Where possible, soil stockpiles shall be located in sheltered areas where they are not exposed to the erosive effects of the wind. Where erosion of stockpiles becomes a problem, erosion control measures shall be implemented at the discretion of the ECO • Regular visual monitoring of air quality with respect to particulates and dust fall shall be undertaken • Vehicle speeds shall not exceed 30km/h when manoeuvring on site 	Contractors		
				Contractors		
				Contractors		
				Contractors		
				Contractors		
				ECO, Proponent		
				Contractors		
10.1	Indigenous and alien vegetation	Invasion of alien species	<ul style="list-style-type: none"> • Only vegetation falling directly in the demarcated access routes shall be removed where necessary after consultation with the ECO and according to the EMP. A principle to follow is where a single indigenous tree species is felled; two new trees shall be planted in accordance with the indigenous vegetation of the surrounding area 	Contractors		
1			<ul style="list-style-type: none"> • All trees to be retained within the construction area shall be clearly indicated on a site plan (master plan) and demarcated 	ECO and landscape architect		

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			<ul style="list-style-type: none"> Demarcation shall remain in place for the duration of works on site. If damaged, demarcation shall be repaired or replaced immediately 	Contractors		
10.1 2	Fire prevention and control	Depletion of natural resources or harm to humans and infrastructure	<ul style="list-style-type: none"> The outbreak of an uncontrolled fire shall be reported to the ECO immediately and the necessary steps shall be taken to control and extinguish the fire A firebreak must be developed and maintained around the construction and surrounding areas Smoking shall be prohibited in the vicinity of flammable substances Open fires for heating and cooking shall not be permitted The contractor shall ensure that fire-fighting equipment is available on site, in particular where flammable substances are being stored or used Any welding or other sources of heating of materials shall be done in a controlled environment and under appropriate supervision, in such a manner as to minimise the risk of fires and/or injury to staff The contractor shall be held responsible for any damage caused as a result of fires caused by their employees or sub-Contractors 	Contractors ECO		
10.1 3	Access	Depletion of natural resources	<ul style="list-style-type: none"> Transport routes, to and within the site and construction areas shall be clearly demarcated prior to use. Any deviations from the principle road plan must be cleared with the ECO All rehabilitation and associated activities shall be confined to the identified site. Access to the site shall be controlled such that only vehicles and persons directly associated with the work at a particular site have access Workers shall be instructed about safety on site and entering on neighbour's properties during the induction programme Ensure contractor's staff arrive and depart promptly to prevent loitering of contractor's staff outside the designated working hours 	Contractors and ECO Contractors Contractors Contractors		

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			<ul style="list-style-type: none"> All personnel and vehicles used for transportation and/or construction purposes shall remain within these demarcated routes and areas, i.e. vehicles shall not be allowed to drive randomly across sensitive areas (demarcated with red and white bunting), but shall remain within the approved routes. The purpose of this measure is to: a) limit unnecessary compaction of topsoil; and b) prevent disturbance of vegetation outside the construction areas 	Contractors		
10.1 4	Consultation with Interested and Affected Parties		<ul style="list-style-type: none"> Open liaison channels shall be established between the Proponent, the Contractors and Interested and Affected Parties, so that any queries, complaints or suggestions can be dealt with quickly and by the appropriate person(s) The ECO shall establish a complaints register to record / register all complaints relating to the Activities. The ECO shall develop a protocol relating to the steps that would be followed once a complaint has been received. The protocol shall cover at least the following steps: registration, investigation, reporting, follow-up action and close out. This protocol shall be maintained by the operator once the Activity is operational 	ECO, Proponent, Contractors		
				ECO		
10.1 5	Creation of employment opportunities		<ul style="list-style-type: none"> The criteria for and selection of Contractors and their labourers for the project shall demonstrate preference for the local communities. Such requirements shall be included in contract documents 	Contractors and proponent		
10.1 6	Record Keeping, Compliance and Penalties	Transgression of EMP measures, statutes and laws	<ul style="list-style-type: none"> The ECO will continuously monitor the contractor’s adherence to the EMP and will issue the contractor with a notice of non-compliance whenever transgressions are observed. The ECO will record the nature and magnitude of the non-compliance in a register, the action taken to discontinue the non-compliance, the action taken to mitigate its effects and the results of the actions 	ECO		

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			<ul style="list-style-type: none"> Complaints received regarding activities on the construction site pertaining to the environment shall be recorded in a register and the response noted with the date and action taken. This record shall be submitted with the monthly reports and a verbal report given at the monthly site meetings The contractor shall act immediately when a notice of non-compliance is received and implement the agreed corrective action Any avoidable non-compliance with the above-mentioned measures will be considered sufficient ground for the imposition of a penalty. The value of the penalty will not be less than the payment that would have been due to the contractor for the day's production of the relevant item of work that gave cause for the infringement. Any non-compliance with the agreed procedures of the EMP is a transgression of the various statutes and laws that define the manner in which the environment is managed. Set penalties should be enforced Failure to rectify the cause will be reported to the relevant authority to deal with the transgression, as it deems fit 	ECO		
				Contractors		
				ECO and Contractors		
				ECO		
10.1 7	Health and safety	Health and safety related incidents	<ul style="list-style-type: none"> All the necessary handling of safety equipment required for the safe use of petrochemicals and oils shall be provided by the contractor to, and used or worn by, the staff whose duty it is to manage and maintain the contractor's and his subcontractor's equipment Workers shall be equipped with adequate personal protective equipment (PPE), e.g. equipment providing protection from the sun Hazardous materials shall be transported, stored, used and disposed of in the correct manner, as discussed under section 9 Any worker working above an open water body must wear a flotation device and there must be a flotation device available next to any open water body The drivers will adhere to the speed limit and the rules of the road The drivers will reduce speed and exercise caution on the access road to the activity 	Contractors		
				Contractors		
				Contractors		
				Contractors		
				Contractors		

NO	ASPECT (of Activity, Service or Product)	POTENTIAL IMPACT	MITIGATION MEASURE(S)	RESPONSIBLE PERSON / PARTY	TIME-FRAME (Construction, Operational and Rehabilitation phases unless stated otherwise)	For ECO Monitoring Purposes only – Successfully Implemented / Corrective action required (To be completed by ECO)
			<ul style="list-style-type: none"> The contractor shall maintain and update all safety records and training provided 	Contractors		
10.18	Emergency issues		<ul style="list-style-type: none"> The ECO shall define emergency reporting procedures for the development 	ECO		
			<ul style="list-style-type: none"> Adopt standard emergency reporting procedures 	Contractors		
			<ul style="list-style-type: none"> Ensure that all personnel are aware of emergency reporting procedures and their responsibilities 	ECO and Contractors		
			<ul style="list-style-type: none"> Ensure immediate clean up of any spills in accordance with relevant legislation 	ECO and Contractors		
			<ul style="list-style-type: none"> Telephone numbers of emergency services, including the local fire fighting service, shall be conspicuous 	ECO and Contractors		
10.19	Landscaping and rehabilitation	Depletion of natural resources	<ul style="list-style-type: none"> Once construction, operational or rehabilitation has been completed, all redundant infrastructure, waste and construction materials shall be removed from site by the contractor and disposed of in an appropriate manner, i.e. at a registered DEAT waste disposal site. 	Contractors	After completion of the construction, operational or rehabilitation phases	
			<ul style="list-style-type: none"> Plants that are indigenous shall be used for rehabilitation 	ECO	During and after completion of the construction operational or rehabilitation phases	

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			<ul style="list-style-type: none"> Vegetative cover shall be encouraged to take place in as short a time as possible 	ECO	During and after completion of the construction, operational or rehabilitation phases	
			<ul style="list-style-type: none"> Areas compacted by vehicles during construction shall be scarified or ripped, if necessary, to allow penetration of plant roots and the re-growth of natural vegetation if outside the boundaries of the site footprint 	ECO	During and after completion of the construction operational or rehabilitation phases	
			<ul style="list-style-type: none"> Stockpiled topsoil (not higher than 2 meters) shall be used as the final cover for all disturbed areas where re-vegetation is required 	ECO	During and after completion of the construction operational or rehabilitation phases	

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			<ul style="list-style-type: none"> The vegetation used for rehabilitation purposes and the cover density shall aim to limit soil erosion 	ECO	During and after completion of the construction operational or rehabilitation phases	
10.20	Storm water management	Soil erosion	<ul style="list-style-type: none"> The access roads shall have storm water drainage channels to prevent soil erosion 	Proponent and Contractors		
			<ul style="list-style-type: none"> Provide suitable control measures for storm water management 	Proponent and Contractors		
10.21	Water for human consumption	Depletion of natural resources	<ul style="list-style-type: none"> The contractor shall ensure the provision and proper utilisation, maintenance and management of chemical toilets, wash and waste facilities. Chemical toilet facilities supplied by the contractor for the workers shall occur at a minimum ratio of 1 toilet per 15 workers. The exact location of the chemical toilets shall be approved by the ECO prior to establishment. Chemical toilets to be managed according to the applicable legislation. All chemical toilets shall also be secured to the ground to the satisfaction of the ECO to prevent them from toppling due to wind or any other cause 	Contractors, ECO		
			<ul style="list-style-type: none"> The contractor shall ensure proper supervision of employees at all times 	Contractors		
10.22	Cooking fuel	Depletion of natural resources	<ul style="list-style-type: none"> The contractor shall provide adequate facilities for his staff so that they are not encouraged to supplement their comforts on site by accessing what can be taken from the natural surroundings 	Contractors		
			<ul style="list-style-type: none"> The contractor shall ensure that energy sources are available at all times for construction and supervision personnel for heating and cooking purposes. No natural materials including animals may be harvested and burned for the use of cooking 	Contractors		

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			<ul style="list-style-type: none"> No fires shall be allowed on site by Contractors or labourers 	Contractors		
10.2 3	Training of Contractors and labourers		<ul style="list-style-type: none"> As part of the induction programme, staff shall be educated as to the need to refrain from destruction of animals and plants, as well as from indiscriminate defecation, waste disposal and/or pollution of local soil and water resources, from trespassing on surrounding private property and from theft of crops and animals from surrounding private property. Immediate and decisive action shall be taken should this occur As mentioned earlier, machine / vehicle operators shall receive clear instructions to remain within demarcated access routes and construction areas 	ECO and Contractors		
				Contractors		

1 MITIGATION MEASURES: SPECIFIC.

NO	ASPECT (of Activity, Service or Product)	POTENTIAL IMPACT	MITIGATION MEASURE(S)	RESPONSIBLE PERSON / PARTY	TIME-FRAME	For ECO Monitoring Purposes only – Successfully Implemented / Corrective action required (To be completed by ECO)
11.1	Terrestrial Specialist study	Terrestrial and aquatic impacts	<ul style="list-style-type: none"> The development zone should be demarcated with danger tape and Contractors informed that no access to areas outside of this zone is allowed The environmental control officer should be present on site, particularly during initial site clearing operations, in order to monitor whether the Environmental Management Plan is being adhered to. Construction teams must, as a contractual obligation, not be allowed to collect firewood or any other plant resources from the surrounding vegetation, although use of vegetation from areas that are strip cleared should be acceptable 	ECO	Pre-construction	
				ECO	Pre-construction and construction	
				ECO	Construction	

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			<ul style="list-style-type: none"> The ECO should spend time in the ecologically sensitive habitats during construction and search for evidence of harvesting of plant resources (bark removal, digging for tubers, etc). 	ECO	Construction	
			<ul style="list-style-type: none"> In order to comply with the Conservation of Agricultural Resources Act, all listed invasive exotic plants as indicated in the text above and others not mentioned in the ecological report should be targeted and controlled; this is particularly important for <i>Lantana camara</i> and <i>Chromolaena odorata</i>. The riparian zone along Rimer’s Creek should be particularly targeted for control 	ECO/Contractors	Construction and Operational	
			<ul style="list-style-type: none"> During the operational phase the control of the listed invasive plants according to the Conservation of Agricultural Resources Act should remain the responsibility of the property owner 	Property Owner /Proponent	Operational	
			<ul style="list-style-type: none"> The environmental control officer should spend time in all the vegetation communities and monitor whether <i>Lantana</i>, <i>Chromolaena</i> and other species are being removed or not. Bare soil surfaces that have been strip-cleared should be monitored for invasion by exotic species 	ECO	Construction	
			<ul style="list-style-type: none"> Building Contractors should be made aware of the necessity to dispose of any building off-site at an approved / permitted DEAT landfill site 	Contractors	Pre-construction and construction	
			<ul style="list-style-type: none"> The ECO should search surrounding ecologically sensitive vegetation to check whether building Contractors are dumping any building rubble on site or not 	ECO	Construction phase	
			<ul style="list-style-type: none"> Penalties should be levied on any contractor who does not comply 	Proponent/ Resident Engineer	Pre-construction and construction phase	
			<ul style="list-style-type: none"> Where the development zone overlaps with sensitive vegetation communities, all conservation-important plants should be translocated to an adjacent similar habitat prior to the clearing of vegetation this is particularly relevant to the numerous specimens of <i>Aloe parvibracteata</i>, some of which could also be replanted during the landscaping of the development area. Where trees are too large to transplant, relevant permits for removal should be obtained from the Department of Water Affairs and Forestry and /or the Mpumalanga Tourism and Parks Agency. 	ECO/ proponent	Pre-construction	
			<ul style="list-style-type: none"> Construction teams must, as a contractual obligation, not be allowed to enter the surrounding untransformed vegetation 	Contractors / ECO	Pre construction and construction	

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			<ul style="list-style-type: none"> Any evidence of poaching must be followed up, and where possible perpetrators prosecuted according to the Mpumalanga Nature Conservation Act 	Contractors / ECO	Pre construction and construction	
			<ul style="list-style-type: none"> All topsoil removed during clearing of roads and housing footprints should be stockpiled for later use such as landscaping gardens and / or rehabilitating disturbed areas 	Contractor/ Resident Engineer/ ECO	Construction and operational	
			<ul style="list-style-type: none"> If access roads are not to be tarred immediately, then any steep road surfaces should have water-traps and drainage furrows constructed in order to direct water off the road as quickly as possible. 	Contractor / Resident Engineer/ ECO	Construction phase	
			<ul style="list-style-type: none"> Cut off drains diverting stormwater around the perimeter of the development should be professionally designed to handle expected run-off and to prevent erosion 	Resident Engineer	Pre-construction and Construction	
			<ul style="list-style-type: none"> Outflow from cut-off drains and stormwater diversions should be attenuated sufficiently to prevent erosion of the receiving environment 	Resident Engineer	Construction and Operational	

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12.1	Geotechnical	Geotechnical impacts	<ul style="list-style-type: none"> The potentially unstable areas (NHBRC Manual (February 1999) - Rating 3) (wet/damp soils) are to be considered for development then earthworks should be carefully controlled and supervised to prevent the creation of an unstable situation 	Resident Engineer	Pre-construction	
			<ul style="list-style-type: none"> Materials exposed in foundation excavations should be carefully examined with a view to identifying localized zones of weakness and implementing appropriate stabilizing measures. 	Resident Engineer	Pre-construction	
			<ul style="list-style-type: none"> Wherever possible, over-steep cut and fill banks (borrow pit areas) should be battered back to a more suitable grade (filled) 	Resident Engineer	Construction	

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			<ul style="list-style-type: none"> In general, due to the moderate depth of the soils in much of the area, normal earthworks for the installation of services and building platforms will require only limited use of jackhammers to excavate below 0,90m. A TLB or hand excavation will suffice for the majority of the excavations required. Limited areas may require the use of jackhammers and in very limited areas possible blasting may be required (These areas will need to be mapped out using a DCP (Dynamic Cone Penetrometer) if the extent is to be measured 	Resident Engineer / Contractors	Pre-construction and construction	
			<ul style="list-style-type: none"> In general, the need for earth work “cuts” on this site will be limited to the areas where excavation for borrow pits and/or deep foundations (multi story buildings) is planned. It is suggested, that where these occur, they should be excluded from the total area proposed for development, as they will require the importation of material to fill the excavations, as well as a good deal of compaction before they could be used for building purposes. It is suggested that the pits could be used as a collection point for building rubble, covered over on completion of the works and possibly used as a recreation centres (playing fields etc) 	Resident Engineer / Contractors	Pre-construction and construction	
			<ul style="list-style-type: none"> Where cut slopes are needed in either the colluvial or the residual soils derived from granite (and/or dolerite where it occurs), the slopes should be battered back to a grade not exceeding 1:1,75 (30°). Cuts in moderately hard weathered bedrock may be slightly steeper, and should be battered back to a grade of 1:1,5 (34°). However, these should be inspected and approved by a Geotechnical Engineer or Engineering Geologist during development. Wherever possible, the maximum height of any cut bank required for platform creation should not exceed 2m, and for any road - 3m 	Resident Engineer / Contractors	Pre-construction and construction	
			<ul style="list-style-type: none"> The amount of filling to be carried out will be restricted to the areas of disturbance. However, where the need arises, the placement of fills should be preceded by the removal of all natural vegetation. The fill should then be constructed in layers not exceeding 300mm loose thickness, each layer being compacted prior to the placement of the subsequent layer 	Resident Engineer / Contractors	Construction	

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			<ul style="list-style-type: none"> On any natural slope steeper than 1:6 (10°) the fills should be placed on surfaces benched into the underlying weathered bedrock. The slope of any fill should not exceed a batter of 1:1,75 and the maximum height of any fill required for a platform should not exceed 2m, and for any road 3m 	Resident Engineer / Contractors	Construction	
			<ul style="list-style-type: none"> Any existing fill banks should be battered back and compacted as much as possible to improve their stability. They should be grassed to aid in erosion prevention and drainage must be in place around the rehabilitated sites 	Resident Engineer / Contractors	Construction and operational	
			<ul style="list-style-type: none"> No soak pits may be used in the area for storm-water disposal. It is essential that all storm-water be carried off the slopes in a controlled manner, in either surface drains or storm-water pipes. Sites should be designed such that storm-water from one site does not cascade down slope over a number of other sites, and storm-water down pipes on structures should not discharge directly onto platform surfaces, but rather storm-water should be carried away from structures in a controlled manner 	Resident Engineer / Contractors	Complete project lifecycle	
			<ul style="list-style-type: none"> As waterborne sewage is to be installed in the area, inhabitants must be encouraged to dispose of all waste water and washing water into the system, rather than discarding water outside onto platforms or over fill banks. In addition, a concrete paving strip at least 1m wide should be placed around the perimeter of all structures, to prevent the ingress of excess water below foundations 	Resident Engineer/ Contractors	Construction and operational	
			<ul style="list-style-type: none"> Only a small portion of the area occurs on very shallow materials. Founding conditions in these areas are such that normal strip footings can be used. However, all footings should be taken through the colluvial and residual soils to bear into weathered granite or dolerite bedrock. In this regard, the optimum location of the structure on the platform in the cut portion will reduce the required depth of founding below final ground level 	Resident Engineer/ Contractors	Construction	
			<ul style="list-style-type: none"> The majority of the area is comprised of soils in this depth range. In these areas, the deeper colluvial and residual soils preclude the use of normal strip footings. In this regard, spread footings should be used. The spread footings should be founded into bedrock or firm weathered granite 	Resident Engineer / Contractors	Construction	

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			<ul style="list-style-type: none"> In only a few places do the soils exceed 1.5m in depth. However, where a platform is uniformly underlain by deep, colluvial and residual soils, piles founded into bedrock may be used to support reinforced ground beams. Alternatively, raft foundations may be used. Where a raft spans across a cut/fill platform, the portion of the raft underlain by fill must be supported by mass concrete pads taken through the fill to bear into the same material which underlies the raft on the cut portion of the platform 	Resident Engineer / Contractors	Construction	
			<ul style="list-style-type: none"> No structures should be constructed on existing fills that have not been adequately formed. In these areas, all foundations must be taken down into weathered bedrock 	Resident Engineer / Contractors	Construction	
			<ul style="list-style-type: none"> All foundations must be inspected and signed off by a qualified person before the construction is undertaken 	Resident Engineer / Consulting engineer	Pre-construction	
			<ul style="list-style-type: none"> Strict drainage control must be carried out both during and after development of the area, to ensure storm-water runoff onto the roads in the area and to prevent pounding of storm-water. Drainage measures must be installed in the seepage/wet areas if they are to be developed. In addition, the storm-water drains under the main road that runs to the south of the proposed area of development will need to be enlarged and kept clean in order to cope with the additional runoff that will occur once development is completed 	Resident Engineer / ECO/ Contractors	Construction and operational	

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13.1	Design of Development	Social impacts	<ul style="list-style-type: none"> The centre should afford quick and easy access in a pedestrian friendly environment 	Planners / Proponent	Pre-construction	
			<ul style="list-style-type: none"> Retailer demands regarding visibility and accessibility should be given attention 	Planners / Proponent	Pre-construction	
			<ul style="list-style-type: none"> Proper signage should contribute to the permeability of the centre 	Planners / Proponent	Pre-construction	

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			<ul style="list-style-type: none"> The centre should comply with modern design standards 	Planners / Proponent	Pre-construction	
			<ul style="list-style-type: none"> The centre should reflect a high quality in order to provide a pleasant shopping experience 	Planners / Proponent	Pre-construction	
			<ul style="list-style-type: none"> The centre should portray a creative, vibrant image and branding – ideally to be aligned with the uniqueness of the local culture and environment 	Planners / Proponent	Pre-construction	