GREATER MBIZANA REGIONAL BULK WATER SUPPLY SCHEME: PHASE 2

WORK PACKAGE 2: SOUTHERN EASTERN FEEDER

FINAL ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

OCTOBER 2023

COMPILED BY	ON BEHALF OF
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DEFINITIONS

Environmental Control Officer – An Environmental Consultant assigned to the project on a part or full-time basis. The Environmental Control Officer will be part of the Project Staff and will advise the Engineer on all environmental matters relating to the works, in terms of this specification and the project specification, if applicable.

Cleared Surface – "Surface vegetation" as referred to in SABS 1200 C 2.3 will be deemed to be any woody or herbaceous vegetation but exclude grasses, sedges, rushes, and reeds.

Clearing and Grubbing shall for the purpose of this specification mean the removal of all woody and herbaceous vegetation including stumps but excluding grass and groundcover vegetation.

Engineer – Is to read Engineer or Supervisor (in the case of the NEC contract), whichever is applicable to the contract.

Interested and Affected Parties (IAP) – All persons who may be affected by the project either directly or indirectly, or who have an interest or stake in the area to be affected by the project. I&AP's include landowners, tribal or local authorities, public interest groups etc.

Open Trench – Open trench will, for the purpose of this specification, be deemed to include: clearing and grubbing; stripping of topsoil; trenching; placing of bedding; pipe laying; placing of selected fill; backfilling to ground level; removing excess material; construction of cross berms to channel water (if required) and replacement of topsoil to final finished level.

Progressive Reinstatement – Reinstatement of disturbed areas to topsoil on an ongoing basis, immediately after selected construction activities (e.g., backfilling of a trench) are completed. This allows for passive rehabilitation (i.e., natural re-colonization by vegetation) to commence. See also 'Open Trench' and 'Rehabilitation'.

Project Manager – The person responsible for coordinating and integrating activities across multiple, functional lines.

Rehabilitation – Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement re-vegetation of a disturbed area and the insurance of a stable land surface. Re-vegetation will aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e., promote rapid vegetation establishment.

Riparian Vegetation – Vegetation occurring on the banks of a river or stream (i.e., vegetation fringing a water body). In this specification, riparian vegetation in terms of removal, storage, and replacement, is only applied to sedge, grass, ground cover, reed, bulrush, or herbaceous component of riparian vegetation and excludes the woody component.

Sedges – Grass-like plants growing in wetland / marshy areas or adjacent to water.

Subsoil – Subsoil is the soil horizons between the topsoil horizon and the underlying parent rock. Subsoil often has more clay-like material than the topsoil. Subsoil is of less value to plants, in terms of nutrient (food) and oxygen supply than topsoil. When subsoil is exposed, it tends to erode fairly easily.

Timeous – At least 2 working days prior to an activity.

Topsoil – This is defined as the A horizon of the soil profile. Topsoil is the upper layer of soil from which plants obtain their nutrients for growth. It is often darker in colour, due to the organic (humic) fraction. Topsoil is deemed for the purposes of this specification as the layer of soil from the surface to the specified depth required for excavation. Where topsoil is referred to, it is deemed to be both the soil

and grass / ground cover fraction (see 'Cleared Surface'). Will no clear A Horizon be present, the top 400mm shall be deemed as topsoil.
Veld – This is defined for the purpose of this specification as unimproved natural vegetation areas (e.g., grasslands).

Water Body – Any open body of water including streams, dams, rivers, lakes, and the sea.
Wetland – A seasonally, temporally, or permanently wet area which also may exhibit a specific vegetation community. It is often marshy in character.
Wetland Vegetation – Vegetation which is indicative of a wetland environment – for example, sedges, rushes, reeds, hydrophilic grasses, and ground covers, but for the purposes of this specification excludes woody species.

LIST OF ACRONYMS

ECDEDEA	Eastern Cape Department of Economic Development and Environmental Affairs
DFFE	Department of Environment, Forestry and Fisheries
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EMPr	Environmental Management Programme
WMMLM	Winnie Madikizela-Mandela Local Municipality
ANDM	Alfred Nzo District Municipality
ORTDM	OR Tambo District Municipality
DWS	Department of Water & Sanitation
GMRBWS	Greater Mbizana Regional Bulk Water Supply Scheme: Phase 2

TABLE OF CONTENTS

LIST OF FIGURES

1. SECTION A: BACKGROUND

1.1. Introduction

NM Environmental has been appointed to assist the Applicant (Umgeni Water) to undertake the Environmental Impact Assessment Process for the proposed Construction of the Greater Mbizana Regional Bulk Water Supply Scheme: Phase 2 – Work Package 2: Southern Eastern Feeder**,** as per the environmental legislative requirements detailed in terms of the National Environmental Management Act (Act No. 107 of 1998) and the 2014 Environmental Impact Assessment Regulations, as amended (11 June 2021).

This EMPr serves as an Environmental Management tool by providing a structured plan of mitigatory measures for all works executed by the Developer, Project Engineer, Contractor, and Subcontractor/s to have a minimum impact on the environment in accordance with all relevant legislation, policies, and standards, during the Pre-Construction, Construction, and Post-Construction Phases of this development.

In this context it should be viewed as a dynamic or 'living' document, which may require updating, or revision during the life cycle of the development to address new circumstances as the need arises. It is essentially, a written plan of how the environment is to be managed in practical and achievable terms.

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

1.2. Background And Overview of The Project

The Greater Mbizana Regional Bulk Water Supply Scheme: Phase 2 – Work Package 2: Southern Eastern Feeder, is located in the Winnie Madikizela-Mandela Local Municipality (previously Mbizana Local Municipality) in the Alfred Nzo District Municipality, Eastern Cape. The Greater Mbizana Regional Bulk Water Supply Scheme: Phase 2 – Work Package 2: Southern Eastern Feeder, is supported by the Regional Bulk Infrastructure Grant (RBIG), which is sponsored by the Department of Water and Sanitation (DWS) and co-funded by OR Tambo District Municipality. The project will be implemented in stages over several years.

The primary focus is to augment the current Bulk Water Supply within the Winnie Madikizela-Mandela Local Municipality including the town of Bizana. The project aims to develop a new water resource, increase the capacityof the Water Treatment Works and improve the bulk water distribution to the region. Phase 1 of this Water Supply Scheme was completed 2012.

The upgrade of the Water Supply Scheme constitutes Phase 2 of the Scheme, which has been broken into three Work Packages viz (see **Figure 1**):

- **Work Package 1**: Upgrade of the Nomlacu Water Treatment Works and Ludeke Pumpstation,
- **Work Package 2: Southern Eastern Feeder**: Construction of three Gravity Mains from the treatment works to Mnyaka Mzamba and Redoubt, and Associated Reservoirs.
- **Work Package 3: Southern and North-western Feeder**: Construction the Pipeline from Entsimbini to Mbongweni and Luthulini; Rising main from Kusiwisa to Ndindini Reservoir; Rising main from Ndindini to Ntlontslane Reservoir and associated Reservoirs and Pumpstations.

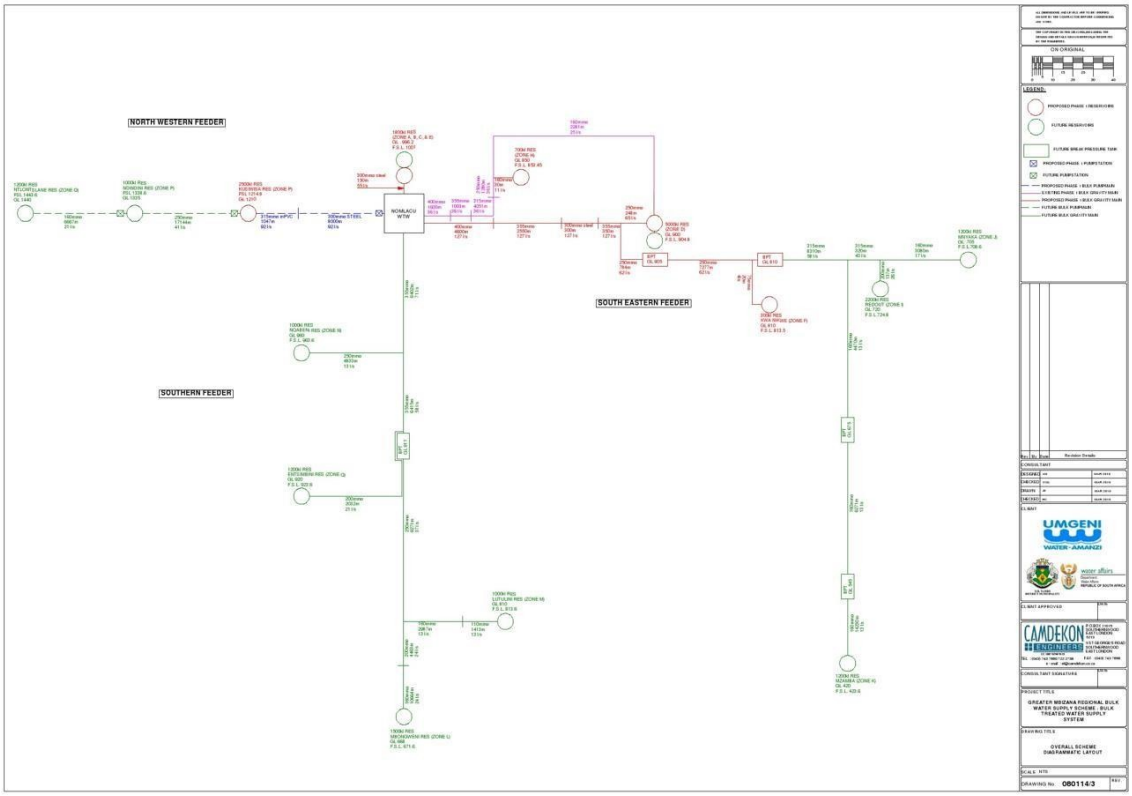

Figure 1 ***: Overall Project Schematic***

This Environmental Management Programme is in respect of Work Package 2: Southern Eastern Feeder of Phase 2 of the Greater Mbizana Regional Water Supply Scheme. The scope of **WORK PACKAGE 2: SOUTHERN EASTERN FEEDER** entails:

- 5 000m^3 Bizana Town Reservoir
- 2 200m^3 Redoubt Reservoir
- 1 200m^3 Mnyaka Reservoir
- 1 200m^3 Mzamba Reservoir
- 315mm ø reduces to 200/160mm ø pipeline from KwaNikhwe to Redoubt and Mnyaka Reservoir
- 160mm ø pipeline from Redoubt to Mzamba Reservoir

1.2.1. Locality Context of The Project

The proposed bulk infrastructure sites are located towards the South East of Mbizana along the R61 starting from KwaNikhwe to Redoubt and Mnyaka down to Mzamba along the R61 towards Mzamba Beach and Port Edward.

The construction of a 5Ml reservoir is the only activity that takes place within the urban portion of the town of Mbizana.

The gravity mains span communities namely: Redoubt, Mnyaka and Mzamba **(Figure 7)** where extensive infrastructure and land transformation has occurred.

The following Bulk gravity mains are proposed for GMRBWSS:PHASE 2 - Work Package 2: Southern Eastern Feeder development stage:

KwaNikhwe to Redoubt

- Installation of 3 662m of 300 diameter steel and
- 5 281m of 315mm PVC and
- 187m of 250mm diameter PVC bulk main.

The pipelines will feed off the bulk gravity main from KwaNikhwe to the Redoubt reservoir pipeline.

Mnyaka and Mzamba

- The construction of a 3 200m 160mm diameter uPVC Class 16 gravity main.
- The construction of a 26 300 m 160 mm diameter uPVC Class 16 gravity main.

The following Bulk Reservoirs are planned to be constructed of reinforced concrete:

- 5 000Ml at Mbizana
- 2 200Ml at Redoubt
- 1 200Ml at Nyaka
- 1 200Ml at Mzamba

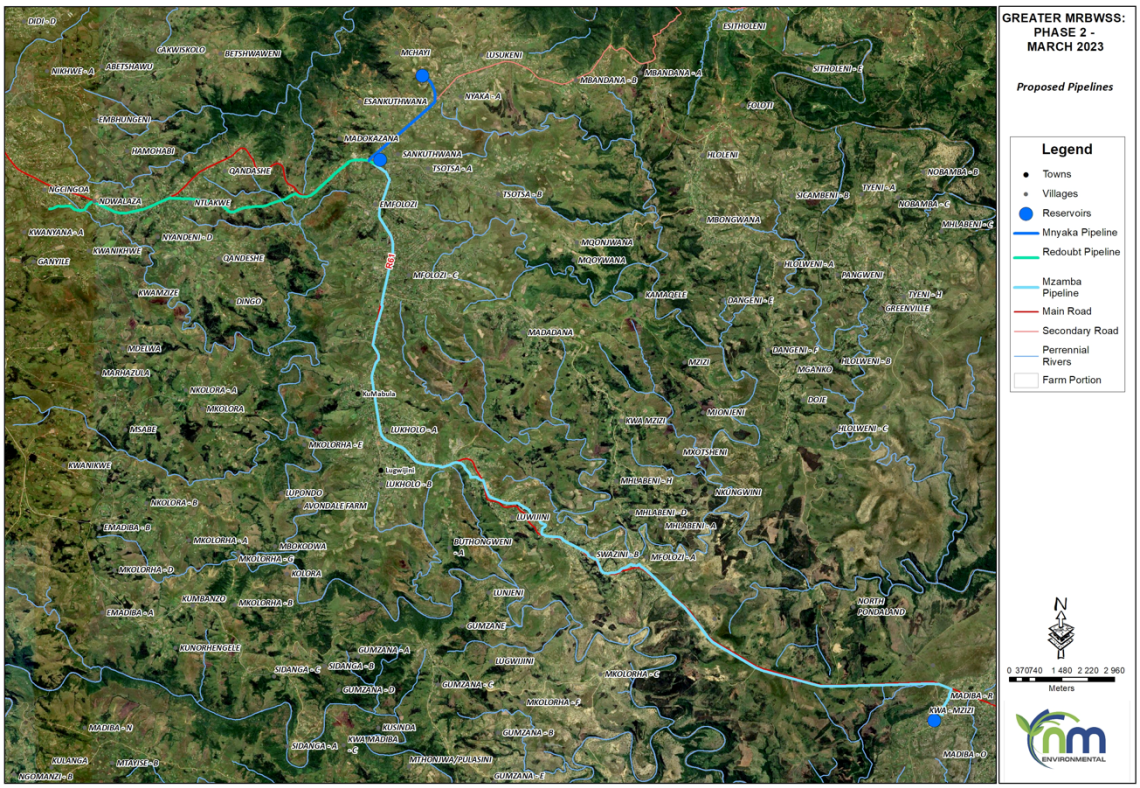

Figure 2: Locality Map

Figure 3: Communities impacted by pipeline (Redoubt, Mnyaka & Mzamba)

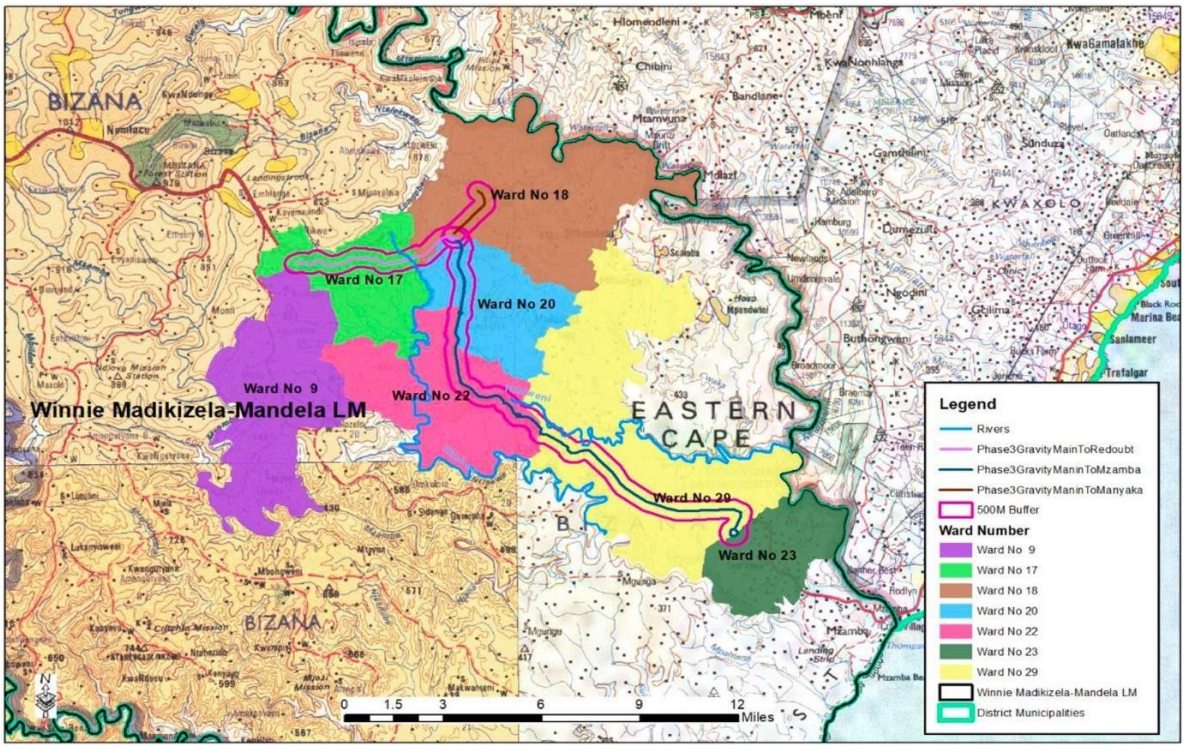

Figure 4: wards affected by proposed development

1.3. Aim and Objectives of this EMPr

This EMPr provides performance criteria required to address potential environmental impacts during the life cycle of the Construction of three Gravity Mains from Mnyaka to Redoubt and Mzamba, as well as associated infrastructure (Pre-construction, Construction, Operation and Decommissioning phases).

This Report must be read in conjunction with the applicable and relevant environmental legislations as relating to the project.

The Aims of the EMPr includes the following:

- Identify those Pre-Construction, Construction and Operational activities identified for the proposed development that may have a negative and or postive impact on the environment.
- Outline the mitigation measures that will need to be taken and the steps necessary for their implementation.
- Describe the reporting system to be undertaken during Construction.

The Objectives of this EMPr include the following:

- Ensuring adherence with regulatory authority stipulations and guidelines (local, provincial, national and/or international).
- Ensuring sufficient provision of resources on the project budget so that the scale of EMP related activities is consistent with the significance of project impacts.

- Verifying environmental performance through information on impacts as they occur.
- Responding to unforeseen events; and
- Providing feedback for continual improvement in environmental performance.

1.4. Interpretations

The principles guiding this EMPR are as follows:

- The Environment is considered to be composed of both biophysical and social components.
- Construction is a disruptive activity, and all due consideration must be given to the environment, particularly the social environment, during the execution of a project to minimize the impact on affected parties.
- Minimization of areas disturbed by construction activities will minimize many of the construction related environmental impacts of the project and reduce rehabilitation requirements and costs.
- As minimum requirements, all relevant standards relating to international, national, provincial, and local legislation, as applicable, shall be adhered to. This includes requirements relating to waste emissions (e.g., hazardous, airborne, liquid, and solid), waste disposal practices, noise regulations, road traffic ordinance etc.
- All effort will be made to minimize, reclaim, or recycle 'waste' material.

1.5. Compliance With Applicable Legislations

The Supreme law of the land is "The Constitution of the Republic of South Africa", which states:

"*Every person shall have the right to an environment which is not detrimental to his or her health or wellbeing*".

Laws applicable to protection of the environment in terms of Environmental Management (and relating toconstruction activities) include but are not restricted to:

- National Environmental Management Act. (Act No. 107 of 1998)
- The National Water Act. (Act No. 36 of 1998)
- Environment Conservation Act. (Act 73 of 1989)
- Conservation of Agricultural Resources Act.
- Hazardous Substances Act (Act No. 15 of 1973.
- Occupational Health and Safety Act, No. 85 of 1993
- Soil Conservation Act, Act No. 76 of 1969
- Animals Protection Act, Act No. 71 of 1962
- Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, No 36 of 1947 • ExplosivesAct, No. 26 of 1956

- National Veld and Forest Fire Act, No 101 of 1998
- Forest and Veld Conservation Act, Act No 13 of 1941
- National Environmental Management Biodiversity Act, No 10 of 2004

Of particular importance is **Section 28 (1) of the National Environmental Management Act, Act No. 107 of 1998** (NEMA) which places an obligation on all individuals to take due care of the environment and to ensure remedial action is instituted to minimize and mitigate environmental impact.

The EMPr forms part of the Contract Documentation and is thus a legally binding document.

In terms of this Act an individual responsible for environmental damage must pay costs both to the environment and human health and the preventative measures to reduce or prevent additional pollution and/or environmental damage from occurring.

1.6. Compliance With this EMPr

Contractor

The Contractor is deemed not to have complied with this EMPr if:

- For the infrastructure components of the project Mbizana Regional Bulk Water Supply Scheme Extension, during the Construction Phase there is evidence of contravention of clauses as mentioned within this EMPr or as directed to by the Local Authority, Project Engineer, or Environmental Consultant.
- If environmental damage ensues due to negligence.
- The Contractor fails to comply with corrective or other instructions issued by the Local Authority; Project Engineer or Environmental Consultant within a specified time; and
- The Contractor fails to respond adequately to complaints from the public.

Application of a penalty clause will apply for incidents of non-compliance, the penalty imposed will be per incident. Penalties imposed for non-compliance will be as follows, and these will be instituted at the discretion of the Project Engineer in line with the project specification:

- Failure to demarcate working areas,
- Working outside of the demarcated area,
- Failure to strip topsoil with intact vegetation,
- Failure to stockpile topsoil correctly,
- Failure to stockpile materials in designated areas,
- Pollution of water bodies and/or groundwater (incl. increased suspended solid loads),
- Failure to implement storm water management provisions during construction,
- Failure to control storm water runoff,
- Downstream erosion,
- Failure to provide adequate sanitation,
- Unauthorised removal of indigenous vegetation,

- Failure to erect temporary fences,
- Failure to provide adequate waste disposal facilities and services,
- Nuisance to neighbours by Construction staff,
- Failure to reinstate disturbed areas within the specified timeframe,
- Failure to rehabilitate disturbed areas within the specified timeframe,
- Failure to maintain a register of incidents on site,
- Failure to maintain the Environmental File on site,
- Failure to submit method statements timeously,
- Any contravention with approved Method Statements,
- Insufficient education of staff regarding environmental matters and Site housekeeping practices,
- Washing of vehicles on site outside of the designated bund facility,
- Untidiness and litter at camp,
- Failure to provide drip trays and/ or empty them frequently,
- Any other contravention of particular (general) environmental Specification,

Penalty fines will be paid by the Contractor to the Developer and will be used towards the rehabilitation and/ or landscaping for the project.

1.7. Detailed Scope of this EMPr

Conditions of Contract / Roles and Responsibilities

The Project Engineer and Contractor shall be responsible for ensuring compliance with the provisions containedin the EMPr and shall be held accountable in terms of the EMPr.

Duties and powers of the Developer

The Developer has overall responsibility for compliance with the EMPr as it is a fundamental component of theauthorisation requirements for the project. This means that the Developer must:

- Ensure that the professional team and the Contractors are appropriately briefed and that their appointment includes environmental requirements as relevant.
- Ensure that he is kept fully informed of the performance of the project against the requirements of theEMPr.
- Ensure that appropriate action is taken where consistent incidents of non-compliance are taking place; and
- Ensure that any corrective action required by the authorities (DFFE) is implemented.

Duties and powers of the Project Engineer

The Project Engineer is responsible for ensuring compliance with the Environmental Management Programme and:

- Maintains a register of environmental incidents, complaints, and queries by members of the public at the site office. This register is forwarded to the Environmental Control Officer on a monthly basis.
- Enforces the EMPr on site.
- Monitors compliance with the requirements of the EMPr; and
- Assesses the Contractor's environmental performance in consultation with the Environmental Control Officer.

The Environmental Control Officer

The Independent Environmental Control Officer (ECO):

- Must be appointed by the Developer to visit the site from time to time once the first activities start on site.
- Undertake induction training and briefs the Project Engineer and the Contractor about the requirements of the Environmental Management Programme.
- Advises the Project Engineer about the interpretation, implementation and enforcement of the Environmental Specification and other related environmental matters.
- Attends site meetings, as necessary.
- Monitors the Contractor's compliance with the EMPr by undertaking an environmental audit at the start of the construction phase, then monthly thereafter until all works on site have been completed, and then a close-out audit is to be undertaken after construction is complete.
- Reports on the performance of the project in terms of environmental compliance with the EMPr to be submitted to the Project Engineer, Developer and DFFE on a monthly basis;
- Provides technical advice relating to environmental issues to the Project Engineer; and
- Acts as liaison with and other environmental organisations or stakeholders as necessary.

The Environmental Site Officer (if required)

The Environmental Site Officer (ESO):

- Must be appointed for the duration of the construction phase of the project.
- Attends site meetings.
- Monitors the site for compliance with the Environmental Specification and EMPr.
- Reports on the performance of the project in terms of environmental compliance to the ECO and Project Engineer.
- Liaises with the ECO on matters of regulation and those requiring clarity and advice.

Extent of the Contractor's Obligations

The Contractor is required to:

- Supply method statements and management plans for all activities requiring special attention as specified and/or requested by the Project Engineer or Environmental Control Officer for the duration of the Contract.
- Be conversant with the requirements of the Environmental Management Programme.
- Brief staff about the requirements of the Environmental Management Programme.
- Comply with requirements of the Environmental Control Officer in terms of this EMPr.
- Ensure any sub-contractors/ suppliers who are utilised within the context of the contract comply with the environmental requirements of the EMPr. The Contractor will be held responsible for non-compliance on their behalf.
- Bear the costs of any damages/ compensation resulting from non-adherence to the EMPr or written site instructions.
- Comply with all applicable legislation; and
- Ensure that the Project Engineer is timeously informed of any foreseeable activities that will require input from the Environmental Control Officer.
- The Contractor will conduct all activities in a manner that minimises disturbance to directly affected residents and the public in general, and foreseeable impacts on the environment.

Compliance with Environmental Specifications

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

- Environmental damage ensues due to negligence.
- Failure to take any reasonable measure to protect the environment if there is a perceived or identified environmental risk associated with an activity that has not been defined in the EMPr.
- Pollution of land surfaces and air pollution results from construction and related activities.
- The Contractor fails to comply with corrective or other instructions issued by the Engineer within a specified time; and
- The Contractor fails to respond adequately to valid complaints from the public.

1.8. Compiled By:

NAME	QUALIFICATION	EXPERIENCE	ROLE
Mr. NjabuloMkhosana	Bachelor's Degree in Geography [BA Geography]	15 Years	Assistant Compiler
Mr. Lumko Mboyi	BSc Hon Environmental Science; MSc Candidate (Botany)	9 Years	Technical review & sign-off

1.9. Monitoring Framework

The independent ECO will conduct audits of the site, auditing against the Environmental Authorization, Appeal decisions where relevant, Amendments to the Authorization approved EMPr, licenses, permits and other applicable environmental legislation.

The audit reports will be made available for management response and will be provided to the Project team to ensure compliance during construction phase. The monthly reports (when requested/ required) will be distributed to Project Engineer responsible, the authorities, and the contractor and other relevant members of the professional team.

The ECO will produce audit reports after each audit and will monitor compliance with the approved EMPr and the Project Specification.

The representatives of the Engineer and Contractor are required to keep a daily report for their on-site management reference. The following registers are to be maintained and kept on site at all times:

- A daily site diary;
- A spill response register;
- An Incident register;
- Public complaints register; and
- A register of audits.

1.10. SENSITIVE ENVIRONMENTAL FEATURES

Cognisance must be taken of the following sensitive environmental features that will be afforded additional care and protection. This list serves to highlight the most sensitive areas and does not negate the duty of care on all aspects of the project:

- **Steep slopes**: Measures to prevent erosion would need to be adopted for these areas.
- **The river/ water course**: Must be protected and maintained such that it does not differ from its natural state, from prior to the construction commencing. When construction related activities have been completed.
- **Rehabilitation of the identified borrow pits (where applicable):** These borrow pits will be reinstated or re-shaped to allow for vegetation re-establishment along the affected areas and to reduce erosion impacts from surface/ storm-water run-off.
- **Social aspects such as safety must be addressed**: Community concerns regarding the construction is to be recorded and closed out using the Public Complaints Register that will be available on site.
- **Topsoil conservation**: Must be separated during trenching and stockpile. Topsoil must be separated from sub-soil at all times, if stockpiled for pro-longed periods [more than 4 weeks] the topsoil must be vegetated with indigenous seed mixture. Topsoil must be barricaded to ensure no encroachment at all times.

2. SECTION B: PRE-CONSTRUCTION (SITE SET-UP OR ESTABLISHMENT) PHASE

2.1. Access to the Site

This site must have strict access control to reduce the risks associated with vehicular transportation and pedestrian access on the site. The Contractor shall be made aware of this requirement by the Developer prior to construction commencing on site. Watercourses and steep gradients must be avoided as much as possible. No vehicle may drive into the retained wetland or sensitive sites and no-go areas. All no-go areas will be indicated as such with warning signs in all relevant areas. Adequate drainage and erosion protection in the form of cut-off berms or trenches must be provided around the sites and where necessary.

2.2. Preparation of Method Statements and/or Management Plans

Method Statements and/or Management Plans shall be submitted by the Contractor to Project Engineer and the ECO. The ECO is to review and provide an approval letter prior to Contractor implementing on site. These relate to water and storm water management requirements, traffic requirements, solid waste management requirements, fuel storage and filling and dispensing of fuel (diesel and petrol), hydrocarbon spills, contaminated water treatment, the storage of hazardous materials, standard emergency procedures, and biohazard control. The Environmental Control Officer (ECO) shall monitor the implementation of the Method Statements and Management Plans. All copies of the method statements and plans shall be submitted to the appointed Environmental Control Officer (ECO).

2.3. Permits Required

The necessary permits shall be obtained by the Developer through the assistance of the appointed ECO prior to the commencement of construction, sufficient time must be allowed to obtain such permits, for activities such as:

- The removal or transplanting of trees (protected or indigenous) would constitute a removal license from the Department of Agriculture, Land Reform and Rural Development (DALRRD);
- The removal or transplanting of protected plant would constitute a removal license from The Eastern Cape Parks and Tourism Agency (ECPTA);
- Impacting on water sources, would constitute a water use license from the Department of Water and Sanitation (DWS);
- The sourcing of borrow material which if required, would constitute Mining Right Permits from the Department of Minerals & Energy (DME);
- The disposal of effluent on site: Safe disposal Waybills must be obtained from a registered waste disposal facility;
- The management of storm water on site: a Stormwater Management Plan to be submitted to DWS for approval.

2.4. Layout of Construction Camp

The site camp should, if possible, be able to connect into existing Municipal Services. At establishment and or should these services not be available, temporary / standalone services will be required and the details thereof are to be furnished by the contractor to the ECO.

The construction camp usually comprises the following:

- a site office.
- ablution facilities.
- a designated first aid area.
- eating areas.
- staff lockers and showers.
- storage areas.
- refueling areas (if applicable).
- maintenance areas.

The size of the camp should be kept to a minimum (especially where natural vegetation or grassland has to be cleared for its construction), parking for staff and visitors needs to be adequately provided. The Contractor must also ensure that drainage on the camp site is such to prevent standing water and/or sheet erosion from taking place.

A **Complaints Register** must be maintained on site for all complaints, this must form part of the Environmental File that must be maintained on site. The minimum composition for this Environmental File should be as follows:

- Complaints register.
- Waybills receiving.
- MSDS sheets.
- EMP.
- Hazardous substances register.
- Incident response register.
- EA with conditions.
- Register of ECO audits.
- Record of personnel environmental training (toolbox talks register).

The Contractor will take into account prevailing wind directions when designing the site layout to minimize impacts due to dust, unpleasant odours etc. The Contractor will take into account the positions of residences when designing the site layout in order to minimize noise impacts on the residents.

No site establishment will be allowed within 100m of a water body or drainage channel or on a flood plain unless approved by the ECO or specified in the project specification.

2.5. Environmental Awareness & Training

The Contractor shall ensure that the construction team and all sub-contractor/s are familiar with the EMPr requirements and have a basic level of environmental awareness training. The ECO shall undertake Environmental Awareness induction training prior to the start of Construction activities on site, continued training is encouraged as and when required in terms of Contractor compliance with the EA conditions, EMPr, and projects specifications.

Topics to be covered by the training should include:

- Explanation of what is meant by “environment” and why the environment needs to be protected and conserved.
- How construction activities can impact on the environment, and what measures can be taken to mitigate against these impacts.
- Awareness of emergency and hazardous spills response provisions.
- Prevention of pollution and litter control and the minimization of disturbance to sensitive areas.
- Social responsibility during construction. This entails being considerate to local residents. Construction Workers need to be made aware that they are not to make excessive noise (e.g., shouting/hooting) as the site borders residential properties.

- The need for a “clean site” policy also needs to be conveyed to construction workers.
- Worker conduct on site which encompasses a general regard for the social and ecological wellbeing of the site and adjacent areas. Workers need to be made aware of the following general rules of behavior.
- No alcohol/drugs to be present on site and no firearms permitted on site or in vehicles transporting staff to /from site, (unless used by security personnel).
- Prevention of noise and unsocial behavior.
- Bringing pets on site is forbidden, and no harvesting of firewood from the site or from areas adjacent to it.
- Workers are to make use of facilities provided for them, as opposed to ad-hoc alternatives, (e.g., the use of surrounding bush as a toilet facility is forbidden; fires for cooking).
- Driving under the influence of alcohol is prohibited.
- Trespassing on private/commercial properties bordering the site is forbidden; and
- Other than pre-approved security staff, no workers shall be permitted to live on site unless deemed necessary due to the specific project in communication and agreement with the Project Engineer.

It is also important that the Project Engineer/ ECO are on hand to explain more complex/ technical issues and to answer questions.

2.6. Storm Water Management

On-site storm water controls shall be implemented prior to the start of construction. When required, a Storm Water Management Plan shall be submitted by the Contractor and approved by the Project Engineer. The contractor will ultimately be responsible for Storm Water Management during the Construction Phase and the Developer will be responsible for Storm Water Management during the Operational Phase. The increase in storm water run-off resulting from construction activities must be estimated and the drainage system assessed accordingly to prevent storm water damage.

2.7. Soil Management

The Contractor should ensure that wind screening and storm water management controls should be undertaken to prevent soil loss during site establishment. This may involve erection of shade cloth fencing around the site perimeter, where considered necessary by the Project Engineer. The time that stripped areas are exposed should be minimised wherever possible, care should be taken to ensure that lead times are not excessive. Procedures that are in place to conserve topsoil during the construction phase are to be applied during the site establishment phase. i.e., topsoil is to be conserved while providing access to the site and setting up the camp.

Prior to Site establishment the Contractor shall strip and stockpile all topsoil within the works area for possible subsequent use. Stockpiled topsoil should not be in excess of 2m in height and should be protected from wind and rain with the use of tarpaulins where necessary. The area stripped of soil is to be protected against surface water run-off causing erosion. Stockpiles must be positioned away from watercourses or storm water drainage lines to prevent soil eroding directly into any water courses and drains nearby. Stockpiles must be positioned in an area that will prevent dust particles being blown onto the residents and road users. The ECO in conjunction with the Contractor and Project Engineer

should identify the relevant areas for stockpiling that are both environmentally sound and will prevent double handling of material.

2.8. Conservation of Natural Resources

No natural vegetation may be cleared during the site establishment without the prior permission of the Project Engineer and ECO. The ECO must be given an opportunity to mark vegetation such as indigenous trees (where applicable) that are to be conserved and any protected plants that must be transplanted before the Contractor starts to clear the site. The replacement ratio for all indigenous or protected trees removed or damaged 1 / 5 (for every 1 tree removed or damaged, 5 similar species should be planted). Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. Particular attention must be paid to imported material. No faunal species should be harmed, and poaching is prohibited.

2.9. Security Fencing and Lighting

During site establishment the site should be secured if necessary to minimize the opportunity for criminal activity in the locality of the site, should be fenced and manned on a 24hour basis. The erection of lighting must be undertaken in such a manner as to preclude the lighting from becoming intrusive. Lighting positions must take cognisance of night-time vehicular movement and ensure that it does not cause temporary blindness of any vehicle operators. Site security lighting is to be positioned such that the direct beam is focused away from residential properties and does not pose a nuisance or danger to road users.

2.10. Noise Impacts and Designated Working Hours

Construction vehicles are to be fitted with Standard silencers prior to the start of construction, should the vehicles or equipment not be in good working order the Contractor may be instructed to remove the offending vehicles or machinery from site. Equipment that is fitted with noise reduction facilities (e.g., side flaps, silencers etc.) will be used as per operating instructions and maintained properly during site operations.

Designated working hours will be restricted to 7am – 6pm on weekdays and 7am – 3pm on Saturdays. Working on Sundays/ Public Holidays is to be approved for by the Project Engineer and appropriate authorisation received prior to commencement.

2.11. Cultural Heritage Environment

Before Construction commences, all staff need to know what possible archaeological or historical objects of value may be present and to notify the Project Engineer/Contractor should such an item be unearthed. This should be covered during the Environmental Awareness Training process conducted by the ECO when the contractor and their staff establish on site.

3. SECTION C: CONSTRUCTION PHASE

3.1. ACCESS TO THE SITE

All access roads within the site need to be maintained in a good condition by addressing problems associated with construction traffic such as potholes, corrugations, and storm water damage as soon as these are apparent. This should be conducted on a weekly basis or after heavy rains by the Project Engineer/ Contractor. Unnecessary compaction of soil on site by heavy vehicles must be avoided as far as possible and construction vehicles need to be restricted to demarcated access, haulage routes and turning areas.

3.1.1. Maintenance of the Construction Camp

This covers various areas for inspection on a regular basis [daily/ weekly]. The Contractor must monitor and manage drainage and runoff from the camp site to avoid standing water from causing soil erosion.

Weekly servicing of the chemical toilets on site needs to be practiced by the supplier and service records are to be filed on site with the Environmental site file. Toilets on site need to be kept in a clean and hygienic state, it is required by law that for every fifteen (15) labour employed there is one (1) portable toilet. Portable toilets which require weekly servicing will only be in use during the construction period. A safe disposal certificate must be provided by the sub-contractor responsible for removal of ablutions waste to designated landfill/ waste disposal site.

The Contractor shall ensure that all litter is collected daily from the work and camp areas. Similarly, all bins and/or skips should be regularly emptied, and their waste disposed of at a registered landfill site. All waybills are to be filed on site. The Contractor shall ensure that the camp site, working & eating areas are maintained in a clean, hygienic, and orderly state.

3.1.2. Ablution & Eating Facilities

Where waterborne sewerage is not available, temporary chemical toilets must be supplied and approved by the Project Engineer. These toilets must be available to all site staff, both at the camp site, and on site as agreed by the Project Engineer, one (1) toilet per 15 staff members must be provided. Toilets should be placed 50m away from any wetlands or natural drainage lines [waterbodies].

Chemical ablution facilities shall be located adjacent to the Site Establishment Office (containers) and shall occur at a minimum ratio of 15 workers per toilet. Provision should be made for additional employee facilities, including shelter, and washing facilities. The Contractor should designate eating areas to the approval of the Project Engineer. Strict control shall be enforced to ensure that no waste is left in these demarcated areas.

The construction of “long drop” toilets is not advised or recommended. Under no circumstances may neighbouring open areas or the surrounding bush be used as a toilet facility.

3.1.3. Visual Impacts

Storage facilities, elevated tanks and other temporary structures on site should be located such that they are visually un-obtrusive to the local residents. The construction camp should be screened with the use of shade cloth prior to the start of construction as considered necessary by the Project Engineer. Screening of highly reflective material should be given particular attention.

3.1.4. Staff Conduct

The Contractor needs to monitor the performance of workers to ensure compliance with good environmental practices and general conduct as explained earlier during the site set-up phase. It is during this phase that the employees undergo their environmental awareness induction training.

3.1.5. Dust/Air Pollution

Vehicles travelling back and forth on the construction site must adhere to speed limits so as to avoid generating excessive dust. A speed limit of 30km/hr must be adhered to on site on all un-surfaced roads.

The Contractor shall take appropriate measures to minimise the generation of dust as a result of construction works, operations and activities to the satisfaction of the ECO. The site must be dampened with a water bowser or sprinklers, as necessary to minimise dust problems. In addition, the Contractor needs to ensure that the fence-line consisting of the wooden poles/supports and shade cloth structure is maintained in good condition to act as a screen to minimize dust pollution.

Stockpiles are to be managed in accordance with the guidelines, vehicles and machinery are to be kept in good working order and should excessive emissions be noted, the Contractor is to have equipment serviced as soon as possible.

No fires are to be permitted on site except for the burning of firebreaks. Should burning be required the necessary written approval must be obtained from the local Fire Department and all the necessary precautions taken to avoid any potential damage to surrounding landowners or their personage.

3.1.6. Noise Associated with Construction Activities

Construction vehicles are to be fitted with standard silencers prior to the start of construction. Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site. Equipment that is fitted with noise reduction facilities (e.g., side flaps, silencers etc.) will be used as per operating instructions and maintained properly during site operations.

Appropriate working hours in terms of the EMPr should be adhered to by the Contractor thru the guidance andmonitoring of the Project Engineer and ECO.

Blasting, piling or other 'noisy' activities must take place during normal working hours. The community must be notified 3 days prior to any planned activities that will be unusually noisy. These activities could include, but are not limited to, blasting and piling. It is suggested that a Bulletin Board on site in a visible location be considered.

3.1.7. Soil Erosion

Clearing activities, including removal of vegetation and heavy earthworks, must only be undertaken during agreed working times, and permitted weather conditions as agreed and approved upon by the ECO. If heavy rains are expected clearing activities should not be commenced with, in this regard, the contractor must be aware of weather forecasts.

According to the terrestrial impact assessment conducted, it can be inferred that the main objective in this instance is to prevent the occurrence of erosion, which could result in significant topsoil losses. This is a considerable problem, given the time (many years) it normally takes for the formation of topsoil. The mitigation strategy for this would be in the form of planting appropriate indigenous species subsequent to the construction of the pipeline.

The unnecessary removal of groundcover from slopes must be prevented, especially on steeper slopes. Following the clearing of an area, the surfaces of all exposed slopes must be roughened to retain water and increase infiltration (especially important during the wet season).

Any steep or large embankments that are expected to be exposed during the 'rainy' months should either be armoured with fascine like structures or grassed immediately with strip sods established at regular intervals (50-100cm) down the bank with hydro-seeding between the strip sods. These areas will be restricted to the cut embankments that will be formed as a result of the cut to fill exercise that will be undertaken during the earthworks phase of construction.

Once an area has been cleared of vegetation, the top layer (nominally 150mm) of soil should be removed and stockpiled in the designated areas, which have been identified and approved by the engineer and ECO. Vegetation shall be stripped in a sequential manner as the work proceeds so as to reduce the time that stripped areas are exposed to elements. Top-soiling and re-vegetation shall start immediately after the completion of an activity and at an agreed distance behind any particular work front.

Storm water control and wind screening should be undertaken to prevent soil loss from the site. The earthworkshave been designed to ensure a zero balance, i.e., no material will require off-site spoiling.

The battering of all banks shall be such that cut, and fill embankments are no steeper than previous natural slopes unless otherwise allowed by the Project Engineer. Cut and fill embankments steeper than previous ground levels must be re-vegetated immediately. All embankments, unless otherwise directed by the ProjectEngineer, shall be protected by a cut off drain to prevent water from running down the face of the embankment and resulting in erosion.

3.1.8. Soil Management

The Contractor should ensure that wind screening and storm water management controls should be undertaken to prevent soil loss during construction. This may involve erection of shade cloth fencing around the site perimeter, where considered necessary.

The time that stripped areas are exposed should be minimised wherever possible. Care should be taken to ensure that lead times are not excessive. Procedures that are in place to conserve topsoil during the construction phase, should entail the protection [barricading] and separation of the topsoil from sub-soil. The topsoil should be re-vegetated if stockpiled for pro-longed periods.

The Contractor shall strip and stockpile all soil within the works area for possible subsequent use, the contractor is advised to limit the cleared working front. Stockpiled soil should not be in excess of 2 metres in height and should be protected from wind and rain with the use of tarpaulins where necessary.

The area stripped of soil is to be surfaced, and it is likely that the stripped soil will be required for rehabilitation purposes. Stockpiles must be positioned away from watercourses or storm water drainage lines to prevent soil eroding directly into any water courses and drains nearby. Stockpiles must be positioned in an area that will prevent dust particles being blown onto the residents and road users.

The ECO should monitor the stockpile management and advise the Contractor to ensure compliance

3.1.9. Storm Water Control

During site establishment, storm water culverts and drains are to be located and covered with metal grids to prevent blockages if deemed necessary by the Project Engineer. Provision should be made during the set-up phase for all polluted runoff to be treated to the Project Engineer's approval before being discharged into the storm water system (this will be required for the duration of the project).

Construction activities often result in the diversion of natural water flow resulting in the concentration of flow and an increase in the erosive potential of the water. Thus, the Contractor shall not in any manner modify or damage the banks or bed of streams, rivers, wetlands, other open water bodies and drainage lines adjacent to or within the designated area, unless as part of the construction project specification, other than approved by the in the Environmental Authorisation.

Earth, stone, and rubble must not be placed in storm water channels, drainage lines or rivers. Periodic checking of the site's drainage system needs to be conducted by the Project Engineer and ECO to ensure that it is unobstructed. It is important to ensure that the storm water management plan/system

implemented is functioning as intended and that the peak storm water discharge from the site has not increased with the development of the site.

Further principles that should be followed include:

- The avoidance of the use of high velocity storm water pipelines in favour of open, high friction, semipermeable channels wherever feasible.
- The construction of a number of smaller storm water outfall points instead of a few large outfall points; and
- The design of storm water outfalls should facilitate reduced flow velocity, minimize, and avoid stream banks and soil erosion through design features such as reno-mattresses or splitter blocks.

Similarly, un-channelled flow must be controlled to avoid erosion. For this purpose, rows of straw/hay o bundles of cut vegetation should be dug into the soil in contours to slow surface wash and trap eroded soil. This is known as brush packing. The spacing between rows will be dependent on the slope. Similarly, the exposed soil can be re-vegetated by the planting of an indigenous grass seed mix or indigenous groundcover mix and the use of grass fencing material at intervals along the slope. In situations where the surface run-off is concentrated as is the case along exposed roadways/tracks, flow should be attenuated by contouring with hay bales or bundled vegetation generated during the site clearance operation. If the area is used for construction vehicles, berms may be used alternatively. These should channel concentrated flow into the detention/attenuation ponds or areas protected with hay bales for flow minimization and sediment trapping.

Furthermore, physical measures that can be taken to prevent storm water pollution include:

- Where necessary rock pitched diversion ditches or berms are to be used to divert water runoff away from exposed soil or construction areas. Silt fences may also be used.
- Separate storm water collection areas and interceptors at fuel storage areas, batching plants and other potentially polluting activities shall be constructed.
- The use and storage of all materials, fuels, and chemicals, which could leach into the ground, shall be controlled. Adequate spillage containment measures shall be implemented, such as cut off drains, berms, etc. Fuel and chemical storage containers shall be set on a concrete plinth with 110% containment capacity to be provided by the bund walls.
- Any residue from spillages shall be removed from site by appropriate contractors. Handling, storage and disposal of excess or containers of potentially hazardous materials shall be in accordance with the requirements of the adjudicating authority or any other relevant department.
- No storage of any materials whatsoever will occur on or near the drainage system.
- Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.
- Silt fences, sandbags and spoil rock must be on hand at all times to assist in establishing temporary runoff control measures and should be used wherever necessary to proactively control erosion and trap sediment.
- Silt traps and sandbags must be used to reduce the energy of surface runoff and capture sediment along the sloping portions of the running track within and outside the wetland units.
- Erosion gullies and rills within the construction ROW must be rehabilitated immediately and the root cause of the erosion dealt with immediately.

- The unnecessary removal of groundcover vegetation from slopes must be prevented and only vegetation within the demarcated construction right-of-way (ROW) must be cleared.
- Natural and artificial preferential flow paths (e.g., channels, culvert outlets, etc.) within the wetland units must be respected and should be flumed / piped across the trench and running track corridors to avoid erosion issues; and

It is important that all of the above-listed mitigation measures are costed for in the construction phase financial planning and budget so that the contractor and/or developer cannot give financial budget constraints as reasons for non-compliance. Proof of financial provision of these mitigation measures must be submitted to the ECO prior to construction commencing.

3.1.10. Water Quality Management

The treatment of contaminated water on site shall require a Method Statement approved by the Project Engineer and ECO. 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. The requirements for a bunded area are listed below:

The following environmental protection is required for each tank installed:

- The bunding will be 110% of the capacity of the tank;
- The bunding must be constructed of a concrete foundation with brick walls, and must have an impermeable lining (e.g., epoxy coating on internal surfaces);
- The containment bund must be sloped to a low point;
- A gate valve to be installed at the low point in the wall to allow for the release of excess storm water in the event of excessive rainfall; and
- In the event of a build-up of rainwater within the bund, the level of contamination of the said rainwater must be assessed by the ECO. The contaminated water will need to be pumped into storage drums and disposed of at an appropriate treatment facility.

Provision should be made during set up for all polluted runoff to be treated to the Project Engineer's approval before being discharged into the storm water system. This will be required for the duration of the project.

A designated, bunded area is to be set aside for vehicle washing and maintenance. Run-off from fuel depots/ workshops/ truck washing areas and concrete swills shall be directed into a conservancy tank and disposed of at a waste disposal site approved by the Project Engineer and the local authority.

Contaminated water storage facilities shall not be allowed to overflow and appropriate protection from rain and flooding shall be implemented.

Should the Contractor require construction vehicles to be washed on site using a high-pressure sprayer, all wash areas will have oil traps installed before draining into the sewer system. The Contractor shall confirm that contaminated wash water does not enter drainage structures untreated.

3.1.11. Groundwater And Soil Contamination

Every precaution must be taken to ensure that any chemicals or hazardous substances do not contaminate the soil or groundwater on site.

For this purpose, the Contractor must:

- Ensure that the mixing /decanting of all chemicals and hazardous materials should take place on a tray or impermeable surface;
- Waste generated from these should then be disposed of at a registered landfill site;

Ensure all storage tanks are properly designed and managed in order to prevent pollution of drains, groundwater, and soils;

- Construct separate storm water collection areas and interceptors at storage tanks, and other associated potential pollution activities;
- Ensure that use and storage of fuels and chemicals that could potentially leach into the ground be properly controlled. Adequate spillage containment measures shall be implemented, such as cut off drains, etc. Fuel and chemical storage containers shall be set on a concrete plinth. The containment capacity shall be equal to the full amount of material stored, plus 10%;
- Appoint appropriate contractors to remove any residue from spillages from site. Handling, storage and disposal of excess or containers of potentially hazardous materials shall be in accordance with the requirements of the above-mentioned Regulations and Acts;
- Ensure that used oils/lubricants are not disposed of on/near the site, and that contractors purchasing these materials understand the liability under which they must operate. The Environmental Control Officer will be responsible for reporting the storage/use of any other potentially harmful materials to the relevant authority;
- Ensure that potentially harmful materials are properly stored in a dry, secure environment, with concrete or sealed flooring. The ECO will ensure that materials storage facilities are cleaned / maintained on a regular basis, and that leaking containers are disposed of in a manner that allows no pillage onto the bare soil or surface water. The management of such storage facilities and means of securing them shall be agreed; and
- Site staff shall not be permitted to use any stream, river, other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any other construction or related activities. Municipal water or another source approved by the Project Engineer should rather be used for all activities such as washing of equipment, dust suppression, concrete mixing and compacting.

3.1.12. Stockpile Management

Stockpiles are not to be situated in an area that should obstruct the natural water pathways on site. Topsoil stockpiles should be kept separate from other stockpiles and must not be compacted and shall not exceed 2meter in height unless otherwise allowed by the Project Engineer. When exposed to windy conditions or heavy rain, they could be protected by re-vegetation using an indigenous grass seed mix or cloth, depending on the duration of the project.

The construction of a berm consisting of sandbags, or a low brick wall can be placed around the base of the stockpile for retention purposes. They should be maintained free of alien vegetation and weeds by regular weeding. Stockpiles shall be kept free of any contaminants whatsoever, including paints, building rubble, cement, chemicals, oil, etc.

Subsoil and topsoil stockpiles will be moved to areas of final utilisation as soon as possible to avoid unnecessary erosion. Stockpiles not utilized within three months of the initial stripping process (or prior to the onset of seasonal rains) will be seeded with appropriate grass seed mixes, including indigenous grasses normally found in grasslands or brush-packed to further avoid possible erosion. Stockpiles must be positioned away from watercourses or storm water drainage lines to prevent soil

eroding directly into any water courses and drains nearby. Stockpiles must be positioned in an area that will prevent dust particles being blown onto the adjacent residents and road users.

3.1.13. General & Hazardous Substances and Materials

Storage areas can be hazardous, unsightly and can cause environmental pollution if not designed and managed carefully. The selection of the site for the storage of materials needs to consider the prevailing winds, distance to water bodies and general on-site topography. These areas need to be designated as per the camp layout plan, demarcated, and fenced if necessary. They should be secure so as to reduce the risk of crime and safe from access from children and animals.

Fire prevention facilities must be present at all storage facilities. It is important that the storage areas for hazardous chemicals are positioned away from the neighbouring residential or business properties (where applicable). The Contractor shall maintain storage of all potentially polluting materials and shall undertake potentially polluting operations as far away as practically possible from drainage areas, and topsoil/subsoil stockpiles. The Contractor will ensure that additional supervisory time is spent to monitor such works. Such materials/operations include (but are not limited to):

- Batching, storing of cement, concrete and mortar;
- Petrol, oil and chemical storage and transfer; • Washing, ablution and toilet facilities; and
- Plant storage.

Hazardous materials to be stored on site are those that are potentially poisonous, flammable, carcinogenic or toxic. These materials include diesel, petroleum, oil, bituminous products; cement; solvent based paints; lubricants; explosives; drilling fluids; pesticides and herbicides and Liquid Petroleum Gas (LPG). Material Safety Data Sheets (MSDS's) shall be readily available on site for chemicals and hazardous substances to be used on site. MSDS's should also include information on ecological impacts and measures to minimize negative environmental impacts during accidental releases or escapes. Furthermore, hazardous storage and refuelling areas must be bunded with an approved impermeable liner to protect groundwater quality.

A Method Statement is required for the filling of and dispensing from fuel storage tanks should such tanks be required. All necessary approvals with respect to fuel storage and dispensing (if required on site) shall be obtained from the appropriate authorities. The Contractor shall submit a Method Statement to the Project Engineer for approval. Fuel tanks must meet relevant specifications and be elevated so that leaks can be easily detected. These areas shall be clearly signed. All staff working with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures.

The Contractor shall submit a Method Statement and plans for the storage of hazardous materials including emergency procedures. Should a spill occur within these bunded areas it must be cleaned up, removed, and disposed safely from these areas as soon as possible after detection in order to minimize pollution risk and reduced bunding capacity. A designated, bunded area is to be set aside for vehicle washing and maintenance. Materials collected in this area must be disposed of at a suitable waste site or as directed by the Project Engineer.

All oils and lubricants that are unopened shall be stored in the workshop store on site. Used oils/lubricants will be put into drums and recycled. The Contractor shall be responsible for ensuring that these used oils/lubricants are not disposed of on/near the site, and that contractors purchasing these materials understand the liability under which they must operate. The Contractor and ECO shall be responsible for reporting the storage/use of any other potentially harmful materials to the relevant department.

All imported materials (e.g., sand) as well as materials excavated from the site must be stockpiled within the site boundary / Construction Zone. Sand and excavated material stockpiles should be protected against wind using temporary screens, and from water erosion using tarpaulins where

necessary.

In the event that the concrete requirements are transported to site as “ready mix” certain precautions must be taken. To prevent spillage onto roads, “ready mix” trucks shall rinse off the delivery chute into a suitable sump prior to leaving the Site.

If a concrete batching plant is required on site, the environmental specifications detailed below are to be employed:

Shade cloth around the batching plant to prevent the cement dust being dispersed across the site;

A sump for the collection of water overflow from the batching process; and

A method statement from the contractor must be drawn up to deal with overruns in the batching of concrete, i.e., 5 m^3 is batched, but only 4.5 m^3 is utilised, what will happen to the 0.5 m^3 unused.

Cement / concrete shall not be mixed directly on the ground. Mixing boards, mixing trays and impermeable sumps shall be used at all mixing and supply points. Unused cement bags are to be stored so as not to be affected by rain or runoff events. Used cement bags shall be stored in weatherproof containers to prevent windblown cement dust and water contamination. Used cement bags shall be disposed of on a regular basis via the solid waste management system and shall not be used for any other purpose.

All visible remains of excess concrete shall be physically removed on completion of the plaster or concrete pour section and disposed of. Washing the remains into the ground is not acceptable as groundwater contamination could occur. All excess aggregate shall also be removed. With respect to exposed aggregate finishes, the Contractor shall collect all contaminated water and fines and store it in sumps for disposal at an approved waste site.

Hazardous chemical substances (as defined in the Regulations for Hazardous Chemical Substances) used during construction shall be stored in secondary containers. The relevant Material Safety Data Sheets (MSDS) shall be available on Site. Procedures detailed in the MSDS shall be followed in the event of an emergency situation.

No paint products may be disposed of on site.

The ECO and Contractor shall be responsible for ensuring that potentially harmful materials are properly stored in a dry, secure environment, with concrete or sealed flooring and a means of preventing unauthorized entry. The ECO shall further ensure that materials storage facilities are cleaned / maintained on a regular basis, and that leaking containers are disposed of in a manner that allows no spillage onto the bare soil. The management of such storage facilities and means of securing them shall be agreed. A ledger of all hazardous materials stored on site must be maintained and a record of the people that have accessed the materials kept as part of the safety system of thematerials. In addition, this system will ensure that the correct people are accessing these materials and therefore they will be well versed in their usage and the precautions required.

All fuel and oil are to be stored within a demarcated area on site. Areas for storage of fuels and other flammable materials shall comply with standard fire safety regulations and may require the approval of the Local Municipal Fire Prevention Officer. Safety and fire prevention precautions must be strictly adhered to.

Fuels and oils must be stored in tanks or drums with lids that remain firmly closed and shielded from the elements and kept under lock and key.

All asbestos material shall be disposed of according to the Asbestos Regulations 2001, as per Government Notice. R: 155, dated 10 February 2002, promulgated under the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).

3.1.14. Risks Associated with Materials on Site

Material stockpiles or stacks such as pipes, must be stable and well secured to avoid collapse and potential injury to site workers and/or local residents. Flammable materials should be stored as far as possible from adjacent residents / landowners. Similarly, no materials are to be stored in unstable or high-risk areas such as steep slopes or floodplains. Firefighting equipment should be present on site at all times as per OSHA.

Obstruction to drivers' line of site due to stockpiles and stacked materials must be avoided, in particular at intersections and sharp corners. All I&APs should be notified in advance of any known potential risks associated with the construction site and the activities thereon.

3.1.15. Handling of Hazardous Materials

A number of considerations relating to the use of these materials must be adhered to. These include:

- The mixing of all concrete must occur on a designated, impermeable surface.
- No vehicles transporting concrete to the site are to be washed on site.
- No vehicles transporting, placing, or compacting asphalt or any other bituminous product may be washed on site.
- Lime and other powders must not be mixed during very windy conditions.
- Similarly, the spraying of herbicides or pesticides should not occur under windy conditions and must comply with OSHA regulations and other chemical handling laws.
- All substances required for vehicle maintenance and repair must be stored in sealed containers until they can be disposed of/removed from the site.
- Hazardous substances/materials are to be transported in sealed containers or bags; and
- The Contractor needs to submit a Method Statement for the dealing of accidents / spillages of hazardous materials.

In particular a Method Statement for the Management of Hydrocarbon Spills shall be prepared by the Contractor. The site shall have a ready supply of absorbent material available to absorb any emergency hydrocarbon spills, and where possible, be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials available shall be able to absorb / deal with a minimum of 200 litres of hydrocarbon liquid spill. The source of the spillage shall be isolated. The Contractor shall contain the spillage using sand berms, sandbags, pre-made booms, sawdust or absorbent materials, and the area shall be cordoned off. The Engineer shall be immediately notified.

3.1.16. Waste Management

Waste receptacles such as skips/bins need to be provided at intervals along the work front and in the construction camp area. Regular disposal needs to be practiced for these containers. Non-hazardous waste generated on site needs to be disposed of at a registered landfill site and waybills submitted on a monthly basis proving disposal for audit purposes. Hazardous waste generated needs to be collected and disposed of by an approved Waste Contractor.

Similarly, the chemical toilets on site need to be regularly serviced by the supplier on a weekly basis. Construction rubble needs to be disposed of at a registered landfill site. There should be recycling of waste practiced with separate drums provided for paper and cardboard; glass; plastics; metals and organic waste.

Construction rubble shall be disposed of in pre-agreed demarcated spoil dumps that have been approved by the Project Engineer and ECO, or at a registered disposal site.

All vehicles and equipment must be maintained in a good condition in order to minimize the risk of

leakage and possible contamination of the soil or storm water by fuels, oils, and hydraulic fluids. Sufficient quantities of suitable hydrocarbon absorption or remediation materials must be present on site at all times. Absorbent spill-mop-up products need to be readily available. All fuel, oil or hydraulic fluid spills are to be immediately reported to the Project Engineer and ECO and disposed of in a permitted landfill site for hazardous substances. 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 waste disposal site as approved by the ECO.

For the purposes of this EMPr, refuse includes all construction rubble, debris, and waste (e.g., food waste, vegetation, and tree stumps, building rubble, etc.), including hazardous waste (e.g., oils).

- The Contractor shall be responsible for the refuse removal control system that is acceptable to the Environmental Control Officer, the Project Engineer, and the Local Authority. Refuse removal should be managed as part of the daily waste management activities.
- Transport of all waste on site shall be undertaken by a reputable, registered waste contractor, approved by the local authority.
- Hazardous waste such as fuel, oils and chemicals shall be disposed of at a licensed hazardous waste disposal site.
- The Contractor shall keep the site clean, tidy and litter free at all times. Strict control of the management of the refuse generated by the employees, such as in the eating areas, shall be enforced. The Contractor shall take steps to ensure that littering by construction workers does

not occur and shall collect litter from the site and immediate surroundings, including litter accumulating at fence lines.

- No refuse or waste material is to be disposed of by burying or burning.
- All vehicles and equipment must be maintained in a good condition in order to minimize the risk of leakage and possible contamination of the soil or storm water by fuels, oils, and hydraulic fluids.
- Sufficient quantities of suitable hydrocarbon absorption or remediation materials must be present on site at all times. Absorbent spill-mop-up products need to be readily available.
- All vehicles requiring servicing, or which are parked on site overnight are to make use of a drip tray to prevent accidental spillage of oils and fuels.
- A suitable leak proof container for the storage of oiled equipment (filters, drip tray contents and oil changes, etc.) must be established.
- All fuel, oil or hydraulic fluid spills are to be immediately reported to the Engineer and Environmental Control Officer, and must be disposed of in a permitted landfill site for hazardous substances; and
- All asbestos material shall be disposed of according to the Asbestos Regulations 2001, as per Government Notice. R: 155, dated 10 February 2002, promulgated under the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).

3.1.17. Wetlands

The project site contains a total of 13 wetland systems (channelled valley bottoms), 2 valley bottoms and 4 hillslope seep wetland systems. The catchments of each of the wetlands form small sub-catchments within the quaternary catchment identified. Owing to the route followed by the pipeline, along the ridgelines, all the contributing catchments of these wetlands are located in the upper reaches of the Quaternary catchments. Where no other alternative exists, pipes need to be buried and alignment must avoid sensitive vegetation. Due to the nature of wetland systems high flow events during high intensity rainfall events are unlikely to be significant. However, it is suspected that baseflow within these systems could be considerable and is a permanent feature which will have to be accommodated in the construction of this pipeline in order to ensure that there is no obstruction which could damage the wetland system and the pipeline.

All new major access roads crossing wetlands must be supported by bridge structures where feasible. Care must be taken to avoid sensitive forest and wetland areas (where practical) when locating intermediate bridge supports. Where impractical to construct a bridge over wetlands and minor roads, the roads must be constructed on a layer of clean dump rock of sufficient depth to allow movement of groundwater under the road embankment in the valley bottom/wetland.

Pipe crossings (particularly gravity services), over steep narrow wetland valley lines (where no structure is planned), must be designed as pipe bridges with pier locations designed to avoid or minimise impact on sensitive forest and wetland areas. Where no other alternative exists, pipes need to be buried and alignment must avoid sensitive vegetation. Where practical all services (longitudinally) must be located outside and/or sensitive/wetland areas. Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are

expected, clearing activities should be put on hold. In this regard, the Contractor must be aware of weather forecast.

When the pipeline crosses a stream, it will be secured on a concrete bedding and encased and protected by a gabion basket.

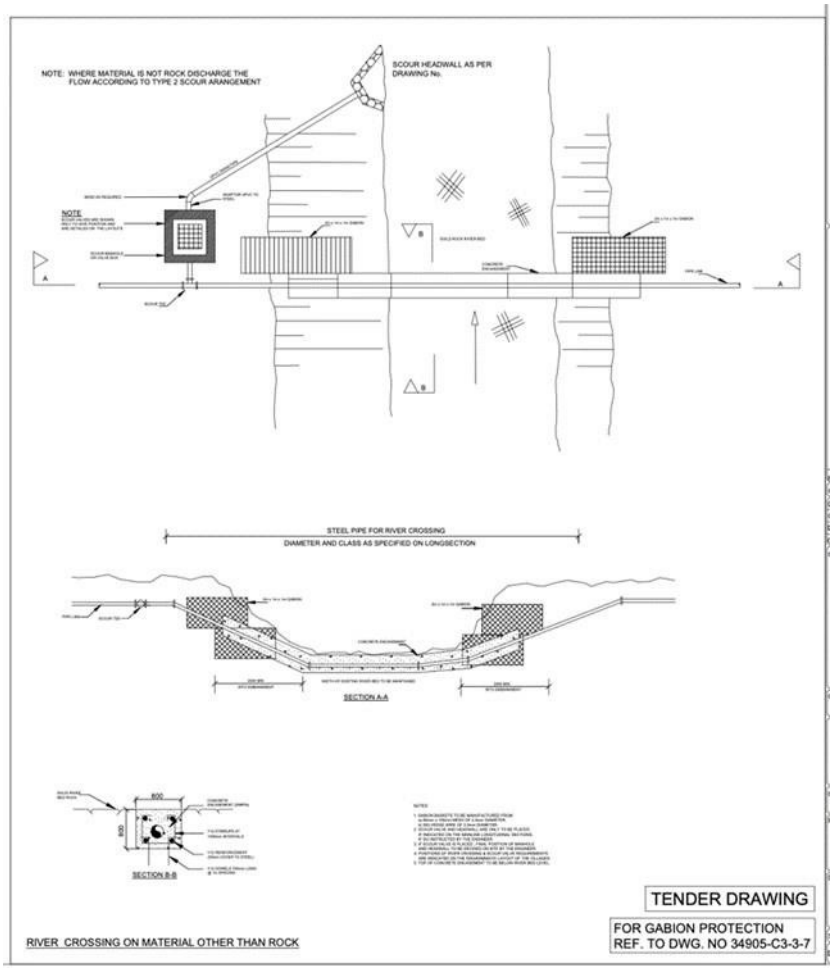

Figure 5: River crossing on material other than rock.

3.1.18. Vegetation

The clearance of vegetation to make way for construction must be kept to a minimum and, where clearance of indigenous vegetation has occurred beyond the development footprint, the rehabilitation using locally indigenous species must be implemented.

A plant rescue plan must be put in place to remove all protected species where possible and relocate them within the local area, in positions that mimic their current situations. The following steps must also be enforced:

Further recommendations include:

- Wetlands must be protected by the contractor and audited by the ECO.
- Avoid wetland habitats and buffers.
- Place construction materials well outside wetland habitats and wetland buffers.
- Waste materials should be stored according to best practice guidelines and recommendations to prevent contamination.
- Accidental spills should be remedied immediately according to specifications contained in the EMPr.
- Construction vehicles should not drive through wetland habitat and buffers.
- Control alien invasive plants within the development footprint, as well as adjacent to the site, to prevent the spread of alien invasive propagules.
- Adjacent sensitive areas should be demarcated and avoided.
- Protected plant species (such as orchids) should be rescued and translocated to a suitable habitat.
- Rehabilitate degraded grasslands on site, that fall outside of the development footprint.
- Keep vegetation clearance to a minimum.
- Sensitive areas should be demarcated and avoided.
- Protected plant species should be rescued or avoided.
- Place herbicides/fungicides in demarcated safety zones only.
- Herbicides/fungicides should be disposed according to the Standard Operating
- Procedures for chemical usage and Health and Safety policy.

3.1.19. River/ Stream Courses

The Contractor shall submit a Method Statement for review 14 days prior to commencing Construction.

The method statement should highlight (but not be confined to) the following issues:

- Detailed plan of crossing including pipe protection works.
- How water flow will be diverted during construction (if applicable).
- Containment of contaminated runoff and wastewater.
- Width of working servitude (if not already detailed in project specification).
- Final expected profile of river/ stream banks.
- Reinstatement and rehabilitation of river/ stream banks.

The Contractor will remove herbaceous riparian vegetation as indicated in the project specification or by the ECO, with their root ball intact. This vegetation is to be kept moist by means of placing it in the shade, covered with moistened hessian cloth until it is replanted.

The Contractor shall not modify the banks or bed of a water course unless as specified in the project specification. Rocks for use in gabion baskets/ reno mattresses may not be obtained from a water course.

The Contractor will not pollute any water body as a result of construction activities. The Contractor shall not cause any physical damage to any aspects of a water course, other than those necessary to

complete the works as specified and in accordance with the accepted method statement where a stream or river crossing requires the diversion of water, a method statement is to be provided to the ECO in this regard for review.

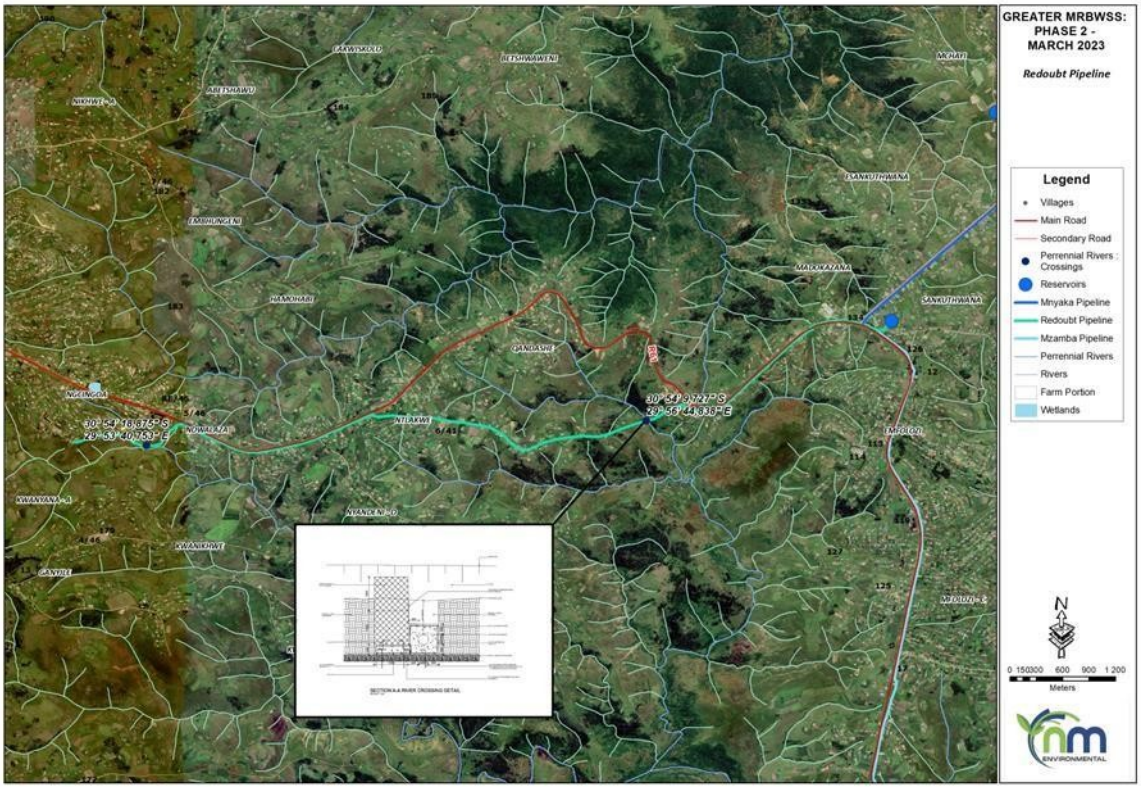

Figure 6: Proposed stream crossing point, along the KwaNikhwe to Redoubt pipeline.

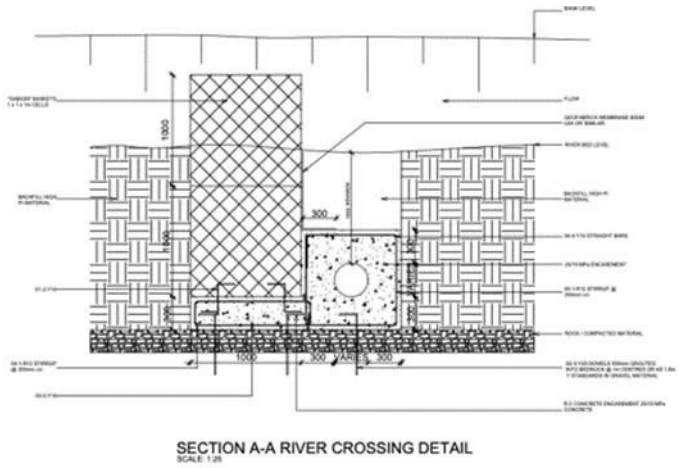

Figure 7: : River crossing detail

3.1.20. Traffic

The Contractor is to ensure that all construction vehicles are in a road-worthy condition. No materials may be transported off site without the load being secured under a tarpaulin or similar, in order to prevent possible danger to other road users from materials falling from the back of vehicles.

All un-surfaced roads on site shall be damped down on a regular basis as considered necessary by the Project Engineer, as often as is necessary under prevailing climatic conditions, to reduce the levels of dust created by construction vehicles operating on the un-surfaced roads. Furthermore, dust can be an aesthetic nuisance for adjacent landowners as well as a significant health hazard.

Construction signs must be utilised to warn road users travelling along the district roads of the construction access and exit points and to slow down. If necessary, the speed limit should be reduced at these points.

Deliveries by large trucks to and from the construction site should be undertaken in periods where traffic volumes are not peaking, i.e., between 8:30 AM and 3:30 PM. This process will require management and it must be controlled by the Stores Manager who should not accept deliveries outside of these prescribed times. All suppliers will be notified of such and will need to comply or otherwise their vehicles will be turned away and only off-loaded once the delivery window opens.

3.1.21. Social Impacts to The Neighbouring Residents

Regular communication between the Contractor, Project Engineer and the I&AP's is important for the duration of the project and will be started during the Site Establishment/pre-Construction Phase. The Project Engineer and Contractor are responsible for on-going communication with the I&AP's. A Complaint's register should be kept at the site office. This should be in a duplicate format, with numbered pages. The I&AP's need to be made aware of the register and the methods of communication available to them. The Contractor needs to appoint a staff member(s) to act as liaison officer for formal consultation with I &AP's in order to handle questions and explain the construction process and what it will entail. This register is to be tabled during monthly site meetings. Any queries or complaints that arise need to be handled by the ECO following a set protocol.

There are a number of areas that need to be monitored in this respect.

- The disruption and safety of access to the local road network for the local residents must be minimized at all costs and have the Project Engineer's permission.
- The Contractor is to inform the neighbours in writing of disruptive activities at least 24 hours beforehand. Leaflets can be circulated in post boxes giving the Engineer's and Contractor's details or other method of communication can be used that is approved by the Engineer.
- It is important that the Contractor's activities and movement of staff are restricted to the designated construction areas.

- Notice of particularly noisy activities such as jackhammers, blasting, drilling must be given to residents adjacent to the construction site at least 72 hours prior to the activity taking place; and
- Noisy activities must be restricted to the times given in the project specification or General Conditions of Contract.

Local residents must be given preference in the hiring of skilled and unskilled construction workers.

3.1.22. Courtesy

All contractors and their employees shall at all times be courteous towards landowners, tenants, and the local community.

Activities that may cause conflict with landowners, tenants, the local work force, or the local community shall be avoided. Should conflict arise it shall be immediately reported to the Project Engineer or coordinator.

3.1.23. Damage to Private Property

Any damage to private property shall immediately be reported to the Project Engineer and the owner. The damage shall be rectified immediately if possible and/or appropriate compensation shall be paid to the owner at the discretion of the project manager/co-ordinator in consultation with the property owner. A record of damages and rectifying action shall be kept. The owner's satisfaction with the outcome of rectifying action shall be obtained in writing.

Camp and office sites shall be dismantled and removed after completion of the construction phase of the project. The site shall be rehabilitated to as close as possible to its original condition to the satisfaction of the landowner which shall be in writing.

All excavations shall be enclosed to prevent animals or people from accidentally falling into excavations.

3.1.24. Safety

The issues around safety are hugely underplayed. The type and extent of the current proposed linear development will require that certain issues are raised and addressed accordingly.

The first issue is leaving trenches and / or excavations open during periods of absence and overnight. The Occupational Health and Safety Act has been amended and danger tape is no longer a suitable medium for making people aware and preventing access to dangerous areas. The new requirement is for the utilization of Orange PVC Bonnox fencing that is placed around such areas to keep out people and livestock.

The second is making the construction team aware of the dangers of working in close proximity to rapidly moving vehicles that will be passing in very close proximity to the proposed excavations. The labour force needs to be made aware and ensure that they take all possible precautions against any potential accidents.

The utilization of point's people to make road users aware of the labour force and ensure that road users slow down are necessary for the entire project.

3.1.25. Fire Control

All fire requirements shall be carried out as contained in the National Building Regulations SABS 0400 and the safety code of the N.F.P.A.

The Contractor shall take all reasonable and active steps to avoid increasing the risk of fire through their activities on site. The Contractor shall ensure that basic fire-fighting equipment is to the satisfaction of the Local Fire Services. The Contractor shall designate a Fire Control Officer. The Contractor shall ensure that all the correct fire-fighting equipment is available on site and within easy access. No fires for heating or cooking shall be permitted. The disposal of any matter by burning is prohibited.

3.1.26. Borrow Pits

Where the Contractor is required to import material, this shall be from commercial sources or borrow areas specified in the project specification.

The Contractor may source material from alternative borrow pits provided: the site location; method of winning material and reinstatement and rehabilitation are environmentally acceptable and approved by the ECO. In this regard, the Contractor shall give the ECO in writing, 30 days prior to opening up alternative borrow pits the following information for acceptance:

- quantities of borrow material required.
- method statement for excavation of material including depth and extent of excavation.
- anticipated 'active life' of the borrow area.
- "}proposal for reinstatement and rehabilitation of borrow area, including final profile.
- written approval from the landowner/ relevant authority that material may be removed from their land subject to their stated conditions, requirements, and royalties, and if the proposal is acceptable to the ECO.

Development and rehabilitation of borrow pit areas are likely to include the following activities (but these must not be regarded as exhaustive):

- Stripping and stockpiling of topsoil as per specification.
- Removal (to nominal depth of 150mm) and stockpiling of sub-soil.
- Infill of borrow pit with spoil material.
- Contouring of borrow pit to approximate natural topography and/ or reduce erosion impacts on the site.
- Placement of excavated subsoil over spoil material.
- Placement of stripped topsoil on subsoil.
- Grassing of topsoil in terms of this specification.

The Contractor is to familiarize himself with the requirements of the Minerals Act No 50 of 1991 in terms of borrow pit development, and the requirements of the EMPR, as applicable.

3.1.27. Spoil Sites

Where the Contractor is required to spoil material, spoil sites must be identified which are environmentally acceptable and approved by the ECO, unless spoil site areas have been identified in the project specification, in which case these will be the designated spoil sites.

If no spoil sites have been previously identified together with reinstatement and rehabilitation criteria, the Contractor is to provide the following information to the ECO; least 30 days prior to requiring sites to spoil material:

- the location, description of and access to alternative sites identified in order that they may be assessed;
- the quantity of material to be spoiled;
- the type of material to be spoiled (i.e., blast rock/ excavated rock/ soft shale/ subsoil etc.); • the proposed method of spoiling;
- the proposed reinstatement and rehabilitation plan including final profile;
- written approval from the landowner/ relevant authority that material may be spoilt on land subject to their stated conditions and requirements and if the proposal is acceptable to the ECO.

Development and rehabilitation of spoil areas are likely to include the following activities (but these must not be regarded as exhaustive):

- Stripping and stockpiling of topsoil as per specification;
- Removal (to nominal depth of 150mm) and stockpiling of sub-soil;
- Placement of spoil material;
- Contouring of spoil site to approximate natural topography and/ or reduce erosion impacts on the site;
- Placement of excavated subsoil over spoil material;
- Placement of stripped topsoil on subsoil.

3.2. EARTHWORKS

3.2.1. Backfill Material

No material stripped or excavated which is classed, in terms of this specification, as topsoil, may be used as backfill in any excavation.

3.2.2. Excavation and Backfilling

During excavation 'conservation of topsoil', as above will apply.

Excavated material is to be stockpiled along within the working servitude for all construction related activities for the duration of the projet, unless otherwise authorised.
Surplus excavated soft, intermediate, and hard rock material shall not be disposed of inappropriately but shall be removed to a spoil site designated in the project specification or indicated by the Project Engineer in conjunction with the ECO.

The deficiency of backfill material shall not be made up by excavation within the free haul distance of 0.5 km of site, without the prior approval of the Project Engineer of the source of the material. Where backfill material is deficient, it should ideally be made up by importation from an approved borrow pit (i.e., one which operates within the ambient of an EMPr).

The Contractor will backfill in accordance with the requirements of progressive reinstatement.

3.3. DEALING WITH WATER ON WORKS

3.3.1. Discharge of water from site

Any water which is discharged from site is to comply with the relevant Water Quality Guidelines implemented by DWS. Water discharged to the storm water / sewer system may only be done so with the permission of the relevant local authority.

3.3.2. Control of Erosion

Surface erosion protection measures will be required to prevent erosion where slopes are steeper than 1:8 on all soil types. Erosion protection measures required may include all or some of the below, as specified in the project specification or upon instruction of the Engineer in conjunction with the Environmental (Control) Officer:

- use of groundcover or grass
- construction of cut off berms (earth and/or rock pack) - these are to be angled across the contour and normally would approximate an angle of 30o from the bisector of the contour.
- placing of brush wood on bare surface.
- pegging of wattle trunks or branches along the contour.
- hard landscaping, e.g., use of Loffelstein walls, ground anchors, gabions etc.

Chambers are to be fitted with energy dissipaters, or the jet of water directed onto a protected (i.e., grouted stone pitching/ rock pack/ reno mattress) area to dissipate water velocity and to control and prevent erosion.

Storm water drainage measures will be required on site to control runoff and prevent erosion.

3.4. CONTROL OF POLLUTION

No waste in a solid, liquid, or gaseous state shall be emitted from or spilled on the site without the approval of the Project Engineer.

No mixed concrete shall be deposited directly onto the ground prior to placing. A board or other suitable

platform is to be provided onto which the mixed concrete can be deposited whilst it awaits placing. Excess concrete from mixing shall be deposited in a designated area awaiting removal to an approved landfill site specification.

The Contractor will contain wash water from cement mixing operations, by directing the water into a sump for collection. The material contained in the sump will be removed to an appropriate landfill site.

No concrete rubble shall be present within the top 1.5m of the embankment. Liquid wastes will not be disposed of to storm water drains. They may be disposed of to sewer only if permitted by (local council) legislation.

In the event of pollution of a water body (including sediment loading), the Contractor will provide alternative.

water supply to users of that water body until the quality of the water body is restored to its previous unpolluted state. For the sake of this clause, pollution is deemed to be a state which is substandard to the normal quality of the water body but is not necessarily in contravention of the South African Water Quality guideline standards for a prescribed activity.

Any ancillary damages resulting from pollution of a water body will be repaired/ remediated at the Contractor's cost. Where, due to construction requirements, pollution of a water body may potentially

occur, the Contractor is to ensure adequate measures (e.g., attenuation/ settlement dams/ oil absorbent products) are in place to prevent pollution. A method statement is to be provided to this effect.

3.4.1. Cutting of Trees

Any tree branches which require removal are to be properly pruned and a sealant applied to the cut surface, if required.

Any indigenous trees or bush which require removal in terms of the project, and which have not been identified in the project specification or EMP, are to be timeously indicated to the ECO prior to work affecting them. The total removal of any protected or indigenous tree shall follow a replacement ratio of 1 to 5, meaning for every 1 (one) tree removed 5 (five) of the similar specie must be planted.

3.5. MTIGATION MEASURES

3.5.1. Terrestrial biodiversity and Ecology

The contractor must ensure that no faunal species are disturbed, trapped, hunted, or killed during the construction phase. Conservation-orientated clauses should be built into contracts for construction personnel, complete with penalty clauses for non-compliance under the supervision of the environmental control officer. Trenches should only be opened as needed to prevent excessive open trench ahead of the pipe laying process. All trenches must have at least one sloping side to allow animals to escape and must be checked on a daily basis for animals which may have fallen in. Rehabilitation of areas where vegetation was disturbed during the construction phase should be undertaken to ensure that habitats for animals are restored.

3.5.2. Aquatic and Watercourse assessment

The most important of all the potential impacts is considered to be the possibility of the pipeline installation changing the hydrology, through changes made to the geology and vegetation, at the landscape level. The pipeline could act as a barrier to the movement of water from the upslope side to the downslope side of the contributing area. In the case of wetlands water should either move over or under the pipeline depending on how compacted the soil has become subsequent to the construction. In the case of some wetlands, significant compaction could result in a ponding effect on the upslope side of the pipeline, as water cannot move through compacted soil as easily as uncompacted soil, and the resultant “dam” could cause water to seep from the soil surface. It is critical that the pipeline is orientated to prevent parallel flows of water and must be buried using soils with similar characteristics to those naturally found within the area.

3.5.3. Surface Hydrology and Geohydrology

Due to the nature of the activity during the construction phase, which will require the use of heavy machinery, it is possible that an occasional spill of fluid from this equipment may occur. As such the following measures are proposed to minimise the potential impacts on both the surface hydrology and geohydrology of the study area.
The following measure are to be followed:

- Emergency numbers are provided on site – e.g. Spilltech, fire department, ambulance, etc.;
- Spill cleaning kits such as a Drizit kit are available on site;
- All chemicals on site are recorded in the inventory of hazardous substances (Safety Data Sheets (SDS) will be available on-site);
- Equipment, machinery and vehicles are regularly checked and maintained in good order;
- Machinery and equipment maintenance is undertaken in designated areas; and
- Drip trays are to be placed underneath machinery and equipment during maintenance.

In the instance of a spill on site the following procedure must be followed:

1. Locate the source of the spill;
2. Stop the spill and prevent further spreading;
3. The appropriate oil sponge, absorbent or spill kit (e.g. Drizit) can then be used to clean and remove the spilled substance(s);
4. Spills from trucks must be contained within a lined site area and prevented from spreading;
5. Spilled petrochemicals can then be cleaned up and removed using the appropriate oil sponge, absorbent or spill kit (e.g. DriZit);
6. The spill must be reported to the site manager / supervisor and ECO;
7. Depending on the significance of the spill, the incident may also need to be reported to the DMR, DEDTEA and/or DWS.

3.5.3.1 Erosion control

The erosion control is particularly relevant during the construction phase of this project, while during the pipelines operational phase, apart from occasional maintenance, it is expected that the construction area will be re-vegetated. To prevent / mitigate the occurrence of erosion the following measures should be taken:

- Immediately rehabilitate eroded areas:
- Install protective structures, e.g. geotextiles;
- Ensure the slope remains gentle and stable;
- Use vegetation plugs, rock packs or gabions where erosion is visible;
- Immediately revegetate the area.
- Ensure that steeper areas are avoided, and that the vegetation remains at these sites.

Continual erosion monitoring should occur by a trained staff member.

3.5.3.2 Groundwater contamination

Although there is a low risk of groundwater contamination (Geohydrology), it is still important to apply mitigation measures to ensure that even slight risks are addressed:

- Any new construction should take place during the dry season wherever possible. Construction should stop during heavy rains as this would minimise the risk of erosion/sediment loss during these periods. Movement of vehicles during these periods can cause severe erosion.
- Vegetation clearing should be limited as much as possible, and plants rescued for rehabilitation.
- Directing clean stormwater towards natural drainage lines, contours and dispersing over grassed, flat areas (preferably the existing watercourses).
- Vehicles and equipment must be kept clean and serviced off site.
- Staff/workers on-site must be educated on identifying potential erosion areas and best practice guidelines.
- Energy dissipating measures with regards to stormwater management should be installed where necessary to prevent soil erosion and promote infiltration.
- The engineer or contactor must ensure that only clean stormwater runoff enters the environment.
- Drainage should be controlled to ensure that runoff from the project area does not culminate in offsite pollution, flooding or result in any damage to properties downstream, of any stormwater discharge points.
- Infrastructure must have the following:
    - Completely lined infrastructure (concrete bunded area), with the capacity to contain 110% of the total amount of petrochemicals stored within a specific tank. This excludes partially pervious areas that do not store chemicals;

3.5.4. Archaeological and Cultural Heritage mitigations

No human graves may be removed without relevant permits from the various heritage agencies and/or municipality. (Ancestral) Graves in non-designated cemeteries are also protected by the heritage legislation. If any graves are accidentally uncovered during construction, then all work must stop within a 50m radius and the SAPS and ECPHRA need to be informed.

3.5.5. Palaeontology mitigations

If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the Chance Find Protocol must be implemented by the ECO or site manager in charge of these developments. Fossil discoveries ought to be protected and the ECO/site manager must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that suitable mitigation (recording and collection) can be carried out.

A desktop palaeontological study was conducted predicting with mitigation - low cumulative impact.

3.5.6. Socio-Economic Impact Assessment

3.5.6.1 Increased community conflicts within communities and between locals and outsiders

It is suggested that a project steering committee consisting of the DWS, contractor (community liaison person), recruitment agency, community leaders, elders, youth, ward councillors and the Winnie Madikizela-Mandela LED must be established in order to:

- Conduct an audit of the affected communities in term of employment capacity.
- Identify potential workers from the affected communities.
- Identify possible conflicts in and between communities.

Should appropriate mitigation measures be adopted, the overall significance of this impact should be **low negative** during the construction and **low** in operational phase as there will be fewer direct job opportunities. With any development, a degree of community tension would be expected.

3.5.6.2 Increase and spread of HIV/AIDs and other communicable diseases.

An HIV/AIDS, non-discrimination, awareness, prevention and health care support, policy must be implemented. Condoms must be made easily accessible to all construction workers.

An HIV/AIDs education and behaviour change programmes for all contracted construction workers, should be developed. The above program must extend to the communities located near the construction site. Existing public health care centres and programmes such as Treatment Action Campaign (TAC) must be involved in HIV/AIDS campaigns and monitoring of HIV/AIDs prevalence should be undertaken in collaboration with these agencies. Voluntary counselling and testing should be encouraged for all workers.

Should appropriate mitigation measures be adopted, the overall significance of this impact should be moderate negative during the construction and low negative during operational phase as the number of migrant labourers would have decreased. The spread of HIV cannot be halted, but with proper awareness and education programmes, impacts may be managed.

3.5.6.3 Economic stimulation of and investment into business and enterprise due to an increase in demand for local services

DWS is limited in its capacity to enhance the benefits of this impact, as the development of the rural communities and the town will occur in response to the needs and demands of construction workers. The proponent can play role in facilitating the skills required to recognise the need and respond appropriately. The proponent must link the Provincial Department of Economic Development and Local Municipal LED programmes with small to medium enterprises (including communities) in the area so that a state of "readiness" to optimise economic benefits is achieved. This may involve training in the following sectors: business, tourism, catering etc.

The success of mitigation cannot be predicted with certainty as it relies on:

- The willingness of enterprises to respond to the available demand opportunities,
- The skills available and acquired.
- The involvement of organisations that can provide support, training, and skills transfer.

The proponent can play a key facilitation role. Ultimately, with successful mitigation, the significance of the potential benefits is high during the construction phase, especially since mitigation can prolong benefits into the operation phase. Economic benefits during the operation phase are discussed in Impact.

3.5.6.4 Impact on Health and general quality of life

As the project is for provision of water supply in the municipality no mitigation measures are suggested.

3.5.6.5 Increased demand on existing infrastructure facilities and social services

The following mitigation measures should be adopted:

- Service providers associated with the Local Municipality, clinics, schools, and the SAPS must be made aware of an increase in demand, both in the town of Bizana and in the surrounding rural areas, and therefore the increased pressure to provide services for new households.

- This will require direct communication with the local municipalities, Alfred Nzo District Municipality, the Department of Health, South African Police Service, and the Department of Education. The channels of communication must be established as permanent points of contact throughout the construction phase of the project.

- Regular monitoring of the schools and clinics to determine whether there are sufficient resources must be undertaken. When resources are deemed insufficient, DWS must communicate, through established channels, with the relevant departments for assistance.

The DWS is limited in its capacity to increase the resources allocated to social services but can be instrumental in communicating with the relevant Provincial departments. With mitigation, resource allocation to social services may meet the demand, resulting in moderate-low negative impact. This impact is likely to be much less severe during the operation phase as the Greater Mbizana RBWSS will retain fewer workers.

3.5.6.6 Noise and dust generated by construction vehicle activity, blasting and hard rock sites.

The following mitigation and/or enhancement measures should be adopted:

- Noise and dust prevention measures and monitoring thereof must be included in an Environmental Management Programme.
- Communities must have access to a grievance reporting mechanism, e.g., through a project steering or liaison committee.

The associated impacts of dust and noise may be reduced to low significance.

3.5.6.7 Reduced safety during the construction of the dam due to high vehicle activity and potential run-away fires

The following mitigation and/or enhancement measures should be adopted:

Traffic safety:

- All affected communities must be informed of the formal construction routes.
- All vehicle operators and drivers must undergo regular training, clearly outlining the high safety risk to local rural communities.
- Signage making communities aware of the high safety risk due to heavy construction vehicles on the road must be erected at appropriate locations.
- Traffic calming devices such as speed bumps should be considered on rural access roads.

Fire safety:

- Fires outside construction camps must be prohibited.
- Fires that are lit must be in a contained area and safety precautions must be followed. The fire must be monitored for cinders and extinguished when no longer needed.
- Firefighting equipment must be stored onsite.
- The construction campsite must be surrounded by a firebreak.
- Education of fire risks must form part of the construction-worker training.

The strict implementation of the recommended mitigation measures, the significance of the risks may be reduced to moderate. Constant auditing of vehicle speed and driver training must be emphasised.

3.5.6.8 Stimulation of Economic Growth

The following mitigation and enhancement measures are proposed:

- Equal jobs opportunities for women and men must be promoted.
- Culture and tradition must be considered when planning the division of labour for construction.
- Employment must be managed by a recruitment agency/office that uses a selection system that ensures recruitment of semi and unskilled workers from all local impacted communities in accordance with recent government policies related to local procurement. This must ensure a fair and equitable recruitment process.
- Where appropriate, employees involved in the construction phase should be incorporated into the permanent maintenance staff for the operational phase; and
- Particular attention must be paid to employment opportunities for women and disabled persons.

This is sensitive impact which could, if managed properly, have a high positive overall impact on the population during the construction phase, and a low positive impact during the operational phase. During the operational phase there will be fewer job opportunities and the spatial scale would become local.

3.5.6.9 Supporting local businesses.

The proponent must ensure that the principal of utilising local business resources (suppliers and SMMEs) in accordance with recent government policies related to local procurement (State of the nation address, 2015) forms part of the procurement specifications. Examples of local business resources that must be considered:

- Catering services
- Transport services
- Quarries/borrow pits (where necessary)
- Small civils
- Accommodation
- Security
- Hygiene services
- Fencing

Should appropriate mitigation measures be implemented, the overall significance of this impact would be high positive especially during the construction phase. SMMEs will develop skills during the construction phase that could then be applied to other sectors, such as tourism. In this way the Greater Mbizana RBWSS project will result in moderate beneficial impacts on local businesses during the operation phase.

3.5.6.10 Skills training opportunities

The following enhancement measure is proposed:

- Implement a skills development programme which includes training in business, project management, monitoring, and evaluation.

By implementing a skills development programme, the Greater Mbizana RBWSS should have a positive overall significant impact on the communities. This is considered as a benefit of high significance during the construction phase and of moderate significance during the operation phase due to the long-term benefits of training and skill development.

3.5.6.11 Impact on grave sites along the route of the pipeline

Where practical and feasible, pipeline routes need to be diverted around identified grave sites. Where this is not possible, the affected families need to be consulted to discuss reburial. Additional mitigation measures are provided in the Heritage Impact Assessment.

This significance of this impact is considered high.

3.5.6.12 Loss of access to natural resources

The following mitigation measures should be adopted:

- It is anticipated that the increase in economic activity in the general area will result in an increase in alternative livelihood opportunities and activities. It is important that all members of the community are afforded equal opportunities to be involved with the proposed development by affording the surrounding communities' opportunities to provide input into project planning.
- Current landowners and land users should be sufficiently compensated. Compensation must be equitable across gender and age.
- Assist with the relocation of livestock, if necessary.

The loss of natural resources that will occur from the pipe installation may be mitigated, but management interventions that ensure financial compensation and alternative livelihood strategies, will reduce the severity of the impact to a low significance.

4. SECTION D: POST CONSTRUCTION

4.1. Reinstatement Of Water Courses and Wetland Areas

The Contractor will ensure that watercourse banks are returned to their original profile unless the project specification states otherwise.

The surface reinstatement of wetland areas is to ensure that no depressions remain which could act as channels for preferential water flow thereby affecting the hydrological regime of the wetland.

The Contractor will preserve all riparian and wetland vegetation for use in rehabilitation of those environments. This vegetation is to be kept moist at all times. It is to be placed in the shade and covered with moistened hessian cloth until replanting, which is to be undertaken immediately surface re-instatement is complete. Plants are to be, as nearly as possible, replanted in areas from which they were removed.

4.2. VEGETATION RE-ESTABLISHMENT

The Contractor will ensure that all areas disturbed by construction activities are re-vegetated to the specified standard. This standard is deemed to be an 85% cover with no areas in excess of 0.04m2/ m2 remaining unvegetated. Re-vegetation shall match the vegetation type which previously existed (e.g., kikuyu pastures are to be returned to kikuyu pasture; 'veld' grass to 'veld' grass, etc.), unless stated otherwise in the project specification.

Prior to re-grassing, and if required:

- the area is to be scarified or ripped (along contour) to a depth of 50 mm to loosen compaction.
- weeds present on site are to be removed. Re-grassing, where required, will be either by means of seeding, instant turf (sods), sprigs or plugs as specified in the project specification or as specified by the ECO.

Where sprigs or plugs are utilized, they are to be planted at 200mm centres. The fertilizer shall be applied as per. During summer, 25mm of irrigation shall be applied each week until reasonable (60%) ground cover has been obtained. During winter 15mm of irrigation shall be applied each week until reasonable (60%) ground cover has been obtained. The amount of irrigation to be applied will make up the difference between rainfall recorded on site and minimum requirement.

Where instant turf is utilized, it shall be laid as specified in the project specification. The fertilizer shall be applied. During summer, 25mm of irrigation shall be applied each week until all the turf is visibly growing.

During winter 15mm of irrigation shall be applied each week until all the turf is visibly growing. The amount of irrigation to be applied will make up the difference between rainfall recorded on site and minimum requirement.

Grassing shall be undertaken by a specialist grassing Sub-contractor unless permission is granted otherwise by the Project Engineer upon receipt of a written motivation from the Contractor.

The Contractor shall state in writing when the re-grassing operation will commence and its expected duration (dates).

4.2.1. Veld Grass Specification

4.2.1.1 Seeding methods

Two methods are recommended, namely hydro-seeding and hand-broadcasting. The required method shall be as specified in the project specification. All seed supplied should be labelled in accordance with the Government Seed Act No. 20 of 1961 and the Contractor shall be required to produce such certification, if requested by the Project Engineer.

4.2.1.2 Hydro-seeding

The Grassing Contractor shall be conversant with this method. Cellulose pulp (consisting of either wood shavings, shredded straw, shredded paper, or cotton waste) shall be added to the mix to be applied at a rate of 250 kg/ha. In addition to the cellulose pulp, compost (consisting of either chicken litter, kraal manure, sugar cane filter cake or mushroom compost) shall be incorporated at a rate of 5m3/ha (»100 X 50kg fertilizer bags/ha).

4.2.1.3 Hand-broadcasting

Fertilizer, at the appropriate rate, is to be distributed by hand in a manner to ensure that there is an even spread of fertilizer over the site. This is to be done prior to seeding.

The seed mix is to be weighed and made up in an appropriately large container which shall be stirred to ensure no settling out of the grass seed, and a uniform distribution of the different types of seed. The seed is to be distributed by hand in a regular grid broadcasting manner to ensure that there is an even spread of grass over the entire site.

The area seeded is to be raked over once the seed and fertilizer have been applied to incorporate these elements into the topsoil.

4.2.1.4 General

Where there is a possibility of neighbourhood livestock grazing a rehabilitated site, these should, as far as is practicable, be excluded for the first 3 months of re-grassing.

4.2.2. Landscaping

Landscaping of the site may be required as indicated in the project specification.

Planting of trees will be in accordance with the following method:

- All tree holes shall be square in plan;
- Tree holes shall be a minimum of 600mm by 600mm square by 700mm deep;
- Holes are to be backfilled with excavated soil in a ratio of 3:1 with compost. The compost is to be weed free and have been composted at temperatures in the order of 65oC. Where possible, any available topsoil should be placed in the hole at the level where the tree rootball will rest. A handful (half-a-cup) of each Superphosphate and 2.3.2 should be mixed into the soil-compost mix;
- The tree holes are to be backfilled to the point where the tree and its rootball are in the desired position. The tree is to be removed temporarily and the hole filled with water and allowed to drain away. This operation of watering and draining should be repeated at least four times in order that the surrounding ground and hole are thoroughly moist. The tree is then to be replaced and the remaining soil replaced;
- All trees shall be tied (using a tree tie) to a suitable timber stake planted in the ground to a depth of at least 500mm. The stake shall have a minimum diameter of 35mm and shall be at least 300mm higher than the planted tree;
- Water retaining basins of at least 500mm diameters are to be formed around each tree;
- The Contractor is to apply at least 10 litres of water per tree per fortnight for a period of at least 3 months.

The planting of shrubs will be in accordance with the tree planting method with the exception that the holes are to be a minimum of 400mm-by-400mm square by 500mm deep, and that the tree stakes and ties are not required.

4.2.3. Alien Plant Control

All alien and invasive species must be removed if seen on site during and post-construction. Below are five practice measures in which alien and invasive species must be handled;

- Cut plants as low to ground as possible.
- All alien plants must be removed carefully, and exposed soil should be covered with cut vegetation or leaf litter that is free of weed seeds to ensure that regrowth will not occur.
- Press any loosened soil down carefully and firmly and mulch with plant material where possible.
- All alien seeds, fruit bulbs, tubers and stems must be collected and placed in a sealable container/plastic bag for disposal at a landfill site.
- The roots system of mature trees including alien invasive play an important role in stabilising soil and therefore the uprooting of large mature specimen of trees is not advocated. It is better to fell the trees and paint the stump with the relevant herbicides. Manual and chemical methods on how to remove alien and invasive species explained further in the Terrestrial Ecological Impact assessment.

The ECO will identify those plants which require removal during both the construction and maintenance period, for the Contractor's action.

5. MONITORING FREQUENCY OF ECO AND ENGINEERS

PRE-CONSTRUCTION [SITE ESTABLISHMENT] PHASE

Aspect	Description	Monitored by	Monitoring Frequency
Layout of Construction Camp	The establishment of: ▪ a site office; ▪ ablution facilities; ▪ a designated first aid area; ▪ eating areas; ▪ staff lockers and showers; ▪ storage areas; ▪ refueling areas (if applicable); ▪ maintenance areas;	ECO	Monthly
Management Requirements: The contractor is to keep records of environmental issues to facilitate compliance to the legislation.	**Keeping of Records** a) The contractor's site management is to keep a separate Environmental file which includes: ▪ A copy of this EMP; ▪ A copy of Umgeni Water's Environmental Policy; ▪ A copy of the Environmental Authorisation with conditions; ▪ Correspondence with the ECO; ▪ Correspondence with IAPs; ▪ MSDSs; ▪ Copies of all the required supplier records; ▪ Records of personnel environmental training; ▪ A detailed series of photographs of the state of the existing access roads prior to construction; ▪ Public complaints register; ▪ Incident response register;	ECO	Monthly

Aspect	Description	Monitored by	Monitoring Frequency
	▪ A daily site diary; ▪ A register of audits; ▪ Safe disposal certificates issued for waste disposal companies for the disposal of waste; and ▪ Any procedures required in terms of this EMP.	ECO	Ongoing
	Site Staff Management a) All contractor staff are to be easily identified by means of distinctive clothing	ECO	Ongoing
Setting up Construction Camp Careful planning of the construction camp can ensure that time and costs associated with environmental management and rehabilitation are reduced. The location of the camp will be finalized prior to the contractor's establishment on site.	**Layout** a) Choice of site for the Contractor's camp requires the Engineer's permission and must take into account location of local residents and / or ecologically sensitive areas, including flood zones and slip / unstable zones. A site plan must be submitted to the Engineer & ECO for approval.	Engineer/ ECO	During surveys and preliminary investigations and prior to moving onto site.
	b) The construction camp may not be situated on a floodplain or on slopes greater than 1:3.	Engineer/ ECO	During surveys and preliminary investigations.
	c) If the Contractor chooses to locate the camp site on private land, he must get prior written permission from both the Engineer and the landowner.	Engineer	During surveys and preliminary investigations.

Aspect	Description	Monitored by	Monitoring Frequency
	d) In most cases, on-site accommodation will not be required. The construction camp can thus be comprised of: ▪ site office; ▪ ablution facilities; ▪ designated first aid area; ▪ eating areas; ▪ staff lockers and showers (where water and waterborne sewers are available); ▪ storage areas; ▪ batching plant (if required); ▪ refuelling areas (if required); ▪ maintenance areas (if required); ▪ crushers (if required)	Engineer/ ECO	During Site Establishment Process
	e) Cut and fill must be avoided where possible during the setup of the construction camp.	Engineer	During Site Establishment Process
	f) The size of the construction camp will be minimized (especially where natural vegetation or grassland has had to be cleared for its construction).	Engineer/ ECO	During Site Establishment Process
	g) Adequate parking must be provided for site staff and visitors.	Engineer/ ECO	During Site Establishment Process
	h) The Contractor must attend to drainage of the camp site to avoid standing water and / or sheet erosion.	ECO	Ongoing, on a monthly basis.

Aspect	Description	Monitored by	Monitoring Frequency
	Ablutions a) Where waterborne sewerage is not available, temporary chemical toilets must be provided by a company that has been approved by the Engineer & ECO. Such toilets must be available for all site staff, both at the camp site, and on site as agreed by the Engineer. Toiletswill be no closer than 50m from any natural water bodies.	ECO	During Site Establishment Process
	b) The construction of “long drop” toilets is not recommended.	ECO	Ongoing
	c) Under no circumstances may open areas or the surrounding bush be used as toilet facility.	ECO	Ongoing
	Provision for Camp Waste Disposal a) Bins and / or skips shall be provided at convenient intervals for disposal of waste within the construction camp. Bins will be at least 200ℓ and clearly identified for waste disposal	ECO	During Site Establishment Process and on a monthly basis.
	b) Bins will have liner bags for efficient control and safe disposal of waste	ECO	Ongoing
	c) Recycling and the provision of separate waste receptacles for different types of waste will be encouraged.	ECO	During Site Establishment Process and on a monthly basis.

Aspect	Description	Monitored by	Monitoring Frequency
Establishing Storage Areas Storage areas can be hazardous, unsightly and can cause environmental pollution if not designed and managed carefully.	**General Substances and Materials** a) Choice of location for storage areas must take into account prevailing winds, distance to water bodies and general on-site topography.	ECO	During Site Establishment Process
	b) Storage areas must be designated, demarcated, and fenced if necessary.	ECO	During Site Establishment Process
	c) Storage areas will be secure so as to minimize the risk of crime. They will also be safe from access by children / animals etc.	ECO	During Site Establishment Process
	d) Fire prevention facilities must be present at all storage facilities.	ECO	During Site Establishment Process
	e) If electrical equipment is stored on site a fire break will be required around the storage area.	E/ECO	During Site Establishment Process and ongoing maintenance of fire break.

Aspect	Description	Monitored by	Monitoring Frequency
	Hazardous Substances and Materials Definition of hazardous substances / materials are those that are potentially: poisonous, flammable, carcinogenic or toxic. a) Some examples of hazardous substances / materials: ▪ diesel; ▪ petroleum; ▪ oil; ▪ bituminous products; ▪ cement; ▪ solvent based paints; ▪ lubricants; ▪ explosives; ▪ drilling fluids; ▪ pesticides; and ▪ herbicides	Engineer/ ECO	During Site Establishment Process and ongoing maintenance of fire break.
	b) Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible and available, MSDSs will additionally include information on ecological impacts and measures to minimized negative environmental impacts during accidental releases or escapes.	Engineer/ ECO	Monthly
	c) Hazardous storage and refuelling areas must be bunded with an impermeable liner to protect groundwater quality. The Contractor shall submit a method statement to the Engineer for approval.	Engineer/ ECO	During Site Establishment Process

Aspect	Description	Monitored by	Monitoring Frequency
	d) Fuel tanks must meet relevant specifications and be elevated so that leaks may be easily detected.	Engineer	During Site Establishment Process
	e) Storage areas containing hazardous substances / materials must be clearly signed.	ECO	During Site Establishment Process
	f) It is very important that the proximity of houses, schools etc is taken into account when deciding on storage areas for hazardous substances.	Engineer	During surveys and preliminary investigations.
	g) Residents living adjacent to the construction site must be notified of the existence of the hazardous storage area.	ECO	When moving onto site or as the relevant materials arrive on site.
	h) Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.	ECO	During staff induction and ongoing as necessary.
	i) Contractors shall submit a method statement and plans for the storage of hazardous materials and emergency procedures.	ECO	Prior to establishment of storage area.

Aspect	Description	Monitored by	Monitoring Frequency
Education of Site Staff on General and Environmental Conduct These points need to be made clear to all staff on site before the project begins.	**Environmental Awareness and Training** a) Ensure that all site personnel have a basic level of environmental awareness training. The Contractor must submit a proposal for this training to the ECO for approval. Topics covered will include: ▪ What is meant by "environment"; ▪ Why the environment needs to be protected and conserved; ▪ How construction activities can impact on the environment; ▪ What can be done to mitigate against such impacts; ▪ Awareness of emergency and spills response provisions; and ▪ Social responsibility during construction. e.g. being considerate to local residents.	ECO	During staff induction and ongoing.
	b) It is the Contractor's responsibility to provide the site foreman with environmental training and to ensure that the foreman has sufficient understanding to pass this information onto the construction staff.	ECO	Prior to moving onto site.
	c) The Engineer / ECO will be on hand to explain more difficult / technical issues and to answer questions.	ECO	Ongoing
	d) Construction workers will be made aware that they are not to make excessive noise (e.g. shouting / hooting, loud music) when the site is near to commercial / residential areas.	ECO	During staff induction, followed by ongoing monitoring.
	e) The need for a "clean site" policy also needs to be explained to the construction workers.	ECO	Induction, ongoing monitoring.

Aspect	Description	Monitored by	Monitoring Frequency
Worker Conduct on Site 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:	a) No alcohol / drugs to be present on site.	ECO	During staff induction, followedby ongoing monitoring.
	b) No firearms allowed on site or in vehicles transporting staff to / from site, (unless used by security personnel).	ECO	During staff induction, followed by ongoing monitoring.
	c) Prevent excessive noise.	ECO	Induction, ongoing monitoring.
	d) Prevent unsocial behaviours.	ECO	During staff induction, followed by ongoing monitoring.

Aspect	Description	Monitored by	Monitoring Frequency
	e) Bringing pets onto the site is forbidden.	ECO	During staff induction, followed by ongoing monitoring.
	f) No harvesting of firewood from the site or from the areas adjacent to it.	ECO	Induction, ongoing monitoring.
	g) Construction staff are to make use of the facilities provided for them, as opposed to ad-hoc alternatives. (e.g.: fires for cooking; the use of surrounding bush as a toilet facility, washing in rivers or static water bodies are forbidden).	ECO	During staff induction, followed by ongoing monitoring.
	h) Trespassing on private / commercial properties adjoining the site is forbidden.	ECO	During staff induction, followed by ongoing monitoring.
	i) Driving under the influence of alcohol is prohibited.	ECO	Induction, ongoing monitoring.
	j) Other than pre-approved security staff, no workers shall be permitted to live on site.	ECO	During staff induction, followed by ongoing monitoring.

Aspect	Description	Monitored by	Monitoring Frequency
Dust / Air Pollution Establishment of the camp site, and related temporary works can reduce air quality.	a) Vehicles travelling along the access roads must adhere to speed limits to avoid creating excessive dust.	ECO	Ongoing
	b) Camp construction / haulage road construction – areas that have been stripped of vegetation must be dampened periodically to avoid excessive dust.	ECO	Ongoing– more frequently during dry and windy conditions
	c) The Contractor must make alternative arrangements (other than fires) for cooking and / or heating requirements. LPG gas cookers may be used provided that all safety regulations are followed.	ECO	Ongoing
Soil Management The stripping of vegetation during preliminary activities on site greatly increases the risk of erosion.	a) The time that stripped areas are left open to exposure will be minimized wherever possible. Care will be taken to ensure that lead times are not excessive.	Engineer / ECO	Throughout the duration of the project.
	b) Wind screening and storm water control will be undertaken to prevent soil loss from the site.	Engineer / ECO	During Site Establishment

Aspect	Description	Monitored by	Monitoring Frequency
	c) Procedures that are in place to conserve topsoil during the construction phase of the project are to be applied to the set-up phase. i.e., topsoil is to be conserved while providing access to the site and setting up the camp.	Engineer / ECO	Daily monitoring during site camp set-up.
	d) Stockpiled soil should not be more than 2m in height and should be protected from wind and rain.	Engineer / ECO	On-going monitoring throughout project
Storm Water Management The increase in storm water run-off resulting from construction activities must be estimated and the drainage system assessed accordingly to prevent storm water damage.	a) To prevent storm water damage, the increase in storm water run-off resulting from construction activities must be estimated and the drainage system assessed accordingly. A drainage plan must be submitted to the Engineer for approval and must include the location and design criteria of any temporary stream crossings (siting and return period etc.).	Engineer	During surveys and preliminary investigations.
	b) During site establishment, storm water culverts and drains are to be located and covered with metal grids to prevent blockages if deemed necessary by the Engineer. (e.g. due to	Engineer	During Site Establishment

Aspect	Description	Monitored by	Monitoring Frequency
Water Quality Incorrect disposal of substances and materials and polluted run-off can have serious negative effects on groundwater quality.	a) Storage areas that contain hazardous substances must be bunded with an approved impermeable liner.	Engineer	Site Establishment
	b) 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.	Engineer / ECO	During site set-up

Aspect	Description	Monitored by	Monitoring Frequency
	c) 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.	Engineer / ECO	Site Establishment
	d) Provision will be made during set up for all polluted run-off to be treated to the Engineer's approval before being discharged into the storm water system. (This will be required for the duration of the project.)	Engineer / ECO	During set up, to be monitored monthly.
Conservation of the Natural Environment Alien plant encroachment is particularly damaging to natural habitats and is often associated with disturbance to the soil during construction activities. Care must be taken to conserve existing plant and animal life on and surrounding the site.	**Fauna and Flora** a) No vegetation may be cleared without prior permission from the Engineer & ECO.	Engineer / ECO	During site set-up and ongoing.
	b) Trees that are not to be cleared will be marked beforehand with danger tape. The ECO must be given a chance to mark vegetation that is to be conserved before the Contractor begins clearing the site.	Engineer / ECO	During Site Establishment
	c) Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material).	ECO	Ongoing in camp site, haulage areas.
	d) Where alien plants have been introduced onto the site during construction, they will be removed. Before this is carried out, the ECO will be consulted. Suitable removal methods include, uprooting, felling, cutting or treatment with a weed killer.	Engineer / ECO	During surveys

Aspect	Description	Monitored by	Monitoring Frequency
	e) The site shall only be cleared immediately prior to construction activities commencing ie at the last practicable stage.	Engineer / ECO	When Required
	Sensitive Habitats Areas which are identified by the Engineer or the environmental control officer as being ecologically sensitive, and which are adjacent to any construction work are to be suitably demarcated to prevent damage by plant and labour. Temporary bonnox type fencing will be used and will be moved in phases as the construction progresses from one area to the next.	Engineer / ECO	During surveys and preliminary investigations and ongoing.
Set up of Waste Management Procedures	a) The excavation and use of rubbish pits on site is forbidden.	ECO	Ongoing
	b) Burning of waste is forbidden.	ECO	Ongoing
	c) A fenced area must be allocated for waste sorting and disposal.	ECO	Site Establishment
	d) No waste disposal receptacle will be placed near fuel storage facilities or other flammable storage facility.	Engineers / ECO	Site Establishment
	e) Individual skips for different types of waste (e.g. “household” type refuse, building rubble, etc) will be provided.	ECO	During site set-up

Aspect	Description	Monitored by	Monitoring Frequency
Social Impacts – Visual & Noise It is important take notice of the needs and wishes of those living or working adjacent to the site. Failure to dowhat you say can cause disruption towork and increase costs in the form of delays.	**Public Participation** a) During the set-up phase of the project, the Contractor needs to make contact with those people that are Interested or Affected by the development (I&AP's)	Engineers / ECO	Prior to moving onto site.
	b) These people will usually have been identified by the environmental consultant that was assigned to the project. If this wasn't the case, the I&AP's can be identified as those who either: ▪ Live close by to the site; ▪ Work close by to the site; ▪ Will have their services / infrastructure affected by the project; ▪ Have a general interest in the project; and ▪ The Councillor for the ward in which the construction is taking place.	Engineers / ECO	Prior to moving onto site.
	Noise Impacts a) Construction vehicles are to be fitted with standard silencers prior to the beginning of construction.	ECO	Prior to moving onto site.
	b) Equipment that is fitted with noise reduction facilities (eg Side flaps, silencers etc) will be used as per operating instructions and maintained properly during site operations.	ECO	Ongoing
	Visual Impacts a) Storage facilities, elevated tanks and other temporary structures on site will be located such that they have as little visual impact on local residents as possible.	Engineer/ECO	During surveys and preliminary investigations and site set-up.

Aspect	Description	Monitored by	Monitoring Frequency
	b) In areas where the visual environment is particularly important (e.g. along commercial / tourism routes), the site may require screening in the form of shade cloth or other suitable materials prior to the beginning of construction.	Engineer / ECO	During surveys and preliminary investigations and site set-up.
	c) Construction is to abide by the setbacks incorporated in the proposed conceptual design. This is of specific relevance to the area along the Manors and the area along the remnant forest.	Engineer / ECO	Ongoing
	d) Any complaints from interest groups regarding the appearance of the construction site must be recorded and addressed promptly by the Contractor.	Engineer / ECO	Ongoing
	e) Special attention will be given to the screening of highly reflective materials on site.	ECO	During Site Establishment
Cultural Environment	Prior to the commencement of construction, all staff need to know what possible archaeological or historical objects of value may look like, and to notify the Engineer / Contractor will such an item be uncovered.	ECO	During site set-up and ongoing.
Security and Safety	**Fencing** a) Secure the site in order to reduce the opportunity for criminal activity in the locality of the construction site.	Engineer	During Site Establishment

Aspect	Description	Monitored by	Monitoring Frequency
	b) Confined sites within residential / commercial areas will be fenced and manned to control the access of persons to the site. Note: This is not always feasible on linear projects such as roads or pipelines.	Engineer	During Site Establishment
	c) Potentially hazardous areas such as trenches are to be demarcated and clearly marked.	ECO	During Site Establishment
	Lighting a) 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 residents or businesses.	Engineer	During Site Establishment
	b) High powered lights are to be fitted with shields such that light can be directed away from neighbouring properties and onto the work site.	Engineer	Ongoing
	Risks Associated with Materials on Site a) Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents.	ECO	Ongoing
	b) Flammable materials will be stored as far as possible from adjacent residents / businesses.	ECO	Ongoing
	c) Firefighting equipment will be present on site at all times as per OHSA.	ECO	Ongoing

Aspect	Description	Monitored by	Monitoring Frequency
	d) Obstruction to drivers' line of site due to stockpiles and stacked materials must be avoided, especially at intersections and sharp corners.	ECO	Ongoing
	e) No materials are to be stored in unstable or high-risk areas such as in floodplains or on steep slopes.	ECO	Ongoing
	g) The contractor will provide a method statement for construction activities (14 days prior to commencement) relating to the slopes unless methods have been prescribed in this project or the project environmental specification. Examples of these are: ▪ stringing of power lines; ▪ blasting; ▪ earthworks / earthmoving machinery on steep slopes above houses / infrastructure; ▪ risk to residences along haulage roads / access routes	Engineer	During Site Establishment

CONSTRUCTION PHASE

Aspect	Description	Monitored by	Monitoring Frequency
Access to Site	**Location** The main access road to the site will be constructed from the existing gravel road. Alternativeaccess will be provided for during construction from the eastern side of the dam wall. This access road will be 4meters wide.	Engineer	On-going
	Haulage Roads a) Contractors shall ensure that all side and mitre drains and scour check walls on access andhaul roads are functioning properly and are well maintained.	Engineer	Weekly and after heavy rains.
	Maintenance of Access a) Contractors will ensure that access roads are maintained in good condition by attending to potholes, corrugations and storm water damage as soon as these develop. b) If necessary, staff must be employed to clean surfaced roads adjacent to constructionsites where materials have been spilt.	Engineer ECO	Weekly inspection. When necessary.

Aspect	Description	Monitored by	Monitoring Frequency
	c) Unnecessary compaction of soils by heavy vehicles must be avoided; constructionvehicles must be restricted to demarcated access, haulage routes and turning areas.	ECO	On-going
	d) Any areas disturbed outside of the demarcated areas or without permission of the ECOor Engineer will be subject to reinstatement and rehabilitation to the Contractors cost	ECO	On-going
	e) Cognisance of vehicle weight / dimensions must be taken when using access constructed out of certain materials. e.g. paved surfaces / cobbled entranceways.	Engineer	On-going
Maintenance of Construction Camp	**Surfaces** a) The Contractor must monitor and manage drainage of the camp site to avoid standingwater and soil erosion.	Engineer	On-going
	b) Run-off from the camp site must not discharge into neighbors' properties.	Engineer	On-going

Aspect	Description	Monitored by	Monitoring Frequency
	Ablutions		
	a) Chemical toilets are to be maintained in a clean state and will be moved to ensure thatthey adequately service the work areas.	ECO	Monthly inspection.
	b) The Contractor is to ensure that open areas or the surrounding bush are not beingused as a toilet facility.	ECO	Monthly inspection.
	c) Not to be placed 50m from the edge of a water course and floodplain.	ECO	On-going
	Camp Waste Disposal		
	a) The Contractor shall ensure that all litter is collected from the work and camp areas daily.	ECO	Ongoing
	b) Bins and/or skips will be emptied regularly, and waste will be disposed of at a registered Landfill site. Waybills for all such disposals are to be kept by the Contractorfor review by the Engineer / ECO.	ECO	Monthly inspection.
	c) A registered chemical waste company is to be used to remove waste from chemical toilets on site.	ECO	Ongoing
	Eating Areas		
	a) Eating areas will be regularly serviced and cleaned to ensure the highest possiblestandards of hygiene and cleanliness.	ECO	Monthly inspection.
	b) All litter throughout the site will be picked up and placed in the bins provided.	ECO	Monthly inspection.

Aspect	Description	Monitored by	Monitoring Frequency
	Housekeeping a) The Contractor shall ensure that his camp and working areas are always kept cleanand tidy.	Engineer / ECO	Monthly inspection.
Staff Conduct	**Environmental Education and Awareness** a) The Contractor must monitor the performance of construction workers to ensure that the points relayed during their induction have been properly understood and are beingfollowed. If necessary, the ECO and / or a translator will be called to the site to further explain aspects of environmental or social behaviour that are unclear.	Engineer / ECO	Ongoing monitoring.
	Worker Conduct on Site a) The rules that are explained in the worker conduct section, must be followed at alltimes.	ECO	Ongoing

Dust / Air Pollution Main causes of air pollution are dust from vehicle movements and stockpiles, vehicle emissions and fires.	a) Vehicles travelling to and from the construction site must adhere to speed limits so as to avoid producing excessive dust.	Engineer	Ongoing
	b) A speed limit of 30km/hr must be adhered to on all dirt roads.	Engineer	Ongoing
	c) Access and other cleared surfaces must be dampened whenever possible and especially in dry and windy conditions to avoid excessive dust.	Engineer	Ongoing
	d) Where dust is unavoidable in residential areas, screening will be required utilizing wooden supports and shade cloth.	Engineer	As directed by Engineer.
	e) Vehicles and machinery are to be kept in good working order and to meet manufacturer's specifications for safety, fuel consumption etc.	ECO	Ongoing
	f) Will excessive emissions be observed, the Contractor is to have the equipment seen to as soon as possible.	Engineer	As directed by Engineer.
	g) No fires are allowed on site except for the burning of firebreaks.	Engineer	Ongoing
	h) Stockpiles may cause dust and so must be managed in accordance with the guidelines in Materials Management	Engineer	Ongoing

Aspect	Description	Monitored by	Monitoring Frequency
Soil Management	**Topsoil Stripping and Stockpiling** a) Once an area has been cleared of vegetation, the top layer (nominally 150mm) of soil willbe removed and stockpiled in a designated area. b) Stockpiles will not be higher than 2m and is only to be handled twice – once to strip andstockpile and secondly to replace, level, shape and scarify. c) Stockpiles must be positioned in an area that will prevent dust particles being blown ontothe residents and road users.	Engineer /ECO Engineer /ECO Engineer /ECO	Ongoing Ongoing Ongoing
	Exposed Surfaces a) The full length of the works shall not be stripped of vegetation prior to commencing otheractivities. b) The time that stripped areas are exposed shall be minimized wherever possible. c) Topsoiling and revegetation shall commence immediately after the completion of an activityand at an agreed stage with the Engineer & ECO behind any work front. d) Storm water control and wind screening will be undertaken to prevent soil loss from the site.	Engineer / ECO Engineer / ECO Engineer / ECO Engineer / ECO	On-going On-going As each activity is completed. On-going
Storm Water Construction activities frequently result in diversions of natural water	**General Principles** a) The Contractor shall not in any way modify nor damage the banks or bed of streams, rivers, wetlands, other open water bodies and drainage lines adjacent to or within the designated area, unless required as part of the construction project specification.	ECO	Ongoing

Aspect	Description	Monitored by	Monitoring Frequency
flow resulting in concentration of flow and an increase in the erosive potential of the water. Measures in this section are aimed at reducing the erosive potential of storm water.	Where such disturbance is unavoidable, modification of water bodies will be kept to aminimum in terms of: - Removal of riparian vegetation; - Opening up of the stream channel.		
	b) Earth, stone and rubble is to be properly disposed of so as not to obstruct natural waterpathways over the site. i.e.: these materials must not be placed in storm water channels, drainage lines or rivers.	Engineer	Monitoring throughout the duration of the project.
	c) There will be a periodic checking of the site's drainage system to ensure that the waterflow is unobstructed.	Engineer / ECO	Monitoring throughout the duration of the project.
	d) The use of high velocity storm water pipelines will be avoided in favor of open, high friction, semipermeable channels wherever feasible.	Engineer / ECO	Monthly checking.
	e) A number of smaller storm water outfall points will be constructed rather than a few large outfall points.	Engineer / ECO	As directed by the Engineer.
	f) Storm water outfalls will be designed to reduce flow velocity and avoid stream bank and soil erosion.	Engineer	As directed by the Engineer.
	g) No liquid or solid wastes will be placed on site such that they would be washed into awatercourse, or outside the confines of the site, during a storm event. Examples of such wastes include soaps, car washings, paints, oils, fuels, and wash water.	ECO	As directed by the Engineer.

Aspect	Description	Monitored by	Monitoring Frequency
Water Quality Water quality is affected by the incorrect handling of substances and materials. Soil erosion and sediment is also detrimental to water quality. Mismanagement of polluted run-off from vehicle and plant washing and wind dispersal of dry materials into rivers and watercourses are detrimental to water quality.	a) Mixing / decanting of all chemicals and hazardous substances must take place eitheron a tray or on an impermeable surface. Waste from these will then be disposed of toa suitable waste site.	ECO	Regular monitoring.
	b) Every effort will be made to ensure that any chemicals or hazardous substances do not contaminate the soil or ground water on site.	ECO	Regular monitoring.
	c) Care must be taken to ensure that run-off from vehicle or plant washing does not enterthe ground water or river. Wash water must be collected and disposed of as approvedby the Engineer.	ECO	Regular monitoring.
	d) Site staff shall not be permitted to use the river or other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction or related activities. Source approved by the Engineer will instead be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, concrete mixing, compacting etc.	ECO	Regular monitoring.
	e) River crossings will only be allowed in designated areas.	ECO	Regular Monitoring
	f) Emergency contact numbers will be referred to in order to deal with spillages andcontamination of aquatic environments.	ECO	As required

Aspect	Description	Monitored by	Monitoring Frequency
Conservation of Natural Environment As the work front progresses the Contractor is to check that vegetation clearing has the prior permission of the Engineer.	**Fauna and Flora** a) Only trees that have NOT been marked beforehand are to be removed.	Engineer	Ongoing
	b) Gathering of firewood, fruit, muthi plants, crops, or any other natural material on site or in areas adjacent to the site is prohibited.	ECO	Ongoing
	c) The hunting/poaching of birds and animals on site and in surrounding areas is forbidden.	ECO	Ongoing
	d) Snares and traps on site and in surrounding areas are forbidden.	ECO	Ongoing monitoring.
	e) Immediate revegetation of stripped areas and removal of aliens by weeding must take place.This significantly reduces the amount of time and money that must be spent on alien plant management during rehabilitation.	ECO	Ongoing monitoring.
	f) Alien vegetation encroachment onto the site as a result of construction activities must becontrolled during construction.	ECO	Twice-monthly monitoring.

Aspect	Description	Monitored by	Monitoring Frequency
	i) Disturbances to nesting sites of birds and animals must be minimized.	ECO	On-going
	i) No water may be abstracted from water bodies for the purposes of construction withoutapproval of the Engineer in consultation with the ECO	Engineer / ECO	On-going
	k) No construction vehicles must be allowed to transverse indiscriminately through ripariananeas.	Engineer / ECO	On-going
	Wetland		
	a) Wetlands must be protected	ECO	On-going
	b) Placement of construction materials well outside wetland habitats and wetland buffers	Engineer / ECO	On-going
	c) Construction vehicle should not drive through wetland habitat		On-going
	d) Accidental spills should be remedied immediately		
	e) Demarcation of the area, and the rescue and transplanting of protected plant is encouraged		
	River/ Stream courses		
	a) The contractor is to submit a method statement for review 14 days prior to commencing construction. Method statement should highlight: - Detailed plan of crossing including pipe protection works - How water flow will be diverted during construction - Containment of contaminated run-off and waste water - Width of working servitude - Final expected profile of river/ stream banks - Re-instatement and rehabilitation of river/ stream banks - Removal of herbaceous riparian vegetation with their root ball intact, and must bekept moist by means of placing in shade, covered with moistened hessian cloth until it is replaced.	ECO	On-going
	b) Contractor shall not modify the banks or bed of the watercourse	ECO	On-going
	c) Rocks used for gabion baskets/ Reno mattresses may not be obtained from watercourse	ECO	On-going

Aspect	Description	Monitored by	Monitoring Frequency
	d) The contractor will not pollute any water body as a result of construction activities.	ECO	On-going
	e) Where a stream/ river crossing requires diversion of water, a method statement is to beprovided to the ECO for review 14 days prior to commence of activities.	ECO	On-going
Materials Management	**Stockpile Management**		
	a) Stockpiles will not be situated such that they obstruct natural water pathways.	Engineer/ECO	Location as directed by the Engineer.
	b) Stockpiles will not exceed 2m in height unless otherwise permitted by the Engineer.	EngineerECO	Ongoing monitoring.
	c) If stockpiles are exposed to windy conditions or heavy rain, they will be covered eitherby vegetation or cloth, depending on the duration of the project. Stockpiles may furtherbe protected by the construction of berms or low brick walls around their bases.	ECO	As this becomes necessary.
	d) Stockpiles will be kept clear of weeds and alien vegetation growth by regular weeding.		Monthly monitoring.

Aspect	Description	Monitored by	Monitoring Frequency
	Handling of Hazardous Materials		
	a) All concrete mixing must take place on a designated, impermeable surface. No concrete mix water is to reach the areas outside the designated mixing area. As such,bunds may be required. Spills of cement are to be promptly cleaned up.	ECO	On-going monitoring.
	b) No vehicles transporting concrete to the site may be washed on site.	ECO	On-going monitoring.
	c) No vehicles transporting, placing or compacting asphalt or any other bituminous product may be washed on site.	ECO	Monthly
	d) Lime and other powders must not be mixed during excessively windy conditions.	ECO	Ongoing monitoring.
	e) All substances required for vehicle maintenance and repair must be stored in sealed containers until they can be disposed of / removed from the site.	ECO	Ongoing monitoring.
	f) Hazardous substances / materials are to be transported in sealed containers or bags.	Engineer / ECO	Ongoing monitoring.
	g) Open store vessels are to be stored undercover to prevent 'splash' contamination.	ECO	Ongoing monitoring
	h) Daily checks are to be conducted on the dispensing mechanism of above ground storage tanks to ensure the timeously identification of faults.	ECO	Ongoing monitoring

Aspect	Description	Monitored by	Monitoring Frequency
	i) Collection containers (e.g. drip trays) are to be placed under all dispensing mechanisms of hydrocarbon or hazardous liquid substances to prevent contaminationfrom leaks and dispensing	ECO	Ongoing monitoring
	j) The dispensing mechanism of diesel and petrol storage is to be stored in a container when not in use.	ECO	Ongoing monitoring
	k) Spraying of herbicides / pesticides will not take place under windy conditions and mustcomply with OHSA specs and other chemical handling laws.	ECO	Ongoing monitoring
	l) The emergency numbers on site will be consulted will 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. Thisstatement must be handed to the Engineer as well as to DWS should the incident occur near to a body of water.	ECO	Ongoing monitoring

Aspect	Description	Monitored by	Monitoring Frequency
Waste Management Definition: "Refuse" refers to all construction waste (such as rubble, asphalt millings, cement bags, waste cement, timber, cans, other containers, wire and nails), household and office waste.	**On-Site Waste Management** a) Refuse must be placed in the designated skips / bins which must be regularly emptied. These will remain within demarcated areas and will be designed to prevent refuse frombeing blown out by wind. b) In addition to the waste facilities within the construction camp, provision must be madefor waste receptacles to be placed at intervals along the work front. c) Littering on site is forbidden and the site shall be cleared of litter at the end of each working day. d) Recycling is to be encouraged by providing separate receptacles for different types ofwaste and making sure that staff are aware of their uses. e) No solid waste is to be disposed of by burning.	ECO ECO ECO ECO ECO	On-going monitoring. On-going monitoring. On-going monitoring. On-going monitoring. On-going monitoring

Aspect	Description	Monitored by	Monitoring Frequency
	Waste disposal All waste must be removed from the site and transported to a registered Landfill site.	Engineer / ECO	Checked at each site meeting.
	Non-hazardous Waste a) Waybills proving disposal at each site shall be provided for the Engineer's inspection.	Engineer / ECO	On-going monitoring.
	b) Construction rubble shall be disposed of in pre-agreed, demarcated spoil dumps thathave been approved by the Engineer, or at permitted disposal sites. No rubbish or debris shall be deposited below the full supply level (FSL).	Engineer / ECO	Monitored weekly and at the start of builders' holidays.
	c) Waste from chemical toilets will be disposed of regularly and in a responsible manner by a registered waste contractor. Care must be taken to avoid contamination of soils and water, pollution and nuisance to adjoining areas.	ECO	On-going monitoring
	Hazardous Waste a) Hazardous waste disposal must be carried out by an approved waste Contractor.Waybills for this will be provided.	ECO	On-going
	b) A sump (earth or other) must be created for concrete waste. This is to be de-sludge regularly and the cement waste is to be removed to a registered disposal site.	Engineer / ECO	On-going monitoring.

Aspect	Description	Monitored by	Monitoring Frequency
Social Impacts	**Disruption of Infrastructure and Services**		
Regular communication between the Contractor and Interested and Affected Parties (I&AP's) is important for the duration of the contract.	a) Contractor's activities and movement of staff to be restricted to designated construction areas.	Engineer	On-going
	b) Will the construction staff be approached by members of the public or other stakeholders, they will assist them in locating the Engineer or Contractor, or provide anumber on which they may contact the Engineer or Contractor.	Engineer / ECO	On-going
	c) The conduction of the construction staff when dealing with the public or other stakeholders shall be in a manner that is polite and courteous at all times. Failure to adhere to this requirement may result in the removal of staff from the site by the Engineer.	Engineer	On-going
	d) Disruption of access for local residents must be minimized and must have the Engineer's permission	Engineer	On-going
	e) The Contractor is to inform neighbors in writing of disruptive activities at least 24 hours beforehand. This can take place by way of leaflets placed in the postboxes/at houses giving the Engineer's and Contractor's details or other method approved by the Engineer.	Engineer / ECO	At least 24 hrs prior to the activity taking place.
	f) All complaints and/or problems related to impacts on man-made facilities and activitiesmust be promptly addressed by the Contractor and documented.	Engineer / ECO	On-going.

Aspect	Description	Monitored by	Monitoring Frequency
	Visual Impacts		
	a) Lighting on the construction site will be pointed downwards and away from nearbyhouses.	ECO	On-going.
	b) The site must be kept clean to minimise the visual impact of the site.	ECO	On-going – weekly monitoring.
	c) If screening is being used, this must be moved and re-erected as the work front progresses.	ECO	On-going.

Aspect	Description	Monitored by	Monitoring Frequency
	Noise		
	a) Machinery and vehicles are to be kept in good working order for the duration of the project to minimize noise nuisance to neighbors.	ECO	On-going
	b) Notice of particularly noisy activities must be given to residents / businesses adjacentto the construction site.	Engineer / ECO	At least 24 hrs prior to the activity taking place.
	Examples of these include: ▪ noise generated by jackhammers; ▪ blasting; ▪ drilling; and ▪ dewatering pumps.		
	c) The contractor will provide a method statements for construction activities (14 days prior to commencement) relating to the excessive noise generating activities, unless methods have been prescribed in this project or the project environmental specification.	Engineer	At least 14 days prior to the activity taking place.
	d) Noisy activities must be restricted to the times given in the Project Specification or General Conditions of Contract.	Engineer	On-going
	e) Work is to be restricted to normal working hours. Nearby IAPs are to be informed priorto work being carried out outside normal working hours.	Engineer	On-going

Aspect	Description	Monitored by	Monitoring Frequency
	Communication with Interested and Affected Parties (I&AP's)		
	a) The Engineer and Contractor are responsible for ongoing communication with those people that are interested in / affected by the project.	Engineer / ECO	Ongoing
	b) A complaints register will be housed at the site office. This will be in carbon copy format, with numbered pages. Any missing pages must be accounted for by the Contractor. This register is to be tabled during monthly site meetings.	ECO	Monthly
	c) I&AP's need to be made aware of the existence of the complaints book and the methods of communication available to them.	Engineer / ECO	Ongoing
	d) Queries and complaints are to be handled by: ▪ documenting details of such communications; ▪ submitting these for inclusion in complaints register; ▪ bringing issues to Engineer's attention immediately; and ▪ taking remedial action as per Engineer's instruction. ▪ Selected staff are to be made available for formal consultation with I&AP's in order to: ▪ explain construction process; and ▪ answer questions.	ECO	Ongoing
	Socio-economic Aspects ▪ Contractors are to make use of local labour forces as far as possible. Any appointmentswill be in consultation with the Community Liaison Officer	CLO / ECO	Ongoing

Aspect	Description	Monitored by	Monitoring Frequency
Cultural Environment	a) Possible items of historical or archaeological value include old stone foundations, tools, clayware, jewellery, remains, fossils etc.	Engineer	As Required
	b) All finds of human remains must be reported to the nearest police station.	Engineer	As required.
	c) Human remains from the graves of victims of conflict, or any burial ground or part thereof which contains such graves and any other graves that are deemed to be of cultural significance may not be destroyed, damaged, altered, exhumed, or removed from their original positions without a permitl.	Engineer	As required.
Conservation of the River Environment	a) The works footprint is to be kept as small as possible.	Engineer	As Required
	b) The sandbags used to effect the river or stream diversions (where required to), will also be placed such that the bank side of the river, upstream and downstream, is protected from flooding and abnormal flows.	Engineer	At river diversion and as required
	c) Sandbags are to be used to protect riverbanks where high flows as a result of construction are anticipated.	Engineer	As Required

Aspect	Description	Monitored by	Monitoring Frequency
	d) A fair level of flow will be maintained throughout the construction process to ensureongoing viability of downstream aquatic communities.	Engineer / ECO	Ongoing
	e) Erosion berms must be installed in strategic positions to prevent gully formation andsiltation of the River.	Engineer / ECO	Ongoing

Aspect	Description	Monitored by	Monitoring Frequency
Earthworks	a) No material stripped or excavated which is classed, in terms of this specification, as topsoil, may be used as backfill in any excavation.	Engineer / ECO	Ongoing
	b) During excavation 'conservation of topsoil', as specified will apply.	Engineer / ECO	Ongoing
	c) Excavated material is to be stockpiled within the working servitude (pipeline or reservoir or pump station), unless otherwise authorized.	Engineer / ECO	Ongoing
	d) Surplus excavated soft, intermediate and hard rock material shall be removed to a spoil site designated in the project specification or indicated by the Engineer in conjunction with the ECO.	Engineer / ECO	Ongoing
	e) In certain cases, for example to help stabilize the disturbed area or to reinstate the natural aesthetics of an area, excess excavated intermediate and hard material may be disposed of in a designated manner, as indicated by the ECO and Engineer, or in the project specification. In this case, rock material shall not exceed 250mm in maximum dimension.	Engineer / ECO	Ongoing
	f) Deficiency of backfill material shall not be made up by excavation within the free hauldistance of 0.5 km of site, without the prior approval of the Engineer of the source of the material. Where backfill material is deficient, it will ideally be made up by importation from an approved borrow pit (i.e. one which operates within the ambient of an EMPR).	Engineer / ECO	Ongoing
	g) Trenches will be fenced with safety netting to reduce potential injuries and to indicatethe work area.	Engineer / ECO	Ongoing

Aspect	Description	MonitoredBy	Monitoring Frequency
	h) Open trenches must be kept to a minimal, contractor must aim on either barricadingor closing off trenches at the end of each business day.	ECO	Ongoing

Aspect	Description	Monitored by	Monitoring Frequency
Borrow Pits	a) The contractor may source material from alternative borrow pits provided the following: - The site location; The method of winning material and re-instatement and rehabilitation are Environmentally acceptable and approved by the ECO b) To give effect to the above the contractor must provide the ECO in writing within 30 days prior to opening up alternative borrow pits the following information for review and acceptance: - Quantities of borrow material required; - Method statement for excavation of material including depth and extent ofexcavation; - Anticipated active life of the borrow area; - Proposal for re-instatement and rehabilitation of borrow area, including final profile; - Written approval from the landowner/ relevant authority that material may be removed from their land subject to their stated conditions, requirements, and royalties, and if the proposal is acceptable to the ECO	Engineer / ECO	As and when required
General	a) The Contractor will programme construction so as to minimize the impact on the environment and provide this programme to the ECO for perusal and acceptance at the onset of the contract period. b) The ECO is to be made aware of any amendments to the construction programme oralterations to the scope of work in order that their impacts on the environment can beassessed. c) The construction programme will need to take into account limitations of the environment in terms of construction activities. These may include scheduling construction in terms of seasonality of water bodies, growth and dormancy periods offauna and flora, etc. The project specification will detail necessary requirements relating to specific aspects of the project which will require attention in terms of construction scheduling.	Engineer / ECO Engineer / ECO Engineer / ECO	On-going On-going On-going

Aspect	Description	Monitored by	Monitoring Frequency
	d) The Contractor (through the Project Manager) will ensure that all affected landowners / authorities are advised of the proposed programme at the beginning of the contractperiod.	Engineer / ECO	On-going

POST-CONSTRUCTION/ REHABILITATION PHASE

Aspect	Description	Monitored by	Monitoring Frequency
Construction Camp	a) All structures comprising the construction camp are to be removed from site.	Engineer	Project completion
	b) The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint etc. and these will be cleaned up.	Engineer	Project completion
	c) All hardened surfaces within the construction camp area will be ripped, all imported materials removed, and the area shall be topsoiled and regressed using the guidelines set out in the revegetation specification that forms part of this document.	Engineer	Project completion
	d) The Contractor must arrange the cancellation and removal of all temporary services.	Engineer	Project completion
Vegetation	a) All areas that have been disturbed by construction activities (including the construction camp area) must be cleared of alien vegetation.	Engineer	Project completion
	b) Open areas are to be re-planted as per the revegetation specification referred to in the EMPr specification.	Engineer	Project completion
	c) All vegetation that has been cleared during construction is to be removed from site or used as mulch as per the revegetation specification, (except for seeding alien vegetation).	Engineer	Project completion

Aspect	Description	Monitored by	Monitoring Frequency
	d) The Contractor is to water and maintain all planted vegetation until the end of the defects liability period and is to submit a method statement regarding this to the Engineer.	Engineer	As per the instructions of the Engineer.
	e) Damage to riparian vegetation at river crossings will be avoided and rehabilitated if it occurs	ECO	Project completion
Land Rehabilitation	a) All surfaces hardened due to construction activities are to be ripped and imported materials thereon removed.	ECO	Project completion
	b) All rubble is to be removed from the site to an approved disposal site or approved by the Engineer. Burying of rubble on site is prohibited.	ECO	Project completion
	c) The site is to be cleared of all litter.	ECO	Project completion
	d) Surfaces are to be checked for waste products from activities such as concreting or asphalting and cleared in a manner approved by the Engineer.	ECO	Project completion
	e) All embankments are to be trimmed, shaped and replanted to the satisfaction of the Engineer.	Engineer / ECO	Project completion
	f) Borrow pits are to be closed and rehabilitated in accordance with the DMR-approved management plan for each borrow pit. The Contractor shall liaise with the Engineer regarding these requirements.	Engineer	Project completion

Aspect	Description	Monitored by	Monitoring Frequency
	g) The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials.	ECO	Project completion
Materials and Infrastructure	a) Fences, barriers and demarcations associated with the construction phase are to be removed from the site unless stipulated otherwise by the Engineer.	Engineer	Project completion
	b) All residual stockpiles must be removed to spoil or spread on site as directed by the Engineer.	Engineer	Project completion
	c) All leftover building materials must be returned to the depot or removed from the site.	ECO	Project completion
	d) The Contractor must repair any damage that the construction works has caused to neighboring properties.	Engineer	As per the Engineer's instructions

Aspect	Description	Monitored by	Monitoring Frequency
General	a) A meeting is to be held on site between the Engineer, ECO and the Contractor to approve all remediation activities and to ensure that the site has been restored to a condition approved by the Engineer.	Engineer / ECO	On completion of the construction & maintenance phases
	b) Temporary roads must be closed and access across these blocked.	Engineer / ECO	On completion of construction
	c) Access or haulage roads that were built across watercourses must be rehabilitated by removing temporary bridges and any other materials placed in / or near to watercourses. Revegetation of banks or streambeds must be as necessary to stabilise these and must be approved by the Engineer.	Engineer / ECO	On completion of construction
	d) All areas where temporary services were installed are to be rehabilitated to the satisfaction of the Engineer.	Engineer / ECO	On completion of construction
	e) Once rehabilitation has been carried in accordance to the procedure listed in C.5 a) above, a post-construction audit is to take place to ensure final compliance. The contractor is to rectify any non-compliance found by this audit, prior to vacating the site.	ECO	On completion of construction

6. CONCLUTIONS AND RECOMMENDATIONS

In order to ensure compliance, all parties undertaking the operation of the Greater Mbizana Regional Bulk Water Supply Scheme Phase 2: Work Package 2 – Southern Eastern Feeder, must be fully acquainted with the contents of this EMPr.

This will ensure that potential adverse impacts are identified, avoided or mitigated, ensuring compliance with the environmental specification and upholding Umgeni Water Environmental commitments to comply with the conditions of this EMPr, Winnie Madikizela-Mandela Local Municipality Bylaws and the Environmental Authorisation conditions (and other related binding documentation) related to the management of this environment.