EON Consulting

Environmental Management Plan: Construction of a New Potable Water Reservoir and Pressure Tower to Service the Etwatwa Extension 19 Township

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ENABLING BUSINESS TO SUCCEED

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Glossary

Construction Phase:

The activities pertaining to the preparation for and the physical construction of the proposed development.

Contractor:

The organisations contracted by the Developer to carry out some of the pre-construction and construction of the reservoir.

Developer:

The Developer is **EKURHULENI METROPOLITAN MUNICIPALITY**

Environmental Manager (EM):

Person/organisation appointed by the Developer to oversee the work of all consultants, sub-developers, contractors, residents and visitors.

Environment:

The environment is defined in terms of the National Environmental Management Act, No 107 of 1998, as the surroundings within which humans exist and that are made up of – the land, water and atmosphere of the earth; micro-organisms, plant and animal life; any part or combination of (i) and (ii) and the interrelationships among and between them; and the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Management Plan (EMP):

The EMP is a detailed plan for the implementation of the mitigation measures to minimise negative environmental impacts during the life-cycle of a project. The EMP contributes to the preparation of the contract documentation by developing clauses to which the contractor must adhere for the protection of the environment. The EMP specifies how the operations of the project is to be carried out and includes the actions required for the Operational Phase to ensure that all the environmental impacts are managed for the duration of the reservoir's life-cycle.

Operational Phase (Post Construction):

The period following the Construction Phase, during which the proposed development will be operational.

Pre-Construction Phase:

The period prior to commencement of the Construction Phase, during which various activities associated with the preparation for the Construction Phase will be undertaken.

Rehabilitation:

Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was in 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 should aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment.

Site Manager:

The person, representing the Contractor, responsible for all the Contractor's activities on the site including supervision of the construction staff and activities associated with the Construction Phase. The Site Manager will liaise with the Principal Agent in order to ensure that the project is conducted in accordance with the Environmental Management Plan.

Abbreviations

BAR	Basic assessmenr report
C	Contractor
CEMP	Construction environmental management plan
CMS	Construction method statement
DEV	Developer
GDARD	Department of Agriculture and Rural Developement (Provincial)
DWS	Department of Water Affairs and Sanitation
EA	Environmental authorisation
ECO	Environmental control Officer
EMM	Ekuhurleni Metropolitan Municipality
EMP	Environmental management plan
EO	Environmental Officer
GA	General authorisation
I & AP's	Interested and affected parties
MSDS	Material safety data sheets
OHSA	Occupational Health and Safety Act, Act 85 of 1993
PM	Project Manager
ENG	Engineer
SABS	South Africa Bureau of Standards
SAHRA	South African Heritage Resourses Agency
SANS	South African National Standards
SM	Site Manager

1. Introduction

The project applicant - Ekurhuleni Metropolitan Municipality (EMM), is proposing the construction and operation of a new potable water reservoir and pressure tower to service the Etwatwa Extension 19 Township.

The proposed activity is located within the boundaries of the EMM in Benoni, Gauteng Province.

The project requires an environmental authorisation from the Gauteng Department of Agriculture and rural Development (GDARD) in terms of the National Environmental Management Act (Act No 107 of 1998). The proposed activity was registered with GDARD on 30 September 2014

This EMP should be implemented during the construction phase of the development to ensure that environmental impact that could occur during construction are mitigated or prevented.

1.1. Overview of the proposed project

This portion of the proposed project entails the construction of 10Ml reservoir, 1.1Ml elevated concrete water tower and pumping facility as well as connecting pipework to the existing bulk water supply.

A detailed assessment process has been followed throughout the BAR which included thorough consultation with landowners as well as key stakeholders.

The following studies were conducted for the proposed route:

1. Biophysical

- Wetlands
- Geotechnical
- Dolomite
- Agricultural Potential (EMP only)

This EMP has been compiled to ensure good environmental compliance during the **pre-construction and construction phase** of the reservoir. The EMP will be strictly implemented during the construction phase of the project and will be consulted regularly during the **pre-construction and construction phase** of the project.

The EMP specifies mitigation measures for the following environmental aspects:

Pre-construction Phase

Generic pre-construction mitigation measures.

Construction Phase

- Site clearing
- Site establishment
- Construction traffic and access
- Construction camp
- Specialised construction methods
- Pile drilling
- Soils and geology
- Erosion control

- Groundwater and surface water pollution
- Hydrology and storm water
- Dolomitic areas
- Air pollution
- Noise
- Flora
- Fauna
- Employment
- Waste management
- Health and safety
- Security
- Social environment
- Visual impact
- Cultural and heritage artefacts

1.2. Applicable legislation and guidelines governing EMM

The reservoir will be operated and maintained according to several national and international standards including but not limited to:

- National Fire Protection Association (NFPA) standards
- International Standards Organization (ISO) 9000/2000 Quality Systems
- South African standards, codes and regulations, which include:
- South African Occupational Health and Safety Act (OHASA) Act 85 of 1993
- South African National Standard (SANS) 10089 (pertaining to the building industry)
- National Environmental Management Act, Act 107 of 1998
- Environmental Conservation Act, 1989 (Act No 73 of 1989) (ECA)
- National Water Act, 1998 (Act No.36 of 1998)
- Constitution of South Africa 1996 (Act No. 108 of 1996)
- National Heritage Resources Act 1999 (Act No 25 of 1999)
- Protected species – provincial ordinances
- Conservation of Agricultural Resources Act (Act No 103 of 1997)
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
- National Environmental Management: Air Quality Act (Act No. 39 of 2004)
- Atmospheric Pollution Prevention Act (Act No. 45 of 1965)
- Ekurhuleni Metropolitan Municipality, consolidated by-laws which are supplementary to the National Building regulations and building Standards Act, 1977 (Act No. 103 of 1977)
- Hazardous Substances Act, 1973 (Act No. 15 of 1973).

1.3. Site description

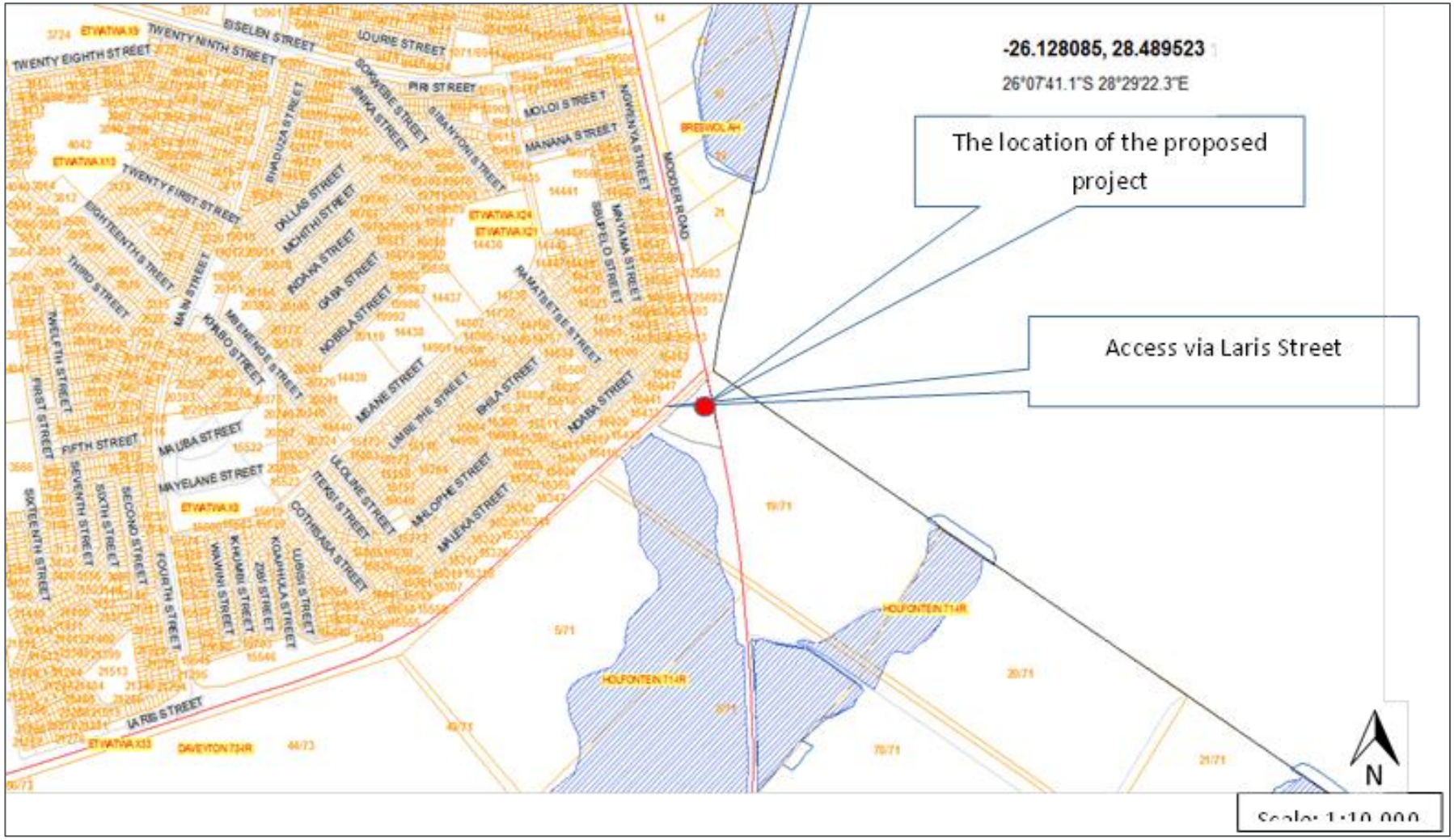

Figure 1: Locality map showing the location of the proposed project

1.4. Applicable Documentation

The following documents should be read in conjunction with this EMP:

- Final Basic Assessment Report for the proposed Etwatwa Reservoir, in the Ekurhuleni Metropolitan Municipality, Gauteng Province.
- Environmental Authorisation issued by Gauteng Department of Agriculture, and Rural Development (GDARD).
- General Authorisation issued by the provincial Department of Water Affairs and Sanitation (DWS).

2. Project Responsibilities

Several professionals will form part of the construction team. The most important from an environmental perspective are the Project Manager, the Environmental Control Officer (ECO), the contractor and the developer. An independent Environmental Auditor will be appointed by the developer.

The Project Manager is responsible for the implementation of the EMP on the site during the pre-construction and construction phases of the project.

The ECO is responsible for monitoring the implementation of the EMP during the design, pre-construction and construction phases of the project.

The contractor is responsible for abiding by the mitigation measures of the EMP which are implemented by the Project Manager during the construction phase.

The Applicant (Ekurhuleni Metropolitan Municipality) will be responsible for the implementation of the EMP during the Operational and Decommissioning phase, which will be dealt within a separate document, entitled the Operational EMP.

2.1. Project Manager

The Project Manager is responsible for overall management of project and EMP implementation. The following tasks will fall within his / her responsibilities:

- Be aware of the findings and conclusions of the environmental Basic Assessment Report and the conditions stated within the Environmental Authorisation
- Be familiar with the recommendations and mitigation measures of this EMP, and implement these measures.
- Monitor site activities on a daily basis for compliance.
- Conduct internal audits of the construction site against the EMP.
- Confine the construction site to the demarcated area.
- Rectify transgressions through the implementation of corrective action.

2.2. Environmental Control Officer

The Environmental Control Officer is responsible for the implementation of the EMP during the construction phase. The ECO will liaise and report to the Developer, Contractor, Landowners and Authorities. The following tasks will fall within his / her responsibilities:

- Be aware of the findings and conclusions of the Environmental Impact Assessment and the conditions stated within the Environmental Authorisation.
- Be familiar with the recommendations and mitigation measures of this EMP.
- Conduct weekly / monthly audits of the construction site according to the EMP and Environmental Authorisation
- Educate the contractor about the management measures of the EMP and Environmental Authorisation and Water Use General Authorisation.
- Regular liaison with the construction team and the project leader.
- Recommend corrective action for any environmental non-compliance incidents on the construction site.
- Compile a regular report highlighting any non-compliance issues as well as good compliance with the EMP.
- All negotiations for any reason shall be between the ECO, the affected parties, the developer and the Contractor. No verbal agreements shall be made. All agreements shall be recorded in writing and all parties shall co-sign the documentation.
- The affected parties shall always be kept informed about any changes to the construction programme should they be involved. If the ECO is not on site, the Contractor should keep the affected parties informed. The contact numbers of the Contractor and the ECO shall be made available to the affected parties. This will ensure open channels of communication and prompt response to queries and claims.

Liaising with the Developer, Contractor and Authorities by the ECO will take place in the following manner:

- Weekly Inspections will be conducted by the ECO. These audits will be conducted randomly (within the week) and will not require prior arrangement with the contractor.
- Weekly Inspections refer to above will take the form of completed audit checklists and photographic checklists. These weekly audit checklists will be appended to, and inform, the monthly consolidated audit report and
- Compilation of a monthly audit report with a consolidated rating of the compliance with the EMP. The monthly audit report will be delivered to the Developer, Engineers and copied to the contractors for necessary corrective action. The audit report will be submitted to the competent authority ten days after the end of the month.
- The only liaison with authorities will be submissions of monthly reports.

2.3. Contractor

The contractor is responsible for the implementation and compliance with recommendations and conditions of the EMP.

- Ensure compliance with the EMP at all times during construction
- Maintain environmental registers which keeps a record of all incidents which occur on the site during construction. These incidents include:
    - Public involvement / complaints
    - Health and safety incidents

- Hazardous materials stored on site
- Non-compliance incidents

2.4. Environmental Officer

The EO will be appointed by the Contractor to monitor the activities on the site on a daily basis against the EMP conditions.

- The Contractor's EO will be the responsible party for all compliance of this EMP during the construction phase.
- The EO will be appointed by the Contractor to monitor the activities on the site on a daily basis against the EMP conditions.
- The EO will liaise on a daily basis with the ECO on site and will report back to the ECO on any significant occurrences during all site inspections and site meetings.
- The EO will keep the ECO informed of the contractors planned construction within areas of environmental concern such as wetlands and other sensitive areas.
- All communication between these parties in this regard will be confirmed in writing via email.
- The EO must further immediately report any major incidents or occurrences to the ECO to ensure immediate remedial action.

2.5. Independent Environmental Auditor

The Independent Environmental Auditor (IEA) will be appointed by the developer to conduct a monthly environmental audit during the construction phase of the project according to the provisions of the Environmental Management Plan.

The independent environmental auditor will:

- Conduct audits
- Submit audit reports to ECO and relevant authority on a monthly basis
- Engage specialist sub consultants when required.

2.6. Environmental Monitoring Committee (EMC)

An Environmental Monitoring Committee (EMC) will be established for the duration of the construction phase to facilitate open communication channels between the project proponent, stakeholders and I&AP's.

The EMC will consist of the following members but are not limited to:

- Applicant / Developer (EMM)
- Environmental Control Officer (ECO)
- Independent Environmental Auditor
- Main Contractor
- Authorities (as and when available)

Table 1: Responsible parties and auditing process

Title	Party	Role during construction	Role during operation	Abbreviation
Develop	Ekurhuleni Metropolitan Municipality	Assume ultimate responsibility	Assume ultimate responsibility	EMM
Project Management	EMM	Project management	Project management	PM
Main Contractor		Main Contractor	N/A	MC
Environmental Officer		Daily monitoring	N/A	EO
Environmental Control Officer	Environmental Impact Management Services	Two weekly to monthly audits	Annual audits	ECO
Independent Environmental Auditor	Environmental Impact Management Services	Monthly audits	Annual audits	IEA
Provincial Authority	Gauteng Department of Agriculture and Rural Development	Conduct site visits when necessary	Conduct site visits when necessary	GDARD

The following are the environmental management responsibilities of the various parties during construction and operational phases. Unless otherwise stated the EMP will be adhered to as follows:

- The monitoring party will be the ECO.
- The scope of ECO monitoring relates to checking/auditing of Contractor's site records of monitoring and testing/analyses data.
- Method of record keeping will be weekly to two weekly audits depending on the stage of the project.
- Audit technique will be the review of records that will be kept on site by the ELO and/or site inspections.
- The Developer will bear ultimate responsibility.

3. The Environmental Management Plan

This EMP seeks to manage and keep to a minimum the negative impacts of a development an at the same time, enhance the positive and beneficial impacts.

3.1. Objectives of an EMP

The objectives of the EMP are to:

- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels
- To identify measures that could optimize beneficial impacts
- To create management structures that address the concerns and complaints of
- I & APs with regards to the development
- To establish a method of monitoring and auditing environmental management practices during all phases of development
- Ensure that the construction and operational phases of the project continues within the principles of Integrated Environmental Management.
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project.
- Ensure that the safety recommendations are complied with.
- Propose mechanisms for monitoring compliance with the EMP and reporting thereon.
- Specify time periods within which the measures contemplated in the environmental management plan must be implemented, where appropriate.

3.1.1. The EMP seeks to highlight the following

- Avoiding impacts by not performing certain actions
- Minimising impacts by limiting aspects of an action
- Rectifying impacts through rehabilitation, restoration, etc. of the affected environment
- Compensating for impacts by providing substitute resources or environments
- Minimising impacts by optimising processes, structural elements and other design features
- Provide ongoing monitoring and management of environmental impacts of a development and documenting of any digressions /good performances
- The EMP is a legally binding document that all parties involved in the project must be made aware of.

3.1.2. Environmental Monitoring

A monitoring programme will be implemented for the duration of the construction phase of the project. This programme will include:

- Bi-weekly audits during first month where after monthly audits will be conducted by the Environmental Control Officer, which are according to the EMP and Environmental Authorisation's conditions. These audits can be conducted randomly and do not require prior arrangement with the project manager.
- Compilation of an audit report with a rating of the compliance with the EMP. This report will be submitted to the relevant authorities (GDARD).

The ECO shall keep a photographic record of any damage to areas outside the demarcated site area. The date, time of damage, type of damage and reason for the damage shall be recorded in full to ensure the responsible party is held liable. All claims for compensation emanating from damage should be directed to the ECO for appraisal. The Contractor shall be held liable for all unnecessary damage to the environment. A register shall be kept of all complaints from the Landowner or community. All complaints / claims shall be handled immediately to ensure timeous rectification / payment by the responsible party.

A formal monitoring protocol will be included within the Contractor Environmental Management System Manual, as detailed in specific procedures outlined in the EMS.

In addition the requirements of the Department of Water and Sanitation in terms of the water licensing process under the National Water Act have not yet been received. These requirements, in terms of a monitoring protocol, will only be able to be incorporated into the contractor EMS's specific operational procedures once authorisation for the relevant water use has been received.

3.1.3. Compliance with the EMP and associated documentation

A Copy of the EMP must be kept on site during the construction period at all times. The EMP will be made binding on all contractors operating on the site and must be included within the Contractual Clauses. It should be noted that in terms of the National Environmental Management Act No 107 of 1998 (Section 28) those responsible for environmental damage must pay the repair costs to the environment, human health as well as the preventative measures to reduce or prevent further pollution and/or environmental damage (The polluter pays principle).

The Contractor is deemed not to have complied with the EMP if:

- Within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of clauses;
- If environmental damage ensues due to negligence;
- The contractor fails to comply with corrective or other instructions issued by the ECO or Authorities within a specified time,
- The Contractor fails to respond adequately to complaints from the public.

The Developer is deemed not to have complied with the EMP if:

- Within the boundaries of the site there is evidence of contravention of clauses;
- If environmental damage ensues due to negligence;
- The Developer fails to respond adequately to complaints from the public.

3.1.4. Layout of the EMP

The EMP is separated into two phases. Each phase has specific issues unique to that period of the development and operation of the proposed reservoir and associated infrastructure.

The two phases of the development are identified below:

- Pre-Construction Phase;
- Construction Phase and associated rehabilitation of affected environment.

3.1.5. Training and Awareness

3.1.5.1. Training of Construction Workers

The Construction workers must receive basic training in environmental awareness, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution. They must be informed of how to recognise historical / archaeological artefacts that may be uncovered during construction excavation. They must also be appraised of the EMP's requirements.

3.1.5.2. Contractor Performance

The Contractor must ensure that the conditions of the Environmental Management Plan are adhered to. Should the Contractor require clarity on any aspect of the EMP the Contractor must contact the Environmental Control Officer for advice.

3.1.6. ISO 14001 (Environmental Management System)

The EMP guides the Construction Environmental Management System (EMS) which will follow the ISO 14001 (EMS) guidelines developed for the construction of the proposed project.

4. Environmental Management Plan: Pre-Construction Phase

Requirements for the pre-construction phase

- Proper and continuous liaison between the Developer, the Contractor and Landowners to ensure all parties are appropriately informed at all times.
- The Landowners must be informed of the starting date of construction as well as the phases in which the construction shall take place.
- The Contractor must adhere to all conditions of contract including the Environmental Management Programme. Adequate planning of the construction programme to allow for disruptions due to rain and very wet conditions.
- All manmade as well as natural (vegetation) structures outside the boundary of the servitude shall be protected against damage at all times and any damage shall be rectified immediately.
- Proper documentation and record keeping of all complaints and actions taken.
- Regular site inspections by the ECO and good control over the construction process throughout the construction period.
- Appointment of an Environmental Control Officer on behalf of the Developer to implement this EMP as well as deal with all Landowner related matters.
- Independent Environmental Audits to be carried out during and upon completion of construction.

- Formal communications protocol should be set up during the construction phase. The aim of the protocol should be to ensure that effective communication on key issues that may arise during this phase be maintained between key parties such as the ECO, Project manager and Contractor. The protocol should also ensure that concerns / issues raised by I&APs are formally recorded and considered and where necessary acted upon. If necessary, a forum for communicating with key stakeholders on a regular basis may need to be set up. This could be done through an Environmental Monitoring Committee that would meet on a regular basis. The communications protocol should be maintained throughout the construction phase.

Table 2: Pre-construction phase

Impact	Pre-construction phase **This section deals with the preparation of the site and actions that need to be implemented before construction commences**	Responsibility	Frequency/monitoring requirements
Phase	Pre-construction	Dev/ECO	Weekly
Environmental management plan			
Mitigation/method statement			
General	1. Appoint an Environmental Control Officer and Environmental Liaison Officer. 2. Before construction commences, all areas to be developed must be clearly demarcated with fencing or orange construction barrier where applicable. 3. The Contractor and ECO must ensure compliance with conditions described in the Environmental Authorisation 4. Records of compliance / non-compliance with the conditions of the authorisation must be kept and be available to GDARD on request. 5. Records of all environmental incidents must be maintained and a copy of these records be made available to GDARD on request throughout the project execution. 6. Confirm, with ECO suitable sites for the construction camps (equipment and batching etc.) and storage areas for materials. 7. All construction equipment must be stored within this construction camp. 8. All servicing must take place within this camp on a sealed surface such as a concrete slab or else off site if necessary. 9. Where possible unskilled labourers should be drawn from the local market	Dev / ECO / C	

Impact	Pre-construction phase This section deals with the preparation of the site and actions that need to be implemented before construction commences	Responsibility	Frequency/monitoring requirements
	10. Training of site staff • Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts. • Project manager shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks. • Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks. • No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager. • Staff should be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and • Receive the necessary safety training.		

5. Environmental Management Plan: Construction Phase

5.1. Site Clearing

Site clearing must take place in a phased manner, in accordance with the accepted construction programme, as and when required. Areas which are not to be constructed on within a reasonable period must not be cleared to reduce erosion risks. The area to be cleared must be clearly demarcated and this footprint strictly maintained. Spoil that is removed from the site must be removed to an approved spoil site or DWS licensed landfill site. The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent. These include wetland. Topsoil from the construction area must be neatly stockpiled ready for backfill when required.

5.2. Site Establishment

Site establishment shall take place in an orderly manner and all required amenities shall be installed at Campsite before the main workforce move onto site. The Construction camp shall have the necessary ablution facilities with chemical toilets. The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed.

The Contractor shall supply waste collection bins where such is not available and all solid waste collected shall be disposed of at a DWS registered landfill. A certificate of disposal shall be obtained by the Contractor and kept on file. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management. The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt on site.

Table 3: Construction traffic and access

Impact	Construction traffic and access This section deals with the impact that construction traffic and access has on the site and surrounds	responsibility	Frequency/ monitoring Requirements
Phase	**Construction**	**C / ECO**	**Weekly**
Environmental management plan			
Mitigation / method statement			
Construction traffic	1. Construction routes and required access roads must be clearly defined and necessary permits, if required obtained prior to construction. 2. Delivery of equipment must be undertaken with the minimum amount of trips. 3. Access of all construction and material delivery vehicles should be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure. 4. Planning of site delivery hours must be scheduled to avoid peak hour traffic, weekends and evenings. 5. Maintenance crew must be utilized to clean roads to reduce dust nuisance. 6. Vehicles and equipment shall be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc. 7. On-site maintenance e.g. oil changes and servicing of equipment will be allowed on site (except in sensitive areas as identified in BAR) provided that adequate preventative measures are implemented (use of drip trays and other spill prevention / response measures in particular). Dedicated locations for servicing/maintenance/oil changes should be prepared using impermeable liner. Soils compacted by construction shall be deep ripped to loosen compacted layers and re-graded to even running levels. Temporary access roads to be rehabilitated prior to the contractor leaving the site.	**C/ EO / ECO / DEV**	**Weekly**

Impact	Construction traffic and access This section deals with the impact that construction traffic and access has on the site and surrounds	responsibility	Frequency/ monitoring Requirements
Access	8. Strategic positioning of entry and exit points to ensure as little effect as possible on the traffic. 9. The main routes to the site must be clearly signposted and printed delivery maps must be issued to all suppliers and Sub-Contractors. 10. Planning of access routes to the site for construction purposes shall be done in conjunction between the Contractor, the Developer (Local Authority) and the Landowner. All agreements reached should be documented and no verbal agreements should be made. The Contractor shall clearly mark all access roads. Roads not to be used shall be marked with a “NO ENTRY for construction vehicles" sign 11. Where new access roads are constructed, this must be done according to design and contract specifications. Drainage channels shall be suitably designed to ensure erosion does not occur, especially at the outflow points. The new access road shall be designed to allow for the natural flow of water where applicable. Crossings of dongas and Environmental Authorised areas on access routes to new site shall be thoroughly planned and installed according to design and contract specifications. All areas susceptible to erosion shall be protected with suitable erosion control measures from the onset of the project. Prevention is the ultimate aim, as restoration is normally very difficult and costly		
Road maintenance	12. Where necessary suitable measures shall be taken to rehabilitate damaged areas In the event of rehabilitation work being required on private roads, such work will be done to the original or better condition of the private road.	**C / ELO / ECO**	**Weekly**
	13. Contractors should ensure that access roads are maintained in good condition by attending to potholes, corrugations and storm water damages as soon as these develop. 14. If necessary, staff must be employed to clean surfaced roads adjacent to construction sites where materials have spilt.		

Impact	Construction traffic and access This section deals with the impact that construction traffic and access has on the site and surrounds	responsibility	Frequency/ monitoring Requirements
General	15. The contractor shall meet safety requirements under all circumstances. All equipment transported shall be clearly labelled as to their potential hazards according to specifications. All the required safety labelling on the containers and trucks used shall be in place. 16. The Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken.	**C**	**Weekly**

Table 4: Construction camp

Impact	Construction camp This section deals with the impacts relating to the construction camp (equipment and batching camp)	Responsibility	Frequency/ monitoring requirements
Phase	**Construction**	**C / EO / ECO**	**Weekly**
Environmental management plan			
Mitigation / method statement			
Site of construction camp	1. Choice of site for the Contractor's camp requires the construction manager and ECO'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 construction manager and the ECO for approval. 2. The construction camp may not be situated within the 1:100 year flood line or on slopes greater than 1:3. 3. The size of the construction camp should be minimized (especially where natural vegetation or grassland has had to be cleared for its construction). 4. Adequate parking must be provided for site staff and visitors. This should not inconvenience or serve as a nuisance for neighbours. 5. The Contractor must attend to drainage of the campsite to avoid standing water and / or sheet erosion. 6. Suitable control measures over the Contractor's yard, plant and material storage to mitigate any visual impact of the construction activity must be implemented.	**C / ECO**	**Weekly**
Storage of materials	7. Dedicated buffer zones will be identified and allocated where appropriate. Where a flood line	**C / ECO**	**Weekly**

Impact	Construction camp This section deals with the impacts relating to the construction camp (equipment and batching camp)	Responsibility	Frequency/ monitoring requirements
(including hazardous materials)	is unknown, no development is permitted within 50m/100m of a watercourse Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary. 8. Storage areas must be designated, demarcated and fenced if necessary. 9. Storage areas should be secure so as to minimize the risk of crime. They should also be safe from access by unauthorised persons i.e. children / animals etc. 10. Fire prevention facilities must be present at all storage facilities. 11. Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s). These pollution prevention measures for storage should include a bund wall high enough to contain at least 110% of any stored volume, and this should be sited away from drainage lines in a site with the approval of the Engineer is charge. 12. These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources. 13. Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible the available, MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes. 14. Storage areas containing hazardous substances / materials must be clearly signed. 15. Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures. 16. An approved waste disposal contractor must be employed to remove waste oil. These		

Impact	Construction camp This section deals with the impacts relating to the construction camp (equipment and batching camp)	Responsibility	Frequency/ monitoring requirements
	wastes should only be disposed of at DWS licensed landfill sites designed to handle hazardous wastes. A disposal certificate must be obtained from the waste disposal contractor. 17. The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training. 18. All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site. 19. Any spillage, which may occur, shall be investigated and immediate action must be taken. In the event of significant spills (>35litres) of any hazardous substance, these must also be recorded and reported to the ECO, DWS and the local/provincial authorities where necessary.		
Drainage of construction camp	20. Run-off from the campsite must NOT discharge into neighbours' properties or into adjacent wetlands, rivers or streams.	**C / ECO**	**Weekly**
End of construction	21. Once construction has been completed on site and all excess material has been removed, the storage area shall be rehabilitated. If the area was badly damaged, seeding shall be done. Such areas shall be rehabilitated to their natural state. Any spilled concrete shall be removed and soil compacted during construction shall be ripped, levelled and vegetated. 22. Only designated areas must be used for storage of construction materials, soil stockpiles, machinery and other equipment. 23. Specific areas must be designated for cement batching plants. Sufficient drainage for these plants must be in place to ensure that soils do not become contaminated.	**C / ECO**	**Weekly**

Impact	Construction camp This section deals with the impacts relating to the construction camp (equipment and batching camp)	Responsibility	Frequency/ monitoring requirements
	24. The construction camp must be kept clear of litter at all times. 25. Spillages within the construction camp need to be cleaned up immediately and disposed of in the hazardous skip bin for correct disposal. 26. No open fires are allowed within the construction camp and no wood from surrounding vegetation may be used to create a fire.		

Table 5: Environmental education and training

Impact	Environmental education and training This section deals with the environmental training of construction employees who will work on the Etwatwa reservoir construction site	Responsibility	Frequency/ monitoring requirements
PHASE	**CONSTRUCTION**	**ECO / C**	**Monthly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
Environmental training	1. 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 should 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 • Social responsibility during construction e.g. being considerate to local residents 2. It is the Contractor's responsibility to provide the site foreman with no less than 1 hour's environmental training and to ensure that the foreman has sufficient understanding to pass this information onto the construction staff. 3. Training should be provided to the staff members in the use of the appropriate fire-fighting equipment. Translators are to be used where necessary. 4. Use should be made of environmental awareness posters on site. 5. The need for a "clean site" policy also needs to be explained to the workers.	**ECO / C**	**Monthly**

Impact	Environmental education and training This section deals with the environmental training of construction employees who will work on the Etwatwa reservoir construction site	Responsibility	Frequency/ monitoring requirements
	6. Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.		
Monitoring of environmental training	7. The Contractor must monitor the performance of construction workers to ensure that the points relayed during their environmental induction have been properly understood and are being followed. If necessary, the ELO and / or a translator should be called to the site to further explain aspects of environmental or social behaviour that are unclear. Toolbox talks are recommended.	**EO / C / ECO**	**Monthly**

Table 6: Borrow pits

Impact	Borrow pits This section deals with the impact that construction traffic and access has on the site and surrounds	Responsibility	Frequency/ monitoring requirements
PHASE	**CONSTRUCTION**	**DEV**	**Monthly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
Location of borrow pits	1. The use of existing borrow pit localities must have relevant mining permits and the permitting process must include consultation with the DME, the local authority/municipality, and landowner.	**DEV**	**Monthly**

Table 7: Reservoir, pressure tower and pump station design

Impact	Design This section deals with the impacts relating to the design of the reservoir, pressure tower and pump station	Responsibility	Frequency/ monitoring requirements
PHASE	**CONSTRUCTION**	**C / DEV / ENG**	**Monthly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
General	1. No additions or upgrades to existing infrastructure on site not included within the BAR must be undertaken. Additional process will need to be initiated should these be required. 2. The relevant standards must be applied at all times during construction. a. SANS 1200; b. The *Guidelines for Human Settlement Planning and Design*, also known as the 'Red Book'; c. The following design standards would be used for the structural design of the reservoirs: • SANS 10160 consists of the following eight parts, under the general title Basis of structural design and actions for buildings and industrial structures: ○ SANS 10160-1, Basis of structural design. ○ SANS 10160-2, Self-weight and imposed loads. ○ SANS 10160-3, Wind actions. ○ SANS 10160-4, Seismic actions and general requirements for buildings. ○ SANS 10160-5, Basis of geotechnical design and actions. ○ SANS 10160-6, Actions induced by cranes and machinery. ○ SANS 10160-7, Thermal actions. ○ SANS 10160-8, Actions during execution; ○ SANS 0100 part 1&2 - The structural use of concrete; • BS 8007 – Design of concrete structures for retaining aqueous liquids;	**DEV / ENG / C**	**Monthly**

Impact	Design This section deals with the impacts relating to the design of the reservoir, pressure tower and pump station	Responsibility	Frequency/ monitoring requirements
	• SABS 1200 – Standard Specification for Civil Engineering Construction.		

Table 8: Reservoir, pressure tower and pump station construction

Impact	Reservoir, Pressure Tower And Pump Station Construction This section deals with the impacts relating to the laying of pipelines. Note that all required design will be done according to the SANS 1200 of Mechanical Engineers.	Responsibility	Frequency/ monitoring requirements
PHASE	**CONSTRUCTION**	**C / DEV / ENG**	**Weekly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
General construction	1. Construction should be limited to daylight hours (06h00 – 18h00) in sensitive areas such as residential areas. Where construction is required after hours in order to avoid traffic interruptions, notification is to be sent out to all potentially affected landowners. 2. Notification must also be ensured when essential services such as water or electricity are to be affected by the construction process.	**C / ENG / DEV**	**Weekly**
Welding	3. All welding must undergo a rigorous series of quality control testing	**C / Approved Inspection Authority**	
Backfilling	4. Topsoil must be segregated from subsoil. The subsoil is replaced first and then the topsoil.	**C**	

Impact	Reservoir, Pressure Tower And Pump Station Construction This section deals with the impacts relating to the laying of pipelines. Note that all required design will be done according to the SANS 1200 of Mechanical Engineers.	Responsibility	Frequency/ monitoring requirements
Reinstatement	5. The impacted areas must be deep ripped to loosen the soil. 6. The area must then be rehabilitated according to the construction methodologies outlined in various tables of this EMP.	**C**	
Construction near Houses	7. Affected neighbouring houses, that are adjacent or in close proximity to the pipeline construction areas e.g. within 100m of the construction site, will be consulted, 2 months prior to construction activities to commence, by the Developer and Contractor. The purpose of this engagement will be to discuss what their concerns are with respect to construction activities and how these can be addressed. Applicable legislation in terms of construction are captured in the construction regulations as part of the Occupational, Health and Safety Act (OSHAct), the National Building Regulations and, SANS 1200 Section A, Standardised Specification for Civil Engineering Construction. 8. Particular attention will be paid to clearly consulting with the, children, parents, bus drivers, Emergency Services, etc. and the public in general about the Construction methodology, timeframe, risks and dangers associated therewith and the steps to be taken by the Contractor to ensure a safe and accident free environment. 9. A separate Construction Method Statement (CMS will be prepared to ensure that all risks have been identified and safety measures are in place to assure a safe and accident free working environment. This is achieved by carrying out a detailed Job Risk Analysis followed by a detailed Job Safety Analysis. Mitigation actions will be described against each risk or safety issue that is identified. The Developer will, then, on the basis of the CMS, consult with the relevant neighbours to finalise the reasonable mitigation measures which should be implemented during construction. 10. Typically, the CMS will clearly describe all of the work activities and risk mitigation actions as well as a timeline schedule for carrying out and completing each one. The CMS will include a map and/or drawings/sketches showing the location of the neighbouring properties and all existing means of normal access to or egress therefrom including pathways, sidewalks,	**DEV / ENG / C**	**2 months prior to construction**

Impact	Reservoir, Pressure Tower And Pump Station Construction This section deals with the impacts relating to the laying of pipelines. Note that all required design will be done according to the SANS 1200 of Mechanical Engineers.	Responsibility	Frequency/ monitoring requirements
	roads, fenced areas, gates, fire hydrants, emergency access and exit routes; parking areas, assembly points, etc. During the construction period temporary means for safe access as well as lighting and the formal temporary traffic management system that must be operational to ensure the safe control of all pedestrian and vehicular traffic in the vicinity. Drawings will also be prepared to clearly identify the location of all temporary barriers that will be installed to ensure that access to the working areas is tightly controlled. Guards will be on duty 24/7 to strictly prevent unauthorised persons including children from gaining access to the work and lay-down areas. Additional temporary barriers and shields will be erected to isolate specific work areas from public view. The CMS will also include explanations concerning reinstatement on completion of the work and the controlled removal of temporary safety measures. 11. The Developer will nominate a single point of contact who can be contacted at any time for further discussion or clarification. 12. Adherence / Compliance to SANS10103 and Gauteng Noise Control Regulations		

Table 9: Specialised construction methods

IMPACT	SPECIALISED CONSTRUCTION METHODS This section deals with the impacts relating to the unique construction methods that are utilised in construction of a reservoir and pressure tower and pump station	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**CONSTRUCTION**	**C / DEV /ENG**	**Bi weekly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
General	1. Contractor to submit detailed procedures for review to ensure any environmental issues are mitigated. The method statement will clearly outline: a. Timing of the activity b. Materials to be used c. Equipment and staffing requirements d. Proposed construction procedure designed to comply with environmental specifications e. System to be implemented to comply with environmental specifications f. Other information deemed necessary by the ECO 2. Method Statements shall be submitted 14 days prior to implementation to allow for signed approval by the ECO. 3. All modifications to method statements must be submitted in writing to the resident engineer and the ECO for approval. 4. The method statements required but are not limited to the following: a. Location, layout and preparation of the construction camp site and materials storage areas;	**C**	

IMPACT	SPECIALISED CONSTRUCTION METHODS This section deals with the impacts relating to the unique construction methods that are utilised in construction of a reservoir and pressure tower and pump station	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	b. Location, layout and preparation of the concrete batching/mixing facility as well as management of the runoff from the area c. Emergency plans for hazardous substance spills and the clean-up methods to be employed d. Implementation of Environmental awareness training and toolbox talks for all contractor staff members and management team. e. Solid waste management		
Piling foundations	5. Contractor to supply method statement for the foundation piling 6. The method statements required but are not limited to the following: a. Vibration monitoring - levels are dependent upon the type of soil or rock. b. Noise monitoring -with respect to the most sensitive receptors i.e. residents on Laris Road.		

Table 10: Hydro testing

Impact	Pipeline testing This section deals with the impacts relating to the tests which are conducted once the reservoir and pressure tower are ready for use to ensure correct functioning.	Responsibility	Frequency/ monitoring requirements
PHASE	**CONSTRUCTION**	**C / ENG / DEV**	**Weekly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
Hydrostatic testing	1. Water saving practices should be undertaken during hydrostatic testing and water wastage must be avoided. 2. Water utilised for hydrostatic testing must be disposed of accordingly at a DWS approved site. No uncontrolled discharges to the environment are permitted. 3. Care must be taken not to contaminate the surrounding soil while undertaking testing. ***4.*** Hydrostatic testing procedures must be finalised in consultation with the Department of Water and Sanitation	**C / ENG / DEV**	
Nondestructive testing (NDT)	5. Materials used for NDT must be safely stored and soil contamination avoided.	**C / ENG / DEV**	

Table 11: Soils and geology

Impact	Soils and geology This section deals with the impact that the proposed development will have on soils and geology	Responsibility	Frequency / monitoring requirements
PHASE	**CONSTRUCTION**	**ECO / C**	**Weekly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
Topsoil	1. The contractor should, prior to the commencement of earthworks determine the average depth of topsoil, and agree on this with the ECO. The full depth of topsoil should be stripped from areas affected by construction and related activities prior to the commencement of major earthworks. This should include the building footprints, working areas and storage areas. Topsoil must be reused where possible to rehabilitate disturbed areas. 2. Care must be taken not to mix topsoil and subsoil during stripping. 3. Should any topsoil become polluted the contractor must remove the polluted soil to the full depth of pollution and replace it at his own expense with approved topsoil which should be at least equal to Department of Agriculture approved topsoil specifications. 4. Removed polluted topsoil should be transported to a licensed landfill site.	**ECO / C**	**Weekly**
Soil Stripping	5. No soil stripping must take place on areas within the site that the contractor does not require for construction works or areas of retained vegetation. 6. Subsoil and overburden in all construction and lay down areas should be stockpiled separately to be returned for backfilling in the correct soil horizon order. 7. Construction vehicles must only be allowed to utilise existing tracts or pre-planned access routes.	**ECO / C**	**Weekly**
Stockpiles	8. Stockpiles should not be situated such that they obstruct natural water pathways.	**ECO / C**	**Weekly**

Impact	Soils and geology This section deals with the impact that the proposed development will have on soils and geology	Responsibility	Frequency / monitoring requirements
	9. Stockpiles should not exceed 2m in height unless otherwise permitted by the Engineer. 10. Stockpiles are to be protected by installing adequate protection barriers to minimize loss of soil where practicable as due to windy conditions or heavy rain, depending on the duration of the project. Dust mitigation and erosion protection measures will be implemented. 11. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding. 12. Where contamination of soil is expected, analysis must be done prior to disposal of soil to determine the appropriate disposal route. Proof of delivery to an approved waste disposal site where contaminated soils are dumped if and when a spillage / leakage occurs should be forwarded to the GDARD.		
Fuel storage	13. Topsoil and subsoil to be protected from contamination. 14. Fuel and material storage must be away from stockpiles. 15. Provisions should be made to contain spillages or overflows into the soil. 16. Any storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. 17. Contaminated soil must be contained and disposed of off-site at an approved landfill site. Records of disposal to be forwarded to GDARD.	**ECO / C**	**Weekly**
Concrete mixing	18. The concrete batching plant must be contained within a bunded area. 19. Concrete mixing must only take place within designated areas. 20. Ready mixed concrete must be utilised where possible. 21. No vehicles transporting concrete to the site may be washed on site. 22. If a batching plant is necessary, run-off should be managed effectively to avoid contamination of other areas of the site. Untreated run-off from the batch plant must not be allowed to get into the storm water system or any rivers, streams, wetlands or existing	**ECO / C**	**Weekly / Monthly**

Impact	Soils and geology This section deals with the impact that the proposed development will have on soils and geology	Responsibility	Frequency / monitoring requirements
	erosion channels / dongas.		
Earthworks	23. All earthworks must be adequately controlled and managed. 24. Soils compacted during construction should be deeply ripped to loosen compacted layers and re-graded to even running levels. Topsoil should be re-spread over landscaped areas. According to specifications by the developer's landscape architect, the area should be re-vegetated upon completion of construction activities. 25. It is very important that the foundation excavations for the proposed structures be inspected by an engineering geologist or geotechnical engineer prior to the placing of steel reinforcement or concrete in order to determine that the structure is being founded upon the correct material, and also to detect whether any active layers have been exposed by the foundation excavation.	**ECO / C**	**Weekly**
Herbicides / pesticides	26. Herbicides should not be used excessively and slow release fertilizers and organic products should be used in preference to highly soluble and inorganic fertilizers. 27. The use of herbicides and pesticides and other horticultural chemicals should be carefully controlled wherever these are used. Where feasible, 'environmentally friendly' products should be utilised.	**ECO / C**	**Weekly**
Geology of the site	28. Sufficient mitigation measures e.g. blast mats must be put in place during blasting to minimise fly rock. 29. Rupture surveys in local area to check and record existing structural ruptures so as to exclude risk of insurance claims to contractor / client from other parties. 30. Clear safe zone around blast point to prevent potential injury to personnel and damage to equipment on site. May include in certain situations halting traffic temporarily. 31. Inform local communities / traffic of blast times.	**ECO / C**	**Weekly**

Impact	Soils and geology This section deals with the impact that the proposed development will have on soils and geology	Responsibility	Frequency / monitoring requirements
SITE SPECIFIC MITIGATION MEASURES			
Blasting	32. Ensure that adjacent works limit blast charges. Alternatively, depending on technical requirements for Etwatwa reservoir site, an exclusion zone of no blasting may be necessary. 33. Ensure legal requirements are in place with party constructing adjacent to existing services/pipelines to protect the developer.	**ECO / C**	**Weekly**
Expansive Clay	34. Pollution potential assessed by detailed geo-hydrological study with appropriate mitigation measures. 35. Monitoring of installation via the long term to continually check for leaks. 36. Should leaks occur then the installation should be appropriately repaired and / or remedial measures implemented to prevent repeat of problem. 37. In areas where expansive clays are present it is recommended that the expansive clay be removed where it is shallow and replaced with an inert soil	**ENG / DEV**	

Table 12: Dolomitic areas

Impact	Dolomite (This section deals with the impact that the dolomite rock present on the Etwatwa construction area)	Responsibility	Frequency/ monitoring requirements
PHASE	**CONSTRUCTION**	**DEV / ECO / C**	**Bi-Monthly**
Precautions	1. Implementation of appropriate water management procedures to limit or prevent the seepage of water into the substrata during construction either from ponding of surface water or leakages from adjacent buried wet services belonging to others. 2. Details of the water management procedures to be implemented are determined by dolomite risk class on the site to be given in the detailed dolomite stability investigation report. 3. The design of the reservoir, any upgrading, repair or maintenance work should take cognisance of industry standards and the contents of the Department of Public Work's Consultants Manual. 4. In addition a Fluid Transfer Auditing System with a high degree of accuracy should be implemented. 5. The design should allow for this loss of support under maximum working conditions (e.g. highest flow/pressure). 6. EMM should require that the Resident Engineer, Design Engineer and Contractor complete a certificate of compliance confirming that the contents of this EMP have been taken into account in the design and construction stage. 7. Dolomite related soils typically create an aggressive environment. Conductivity must be measured and suitable protection implemented. In addition, cathodic protection is essential.		

Impact	Dolomite (This section deals with the impact that the dolomite rock present on the Etwatwa construction area)	Responsibility	Frequency/ monitoring requirements
Open works and general construction activities	8. During construction the excavations should be opened and closed as rapidly as possible to avoid ponding of rainwater. Spoil should preferably be placed along the upslope side to preclude flooding of the open excavations. Avoid leaving excavations open over weekends or holidays. 9. All excavations must be properly backfilled and compacted at least according to specifications given in sub-clause 5.2.4 of SABS 1200 DA. However, the excavations should backfilled in this manner to ground surface. No rocks are permitted in the top layer and avoid free draining soils. 10. Where a pipeline (water or sewage) is to pass under roads or other important infrastructure, prevent the longitudinal movement of water along the trench by installing 1m wide clay plugs filling the trench cross section approximately 3m either side of the particular structure. 11. All trenches and open works should be inspected by a Dolomite Risk Specialist to assess if adverse ground conditions are present e.g. paleostructures. This procedure allows for the adjustment of construction methods, i.e. special bedding requirements, additional excavation and compaction, or pipe protection measurements. 12. All sewerage pipes must be watertight. All laid drainage and sanitary sewer pipes should be tested for leakage using appropriate tests such as the standard SABS air and water test on installation. 13. Electricity and Communication services installation: 20.1 Trenching, backfilling and compaction of trenches to be similar as for wet services. 20.2 The use of non-cohesive single size graded sand or crusher sand for bedding and fill blankets shall not be allowed. 20.3 Special attention to be given to drainage of all areas with gradients less than 1:80.	**C / ELO / ECO**	

Impact	Dolomite (This section deals with the impact that the dolomite rock present on the Etwatwa construction area)	Responsibility	Frequency/ monitoring requirements
Storm water Drainage	14. No ponding of water shall be allowed on site. 15. Sheet flow should be encouraged in undeveloped areas. 16. Concentration immediately within or outside the reservoir site may result in sinkhole formation. 17. The use of HDPE piping for water, sewer and storm water is preferred, as the material is more tolerant of movement.	**C / ENG**	
Mitigation against the impact of third party services	18. EMM must compile a register of other services traversing its property. Data gathered should include type of service, age, owner of service, etc. The level of maintenance of third party services is critical to the success of EM's own Dolomite Risk Management Strategy. 19. EMM should compile a set of minimum standards and dolomite risk management requirements that other parties should comply with when designing, installing and maintaining services traversing dolomite land and its infrastructure. 20. Verify that services traversing the site have not been damaged during construction prior to backfilling excavations 21. The relevant specifications of SABS 1200 DB, L, LB, LC, LD and LE shall be observed in the installation of all underground services. 22. The backfilling to service trenches and other excavations shall, except in rock, not be more permeable than the surrounding material. (General minimum compaction standard of 93% Mod AASHTO). The use of non-cohesive single size graded sand or crusher sand for bedding and fill blankets should not be allowed. 23. Water, sewer and non-concrete storm water pipes shall have a minimum cover of 600mm (soilcrete protection under roadways if required). 24. Provision should be made in all water bearing pipelines to accommodate potential differential movements without causing the pipeline or joints to leak.	**DEV / C**	

Impact	Dolomite (This section deals with the impact that the dolomite rock present on the Etwatwa construction area)	Responsibility	Frequency/ monitoring requirements
Control of storm water in trenches	25. Pumping equipment must be kept available on site during construction to keep open trench excavations dry.	**C**	
Blasting	26. Experience on dolomite indicates that blasting may lead to severe disturbance of the meta-stable dolomite environment giving rise to sinkhole formation. Consequently, if blasting is necessary, it is essential that appropriately experienced blasters are approached to determine the particular method specification for blasting, regarded as appropriate in context of the geological conditions. 27. Check for cracks in ground and surrounding structures before and after blasting.	**C / ENG / Blasting Expert**	
Ongoing geotechnical monitoring	28. The subsurface profile on site should be examined by an engineering geologist or an appropriately experienced person to permit the assessment and development of a comprehensive record of the surficial conditions e.g. identification of paleo-features. These delineated zones can then be treated with greater vigilance during the ongoing maintenance of the structures. 29. Ongoing interaction between Dolomite Risk Specialist and the Consulting Engineers responsible for the project is strongly recommended.	**C / ENG**	

Table 13: Erosion control

Impact	Erosion control This section deals with the impact that the proposed development will have with regards to potential erosion	Responsibility	Frequency / monitoring requirements
PHASE	**CONSTRUCTION**	**ECO / C**	**Bi Monthly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
General	1. Wind screening and storm water control should be undertaken to prevent soil loss from the site. 2. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion. 3. Other erosion control measures that can be implemented are as follows: • Brush packing with cleared vegetation • Mulch or chip packing • Planting of vegetation • Hydroseeding / hand sowing 4. Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented. 5. All erosion control mechanisms need to be regularly maintained. 6. Retention of vegetation where possible to avoid soil erosion 7. Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time. 8. Re-vegetation of disturbed surfaces should occur immediately after construction activities are completed. 9. No impediment to the natural water flow other than approved erosion control works and DWS approved wetland management is permitted.	**ECO / C**	**Bi Monthly**

Impact	Erosion control This section deals with the impact that the proposed development will have with regards to potential erosion	Responsibility	Frequency / monitoring requirements
	10. 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 Project Manager for approval and must include the location and design criteria of any temporary installations. 11. Stockpiles not used in three (3) months after stripping must be seeded to prevent dust and erosion, only if natural seeding does not occur.		

Table 14: Ground and surface water pollution

Impact	Groundwater and surface water pollution this section deals with the impact that the construction and operation of the development could have on ground and surface water pollution	Responsibility	Frequency / monitoring requirements
PHASE	**CONSTRUCTION**	**ECO / C**	**Weekly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
Sanitation	1. Adequate sanitary facilities and ablutions must be provided for construction workers (1 toilet per every 15 workers). 2. The facilities must be regularly serviced to reduce the risk of surface or groundwater pollution.	**ELO / C**	**Weekly**

Impact	Groundwater and surface water pollution this section deals with the impact that the construction and operation of the development could have on ground and surface water pollution	Responsibility	Frequency / monitoring requirements
Hazardous materials	3. Use and/or storage of materials, fuel and chemicals which could potentially leak into the ground must be controlled. 4. All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material with an additional allocation for potential storm water events. 5. Any hazardous substances must be stored at least 50m from any of the water bodies on site. 6. The ECO should be responsible for ensuring that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of preventing unauthorised entry. 7. Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp shall be collected and removed from the site for appropriate disposal at a licensed commercial facility.	**ECO / C**	**Weekly**
Concrete / Cement mixing	8. Concrete /Cement contaminated water must be detained, settled and pH tested before allowed to enter the water system as this disturbs the natural acidity of the soil and affects plant growth. Only neutral (pH 6-8) may be allowed to enter water systems.	**ECO / C**	**Weekly**
Public areas	9. Food preparation areas should be provided with adequate washing facilities and food refuse should be stored in sealed refuse bins which should be removed from site on a regular basis. 10. The contractor should take steps to ensure that littering by construction workers	**ECO / C**	**Weekly**

Impact	Groundwater and surface water pollution this section deals with the impact that the construction and operation of the development could have on ground and surface water pollution	Responsibility	Frequency / monitoring requirements
	does not occur and persons should be employed on site to collect litter from the site and immediate surroundings, including litter accumulating at fence lines. 11. No washing of vehicles except at designated sites.		
Water resources	12. Site staff shall not be permitted to use any other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing. 13. Municipal water (or another source accepted by the ECO and Project manager) should instead be used for all activities such as washing of equipment,, dust suppression, concrete mixing, compacting, or for any construction or related activities. 14. Department of Water Sanitation and the ECO as well as other Emergency contact numbers provided by the Municipality should be contacted in order to deal with spillages and contamination of aquatic environments.	**ECO / C**	**Weekly**
SITE SPECIFIC MITIGATION MEASURES			
General	Ref: Table 21: Wetlands and other surface water features. 15. Ensure that surface/storm water is diverted away from excavation trenches 16. Ensure that stream flow can bypass construction site 17. Ensure that contaminants are safely stored and away from construction site.	**ECO / C**	**Weekly**
Hydrotesting	18. The source of water for hydro testing must be agreed with the DWS prior to use. 19. Any water discharge will have to comply with the water quality standards as agreed with DWS. 20. Discharge permits will need to be obtained from DWS prior to any discharge to the	**C**	

Impact	Groundwater and surface water pollution this section deals with the impact that the construction and operation of the development could have on ground and surface water pollution	Responsibility	Frequency / monitoring requirements
	natural environment.		

Table 15: Hydrology and storm water

Impact	Hydrology and storm water this section deals with the impact that the construction and operation of the development could have on hydrology and storm water	Responsibility	Frequency / monitoring requirements
PHASE	**CONSTRUCTION**	**ECO/ EO / C**	**weekly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
General	1. The site must be managed in order to prevent pollution of drains, downstream watercourses or groundwater, due to suspended solids, silt or chemical pollutants. 2. Silt fences should be used to prevent any soil entering the storm water drains. 3. Temporary cut-off drains and berms may be required to capture storm water and promote infiltration. 4. Promote a water saving mindset with construction workers in order to ensure less water wastage. 5. New storm water construction must be developed strictly according to specifications from engineers in order to ensure efficiency. 6. Hazardous substances must be stored at least 20m from any water bodies on site to avoid	**ECO/ EO / C**	**weekly**

Impact	Hydrology and storm water this section deals with the impact that the construction and operation of the development could have on hydrology and storm water	Responsibility	Frequency / monitoring requirements
	pollution. 7. The installation of the storm water system must take place as soon as possible to attenuate storm water from the construction phase as well as the operation phase. 8. Earth, stone and rubble is to be properly disposed of so as not to obstruct natural water path ways over the site. I.e. these materials must not be placed in storm water channels, drainage lines or rivers. 9. There should be a periodic checking of the site's drainage system to ensure that the water flow is unobstructed. 10. If a batching plant is necessary, run-off should be managed effectively to avoid contamination of other areas of the site. Untreated runoff from the batch plant must not be allowed to get into the storm water system or nearby streams, rivers or erosion channels or dongas.		

Table 16: Air quality

Impact	Air pollution this section deals with the impact from air pollution	Responsibility	Frequency / monitoring requirements
PHASE	**CONSTRUCTION**	**EO / C**	**Daily**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
Dust control	1. To prevent dust nuisance a maintenance crew will be utilised to clean roads. 2. Retention of vegetation where possible will reduce dust travel 3. Excavations and other clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas. 4. Damping down of all exposed soil surfaces with a water bowser or sprinklers when necessary to reduce dust. 5. Blasting must be carried out in accordance with legislation using optimal and not excessive quantities of explosives. Blasting should where practical be restricted to calm days in order to reduce dust carry. The geotechnical report indicated that the probability of blasting is low. 6. The Contractor shall be responsible for dust control on site to manage potential nuisance caused to the Landowner or neighbouring Communities. 7. Any complaints or claims emanating from the lack of dust control shall be attended to immediately by the Contractor.	**EO / C**	**Daily**
	8. Rehabilitation The contractor should commence rehabilitation of exposed soil surfaces as soon as practical after completion of earthworks.	ELO / Contractor	After completion of Earthworks
Odour control	9. All construction vehicles must comply with relevant vehicle emissions standards 10. Regular servicing of on-site toilets to avoid potential odours.	**EO / C**	**Weekly**

Impact	Air pollution this section deals with the impact from air pollution	Responsibility	Frequency / monitoring requirements
	11. Allocated cooking areas must be provided. 12. The contractor must make alternative arrangements (other than fires) for cooking and / or heating requirements. LP gas cookers may be used provided that all safety regulations are followed.		
Fire prevention	13. The contractor must ensure that any grass left in a natural state within 10m of the construction servitude during construction should be cut in order to prevent veld fires, especially during the dry months. 14. No open fires shall be allowed on site under any circumstance (The Forest Act, No 122 of 1984). All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires. 15. The Contractor shall have operational fire-fighting equipment available on site at all times. The level of firefighting equipment must be assessed and evaluated through a typical risk assessment process. It may be required to be increase the level of protection during the winter months.	**EO / C**	**Weekly**

Table 17: Noise

Impact	Noise this section deals with the impact that increased noise will have on surrounding areas	Responsibility	Frequency / monitoring requirements
PHASE	**CONSTRUCTION**	**C / EO**	**Daily**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
General	1. The construction phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of residential areas in close proximity to the development. 2. Construction site yards, workshops, concrete batching plants, and other noisy fixed facilities should be located where possible away from noise sensitive areas. Once the proposed final layouts are made available by the contractor(s), the sites must be evaluated by the Contractor and specific measures designed in to the system as far as practical. 3. Truck traffic should be routed away from noise sensitive areas, where possible. 4. Noise levels must be kept within acceptable limits. All noise and sounds generated must adhere to SANS 10103 specifications for maximum allowable noise levels for residential areas. No pure tone sirens or hooters may be utilised except where required in terms of SABS standards or in emergencies. 5. Noisy operations should be combined so that they occur where possible at the same time. 7. Construction activities are to be contained to reasonable hours during the day and early evening. Nighttime activities near noise sensitive areas should not be allowed. 8. With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the contractor should liaise with local residents on how best to minimise impact, and the local population should be kept informed of the nature and duration of intended activities. 9. As construction workers operate in a very noisy environment, it must be ensured that their	**C / EO**	**Daily**

Impact	Noise this section deals with the impact that increased noise will have on surrounding areas	Responsibility	Frequency / monitoring requirements
	working conditions comply with the requirements of the Occupational Health and Safety Act (Act No 85 of 1993). Where necessary ear protection gear should be worn. 10. Noisy activities to take place during allocated construction hours only as per section 25 of the Noise Control Regulations of the Environment Conservation Act, 1989 (Act No. 73 of 1989) 11. Noise from labourers must be controlled. 12. The contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance. Where possible labour shall be transported to and from the site by the contractor or his Sub-Contractors by the contractors own transport.		
Noise monitoring	13. The Contractor shall prepare a noise monitoring procedure. 14. Noise monitoring shall be carried out using integrated sound level meters the calibration certificate of which shall be attached to this document once the unit is available. 15. Noise monitoring shall respect the following requirements: a. Monitoring is to take place at points of impact where there is expected to be disturbance to the public or landowners form construction activities and at worksite boundaries if applicable; b. Monitoring points are to be agreed with the ECO's on site and are to be recorded and referenced properly. c. Monitoring is to take place at points of impact where there is expected to be disturbance to the public or landowners form construction activities and at worksite boundaries if applicable; d. Monitoring points are to be agreed with the ECO's on site and are to be recorded and referenced properly.	C / EO	This data will be submitted to EMM on a monthly basis
	16. Noise baselines: Baseline noise monitoring shall be conducted so that the real Impact caused by construction activities could be effectively measured;	**C / EO**	Baseline noise monitoring should take place for at least 2 weeks but preferably 1 month

Impact	Noise this section deals with the impact that increased noise will have on surrounding areas	Responsibility	Frequency / monitoring requirements
			prior to construction activities in an area and should continue for at least 2 weeks but preferably one month after the major construction activities have ended.
	17. Monitoring the construction activities: During construction activities noise levels are to be monitored at all points as agreed with the ECO's The monitoring points are to remain constant and are to be monitored during a variety of times during working hours. e. These periods are to be times during which construction activities are taking place and should not fall over lunch breaks, on public holidays or other periods of reduced activities. f. Data recorded is to reflect the ambient average noise level for the monitoring period. g. The data is to reflect the ambient average noise level for the monitoring period. h. The data is to be recorded onto field data sheets and is to be captured on a central database. i. The reporting of all noise monitoring data is to be done via the relevant reporting channels to EMM	C / EO	At least once per week.
	18. Calibration certificates are to be provided for all new equipment and regular field calibration is to be done as per the manufacturer's specifications. These calibrations are also to be recorded on a register.	C / EO	
	19. The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication shall be as per SANS 10103:2004. The contractor is to monitor noise in relation to the type of area in which activities are taking place.	**C / EO**	

Table 18: Dust

Impact	Dust this section deals with the impact that increased noise will have on surrounding areas	Responsibility	Frequency / monitoring requirements
PHASE	**CONSTRUCTION**	**C / EO**	**Daily**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
Dust monitoring	1. The Contractor is required to implement a dust management programme, the aim of which is to ensure that the air quality on site does not impact negatively on the health or environment of the persons, animals and plants that are living and working in close proximity to the construction activities. The primary purpose of the dust management programme is to be able to measure the efficiency of the dust management programme. As dust is an immediate problem which results in loss of visibility "at the present moment" so visual monitoring of dust conditions is considered to be the most effective means of monitoring this.		
	2. Should there be areas where the management of dust suppression is not effective it is recommended that a quantifiable system is implemented. a. The Contractor shall agree with the ECO's the areas of greatest importance in terms of managing dust on site. b. A number of meters for measurement of dust are to be placed thought the works areas during the work activities. c. As far as possible dust monitoring stations will be active for at least 1 month prior to the onset of construction in the dry season in areas as directed by the ECO's. d. The meters will be placed in representative areas in such a way that they will not be impacted on by construction activities. e. The location of the meters is to be agreed based on the closest points of impact such as schools, houses, dangerous bends on roads and at businesses. f. The meters will collect fall out dust either in a single bucket unit or in a directional dust		Monthly collection of the samples is to be done.

<table>
<tr><th>Impact</th><th>Dust
this section deals with the impact that increased noise will have on surrounding areas</th><th>Responsibility</th><th>Frequency / monitoring requirements</th></tr>
<tr><td></td><td>collection device with four removable dust collection cups.
g. The agreement of the preferred collection device for each area is to be agreed on site with the ECOs. The determination of this will be based on the potential dust sources.
h. In areas where dust is from sources other than construction are expected the directional meters are recommended.
i. All meters are to be at a height of 2m above the ground and are to be firmly planted or weighed down to prevent wind damage.
3. Where readings are unacceptably high, the areas will be classified as a hot spot and weekly monitoring may be advised until such time as the dust problem has been rectified.</td><td></td><td></td></tr>
<tr><td></td><td>4. The classification of dust levels is indicated in the table below and is based on the Department of Environmental Affairs and Department of Minerals and Energy definition of dust levels
<table>
<tr><th>Dust level</th><th>Quality (g/m²/day)</th><th>Action required</th></tr>
<tr><td>Slight</td><td>> 250</td><td>No additional action</td></tr>
<tr><td>Moderate</td><td>250 to 500</td><td>Investigate cause of increase and upgrade dust management efforts with water carts</td></tr>
<tr><td>Heavy</td><td>500 to 800</td><td>Increase dust management efforts with water carts or binding agents</td></tr>
<tr><td>Very heavy</td><td>800 to 1200</td><td>Use of additional agents for dust management</td></tr>
</table>
Areas considered to be “active areas” where dust can be expected include:
a. All areas were trenching, drilling, blasting and backfilling are taking place.
b. Where the above activities are taking place including areas were hauling is actively</td><td></td><td></td></tr>
</table>

Impact	Dust this section deals with the impact that increased noise will have on surrounding areas	Responsibility	Frequency / monitoring requirements
	being undertaken. c. Note that rehabilitation areas are not considered to require monitoring. d. It is also noted that other material will from time to time skew results. This other material includes ash from veld fires, sand, grass and other seeds. These will not be totally eliminated by the design of the meters and the interpretation of the results are to take these factors into account.		

Table 19: Flora

IMPACT	FLORA This section deals with the impact that the development will have on flora on site and in the surrounding areas	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	CONSTRUCTION	ECO / C	weekly
ENVIRONMENTAL MANAGEMENT PLAN			
MITIGATION / METHOD STATEMENT			
Existing vegetation	1. Existing indigenous vegetation must be retained where possible. 2. A follow up vegetation survey should be conducted before site clearing to demarcate vegetation that should remain and remove and relocate any plants of botanical or ecological significance. 3. Vegetation to be removed as it becomes necessary. 4. Materials should not be delivered to the site prematurely which could result in additional areas being cleared or affected. 5. No existing vegetation to be used for firewood on site.	EO / C	weekly

IMPACT	FLORA This section deals with the impact that the development will have on flora on site and in the surrounding areas	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
Rehabilitation	6. All damaged areas shall be rehabilitated upon completion of the contract in accordance with design specifications. In accordance with the Conservation of Agricultural Resources Act, Act No 43 of 1983, slopes in excess of 2% must be contoured and slopes in excess of 12% must be terraced. Extra seed shall be sown on disturbed areas as directed by the ECO (see below for specifications). Other methods of rehabilitating disturbed sites may also be used at the discretion of the Contractor; and approved by ECO to comply with the conditions of the Environmental Authorisation and EMP, e.g. stone pitching, logging, etc. Contour banks shall be spaced according to the slopes. The type of soil shall also be taken into consideration. 7. A mixture of vegetation seed can be used provided the mixture is carefully selected to ensure the following: a) Annual and perennial species are chosen. b) Pioneer species are included. c) Species chosen will grow in the area under natural conditions. d) Root systems must have a binding effect on the soil. e) The final product should not cause an ecological imbalance in the area. 8. To get the best results in a specific area, it is a good idea to consult with a vegetation specialist or the local Extension Officer of the Dept. of Agriculture. Seed distributors can also give valuable advice as to the mixtures and amount of seed necessary to seed a certain area. 9. All natural areas impacted during construction must be rehabilitated with locally indigenous grasses typical of the representative botanical unit. 10. Rehabilitation must take place as soon as construction is complete to avoid the infiltration of alien species and soil erosion within the site. 11. Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding. 12. Rehabilitation process should be monitored and maintained throughout the construction	ECO / C	weekly

IMPACT	FLORA This section deals with the impact that the development will have on flora on site and in the surrounding areas	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	phase and post construction phase until rehabilitation has been successfully completed 13. Appropriate indigenous vegetation must be planted on the site to -attract avi-fauna, reptiles and small mammals back into the area		
Permits	14. Permits for removal of any protected species must be obtained from Provincial Nature Conservation should such species be affected.	EO / C	weekly
Demarcation of construction site	15. All natural vegetation not interfering with the site construction shall be left undisturbed, clearly marked and indicated on the site plan. 16. The construction area must be well demarcated and no construction activities must be allowed outside of this demarcated footprint. 17. Areas which are identified by the ECO as being ecologically sensitive and which are adjacent to any construction work are to be suitably demarcated to prevent damage by labour and equipment. 18. Vegetation removal must be phased in order to reduce impact of construction. 19. Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas. 20. Where the route passes intact vegetation (but does not impact on it), a buffer zone should be established to ensure that construction activities do not extend into these areas. 21. Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora. 22. Daily environmental auditing must take place.	EO / C / ECO	weekly
Utilisation of resources	23. All construction staff are prohibited from gathering of firewood, fruit, muthi plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO.	/ C / ECO	weekly
Exotic vegetation	24. All exotic vegetation must be removed from site.	EO / C	weekly

IMPACT	FLORA **This section deals with the impact that the development will have on flora on site and in the surrounding areas**	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	25. Alien vegetation on the site will need to be controlled in terms of Government Notice R1048. 26. The contractor should be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion. 27. The spread of exotic species occurring throughout the site should be controlled.		
Herbicides	28. Herbicide use shall only be allowed with the approval of the Developer and according to relevant contract specifications. The application shall be according to set specifications and under supervision of a qualified technician. The possibility of leaching into the surrounding environment shall be properly investigated and only environmentally friendly herbicides shall be used. 29. The use of pesticides and herbicides within the servitude must be discouraged as this will impact on important pollinator species of indigenous vegetation.	EO / C / DEV	weekly
Construction schedule	30. Where possible, construction should take place during winter i.e. the dormant stage to minimise impacts on vegetation during the growing season.	C / DEV	
SITE SPECIFIC MITIGATION			
Sensitive area mitigation measures	Sensitive wetland area 31. Environmental audits (daily in these sensitive areas) by an independent party during this construction period. 32. A copy of the Basic Assessment Report and associated Environmental Management Plan must be present at the construction site for easy reference to specialist recommendations in sensitive areas. *33.* It is recommended that the construction crew be educated about the sensitivities involved in this area as well as the potential species they could encounter. A poster of sensitive species (compiled by a qualified specialist) should be kept on the construction site for easy reference.	EO / C / ECO / Ecologist	Daily

Table 20: Fauna

IMPACT	FAUNA This section deals with the impact that the development will have on fauna in the area	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	CONSTRUCTION	ECO	weekly
ENVIRONMENTAL MANAGEMENT PLAN			
MITIGATION / METHOD STATEMENT			
General	1. Containment of construction site through identified sensitive areas 2. Demarcation of sensitive areas prior to construction activities starting 3. Intensive environmental auditing in these areas (daily audits recommended) 4. No trapping or damage to fauna on the construction site should be allowed.	ECO / C	Daily
SITE SPECIFIC MITIGATION			
General	5. The containment of the proposed site to the existing impacts identified will be an important mitigation measure which must be combined with a containment of all construction related activities to the minimum area. 6. No faunal species occurring on site or on adjacent properties may be captured or intentionally harmed. The setting of snares will be strictly prohibited and EMM shall take stringent actions against any individual found to be guilty of such offence.	ECO / C/	Daily

Table 21: Wetlands and other surface water features

IMPACT	WETLANDS This section deals with the impact that the development will have on wetlands and other surface water features in the study area	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	CONSTRUCTION	ECO / C / EO / Engineer / Wetland Specialist	Weekly
ENVIRONMENTAL MANAGEMENT PLAN			
MITIGATION / METHOD STATEMENT			
General	1. As specified in the GDARD guidelines for undertaking biodiversity assessments, prior to the onset of construction, the edge / boundary of each wetland must be clearly demarcated in the field with poles, sticks, or any solid structure that will last for the duration of the development. These indicators must be coloured as follows: a. red – Indicating the edge / boundary of the wetland b. orange – Indicating the edge of the buffer zone 2. As specified in the GDARD guidelines for undertaking biodiversity assessments, a 30m / 50m buffer area (according to whether the wetland is located within or out of the urban edge) must be maintained around each wetland. Within this buffer zone a setback buffer area must be preserved. In this setback area, ground, vegetation and root systems must remain. 3. Measures should be implemented to prevent the transport of excess silt downstream. This should include the erection of silt barriers within the wetland immediately downstream of the construction site. 4. Where possible, the construction earthworks activities should occur during dry (winter months) when water levels and seepage in wetlands / rivers are lower. 5. Where dewatering of trenches is required, the water from the dewatering operation should be cleaned of any excess silt and be discharged back into a downstream portion of the wetland in a manner that does not cause the initiation of soil erosion. 6. No stockpile areas should be located within the wetland boundary, or within the associated	ECO / C / EO / ENG / Wetland Specialist	Daily

IMPACT	WETLANDS This section deals with the impact that the development will have on wetlands and other surface water features in the study area	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	buffer zone. 7. No hazardous materials (such as oil) should be kept within 50m of the edge of a wetland buffer zone. 8. No vehicles and access of persons should be allowed through the wetland.		
Erosion Control	9. Where possible, silt fences / barriers or other relevant measures should be installed along the edge of streams and wetlands to prevent soil erosion and ingress of runoff water carrying silt from the catchment of the wetland (i.e. the slopes surrounding the wetland) to enter the water body.	ECO / Main C / EO / Engineer / Wetland Specialist	Daily
SITE SPECIFIC MITIGATION			
Prevention of water pollution	10. The placing of silt fences / silt barriers adjacent to the wetland to prevent discharge of silt into the wetland, and the inclusion of buffer zones in which no stockpiles, machinery, chemicals or construction camps must be included to prevent pollution into the wetland. 11. Wetlands must not be viewed in isolation from the surrounding slopes / catchment, as eroded material or other potential pollutants emanating from the surrounding non-wetland areas adjacent to the wetland boundaries may enter the wetland and cause significant pollution of the wetland. 12. In cases where this seepage water is removed from the construction excavations, as part of a dewatering process, this water may contain a high silt load, which could have a detrimental effect if discharged back into the wetland. It is thus recommended that water from dewatering operations be cleaned of silt prior to the water being discharged into the wetland.	ECO / C / EO / Engineer / Wetland Specialist	Daily
Wetland sensitivity	13. The onsite wetland as per the BAR 14. Present ecological state – F (Critically modified).		

Table 22: Employment

IMPACT	EMPLOYMENT This section deals with the impact that increased employment from the development will have on the area	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	CONSTRUCTION	C / ECO	Weekly
ENVIRONMENTAL MANAGEMENT PLAN			
MITIGATION / METHOD STATEMENT			
General	1. The use of labour intensive construction measures should be used where appropriate. 2. Training of labour to benefit individuals beyond completion of the project 3. Labour to be sourced from the local community where possible 4. Local suppliers to be used where possible 5. The Project Manager must ensure that all staff working on the proposed project must be in possession of a South African Identity Document or a relevant work permit.	DEV / C	

Table 23: Waste management

IMPACT	WASTE MANAGEMENT This section deals with the impact from waste Environmental Authorisation used by the development	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	CONSTRUCTION	C / EO / ECO	Weekly
ENVIRONMENTAL MANAGEMENT PLAN			
MITIGATION / METHOD STATEMENT			
Construction rubble	1. All rubble from demolition activities must either be used on site as part of the existing development, or must be taken off the reserve and disposed of at an approved site. 2. Rubble must not be dumped on site but must be placed within a skip bin for regular removal. 3. Construction rubble shall be disposed of in pre – agreed, demarcated spoil dumps that have been approved by the relevant EMM. *4.* Construction waste/rubble may not be burned or buried on site.	C / EO / ECO	Weekly
Litter management / Housekeeping	5. The Contractor shall maintain an effective waste management regime that ensures that there is adequate provision for waste disposal (in the form of bins), segregation and frequent removal (at least weekly) for permanent disposal at a licensed waste disposal facility. Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site. 6. A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site. 7. If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled. An independent contractor can be appointed to conduct this recycling. 8. Littering by the employees of the Contractor shall not be allowed under any circumstances. The ECO shall monitor the neatness of the work sites as well as the Contractor campsite. 9. Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly form the site by the local council.	C / EO / ECO	Weekly

IMPACT	WASTE MANAGEMENT This section deals with the impact from waste Environmental Authorisation used by the development	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	10. All waste must be removed from the site and transported to a landfill site as approved by the relevant Municipality. No permanent waste disposal shall be permitted at the campsites 11. Waybills providing disposal at each site shall be provided to the Engineer's and ECO inspection.		
Hazardous waste	12. All waste hazardous materials must be carefully stored as advised by the ECO, and then disposed of offsite at a licensed landfill site. 13. Contaminants to be stored safely to avoid spillage 14. Material Safety Data Sheets (MSDS) Information and records of all materials stored must be available and strict control of the volumes stored and removed must be kept. 15. Machinery must be properly maintained to keep oil leaks in check 16. Staff must be trained in the hazards and required precautionary measures for dealing with these substances.	C	Weekly
Sanitation	17. The Contractor shall install mobile chemical toilets on the site. 18. Staff shall be sensitised to the fact that they should use these facilities at all times. No indiscriminate sanitary activities on site shall be allowed. 19. Ablution facilities shall be within 100m from workplaces but not closer than 50m from any natural water bodies or boreholes. There should be enough toilets available to accommodate the workforce (minimum requirement 1: 15 workers). Male and females must be accommodated separately where possible. 20. Toilets shall be serviced regularly and the ECO shall inspect toilets regularly. 21. Toilets should be no closer than 100m or above the 1:100 year flood line from any natural or manmade water bodies or drainage lines or alternatively located in a place approved of by the Engineer. 22. Under no circumstances may open areas, neighbours fences or the surrounding bush be used as a toilet facility. 23. The construction of "Long Drop" toilets are forbidden.	C	Weekly

IMPACT	WASTE MANAGEMENT This section deals with the impact from waste Environmental Authorisation used by the development	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	24. Potable water must be provided for all construction staff.		
Remedial actions	25. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site. 26. Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site. 27. The Environmental Managers must determine the precise method of treatment of polluted soil. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil. 28. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent material. 29. If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure. 30. Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use. 31. Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal	C	Weekly

Table 24: Health and safety

IMPACT	HEALTH AND SAFETY This section deals with the safety of workers and the public exposed to construction hazards	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**CONSTRUCTION**	**C / ECO / DEV**	**Daily**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
Worker safety	1. Implementation of safety measures, work procedures and first aid must be implemented on site. 2. A health and safety plan in terms of the Occupational Health and Safety Act (Act No. 85 of 1993) must be drawn up to ensure worker safety. 3. Workers should be thoroughly trained in using potentially dangerous equipment 4. Contractors must ensure that all equipment is maintained in a safe operating condition. 5. A safety officer must be appointed. 6. A record of health and safety incidents must be kept on site. 7. Any health and safety incidents must be reported to the project manager immediately. 8. First aid facilities must be available on site at all times. 9. Workers have the right to refuse work in unsafe conditions. 10. The Contractor shall take all the necessary precautions against the spreading of disease such as measles, foot and mouth, etc. especially under livestock. 11. A record shall be kept of drugs administered or precautions taken and the time and dates when this was done. This can then be used as evidence in court should any claims be instituted against EMM or the Contractor. 12. The contractor must ensure that all construction workers are well educated about HIV/ AIDS and the risks surrounding this disease. The location of the local clinic where more information and counselling is offered must be indicated to workers. **13.** Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents.	**C / Safety Officer**	**Daily**

IMPACT	HEALTH AND SAFETY This section deals with the safety of workers and the public exposed to construction hazards	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
Worker facilities	14. Eating areas should be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness 15. Fires are not to be allowed.	**C / Safety Officer**	**Daily**
Protective gear	16. Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc. 17. No person is to enter the site without the necessary PPE. 18. SABS Standards and specifications governing dangerous processes such as welding and radiographic testing of welds must be strictly applied, with a view to proper protection of the public and workers.	**C / Safety Officer**	**Daily**
Site safety	19. The construction camp must remain fenced for the entire construction period. 20. Potentially hazardous areas such as trenches are to be demarcated and clearly marked 21. Adequate warning signs of hazardous working areas. 22. Uncovered manholes and excavations must be clearly demarcated 23. Emergency numbers for local police and fire department etc. must be placed in a prominent area. 24. Firefighting equipment must be placed in prominent positions across the site where it is easily accessible. This includes fire extinguishers, a fire blanket as well as a water tank. 25. Suitable conspicuous warning signs in English must be placed at all entrances to the site. Emergency and Info signs must be in English and other applicable languages. 26. All speed limits must be adhered to.	**C / Safety Officer**	**Daily**
Construction equipment safety	27. All equipment used for construction, including drills, TLB's must be in good working order with up to date maintenance records.	**C / Safety Officer**	**Daily**
Hazardous Material Storage	28. Staff that will be handling hazardous materials must be trained to do so. 29. Any hazardous materials (apart from fuel) must be stored within a lockable store with a sealed floor. 30. All storage tanks containing hazardous materials must be placed in bunded containment	**C / Safety Officer / EO**	**Daily**

IMPACT	HEALTH AND SAFETY This section deals with the safety of workers and the public exposed to construction hazards	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. 31. Material Safety Data Sheets (MSDS) which contain the necessary information pertaining to a specific hazardous substance must be present for all hazardous materials stored on the site. 32. The bund walls for the transformer oil containers must be in place before the installation of these containers. 33. The provisions of the Hazardous Chemical Substances Regulations promulgated in terms of the Occupational Health and Safety Act 85 of 1993 and the SABS Code of Practise must be adhered to. This applies to solvents and other chemicals possibly used in the construction time.		
Procedure in the event of a petrochemical spill	34. The individual responsible for or who discovers the petrochemical spill must report the incident to the Project Manager, contractor or ECO. 35. The problem must be assessed and the necessary actions required will be undertaken. 36. The immediate response must be to contain the spill. 37. The source of the spill must be identified, controlled, treated or removed wherever possible.	**C / EO / ECO**	
Fire management	38. Firefighting equipment should be present on site at all times as per OHSA. 39. All construction staff must be trained in fire hazard control and firefighting techniques. 40. All flammable substances must be stored in dry areas which do not pose an ignition risk to the said substances. 41. No open fires will be allowed on site. 42. Smoking may only be conducted in demarcated areas.	**C / Safety Officer**	**Daily**
Safety of surrounding residents	43. All I & AP's should be notified in advance of any known potential risks associated with the construction site and the activities on it. Examples of these are: - Blasting - Earthworks / earthmoving machinery on steep slopes above houses / infrastructure - Risk to residence along haulage roads / access routes	**C / Safety Officer / EO**	**Weekly**

Table 25: Security

IMPACT	SECURITY This section deals with issues of security during construction for workers and surrounding land users.	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**CONSTRUCTION**	**C / EO**	**weekly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
General	1. Access to the construction site should be strictly controlled by a security company. 2. 24-hour security on-site. 3. Labour should be transported to and from the site to discourage loitering in adjacent areas and possible increase in crime or disturbance. 4. Unsocial activities such as consumption or illegal selling of alcohol, drug utilisation or selling and prostitution on site shall be prohibited. Any persons found to be engaged in such activities should receive disciplinary or criminal action taken against them. 5. Other than pre-approved security staff, no workers shall be permitted to live on the construction site. 6. The site shall be fenced, where necessary to prevent any loss or injury to persons or livestock during the construction phase. 7. If any fencing interferes with the construction process, such fencing shall be deviated until construction is completed. The deviation of fences shall be negotiated and agreed with the landowner in writing. 8. No alcohol / drugs to be present on site. 9. No firearms allowed on site or in vehicles transporting staff to / from site (unless used by security personnel). 10. No harvesting of firewood from the site or from the residential and business properties adjacent to it.	**C / EO**	**weekly**

IMPACT	SECURITY **This section deals with issues of security during construction for workers and surrounding land users.**	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	11. Construction staff is 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 are forbidden). 12. Trespassing on private / commercial properties adjoining the site is forbidden. 13. Driving under the influence of alcohol is prohibited. 14. All employees must undergo the necessary safety training and wear the necessary protective clothing. 15. Secure the site in order to reduce the opportunity for criminal activity in the locality of the construction site.		

Table 26: Social environment

IMPACT	SOCIAL ENVIRONMENT This section deals with the social impacts that the new development will have on the site and surrounds	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**CONSTRUCTION**	**DEV / C / ECO**	**Bi monthly**
ENVIRONMENTAL MANAGEMENT PLAN			
MITIGATION / METHOD STATEMENT			
General	1. All contact with the affected parties shall be courteous at all times. The rights of the affected parties shall be respected at all times. 2. A complaints register should be kept on site. Details of complaints should be incorporated into the audits as part of the monitoring process. This should 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. 3. During the setup phase of the project, the Contractor needs to make contact with those people that are interested in or affected by the development (I&AP's). The contractor will notify adjacent neighbours and inform them of the intended development. He will also inform neighbours that a complaints register will be available on site. 4. No interruptions other than those negotiated shall be allowed to any essential services. Damage to infrastructure shall not be tolerated and any damage shall be rectified immediately by the Contractor. A record of all damage and remedial actions shall be kept on site. 5. All existing private access roads used for construction purposes, shall be maintained at all times to ensure that the local people have free access to and from their properties. Speed limits shall be enforced in such areas and all drivers shall be sensitised to this effect. 6. Any possible disruptions to essential services must be kept to a minimum and should be well advertised and communicated to the Landowners and surrounding Communities. Care must be taken not to damage irrigation equipment, lines, channels and crops, as this could lead to major claims being instituted against EMM and the Contractor. The position of all pipelines	**DEV / C**	**Bi monthly**

IMPACT	SOCIAL ENVIRONMENT This section deals with the social impacts that the new development will have on the site and surrounds	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	and irrigation lines in the vicinity of a site must be obtained from the Landowners or local Community and clearly marked. Where required such lines shall be deviated.		
SITE SPECIFIC MITIGATION			
Built-up areas (residential)	7. Construction activities close to residential homes should be restricted to working hours to cause minimal disruption to local movement patters, i.e. between the hours of 8am and 5pm. 8. Inform landowners of the construction process so that they are prepared for the construction activities to follow. 9. Consult with landowners in the event that extreme construction activities, such as blasting, would have to take place. Agree on a certain date and time with the property owners for such activities to take place. 10. Damage caused to housing structures as a result of blasting should be repaired as soon as possible. 11. Implement traffic flow controls where road closure or partial road closure is unavoidable. This can either be in the form of providing alternative access routes via detours and/or the use of 1-way traffic flow control. 12. In the event of 1-way traffic flow control, trained personnel should be used to regulate the traffic to prevent severe delays at waiting points.	**DEV / C**	**Bi monthly**
Roads	13. Road rehabilitation should take place during and once construction is completed. 14. Construction traffic should only make use of an approved route. 15. The number of trucks that pass through communities should be kept to a minimum and should be restricted to certain times of the day, i.e. avoid peak hours when community members are on their way to or from school and work. 16. Traffic signs should warn construction vehicles of the presence of pedestrians and school children along the road. 17. General road rules should be enforced. 18. Implement traffic flow controls where road closure or partial road closure is unavoidable.	**DEV / C**	**Bi monthly**

IMPACT	SOCIAL ENVIRONMENT This section deals with the social impacts that the new development will have on the site and surrounds	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	This can either be in the form of providing alternative access routes via detours and/or the use of 1-way traffic flow control. 19. In the event of 1-way traffic flow control, trained personnel should be used to regulate the traffic to prevent severe delays at waiting points.		
Influx of construction workers	20. Raise awareness amongst construction workers about local traditions and practices. 21. Alert local businesses to the fact that construction workers will move into the area to enable local businesses to plan for the extra demand. 22. Ensure that the local community communicate their expectations of construction workers' behaviour with them.	**DEV / C**	**Bi monthly**
Influx of job seekers	23. Ensure that employment procedures / policy are communicated to local stakeholders, especially community representative organisations and ward councillors. 24. Have clear rules and regulations for access to the camp / site office to control loitering. Consult with the local SAPS to establish standard operating procedures for the control and/or removal of loiterers at the construction site. 25. Construction workers should be clearly identifiable by wearing proper construction uniforms displaying the logo of the construction company. Construction workers could also be issued with identification tags.	**DEV / C**	**Bi monthly**
Outflow of labourers	26. Implement methods (posters, talks, etc.) to create HIV and STI awareness amongst construction workers. 27. Develop skills transfer plans (e.g. portable skills training) that would enable a worker to move from one project to another project within the same area. 28. Payment should comply with applicable Labour Law legislation in terms of minimum wages. 29. Where local labourers are employed on a more permanent basis, cognisance should be taken of the Labour Law in terms of registering the worker with the Unemployment Insurance Fund (UIF), Pay as you earn (PAYE), workman's compensation and all other official bodies as required by law. This would enable the worker to claim UIF as a means of continuous financial support when the worker's position on the construction team has either	**DEV / C**	**Bi monthly**

IMPACT	SOCIAL ENVIRONMENT This section deals with the social impacts that the new development will have on the site and surrounds	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	become redundant or once the construction phase comes to an end.		
Direct formal employment opportunities for local individuals	30. Unskilled job opportunities should be afforded to local community members. Local trade unions could assist with the recruitment process to counteract the potential for social mobilisation. 31. Equal opportunities for employment should be created to ensure that the local female population also have access to these opportunities. Females should be encouraged to apply for positions. 32. Individuals with the potential to develop their skills should be afforded training opportunities. Ekurhuleni Metropolitan Municipality should be involved in this process. 33. Mechanisms should be developed to provide alternative solutions for creating job security upon completion of the project. This could include formal and/or informal training on how to look for alternative employment, information on career progression, etc. to ensure that people are equipped to seek other jobs with the skills that they have gained. 34. Payment should comply with applicable Labour Law legislation in terms of minimum wages. 35. Where local labourers are employed on a more permanent basis, cognisance should be taken of the Labour Law in terms of registering the worker with the Unemployment Insurance Fund (UIF), Pay as you earn (PAYE), workman's compensation and all other official bodies as required by law. This would enable the worker to claim UIF as a means of continuous financial support when the worker's position on the construction team has either become redundant or once the construction phase comes to an end.	**DEV / C**	**Bi monthly**
Indirect formal and/or informal employment opportunities for local individuals	36. Develop a procurement policy that is easy to understand and ensure that local subcontractors also comply with the procurement policy and any other applicable policies. 37. Ensure that local subcontractors receive the necessary support in terms of resources. 38. Agree on specific performance criteria prior to appointment. 39. Identify the segment that might benefit from informal indirect opportunities, and assist them with skills development and subsidise initiatives that are sustainable. 40. Encourage construction workers to use local services.	**DEV / C**	**Bi monthly**

IMPACT	SOCIAL ENVIRONMENT This section deals with the social impacts that the new development will have on the site and surrounds	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	41. Consider housing construction workers in local communities.		
Attitude formation against the project	42. Transparent information should be supplied to the community from the outset of the project. 43. The local community should play an active participatory role in the planning process, especially landowners of neighbouring properties. This could be achieved by means of establishing a community forum that meet quarterly or once a month to discuss issues and progress surrounding the project. 44. Employment opportunities should first be offered to the local community if the skills are available within the community. 45. Ekurhuleni Metropolitan Municipality should deliver on their undertakings with the community in terms of employment creation, etc. (tangible benefits to the community). 46. The undertakings in the EMP should also be implemented effectively and with due diligence.	**DEV / C**	**Bi monthly**
Disaster Management Plan	47. Develop and implement an Emergency Response Plan for implementation during the construction phase. 48. Identify suitable individuals that can be trained and used as first aid officers on site (levels 1 to 3). Training of these individuals should ideally take place during this phase of the project to ensure that qualified first aid officers are on site once construction commences. 49. Consult with private ambulance services and/or hospitals so that they are aware of the project and would be able to provide emergency and/or medical services if needed. 50. Integrate risk management programmes with the IDP; 51. Maintain risk-specific safety infrastructure and plans – such as major accidents involving aircraft, railways and roads; 52. The contractor to establish a fully functional and equipped emergency response centre for the Etwatwa reservoir construction site 53. Establish disaster prevention programmes that focus on the most vulnerable communities – and, at the same time, support sustainable livelihoods; 54. Establish and maintain fire protection on the urban fringe;	**DEV / C**	**Bi monthly**

IMPACT	SOCIAL ENVIRONMENT This section deals with the social impacts that the new development will have on the site and surrounds	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	55. Establish a culture of scientific risk analysis by investigating possible risk scenarios and developing standard operating procedures for such scenarios; 56. Establish and maintain multi-disciplinary co-operation and cooperative partnerships; 57. Establish pro-active media liaison; 58. Educate and inform surrounding communities and/or households on the standard operating procedures to follow during a suspected leak or other accidents. Ensure that these communities and/or households know who to contact in case of an emergency and are able to implement a step-by-step disaster management procedure; 59. The way in which the disaster management plan is communicated to the surrounding communities and/or households should be jargon-free and outline an easy to follow step-by-step procedure. Cognisance should be taken of the fact that some members of the surrounding communities and/or households are illiterate – make use of alternative communication methods (e.g. picture posters) to educate and inform these individuals;		
Pollution and fire risk	60. Sufficient portable chemical toilets on site and at the construction village. 61. Refuse on site should be discarded in sealed bins and/or covered skips. Refuse should be removed from the site on regular intervals (at least once a week) and disposed of at an approved waste disposal site. 62. Contractors are liable for the costs involved with connecting to the electricity network and the water services network. 63. Construction workers should only be allowed to make fire in designated areas. Disciplinary action should be taken against Construction workers who do not keep within designated areas.	**DEV / C**	**Bi monthly**
Sanitation	64. Construction workers should receive medical advice regarding correct sanitation and should receive medical attention where required. 65. Adequate water facilities should be provided. 66. Sufficient portable chemical toilets on site and at the construction village. 67. Adequate sanitation services (e.g. showers) at the construction camp with effective	**DEV / C**	**Bi monthly**

IMPACT	SOCIAL ENVIRONMENT This section deals with the social impacts that the new development will have on the site and surrounds	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
	drainage facilities to ensure that used water is carried away from the site.		
Integration with local community	68. An aggressive STI and HIV/AIDS awareness campaign should be launched, which is not only directed at construction workers but also at the community as a whole. 69. Condoms should be distributed by placing them at centrally located points and by ensuring that construction workers and community members are aware of the availability and location of condoms. The distribution of condoms should be approached with the necessary cultural sensitivity. 70. Access at the construction site should be controlled to prevent sex workers from either visiting and/or loitering at the construction site. 71. Local women should be empowered. This could be achieved by employing them to work on the project, which in turn would decrease their (financial) vulnerability.	**DEV / C**	**Bi monthly**
Third party tampering	72. Conduct a vulnerability assessment to identify essential portions and dimensions of the reservoir, pressure tower and pump house that are particularly vulnerable to wilful damage. 73. Ensure that physical security systems and emergency tactical response measures are adequate and effective.	**DEV / C**	**Bi monthly**

Table 27: Visual impact

IMPACT	VISUAL IMPACT This section deals with the visual impact that the new development will have on the site and surrounds	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**CONSTRUCTION**	**C / EO**	**Monthly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
General	1. Soften impact by use of landscaping 2. Fencing of the site will also aid in reducing the visual impact of construction. 3. Cluster construction activities on site. 4. Storage facilities, elevated tanks and other temporary structures on site should be located such that they have as little visual impact on local residents as possible. 5. Unwanted material and litter should be removed on a frequent basis 6. Lighting must be subtle and not disturb passing motorists and surrounding residents. 7. Lighting should be inward and downward facing. 8. The site shall be kept visually and aesthetically pleasing, especially in and around the Contractor camp. The ECO shall regularly inspect the site to ensure that it is neat and clean. 9. Where required the campsite shall be screened by the Contractor to ensure that there is no unacceptable visual intrusion in the area of the site. Screening can be done by use of shade cloth.	**C / EO**	**Monthly**

Table 28: Cultural and heritage artefacts

IMPACT	CULTURAL AND HERITAGE ARTEFACTS This section deals with the impact that the new development has on potential archaeological artefacts of the site	RESPONSIBILITY	FREQUENCY / MONITORING REQUIREMENTS
PHASE	**CONSTRUCTION**	**C / EO / ECO**	**Monthly**
ENVIRONMENTAL MANAGEMENT PLAN			
	MITIGATION / METHOD STATEMENT		
General	1. Any finds must be reported to the nearest National Monuments office to comply with the National Heritage Resources Act (Act No 25 of 1999) and to GDARD. 2. Local museums as well as the South African Heritage Resource Agency (SAHRA) should be informed if any artefacts are uncovered in the affected area. 3. The contractor must ensure that his workforce is aware of the necessity of reporting any possible historical or archaeological finds to the ECO so that appropriate action can be taken. 4. Any discovered artefacts shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits shall be obtained from the South African Heritage Resources Association (SAHRA) should the proposed site affect any world heritage sites or if any heritage sites are to be destroyed or altered. 5. Should any archaeological sites / graves be uncovered during construction, their existence shall be reported to EMM immediately. 6. If gravesites are uncovered during construction, work must immediately be stopped in the area and the find must be reported to SAHRA as well as the South African Police Service for further investigation.	**C / EO / ECO**	**Monthly**

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