



**DRAFT ENVIRONMENTAL MANAGEMENT PROGRAM REPORT
'PROPOSED UPGRADING AND CONSTRUCTION OF GRIMTHORPE
AVENUE BRIDGE, PIETERMARITZBURG'**

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FOREWORD

This Environmental Management Program report (EMPr) is designed to serve as a guide to mitigating impacts associated with the upgrading of the Grimthorpe Avenue Bridge and associated road upgrade and realignment, in Lincoln Meade, Pietermaritzburg.

This EMPr is to be treated as a 'live' document and changes and recommendations may be agreed upon by the ECO, depending on onsite working conditions.

This EMPr does not negate the holder from complying with all other statutory, legislative and regulatory requirements.

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1. INTRODUCTION

Project Background:

The Msunduzi Municipality has appointed Makhaotse, Narasimulu and Associates to design and implement the upgrade of the river bridge (over the Msunduzi River) at Grimthorpe Avenue in Lincoln Meade, Pietermaritzburg, located within the Msunduzi Municipality in the Province of Kwa-Zulu Natal.

This document was compiled to address the potential environmental, social and economic impacts associated with the proposed project, by prescribing meaningful and practical mitigation measures through adherence to relevant environmental legislation, to prevent the occurrence of environmental degradation. These mitigation measures should be made binding to all contractors during the construction and operational phases. In addition to the EMP, contractors must be compliant with the requirements set out in the Occupational Health and Safety Act (Act No. 85 of 1993).

Project Location and description:

The proposed project is located on Grimthorpe Avenue, Lincoln Meade, Pietermaritzburg which is located within the Msunduzi Municipality. The site is zoned as bridge and road, road reserve, surrounding use is open space, residential, water treatment works.

Geographical coordinates are as follows:

Latitude /Longitude	Degrees	Minutes	Seconds
South	29	37	06
East	30	26	50

The project comprises the upgrading of the existing river bridge to accommodate for two way traffic with pedestrian walkways. The new vertical alignment of the bridge will also require the realignment on either side of Grimthorpe Avenue over a distance of approximately 600 metres. The re-aligned roadway will be designed to approved surfaced standards. All existing services will require investigating and relocating and upgrading if required.

The project falls within the eastern valley bushveld vegetation group. Significant impacts on indigenous vegetation are not expected and the vicinity of the bridge, adjacent riparian habitat and open space along Rodgers Avenue comprises mainly alien invasive plants, with some Acacia species. The area is a residential area, with a water treatment works located near the bridge site.

Phases of the Project:

Planning Phase

This phase of the project pertains to preconstruction aspects (before actual construction begins on the ground), and can serve to enhance environmental management on site.

Construction Phase

The majority of the environmental impacts arises during the actual construction phase. This phase pertains to the actual construction of the bridge and related activities. Impacts within

the construction phase can be managed via implementation of mitigation measures and recommendations contained in the EMPr.

The Operational Phase

This phase pertains to the actual operation of the activity, when the bridge is open to the public for use. Through implementation of mitigation measures during the construction phase, the operational phase will enjoy sounder functioning of the bridge.

Objectives of the EMPr

This document aims to provide prescriptive environmental management guidelines to address planning, design, operational and post-construction mitigation measures with regards to the construction and upgrade of infrastructure to be undertaken. It identifies specific people who will perform specific tasks in order to ensure that potentially significant impacts on the environment are minimized during all phases of this construction project.

All the parties involved in the construction/post-construction rehabilitation works must embrace the EMPr. The person in charge of implementing the EMPr must have the authority to make important decisions and this document must be integrated with other routine management processes.

Notwithstanding the above, this EMPr must ensure that:

- Environmental management principles are considered from the onset of the construction activity
- Disturbance of the natural environment is minimised
- Measures are taken to prevent or minimise all forms of pollution
- Indigenous flora and fauna are protected
- Precautions against environmental damage and claims arising from such damage are taken timeously.
- Compliance with relevant legislation and guidelines
- Roles and responsibilities are identified
- Changes to project implementation and unforeseen events can be incorporated into the EMPr at any stage
- Monitoring and feedback mechanisms are in place to verify environmental performance

Project area

The Project Manager/RE and Environmental Control Officer are to determine and prescribe suitable sites for the establishment of a construction camp. The contractor will take into consideration the position of residences when designing the site layout in order to minimise noise impacts on the residents. Construction activities shall be limited to the area as shown on the available site plans. Any area outside the shown areas required to facilitate access, construction activities, construction camps or material storage areas, shall be negotiated with the affected landowners. All areas marked as “no-go” areas shall be treated with the utmost care and responsibility. Appropriate fencing shall be used to prevent livestock and/or unauthorised people from entering areas such as construction camp sites, etcetera. No work shall commence until permission is granted from the Environmental Control Officer and/or the Project Manager.

2. ROLES AND RESPONSIBILITIES

General

Proper and continuous liaison is required between all parties to ensure that the public is informed at all times. The residents shall be informed of the starting date of construction as well as the phases in which the construction shall take place. The Contractors must adhere to all conditions of contract, including the EMPr and landowner special conditions.

All manmade structures shall be protected against damage at all times and any damage shall be rectified immediately.

The Contractor and Project Manager shall ensure that all damaged areas are rehabilitated to the satisfaction of the Environmental Control Officer (ECO). This includes rehabilitation of the camp sites, deviations etc, as applicable.

Documentation:

Effective document management and record keeping must be undertaken. Regular site inspections and good control over the construction process throughout the construction period is required to be undertaken by either a SHE officer or EO. In addition the following is required on site:

- ◆ **Environmental file** with all audit reports, EA and EMPr, waste disposal slips and chemical toilet servicing slips, method statements for each aspect of work, daily site diary, permits from DME from sand suppliers (if applicable), complaints register and close out report, environmental incident and close out register. Environmental complaints shall be closed out within 14 days of complaint and all interactions and negotiations shall be documented and maintained in the environmental file.
- ◆ **Responsibilities for Environmental Management**
The Applicant, implementing agent/project manager and contractors will be responsible for environmental management on site during the construction period. In addition, surrounding residents, tenants or land owners must be notified in advance of any potentially disruptive activities.
- ◆ **Environmental Awareness Training**
All staff on site shall be inducted with regards to their environmental obligations. The ECO or EO or SHE officer (with a degree in environmental management) shall provide environmental awareness training at the start of construction and for each new construction team.

Project Manager:

- ⇒ Responsible for the overall co-ordination between the Project Engineer, Supervisor, Environmental Control Officer (ECO) and Contractor.
- ⇒ Monitors progress of the contractor and instructs contractor to comply with conditions of the EA and EMPr
- ⇒ Monitor progress and environmental issues,
- ⇒ Ensure that damages to property/land are addressed adequately and compensation is paid where appropriate.
- ⇒ Ensures protection of water bodies,
- ⇒ Ensures that chances for erosion are minimised, and remedies possible erosion timeously.
- ⇒ Ensures that alien vegetation/weeds that have established during post-construction are removed completely.
- ⇒ Has to ensure that all disturbed areas are rehabilitated to mimic their original state.

- ⇒ Ensures that all waste material is removed and disposed of in a registered landfill.
- ⇒ Ensures that all impacted areas are rehabilitated, and that all general waste/litter is removed.
- ⇒ Ensures that all complaints by residents are dealt with promptly.
- ⇒ Ensures that polluted/eroded areas are mitigated and rehabilitated,
- ⇒ Is responsible for any contravention/s by construction staff of any non-compliance with the EMPr.

The Contractor:

- ⇒ Complies with the stipulations of the EMPr.
- ⇒ Reports to Project Manager.
- ⇒ Ensures that construction staff is made aware of the need to conduct activities in an environmentally responsible manner.
- ⇒ Ensures staff does not work outside demarcated site areas.
- ⇒ Ensures protection of water bodies.
- ⇒ Ensures that chances for erosion are minimized, and remedies possible erosion timeously.
- ⇒ Ensures that alien vegetation/weeds that have established during post-construction are removed completely.
- ⇒ Has to ensure that all disturbed areas are rehabilitated to mimic their original state.
- ⇒ Ensures that all waste material is removed and disposed of in a landfill.
- ⇒ Ensures that all impacted areas are rehabilitated, and that all general waste/litter is removed.
- ⇒ Ensures that all complaints by residents are dealt with promptly.
- ⇒ Ensures that polluted/eroded areas are mitigated and rehabilitated.
- ⇒ Is responsible for any contravention/s by construction staff of any non-compliance with the EMPr.

The ECO:

- ⇒ Provides advice to the Project Engineer/Supervisor/Contractor when requested.
- ⇒ Will be responsible for audits at the request of the relevant authority.
- ⇒ Monitors compliance with the EMPr.
- ⇒ Discuss content of EMPr with Supervisor and Contractor.
- ⇒ Will compile monthly audit reports and submit to DAEEA.

Resident Engineer:

- ⇒ Enforcing the environmental specification on site;
- ⇒ Monitoring compliance with the requirements of the specification on a daily basis
- ⇒ Assessing the Contractor's environmental performance in consultation with the Environmental Control Officer or EO.
- ⇒ Providing site instructions to the contractor to comply with all requirements of the EA/EMPr and recommendations of the ECO.

Basic Rules of Conduct

The following list represents the dos and don'ts towards environmental awareness that all participants in this project must consider whilst carrying out their tasks. These are not exhaustive and serve as a quick reference aid.

DO:

Use the toilet facilities provided – report dirty or full facilities

Clear your work areas from litter and building rubbish at the end of each working day – use the waste bins provided and ensure that the litter will not be wind blown
Report all fuel or oil spills immediately and stop and / or contain the spillage
Dispose of cigarettes and matches carefully
Confine work and storage of equipment to within the immediate work area
Use all safety equipment and comply with all safety procedures
Ensure a working fire extinguisher is immediately at hand if any 'Hot Work' is undertaken e.g. welding, grinding, gas cutting etc.
Prevent excessive dust and noise

DO NOT:

Make any fires
Enter any fenced-off or marked area
Allow cement or cement bags to be wind blown
Allow waste, litter, oils or foreign materials into the storm water channels
Litter or leave food lying around
Remove any artefacts from site

Relevant documents

- ♦ Conservation of Agricultural Resources Act (Act 43 of 1983), and amendments
- ♦ Environment Conservation Act (Act 73 of 1989) and amendments
- ♦ Hazardous Substances Act (Act 15 of 1973) and amendments
- ♦ Health Act (Act 63 of 1977)
- ♦ Minerals Act (Act 50 of 1991)
- ♦ National Environmental Management Act (Act 107 of 1998) and amendments
- ♦ National Forest Act (Act 84 of 1998)
- ♦ National Heritage Resources Act (Act 25 of 1999)
- ♦ National Water Act (Act 36 of 1998)

3. GREEN BUILDING AND CARBON FOOTPRINTING

With today's evolving world more concentration is emphasized on constructing efficient structures and buildings which has become a high priority, other structure and building alternatives have been suggested like green building; the concept of sustainable building incorporates and integrates a variety of strategies during the design, construction and operation of structures and building projects. The use of green building materials and products represents one important strategy in the design of a structure and building.

- ♦ Green building materials offer specific benefits to the structure.
- ♦ Reduced maintenance/replacement costs over the life cycle of the structure.
- ♦ Energy conservation.
- ♦ Improved occupant health and productivity.
- ♦ Lower costs associated with changing space configurations.
- ♦ Greater design flexibility.

Integrating green building materials into building projects can help reduce the environmental impacts associated with the extraction, transport, processing, fabrication, installation, reuse, recycling, and disposal of these building industry source materials.

Green building materials are composed of renewable, rather than non-renewable resources. Green materials are environmentally responsible because impacts are considered over the life of the product.

Materials sourced for this project would be advantageous if recycled content were to be used preferably with resource efficient manufacturing process including reducing energy consumption, minimizing waste in order to reduce greenhouse gases.

Locally sourced materials should also be high priority on the list in order to cut down transportation and high costs pertaining to the project, in this way it is easier to re-use selected materials which can be easily dismantled at the end of the project for further use elsewhere.

When purchasing materials it is always wise to choose durable materials as they are longer lasting and have higher life expectancies as compared to conventional products.

As a result of incorporating green materials into the proposed project, this will help by reducing the overall carbon footprint; there are many ways to reduce carbon emissions. Here are just a few:

- ◆ Enacting a recycling policy.
- ◆ Educating employees in the need to reduce carbon emissions.
- ◆ Reducing the use of electricity.
- ◆ Developing new methods of work and manufacturing that are less harmful to the environment.

Planting trees is a popular way to offset carbon. Trees breathe in carbon dioxide and convert it into oxygen. This process is called sequestration.

Water conservation is also a high priority and so the practices of reusing grey water and rainwater harvesting must be adopted.

4. **EMPR APPLICABLE TO PROJECT**

Table one records general impacts that may or may not occur during the different phases of the proposed project and the suitable management of such impacts.

(TABLE 1)

Aspect of Environment	Impacts	Management	Responsible	Frequency
Site Establishment and Preliminary Activities Site Establishment	⇒ Planning	<ul style="list-style-type: none"> - Disturbance and interference with natural assets must be avoided at all. - Natural features must be taken into consideration during design and retained. - Ensure that materials to be used during construction are legally sourced, and that water or sand is not extracted from streams or rivers; should this be a requirement then the necessary permits from DME and approvals have to be obtained from authorities before construction is to commence. 	Project Engineer/ Contractor	Site Establishment
	⇒ Site Survey	<ul style="list-style-type: none"> - Fence the entire construction site. - Marking of survey points must be done with the Engineer's approval. 	Project Engineer/ Contractor	Site Establishment
Vegetation & Biodiversity	⇒ Planning	<ul style="list-style-type: none"> - The site must be assessed by a vegetation specialist or ECO to determine if there are any plants or trees of conservation value that will need to be rescued or removed. Permits will be required from DAFF and EKZNW prior to removal or relocation. Each tree removed, will be replaced by three more outside the work footprint. - Large trees should be pruned rather than removed to accommodate 	Project Engineer/ Contractor/ specialist	Site Establishment/ ongoing

Aspect of Environment	Impacts	Management	Responsible	Frequency
		<p>construction, where possible.</p> <ul style="list-style-type: none"> - Where trees will be removed, indigenous trees must be replaced at a ratio of 1:3. - Staff are to be informed that they may not hunt, capture, kill, injure or disturb any fauna on site, even if it is just birds. - In addition, sufficient funds must be made available for rehabilitation and weed control. 		
Geotechnical aspects	⇒ foundations	<ul style="list-style-type: none"> - all conditions as outlined in the geotech report must be adhered to. 	Project Engineer/ Contractor/	Site Establishment/ Ongoing
Access to site	⇒ Routing	<ul style="list-style-type: none"> - The location of all underground services and servitude (if any) must be identified and confirmed. - Choice of access routes should take into account minimum disturbance to other road users. - There is existing access to site, which must be used. - Detours or deviations must be created to ensure traffic flows during construction. - A traffic control plan must be developed prior to construction 	Project Engineer/ Contractor/	Site Establishment
Construction camp	⇒ Layout	<ul style="list-style-type: none"> - Choice of site for the Contractor's camp requires the Engineer's permission and must take into account location of businesses. A site plan must be submitted to the Engineer for approval. - If the Contractor chooses to locate the campsite on land close to, but not on the site, he must get prior permission from Engineer. 	Project Engineer/ Contractor/	Site Establishment

Aspect of Environment	Impacts	Management	Responsible	Frequency
		<ul style="list-style-type: none"> - Cut and fill must be avoided where possible during the set up of the construction camp. - The size of the construction camp should be minimized (especially where natural vegetation or grassland has had to be cleared for its construction). <p><u>Ablutions</u></p> <ul style="list-style-type: none"> - Where water-borne sewage is not available, a reputable company must provide temporary chemical toilets. A registered chemical waste company is to be used to remove waste from chemical toilets on site. Servicing slips must be obtained and kept on file (servicing to be done weekly) - The construction of long drop toilets is forbidden. - The proposed means of treatment and disposal of sewage from the ablution facilities on site must be clearly indicated. - Under no circumstances may open areas or the surrounding bush be used as a toilet facility. Servicing <p>❖ <u>Provision for Camp Waste Disposal</u></p> <ul style="list-style-type: none"> - Bins/skips with lids shall be provided for disposal of waste. - Bins should have liner bags for efficient control and safe disposal of waste. - Recycling and the provision of separate waste receptacles for different types of waste should be encouraged. 	<p>Contractor</p> <p>Project Engineer/Contractor</p> <p>Project Engineer/Contractor/</p>	<p>During site set up. On a weekly basis</p> <p>During Site Establishment and Preliminary Investigations</p>
<i>Maintenance of Site</i>	⇒ Storm water	<ul style="list-style-type: none"> - As applicable, during site establishment, storm water culverts and drains are to be located and covered with metal grids to prevent blockages. 	Project Engineer/Contractor	Site Establishment

Aspect of Environment	Impacts	Management	Responsible	Frequency
		<ul style="list-style-type: none"> - Road drainage must prevent any significant ponding, as this would pose a safety risk and be likely to cause damage to the road surface - Points of discharge need to be within areas of dense grass cover, and away from other developments. 		
Storage Areas	<p>⇒ General Substances and Materials</p> <p>⇒ Hazardous Substances and Materials</p>	<ul style="list-style-type: none"> - Choice of location of storage areas must take into account prevailing winds, distance to water bodies and general on-site topography. - Storage areas must be designated, demarcated and fenced and secured if necessary. - Fire prevention facilities must be present at all storage facilities. - Storage areas should be secure so as to minimize the risk of crime/injury. - Hazardous materials must be banded with an impermeable liner to protect groundwater quality. - Storage areas containing hazardous substances/materials must be clearly signed. - It is very important that the proximity of houses, etc. is taken into account when deciding on the storage areas for hazardous substances. - Residents living adjacent to the construction site must be notified of the existence of the hazardous storage area as well as businesses in the area. - Staff dealing with hazardous materials / substances or even equipment must be aware of the potential impacts and follow appropriate safety measures. 	<p>Project Engineer/Contractor</p> <p>Project Engineer/Contractor/</p> <p>Project Engineer/Contractor</p>	<p>During site set up. Ongoing.</p> <p>During site set up.</p>

Aspect of Environment	Impacts	Management	Responsible	Frequency
	⇒ Materials Management - Sourcing	<ul style="list-style-type: none"> - Contractors shall submit a method statement and plans for the storage of hazardous materials and emergency procedures. - Contractors shall prepare a source statement indicating the sources of all materials (including topsoil, sands, natural gravels, crushed stone, asphalt, clay liners etc), and submit these to the Engineer for approval prior to commencement of any work. This must also be filed. - Where possible, a signed document from the supplier of natural materials should be obtained confirming that they have been obtained in a sustainable manner and in compliance with relevant legislation. 	Project Engineer/Contractor	On receipt of materials.
Dust	⇒ Air pollution	<ul style="list-style-type: none"> - Vehicles traveling along the access roads must adhere to speed limits to avoid creating excessive dust. - Camp construction / haulage road construction – areas that have been stripped of vegetation must be dampened periodically to avoid excessive dust. 	Project Engineer/ Contractor	Ongoing. More frequently during dry and windy conditions.
Soil erosion	⇒ Soil erosion	<ul style="list-style-type: none"> - Wind screening and storm water control should be undertaken to prevent soil loss from the site. - Procedures that are in place to conserve top soil during the construction phase of the project are to be applied to the set up phase i.e. top soil is to be conserved while providing access to the site and setting up the camp. 	Project Engineer/ Contractor	Throughout the duration of the project.

Aspect of Environment	Impacts	Management	Responsible	Frequency
Surface and ground water Quality	⇒ Run – Off	<ul style="list-style-type: none"> – Storage areas that contain hazardous substances must be bunded with an approved impermeable liner. – Spills in bunded areas must be cleaned up, removed and disposed of safely from the bunded area as soon after detection as possible to minimize pollution risk and reduced bunding capacity. – A designated bunded area is to be set aside for vehicle washing and maintenance. Materials caught in this bunded area must be disposed of to a suitable waste site or as directed by the engineer. – Provision should be made during set up for all polluted runoff to be treated to the Engineer's approval before being discharged into the stormwater system. 	Project Engineer/ Contractor	During site set up
Set up of Waste Management Procedures	⇒ Waste Management	<ul style="list-style-type: none"> – The excavation and use of rubbish pits on site is forbidden. – Burning of waste is prohibited. – A fenced area must be allocated for waste sorting and disposal. 	Project Engineer/ Contractor	Ongoing.
Noise and Visual Impacts	<p>⇒ Noise Impacts</p> <p>⇒ Visual Impacts</p>	<ul style="list-style-type: none"> – Equipment that is fitted with noise reduction facilities will be used as per operating instructions and maintained properly during site operations. – Storage facilities, elevated tanks and other temporary structures on site should be located such that they have as little visual impact on local residents and/or businesses. – Special attention should be given to the screening of highly reflective materials on site. 	<p>Project Engineer/ Contractor</p> <p>Project Engineer/ Contractor</p>	<p>Ongoing.</p> <p>On site setup</p>

Aspect of Environment	Impacts	Management	Responsible	Frequency
Safety and Security	⇒ Fencing	<ul style="list-style-type: none"> - Secure the site in order to reduce the opportunity for criminal activity in the locality of the construction site. - Potentially hazardous areas such as trenches are to be demarcated and clearly marked. 	Project Engineer/ Contractor	On site setup.
	⇒ Lighting	<ul style="list-style-type: none"> - Lighting on site is to be set out to provide maximum security and to enable easier policing of the site, without creating a visual nuisance to local residence or businesses. 	Project Engineer/ Contractor	On site setup.
Construction phase activities				
Access to site	⇒ Maintenance of Access	<ul style="list-style-type: none"> - Contractors should ensure that access roads are maintained in good condition by attending to potholes, corrugations and stormwater damage as soon as these develop. - Construction vehicles must be restricted to demarcated access, haulage routes and turning areas. 	Project Engineer/ Contractor	Weekly and after heavy rains.
Maintenance of site	⇒ Haulage Roads	<ul style="list-style-type: none"> - Contractors shall construct formal drainage on all temporary haulage roads in the form of side drains and mitre drains to prevent erosion and point source discharge of run-off. - Contractors should ensure that access roads are maintained in good condition by attending to potholes, corrugations and stormwater damage as soon as these develop. - Vehicles travelling to and from construction site must adhere to speed limits. - Access and other cleared surfaces must be dampened whenever possible and especially in dry/windy conditions. 	Project Engineer/ Contractor	Construction Phase

Aspect of Environment	Impacts	Management	Responsible	Frequency
	⇒ Worker Conduct on Site	<ul style="list-style-type: none"> ❖ Surfaces <ul style="list-style-type: none"> - The Contractor must monitor and manage drainage of the campsite to avoid standing water and soil erosion. - Run-off from the campsite must not discharge into surrounding properties. ❖ Ablutions <ul style="list-style-type: none"> - Chemical toilets are to be maintained in a clean state and should be moved to ensure that they adequately service the work area. - The Contractor is to ensure that open areas or the surrounding bush are not being used as a toilet facility or washing purposes. ❖ Camp Waste disposal <ul style="list-style-type: none"> - If chemical toilets are used then the waste should be disposed of regularly. Care must be taken to avoid contamination of soils and water, pollution and nuisance to adjoining areas. - A registered chemical waste company is to be used to remove waste from chemical toilets. - Bins and/or skips should be emptied regularly and waste should be disposed of at a registered landfill site. ❖ Eating areas <ul style="list-style-type: none"> - Eating areas should be regularly serviced, and cleaned to ensure the highest possible hygiene and cleanliness. - All litter throughout the site should be picked up and placed in bins provided. 	<p>Project Engineer/ Contractor/</p> <p>Project Engineer/ Contractor</p> <p>Project Engineer/ Contractor</p> <p>Project Engineer/ Contractor</p>	<p>Ongoing</p> <p>Weekly Inspection.</p> <p>Ongoing.</p> <p>During staff induction and ongoing as necessary followed by monitoring.</p>

Aspect of Environment	Impacts	Management	Responsible	Frequency
	⇒ Dust / Air Pollution	<p>❖ Housekeeping The contractor shall ensure that his camp and working areas are kept clean and tidy at all times.</p> <p>– A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules:</p> <ul style="list-style-type: none"> ▪ <i>No alcohol/drugs to be present on site.</i> ▪ <i>No firearms allowed on site or in vehicles transporting staff to/from site (unless used by security personnel)</i> ▪ <i>Prevent excessive noise.</i> ▪ <i>Prevent unsocial behavior.</i> ▪ <i>Construction staffs are to make use of the facilities provided for them, as opposed to alternatives.</i> <p>– Other than pre-approved security staff, no workers shall be permitted to live on site.</p> <p>– Vehicles traveling along the access roads must adhere to speed limits to avoid creating excessive dust.</p> <p>– Camp construction / haulage road construction areas that have been stripped of vegetation must be dampened periodically to avoid</p>	<p>Project Engineer/ Contractor/</p> <p>Project Engineer/ Contractor</p> <p>Project Engineer/ Contractor/</p> <p>Project Engineer/</p>	<p>During staff induction and ongoing as necessary followed by monitoring.</p> <p>During staff induction and ongoing as necessary followed by monitoring.</p> <p>Ongoing monitoring</p>

Aspect of Environment	Impacts	Management	Responsible	Frequency
	<p>⇒ Storm water</p>	<p>excessive dust.</p> <ul style="list-style-type: none"> - Ash disposal areas are to be promptly rehabilitated to minimize potential for dust pollution. - Water may only be discharged into a stormwater system with the permission of the local authority. - Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes or along pipeline routes without erosion protection measures being in place. Temporary cut off drains and berms may be required to capture stormwater and promote infiltration. - Earth, stone and rubble is to be properly disposed of so as not to obstruct natural water pathways over the site. i.e. These materials must not be placed in stormwater channels, drainage lines or rivers. - No temporary works, stockpiles or other circumstances may exist that impede natural water movements or act to concentrate run-off. - There should be periodic checking of the site's drainage system to ensure that the water flow is unobstructed. - The use of high velocity stormwater pipelines should be avoided in favour of open, high friction, semi-permeable channels wherever feasible. - Stormwater outfalls should be designed to reduce flow velocity in order to reduce and avoid soil erosion. <ul style="list-style-type: none"> - Stockpiles should not exceed 2m in height - Stockpiles should be covered by 	<p>Contractor</p> <p style="margin-top: 150px;">Project Engineer/ Contractor</p>	<p>Ongoing-more frequently during dry and windy conditions.</p> <p>Throughout the duration of the project.</p>

Aspect of Environment	Impacts	Management	Responsible	Frequency
	<p>⇒ Materials and Management</p> <p>⇒ Hazardous materials</p> <p>⇒ Waste Water Management</p>	<p>vegetation or cloth or berms.</p> <ul style="list-style-type: none"> - Stockpiles should not be situated such that they obstruct natural water pathways. - All materials should have designated areas to ensure that stockpiles are in their demarcated areas. - No stockpiles to be located within the flood line - All concrete mixing must take place on a designated, impermeable and bunded surface - No vehicle transporting concrete may be washed on site - All substances required for vehicle maintenance and repair must be stored in sealed containers until they can be removed from site. - Storage of hazardous substances within bunded area, and away from buffered zones. - Hazardous waste disposal must be carried out by an approved waste contractor. - Storage areas that contain hazardous substances must be bunded with an approved impermeable layer. - A designated, bunded area is to be set aside for vehicle washing and maintenance. - Provision should be made during set up for all polluted run off to be treated to the Engineer's approval before being discharged into the stormwater system. - No form of secondary pollution should arise from the disposal of sewage and refuse. If any problems should arise, the 	<p>Project Engineer/ Contractor</p> <p>Project Engineer/ Contractor</p> <p>Project Engineer/ Contractor</p>	<p>Monitoring throughout the duration of the project.</p> <p>Ongoing</p> <p>Construction phase</p>

Aspect of Environment	Impacts	Management	Responsible	Frequency
	⇒ Waste Management	<p>Developer should address these immediately.</p> <ul style="list-style-type: none"> - Refuse must be placed in designated skips. These should remain in demarcated areas. - Littering on site is forbidden and the site should be cleared of all litter at the end of each working day. - Where feasible, collect waste paper, glass and metal waste separately and arrange for collection by recycling contractors. - Litter bins must be equipped with a closing mechanism to prevent their contents from blowing out. - Litter bins should be emptied on a weekly basis. - All waste must be removed from the site and transported to a Registered, permitted landfill site. - Ensure that solid waste disposal is transported properly in order to avoid waste spills en-route. - Where solid waste disposal is to take place on site, ensure that only non-toxic materials which have no risk of polluting the groundwater, are designated approved areas at acceptable depths below ground level. (The necessary approvals and permits are to be in place before any such disposal takes place) - Construction rubble shall be disposed off in a pre-agreed demarcated spoil dumps that have been approved by the Engineer. - A sump (earth or other) must be created for concrete waste. This is to be de-sludged regularly and the cement waste is to be removed to a tip site as approved by the 		Construction phase

Aspect of Environment	Impacts	Management	Responsible	Frequency
	⇒ Surface Water	<p>local solid waste company that is in charge of that particular area.</p> <ul style="list-style-type: none"> - No form of secondary pollution should arise from the disposal of sewage and refuse. If any problems should arise, the Developer should address these immediately. - In the case of rubble and waste rock, subject to the approval by the Project Engineer, certain borrow pits and / or quarries may be utilised for the disposal of waste rock and inert building rubble. - No solid waste may be burned on site. - The excavation and use of rubbish pits on site is forbidden. <ul style="list-style-type: none"> - Care must be taken to ensure that run-off from vehicle or plant washing does not enter the groundwater. - 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 ponding of storm-water. - Temporary cut-off drains and berms may be required to capture stormwater and promote infiltration. - The most important factor in stable development of the site is the control and removal of both surface and groundwater from the site. - Should any pollution of groundwater or surface water occur then the regional DWA office should be contacted urgently. - Suitable and effective erosion control measures to be put in place. - The most important factor in stable development of the site is the control and removal of both surface and groundwater 	Project Engineer/ Contractor	Construction phase

Aspect of Environment	Impacts	Management	Responsible	Frequency
		<p>from the site.</p> <ul style="list-style-type: none"> - Disturbed surfaces to be properly rehabilitated - Clearance of vegetation to be kept to a minimum. - All working areas to be properly bunded 		
Storage areas	⇒ General substances and materials	<ul style="list-style-type: none"> - Choice of location for storage areas must take into account prevailing winds, distance to water bodies and general on-site topography. - Storage areas must be designated, demarcated and fenced. - Fire prevention facilities must be present at all storage areas. - Where materials are borrowed (mined) proof must be provided of authorisation to utilise these materials from the landowner and the Dept. of Mineral Resources. 	Project Engineer/ Contractor	Construction phase
	⇒ Hazardous storage areas	<ul style="list-style-type: none"> - Hazardous storage areas must be bunded with an impermeable liner to protect groundwater quality. - Storage areas containing hazardous substances/materials must be clearly signed. 	Project Engineer/ Contractor	Construction phase
	Accidental Spills and Leaks	<ul style="list-style-type: none"> - Material Safety Data Sheets (MSDSs) should be readily available on site for all chemicals and hazardous substances to be used on site. Where possible and available, MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental spill 	Project Engineer /Contractor	Construction phase

Aspect of Environment	Impacts	Management	Responsible	Frequency
		<p>releases or escapes.</p> <ul style="list-style-type: none"> - Emergency numbers should be put up on site and consulted should any accidents / spillages of hazardous substances and / or materials take place. The Contractor is to outline a method statement for the dealing of accidents / spillages of hazardous materials or substances. This statement must be handed to the Engineer as well as to DWA should the incident occur near a body of water. - Spills in bunded areas must be cleaned up, removed and disposed of safely from the bunded areas as soon as possible after detection in order to minimise the risk of pollution and reduced bunding capacity. <p>❖ <u>Chemical spills</u></p> <ul style="list-style-type: none"> - Contain chemical spills and arrange for clean up / control by the supplier or by professional pollution control personnel. <p>❖ <u>Oil and Fuel spills</u></p> <ul style="list-style-type: none"> - The area that houses the construction camp is to be checked for spills of substances such as oil, paint etc. and these should be cleaned up. - Immediately clean up any accidental oil or fuel spills or leakages. - Do not hose oil or fuel spills into a stormwater drain or sewer, or into the surrounding natural environment. - Clean small oil or fuel spills with an approved absorbent material, such as 'Drizit' or 'Spill-sorb'. - Contain oil or fuel spills in water using an 	<p>Project Engineer/ Contractor</p> <p>Project Engineer/ Contractor</p>	<p>Construction phase</p> <p>Construction phase</p>

Aspect of Environment	Impacts	Management	Responsible	Frequency
		<p>approved oil absorbent fibre.</p> <ul style="list-style-type: none"> - Treat soil contaminated by oil or fuel using one of the following approved methods, as per instruction of the RE or Project Engineer: <ul style="list-style-type: none"> ▪ <i>Remove the soil to the depth of the contamination and dispose of it at a registered Hazardous Waste Disposal Site.</i> ▪ <i>Remove the soil to the depth of the contamination, and regenerate it by using approved bio-remediation methods.</i> <p>Report all major oil or fuel spills to the provincial Department of Water Affairs, as well as to the relevant Local Authority.</p>		
Visual aspects	⇒ Lighting on site	<ul style="list-style-type: none"> - Lighting is to be set out to provide maximum security, without creating a visual nuisance to surrounding residents. 	Project Engineer/ Contractor	Construction phase
Vegetation	⇒ Conservation of natural environment	<ul style="list-style-type: none"> - Care to be taken not to introduce alien plant species to site - Do not remove any large indigenous tree without the permission of the Project Engineer/ECO. - Ensure that permits from DWA are in place before removing any protected plant/tree, and that licences have been obtained for the damage or removal of trees/plants protected under the National Forest Act. - No open fires are permitted under any tree. - No vegetative matter may be removed for firewood. - No material storage or lay down is permitted 	Project Engineer/ Contractor	Ongoing monitoring

Aspect of Environment	Impacts	Management	Responsible	Frequency
	⇒ Alien Vegetation Control	<p>under trees.</p> <ul style="list-style-type: none"> - No heavy equipment, machinery and vehicles may be parked under any tree unless authorised by the Project Engineer. - Utilise the method of mechanical de-bushing rather than chemical. - Wherever possible, store removed indigenous vegetation in a nursery for replanting during rehabilitation. <p>- Exotics and invasive plants to be eradicated. Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion.</p> <ul style="list-style-type: none"> - All sites disturbed by construction activities must be monitored for colonisation of exotics or invasive plants and control these as they emerge. - Follow manufacturer's instructions when using chemical methods, especially in terms of quantities, time of application etc. - Ensure that only properly trained people handle and make use of chemicals. - Dispose of the eradicated plant material at an approved solid waste disposal site. - Immediate re-vegetation of stripped areas and the removal of alien plant species by regular weeding must take place. This significantly reduces the amount of time and money that must be spent on alien plant management during rehabilitation. - Topsoil that is suspected to be contaminated with the seed of alien vegetation should not be used. Alternatively, the soil is to be sprayed with specified herbicides. 	Project Engineer/ Contractor	Ongoing monitoring
Soil Erosion and	⇒ Soil Erosion	- The time that's stripped areas are	Project	Ongoing

Aspect of Environment	Impacts	Management	Responsible	Frequency
<p>Excavations</p>	<p>⇒ Erosion Control</p>	<p>left open to exposure should be minimized wherever possible. Care should be taken to ensure that these times are not excessive.</p> <ul style="list-style-type: none"> - Soil erosion on site must be prevented during all phases of the development. - Wind screening and stormwater control should be undertaken to prevent soil loss from the site and sedimentation of water bodies. - All embankments shall be protected by a cut-off drain to prevent water from cascading down the face and causing soil erosion. - Monitor access roads and the site for signs of erosion and remedy this as soon as possible. - Areas with potential of soil erosion must be rehabilitated with indigenous vegetation to minimize future impacts of soil erosion and other human activities. 	<p>Engineer/ Contractor</p>	<p>monitoring</p>
		<ul style="list-style-type: none"> - Topsoil removed must be placed carefully aside and must be used for rehabilitation purposes. - Surface Water Management: - Ensure that water abstraction points (i.e. from rivers etc.) do not degrade or erode as a result of leaking pipes, spills, muddy conditions or wash-aways. These problems should be rectified as soon as they arise. - Repair identified leaks and address 	<p>Project Engineer/ Contractor</p>	<p>Ongoing monitoring</p>

Aspect of Environment	Impacts	Management	Responsible	Frequency
	<p>⇒ Erosion Protection</p>	<p>issues of water wastage as soon as these are identified.</p> <ul style="list-style-type: none"> - Avoid over-wetting, saturation and unnecessary runoff during dust control activities and irrigation. - Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes or along pipeline routes without erosion protection measures being in place. - Line overflow and scour channels with stone pitching along their length and at their points of discharge to prevent soil erosion. The point of discharge must be at a point where there is dense natural grass cover. - Ensure that channels do not discharge straight down the contours. These must be aligned at such an angle to the contours that they have the least possible gradient. - Ensure that overland discharge occurs over areas that have a minimum cover of 90% grass cover at a minimum height of 150mm. This applies to areas down slope of the discharge point as well. - Stormwater control and wind screening should be undertaken to prevent soil loss from the site. <p>- Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within</p>	<p>Project Engineer/ Contractor</p>	<p>Construction phase.</p>

Aspect of Environment	Impacts	Management	Responsible	Frequency
	Excavations	<p>and adjacent to the construction camp and Work Areas.</p> <ul style="list-style-type: none"> - All natural trees, shrubbery and grass species should be retained wherever possible. - Do not permit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the Works Area. - Utilise only light equipment for access and deliveries into areas of unstable soils and in areas where erosion is evident. - Do not allow erosion to develop on a large scale before effecting repairs. When in doubt. - Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth. <ul style="list-style-type: none"> - Excavations should be undertaken carefully incorporating appropriate drainage or dewatering. - Programme excavations to take place once the required materials are on site. This facilitates the immediate laying of services and / or construction of subsurface infrastructure and minimises open trench time. - Excavation activities must be limited to areas of immediate work to prevent soil erosion. 	Project Engineer/ Contractor	Ongoing.
Air Quality Noise & Dust	⇒ Slight increase in noise/dust during	Construction hours to be limited to normal working hours. Should dust pollution become a problem during	Project Engineer/ Contractor	Ongoing Monitoring

Aspect of Environment	Impacts	Management	Responsible	Frequency
	construction.	the construction phase, dust amelioration measures (periodic wetting of exposed surfaces) will have to be put in place. Vehicles travelling along the access roads must adhere to speed limits to avoid creating excessive dust. Noisy activities must be restricted to the times given in the Project Specification or General Conditions of Contract.		
Safety and Security	Construction camp	The site should be secured (fenced) or protected by security personnel in order to reduce criminal activity Potentially hazardous areas such as trenches are to be demarcated and clearly marked with danger tape. Material stockpiles or stacks (pipes) must be stable and secured to prevent collapse Obstruction to drivers' line of sight due to stockpiles and stacked materials must be avoided, especially at intersections and sharp corners. No materials are to be stored in unstable or high-risk areas (steep slopes). All I&AP's should be notified in advance of any potential risks associated with the construction site and the activities. Campsites to be fenced. Burning at campsite area to be prohibited Proper mobile toilet facilities to be provided No firearms to be allowed on camp site areas No hunting or poaching to be allowed at any time	Project Engineer/ Contractor	Ongoing 24 hours prior to the activity in question
Social Impacts	Disruption of Infrastructure/Services	<ul style="list-style-type: none"> - Contractor's activities and movement of staff to be restricted to designated construction areas. - The Engineer and Contractor are 	Project Engineer/ Contractor	During Construction

Aspect of Environment	Impacts	Management	Responsible	Frequency
		responsible for ongoing communication with those people that are interested in/affected by the project. A complaints register should be housed at the site office. I&AP's need to be made aware of the existence of the complaints book.		
Heritage/ archaeological	⇒ Construction activities	<ul style="list-style-type: none"> - Should any subsurface artefacts be uncovered, construction is to cease and Amafa must be contacted immediately. The same would apply to graves. No tampering of gravesites or artefacts is permitted. Work must stop and the suspected grave/artefact site must be demarcated at a radius of 40m until the specialist/ Amafa arrives on site. 	Project Engineer/ Contractor	Construction
Post Construction Activities Site Maintenance	⇒ Construction Camp	<ul style="list-style-type: none"> ❖ Removal of structures and infrastructure <ul style="list-style-type: none"> - Clear and completely remove from site all construction plant, equipment, storage containers, temporary fencing, temporary services, fixtures, implements and any other temporary works. - Materials that will not be used again in the proposed development must either be sold if possible or rehabilitated to blend in with the surrounding landscape. - All access roads that where utilised during the construction phase (which are not earmarked for closure and rehabilitation) should be returned to a usable state and / or a state no worse than prior to construction. - The Contractor must repair the damages that may have been caused to neighbouring property and both public and private roads, during the construction phase. - Borrow pits (if any) are to be closed and rehabilitated in accordance with DME-approved management plan. ❖ Inert waste and rubble 	Project Engineer/ Contractor	Project completion

Aspect of Environment	Impacts	Management	Responsible	Frequency
		<ul style="list-style-type: none"> - The site should be cleared of all inert rubble, including surplus rock, foundations and batching plant aggregates. - All excess spoil and inert rubble should be loaded and hauled to fill in borrow pits / dongas or to dump sites indicated / approved by the Engineer. - All domestic waste must be removed from the site and disposed of in an approved manner at a registered waste disposal site. - Subject to the approval by the Project Engineer, certain borrow pits and / or quarries may be utilised for the disposal of waste rock and inert building rubble. <p>No temporary works, stockpiles or other circumstances may exist that impede natural water movements or act to concentrate run-off.</p> <p>❖ <u>Hazardous waste and pollution control</u></p> <ul style="list-style-type: none"> - All pollution containment structures must be removed from the site. Materials that will not be used again must be disposed off as hazardous waste. - All temporary sanitary infrastructure and waste water disposal systems must be removed from the site. Care should be taken to avoid leaks, overflows and spills. The disposal of any waste should be conducted in an approved manner. <p>Bunded areas must be cleared to a suitable waste site or municipal sewer and be removed from site.</p> <p>❖ <u>Final shaping</u></p> <ul style="list-style-type: none"> - All prospecting boreholes, excavations 	<p>Project Engineer/ Contractor</p> <p>Project Engineer/ Contractor</p> <p>Project Engineer/ Contractor</p>	<p>Project Completion</p> <p>Project Completion</p> <p>Project Completion</p>

Aspect of Environment	Impacts	Management	Responsible	Frequency
	⇒	<p>and/or test pits must be backfilled with in-situ material.</p> <ul style="list-style-type: none"> - All borrow pits, quarries and dangerous excavations should be made safe by backfilling, grading and blasting as required. - Where possible, programme the backfill of excavations so that the subsoil is deposited first, followed by the topsoil. The layers should be compacted for best results. - A deficiency of backfill may not be made up by excavating haphazardly within the Work Site. Additional fill may only be imported from approved borrow areas as indicated by the Project Engineer. - Backfill areas must be monitored for subsidence (as backfill settles) and fill the depressions using available material. - All disturbed areas should be shaped in order to fit in with the surrounding environment. - No excavated material or stockpiles should be left on site after construction has been completed. All materials remaining after the backfill should be smoothed over the site to blend in with the surrounding landscape. 		

Aspect of Environment	Impacts	Management	Responsible	Frequency
Site Rehabilitation	⇒ Topsoil replacement and Soil amelioration	<ul style="list-style-type: none"> - Execute top soiling activity prior to the rainy season or any expected wet weather conditions. - Topsoil placement should be executed concurrently with construction where possible, or as soon as construction in an area 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 and roads. Topsoil should be replaced to original depth (i.e. as much as was removed prior to the commencement of the construction activities). - Place topsoil in the same area where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of a similar quality may be brought from other areas of similar quality (provided they have been treated and are free of weeds or alien seeds). - Topsoil that is suspected to be contaminated with the seed of alien vegetation should not be used. Alternatively, the soil is to be sprayed with specified herbicides. - After topsoil placement has been completed, available stripped vegetation must be spread randomly by hand over the top soiled area. Sods may also be planted onto top soiled areas. 	Project Engineer/ Contractor	Project Completion
	⇒ Ripping and scarifying	<ul style="list-style-type: none"> - Rip and / or scarify areas following the application of topsoil to facilitate mixing of 	Project Engineer/ Contractor	Project Completion

Aspect of Environment	Impacts	Management	Responsible	Frequency
		<p>the upper most layers</p> <ul style="list-style-type: none"> - All disturbed areas of the construction site, including temporary access routes and roads, compacted during the execution of the Works, must be ripped and / or scarified. - Rip and / or scarify along the contours 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. 		
Vegetation	Re-vegetation	<p>❖ Transplanting</p> <ul style="list-style-type: none"> - Transplanting entails the removal of plant material and replanting the same plants in another designated position. - Transplant trees and shrubs during winter (between April and September). Deciduous trees should be transplanted before new growth appears. - Trees and shrubs should be planted so that their stems and trunks are at the same depth as in their original position. - Orientate trees and shrubs in the same direction as their original position. - Where necessary, protect newly planted trees against harsh environmental conditions such as wind etc. by fencing or sacking. - Transplanted trees and shrubs should be watered on a regular basis until the plants are able to survive independently. 	Project Engineer/ Contractor	Project Completion

Aspect of Environment	Impacts	Management	Responsible	Frequency
		<ul style="list-style-type: none"> - Fences, stakes, sacks etc. should be removed once the plants have become established. 		
Soil Erosion	Erosion control	<ul style="list-style-type: none"> - All cleared land surfaces must be prepared, top soiled and revegetated. - All spoil material must be removed from site. - All areas that show signs of erosion during construction must be remediated. 	Project Engineer/ Contractor	Project Completion
General	⇒ General aspects	<ul style="list-style-type: none"> - Temporary roads must be closed and access across these blocked. - All areas where temporary services were installed are to be rehabilitated to the satisfaction of the Project Engineer. - A meeting is to be held on site between the ECO, Engineer and Contractor to approve all remediation activities and to ensure that the site has been restored to a condition approved by the Engineer. 	Contractor/ Project Engineer	Project Completion
Alien plant	⇒ Control of weeds	<ul style="list-style-type: none"> - Ongoing weed control is required for the construction and post construction phase, for a period of three months post construction. 	Contractor/ Project Engineer	Operational Phase

5 CONCLUSION

In order to mitigate impacts on the environment to a level of low significance, it is vital that all mitigatory recommendations made within this EMPR are adhered to. Key recommendations are summarised as follows:

1. All management recommendations made in this report must be strictly adhered to.
2. This EMPr addresses the issues of solid waste management; materials management; re-vegetation; erosion; hazardous waste/pollution control.

This project could potentially result in negative impacts on the receiving environment. These significant negative impacts have been identified and assessed. These impacts can be effectively mitigated thus reducing the risk to the environment. This can be achieved by effective implementation of the necessary mitigation measures as stipulated in the EMPr.