BULK INFRASTRUCTURE SERVICES FOR THE ELISENHEIM TOWNSHIP

Construction Environmental Management Plan

JUNE 2025

ELISENHEIM
PROPERTY DEVELOPMENT COMPANY

URBAN green cc
Town and Regional Planning Consultants
Environmental Management Consultants

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CEMP REVISION STATUS

Version	Date Approved	Revision Details
V1 – Original CEMP	November 2012	
V2 – Updated CEMP	June 2025	Signed: 

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PART 3: ENVIRONMENTAL SPECIFICATIONS

GLOSSARY

Alien Vegetation: Alien vegetation is defined as undesirable plant growth which shall include, but not be limited to, all declared category 1, 2 and 3 listed invader species. Other vegetation deemed to be alien shall be those plant species that show the potential to occupy in number, any area within the defined construction area. The Declared Alien Invasive Species are listed in Appendix D of this Document.

Audit: Regular inspection and verification of construction activities for implementation of the CEMP.

Batch plant: Machinery used on site for the mixing and production of concrete and associated equipment and materials.

Bund: Enclosure under/around a hazardous substance storage facility to contain any spillage.

CEMP This document, Construction Environmental Management Plan for managing potential environmental impacts during the construction phase of a development.

Contaminated water: Water contaminated by the Contractor's activities, e.g. concrete water and runoff from plant/personnel wash areas.

Construction activity: A construction activity is any action taken by the Contractor, his subcontractors, suppliers or personnel during the construction process.

Contractor: Any legal entity or consortium contracted by Elisenheim Property Development Company (PTY) Ltd (applicant) to undertake the activity associated with the construction of the proposed development.

Council: The authority, Windhoek City Council within which jurisdictional area the development is taking place.

DEA: Namibia's Department of Environmental Affairs the Government authority responsible for authorizing activities in terms of the appropriate Environmental Management Act.

Developer: Elisenheim Property Development Company (PTY) Ltd, the company or its duly authorized and appointed representative, with rights to undertake the development on the Site. The Developer is also the Client, where ever referred to in this document.

Emergency situation: An incident, which potentially has the ability to significantly impact on the environment, and which, could cause irreparable damage to sensitive environmental features. Typical situations entail amongst others the:-

- Spill of petroleum products and lubricants into the aquatic system;

- Potential damage, erosion and slumping of unstable river embankments or drainage channels;
- Potential event of impeding the continuous flow of water to downstream water users dependent on the flow; and
- Dangerous situation where livestock and children can be injured by any activity emanating from the construction or rehabilitation of the project implementation.

Engineer: The person(s) who represents Elisenheim Property Development Company (PTY) Ltd and are responsible for the technical and contractual implementation of the works to be undertaken by the appointed contractors.

Environment: The biosphere in which people and other organisms live. It consists of renewable and non-renewable natural resources, natural or modified ecosystems and habitats, and places of cultural significance.

Environmental impact: An impact or environmental impact is the change to the environment, whether desirable or undesirable, that will result from the effect of a Construction Activity between the limits that define the construction site. An impact may be the direct or indirect consequence of a Construction Activity.

Environmental Impact Assessment (EIA): The process of examining the environmental effects of a development. The assessment requires detailed/specialist studies of significant issues that have been identified during the environmental Scoping phase.

Environmental Management Plan (EMP): A detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.

ESM: Environmental Site Manager, a suitably qualified professional to be appointed by Elisenheim Property Development Company (PTY) Ltd who oversees the construction phase and ensure that all environmental specifications and CEMP obligations are met during these phases. The ESM will be responsible for the monitoring, reviewing and verifying of compliance with the CEMP by the Contractor.

Hazardous substance: A substance that, in the reasonable opinion of the Engineer and/or ESM, can have a harmful effect on the environment.

Landscape Architect: The person or company responsible for the landscape architectural aspects of the development.

Monitoring: Regular inspection and verification of construction activities for degree of compliance to the CEMP.

'No Go' areas: Areas identified as being environmentally sensitive in some manner and demarcated on plan, and on the Site with pegs or fencing and which are out of bounds to unauthorized persons. Authorization must be obtained prior to entry.

Resident Engineer: Resident Engineer (RE), a person who represents the Engineer on Site and is responsible for the technical and contractual implementation of the works to be undertaken.

Search and rescue: The location and removal of specified plant species, without unnecessary damage, and their transfer to a specified location (on-site nursery)

Species of special concern: Those species listed in the Endangered, Threatened, Rare, Indeterminate, or Monitoring categories of the South African Red Data Books, and/or species listed in Globally Near Threatened, Nationally Threatened or Nationally Near Threatened categories (Barnes, 1998).

Site: The boundary and extent of development works and infrastructure, including any areas off the main site on which works are to be carried out in order to allow the development to proceed successfully.

Solid waste: All solid waste, including construction debris, chemical waste, excess cement/concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste.

Specification: A technical descriptions of the standards of materials and workmanship that the Contractor is to use in the works to be executed, the performance of the works when completed and the manner in which payment is to be made.

Topsoil: The top 30cm of soil (topsoil) and root material of cleared vegetation.

Works : The construction operations and all related and incidental works, such as search and rescue, fencing and rehabilitation, in connection with the execution and carrying to completion of the project.

PART 1: OVERVIEW

1.1 INTRODUCTION

This document represents the framework Construction Environmental Management Plan (CEMP) for the remaining bulk infrastructure services still to be constructed for the Elisenheim Township. The larger Elisenheim township provides for 22 Extensions of approximately 10,000 erven of different land uses (i.e., business, office, residential, institutional, public open space, private open spaces) to be developed in different phases over time. Phase 1 (Elisenheim Proper) has been developed, which included roads and storm water, underground power lines, water reservoir and water pipelines, as well as sewage treatment plant with reticulation network and effluent storage dam.

1.2 THE CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

1.2.1 Environmental Management Plans

The purpose of the CEMP is to provide specifications for "good environmental practice" for application during construction.

As such the CEMP provides specifications that the Developer and his nominated Contractors must adhere to, to minimize adverse environmental impacts associated with the construction activities. The Developer to which authorization was granted, is ultimately responsible for overall environmental performance.

The guidelines for the execution of an CEMP include the following:

- Responsibilities for the environmental performance of the proposed development are communicated to the construction staff;
- Communications channels to report on environmental performance, problems and priorities are in place;
- A monitoring schedule is established to identify potential negative environmental impacts associated with the construction of the proposed development;
- Method Statements (mitigation measures) are implemented to avoid or minimize the identified negative environmental impacts (rehabilitation of eroded areas; bush clearings; complaints from property owners) as well as to enhance the positive impact on the environment (employment; support of conservation efforts); and
- Monitoring programme or schedule is developed to track the plans that have been implemented so as to ensure the effectiveness of the plan.

1.2.2 Scope of the CEMP

In order to ensure a holistic approach to the management of environmental impacts during the construction of civil works of the bulk infrastructure services for the Elisenheim Township, this

CEMP sets out the methods by which proper environmental controls are to be implemented by the Contractor and all other parties involved, and monitored by the Environmental Site Manager (ESM) and Resident Engineer (RE).

This CEMP intends to guide and manage the construction activities on each construction site and surrounding areas as they relate to the natural environment. It describes mitigation measures, and is prescriptive, identifying specific people or organizations to undertake specific tasks. This document must further be seen as open-ended, requiring regular review and updating via the correct channels in order for it to effectively guide environmental management of this project.

The provisions of this CEMP are binding on the Developer, until such time that ownership is transferred to these various other parties (Contractors). Any third party appointed by the Developer in terms of the design and construction must comply with the conditions of this CEMP.

Once the bulk service infrastructure works are complete, the operation and maintenance of the Elisenheim Township will become the responsibility of the Developer until such time that it is transferred to the Windhoek City Municipality and the home-owners association, individual home-owners and businesses managers.

This CEMP has been designed to suite the particular civil construction activities and needs

of the proposed development, and incorporates the following:

- General civil construction mitigation measures;
- Specific project mitigation measures;
- Construction activities that could impact on the environment;
- Specifications with which the Contractor shall comply in order to protect the environment from the identified impacts; and
- Actions that shall be taken in the event of non-compliance.

The CEMP is a dynamic document subject to similar influences and changes as are created by variations to the provisions of the project specification. Any substantial changes shall require the approval of the Environmental Forum.

1.2.3 Format of the CEMP

The CEMP is designed to fit within current civil engineering contract documentations.

This document consists of two sections:

- **Part 1** contains the **Overview** providing a brief description of the CEMP, information on the development, the environmental process followed, and the Project.
- **Part 2** deals with **Compliance Monitoring** stipulating the general requirements, responsibilities of the different role players, financing of environmental control, dispute resolution, and requirements for monitoring.

- **Part 3** details the **Environmental Specifications** that set out the environmental objectives and targets with which the Contractor/s shall comply.

1.2.4 Amendments to the CEMP

Any party involved with the Project can suggest changes to the CEMP via the ESM and Engineer. Such suggestions will be presented to the Environmental Forum before approval and implementation. Approved changes will be minuted and drafted into this existing CEMP in the form of an appendix or amendments. This should be clearly stipulated in the CEMP to avoid confusion (see CEMP Revision).

1.3 THE BULK INFRASTRUCTURE SERVICES FOR THE ELISENHEIM TOWNSHIP

Elisenheim Property Development Company (Pty) Ltd, the Proponent, has recently developed the first phase (Elisenheim Proper) of the Elisenheim Township comprising of 22 township extensions. As part of the Elisenheim Township Development, bulk infrastructure had to be constructed to service the entire Township's short and long term needs.

Most of the different bulk infrastructure services are situated within the Elisenheim Township boundary, which is situated to the east of the B1 Highway (Windhoek-Okahandja) ± 8.5 km north of Windhoek within the Brakwater. The 22 township extensions are planned to be developed in phases over the following years. The first phase of the Township has recently been developed (i.e. roads and stormwater infrastructure, electricity infrastructure, potable water infrastructure, and waste water infrastructure). Along with this, some of the bulk infrastructure services were also constructed (i.e. bulk water reservoirs, bulk electricity line, and waste water treatment plant with bulk sewer line).

The portion of land (Portion 5 of the Farm Elisenheim No 48) (Figure 1) on which the Elisenheim Township has been established was formerly subdivided from the Farm Elisenheim No. 68. Brakwater is a 'peri-urban' like extension to the city of Windhoek and has been undergoing a rapid and major transformation in land use (i.e. from low density residential and agriculture to high density residential and industrial developments) and character.

The recommendations presented in this document refer to the bulk infrastructure services of the Elisenheim Township either already constructed or being completed or those intended for construction. Those bulk infrastructure services already constructed (e.g. water, electricity, sewer and waste water treatment) include the bulk power supply infrastructure; waste water treatment plant (WWTP), dam and associated bulk sewer line, and the bulk potable water reservoir and associated water lines. Construction of two other reservoir sites namely Reservoir Site 2 and Reservoir Site 3 has not commenced yet. These bulk infrastructure services are situated at different localities within the larger study area,

determined by the particular technology and topography. The on-site assessments conducted focused on these smaller sites accommodating the bulk infrastructure services or those sited intended to accommodating the bulk infrastructure services.

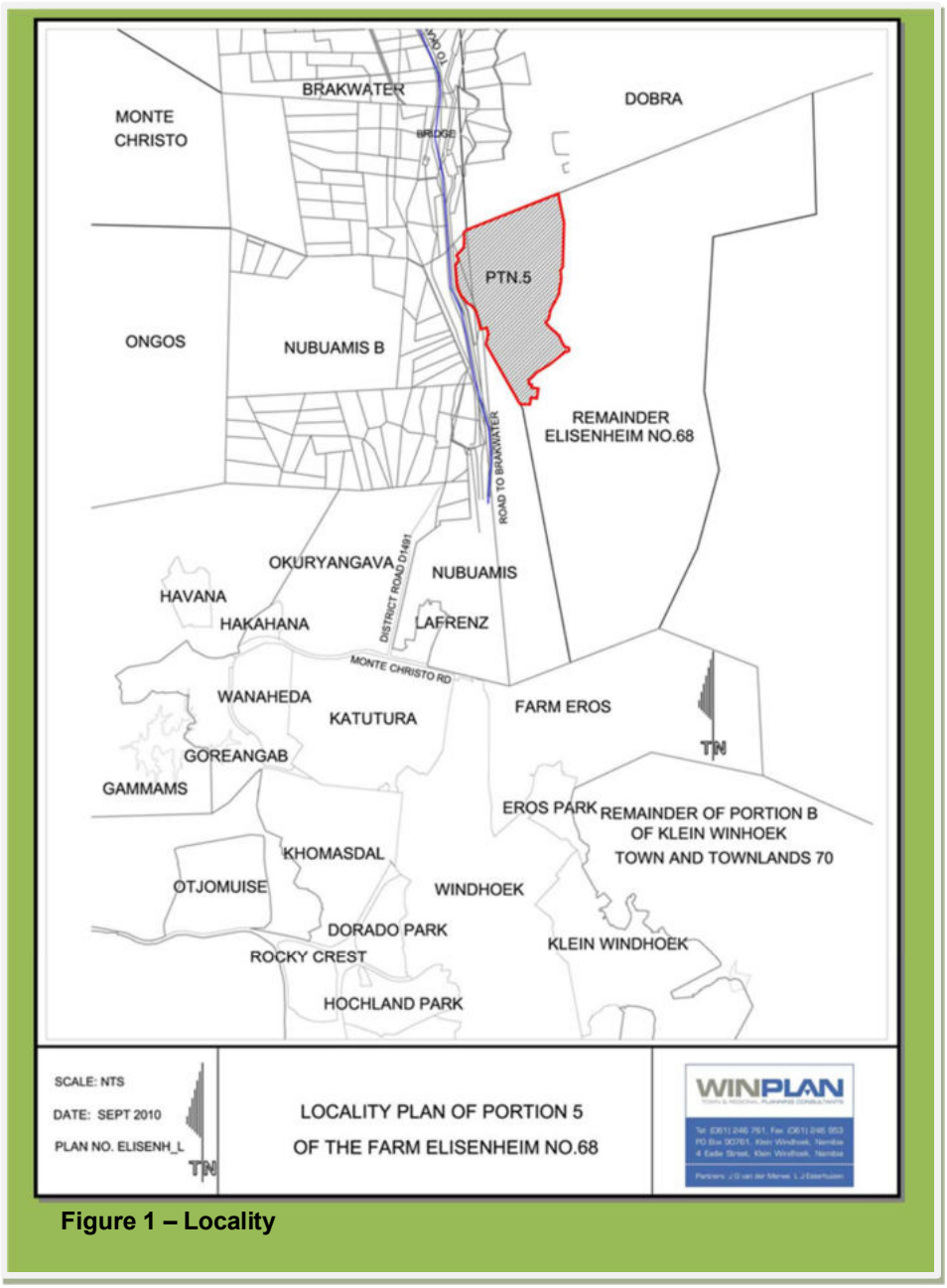

Figure 1 – Locality

From an ecological perspective the larger study area is generally speaking by no means regarded as sensitive, although species protected under the Forestry Ordinance (No. 37 of 1952) and/or Forest Act (Act No. 72 of 1968); Nature Conservation Ordinance (No. 4 of 1975) & CITES, appear as scattered individuals throughout the property and larger area. The river drainage lines and various outcrops which can be regarded as more sensitive provide habitat to a variety of both fauna and flora species. The outcrop intended to accommodate two of the future water reservoirs has been found to contain many protected species and was accordingly recommended to be replaced with an alternative outcrop being less sensitive and significant. Given the biophysical characteristics of the area, as defined by the Windhoek Environmental Structure Plan, the area is regarded as a *Medium Control Zone,* comprising three Sensitivity Zones namely; *Vegetation -, Water - and Landscape Sensitivity*.

All information suggests that the area in general has poor groundwater potential and the predominant geology in the area (biotite schist and alluvium) results in very little risk of groundwater contamination, *unless* geological structures are present acting as preferential groundwater flow paths or along the river courses where the alluvial thickness is significant. Structures are present in the larger area are mainly north-south and northwest-southwest faults and joint systems, while occasional cross-cutting fractures occur. These fractures very often determine the major drainage channels and act as preferential, high(er) transmissive groundwater flow paths. The greatest sensitivity of the larger study area thus lies within the hydrogeological aspect (surface and underground characteristics).

Impacts caused as a result of the bulk infrastructure services already constructed are (i) vegetation clearance again resulting in loss of habitat and biodiversity, dust generation, surface runoff, and erosion; (ii) disturbance to the landscape and sense of place; and (iii) potential to surface and underground water pollution.

1.4 THE PROJECT

For the purpose of this CEMP, the project involves the bulk infrastructure services already constructed for the Phase 1 (Township Extension Proper), which included the bulk power supply infrastructure; waste water treatment plant (WWTP), dam and associated bulk sewer line, and the bulk potable water reservoir and associated water lines. Construction of two other reservoir sites namely Reservoir Site 2 and Reservoir Site 3 has not yet commenced.

This document is also intended for consideration if future Township extensions and expansion of existing bulk infrastructure services of the Elisenheim Township are proposed or if construction of entirely new bulk infrastructure services may be required.

PART 2: COMPLIANCE MONITORING

2.1 APPOINTMENT OF ENVIRONMENTAL SITE MANAGER (ESM)

For the purposes of implementing the conditions contained herein, an ESM must be appointed by the Developer who shall be the responsible person for ensuring that the provisions of the CEMP are complied with during the duration of the Project. The ESM shall submit written reports to the Developer and relevant Contractor after visiting the site.

2.2 IMPLEMENTATION OF THE CEMP

The Environmental Site Manager (ESM) and Engineer supported by the Resident Engineer will be central to the implementation and be directly responsible to oversee the civil engineering construction activities for the duration of the Project. Implementation of the CEMP will also be the responsibility of all parties involved with the construction works.

2.3 PROJECT DIVISION PLAN (PDP)

Given that there will be many Contractors on Site simultaneously, management and control by the ESM and Resident Engineer will become challenging, requiring proper pre-planning to enable implementation and project operation. It is thus essential that the ESM in assistance by the Engineer draw-up a PDP to ensure optimal control and management as per the Specifications of this CEMP.

It is recommended that the Site be dived into construction zones according to the applicable civil works to be performed by a specific Contractor/Sub-contractor in accordance with the applicable Tender's ToR. Each zone will thus become and independent project forming part of the larger Project, to be monitored independently by the ESM.

Implementation of this CEMP and monitoring per zone can only be effective if the area of study is clearly defined and understood by the Contractor and the status during and after construction is measured against the pre-construction status.

This Plan will consists of two parts, the first being the Civil Construction Map clearly presenting the boundaries of each of the civil construction zones, both on paper and physically on Site (physical beacons). The second part of this Plan, the Environmental Status Quo Description is a general description of the pre-construction environmental status done by a credible and experienced ecologist. This part of the Plan should provide a brief outline of the status of the natural environment (i.e. vegetation type and cover, erosion status, damaged areas, etc.) as on the day of assessment. It is advisable to have photos taken at fixed points (record points with GPS) in each zone that can be compared with photos taken during and after construction (monitoring).

It is very important that each Contractor be made aware of the boundaries of the applicable zone to avoid uncertainty and confusion during construction and monitoring of construction activities. The applicable zone beacons should be clearly marked and pointed-out to each Contractor before construction commences. Agreement to the status of the environment before construction commences is required from the side of the contractor to avoid any discrepancies or disagreements later on in the Project.

2.4 HOLISTIC INTEGRATED SYSTEMS

Given the nature of the Project, being that civil construction works will be done simultaneously by various independent contractors, it is advisable to have a holistic and interdependent system for some activities rather than various smaller individual and independent systems implemented by various Contractors.

It is recommended that the ESM and Engineer draft a holistic and interdependent system for the Site's waste management and waste water management systems as per the Specifications of this CEMP (Part II of this Document).. Each contractor on Site will design his system to link-up with this Site System.

The following should also be shared between contractors -

- Contractors camp;
- Concrete batching facilities;
- Handling and storage of hazardous wastes; and
- Onsite nursery.

2.5 RECORD KEEPING

Record keeping forms an integral part of the CEMP implementation and will be the direct responsibility of the ESM and/or RE.

Copies of the documents described below must be maintained on site at all times, to be provided on request to authorities or stakeholders for inspection. Contractors' meeting minutes must reflect environmental queries, agreed actions and dates of eventual compliance.

2.5.1 Site Instruction Entries

The Site Instruction Book entries will be used for the recording of general site instructions as they relate to the works on site and CEMP measures. It will also be used for the issuing of stop-work orders issued by the ESM for the purposes of immediately halting any particular activities of the Contractor in lieu of the environmental risk that they may pose.

2.5.2 ESM Diary Entries

The purpose of these entries will be to record the comments of the ESM as they relate to activities on the site including infringements, possible changes to the CEMP or work stop orders.

2.5.3 Method Statements

Method statements from the Contractor will be required for specific sensitive actions on request of the ESM. These specific sensitive actions must be clearly stipulated by the ESM to the Contractor before construction commences.

Given that the agreement between the Contractor and Developer did not include this CEMP, these 'specific sensitive actions' referred to only to those areas within the Site regarded as 'no-go areas' or areas earmarked by the ESM as environmentally sensitive. The ESM however withholds the right to require a Method Statement from the Contractor for any activity, if so required.

See Appendix A for more information on the Method Statement and Pro-forma Method Statement.

2.5.4 Monthly Monitoring Reports

Copies of the monthly monitoring reports compiled by the ESM should be kept on site for inspection.

2.5.5 Other Documents

A list of other reports to be kept on site is -

- Final design documents and diagrams issued to and by the Contractor.
- All communications detailing changes of design/scope that may have environmental implications.
- Occupational Health and Safety reports.
- Complaints register.
- Incident and accident reports.
- Emergency preparedness and response plans.
- Crisis communication manual.
- Monthly site meeting minutes during construction.
- Environmental Forum's minutes of meetings.
- All relevant permits.
- All method statements from the Contractor.

2.6 ENVIRONMENTAL AWARENESS TRAINING

2.6.1 Environmental Site Manager

The ESM must be appropriately trained in environmental management and must possess the skills necessary to impart environmental management skills to all personnel involved in the contract.

2.6.2 Environmental Awareness Course

Contractors shall ensure that its employees and any third party who carries out all or part of the Contractor's obligations are adequately trained with regard to the implementation of the CEMP, as well as regarding environmental legal requirements and obligations. Training shall be conducted by the ESM where necessary.

The purpose of this environmental training is to provide a general explanation of sustainable environmental practices, but also to explain the content of the CEMP, the relevance thereof and how it will be implemented through monitoring. The general specifications as per Part Two of this CEMP should clearly be explained to both the Contractors and their site staff, as well as non-compliance to it and related penalties.

Environment and health awareness training programmes should be targeted at three distinct levels of employment, i.e. the executive, middle management and labour. The Developer shall ensure that adequate environmental training takes place. All employees shall have been given an induction presentation on environmental awareness and the content of the CEMP. The presentation needs to be conducted in the language of the employees to ensure it is understood.

The environmental training shall, as a minimum, include the following:

- The mitigation measures required to be implemented when carrying out their work activities.
- Environmental legal requirements and obligations.
- Details regarding floral/faunal species of special concern and protected species, and the procedures to be followed should these be encountered during the construction of the bridge, main access roads, approach roads or construction camps.
- The importance of not littering.
- The importance of using supplied toilet facilities.
- The need to use water sparingly.
- Details of and encouragement to minimize the production of waste and re-use, recover and recycle waste where possible.
- Details regarding archaeological and/or historical sites which may be unearthed during construction and the procedures to be followed should these be encountered.

2.7 CONSTRUCTION MONITORING

The ESM will carry the responsibility of monitoring the implementation of the CEMP on Site, assisted by the Resident Engineer. In this regard, the ESM will submit a monthly monitoring report to the Environmental Forum until after all rehabilitation work has been completed. A pro-forma monitoring report is contained in Appendix B.

The monthly monitoring report should include:

- A copy of the Monitoring Report (Appendix B);
- A description of any environmental accident or developments which could potentially develop into a non-conformance event by the Contractor; and
- Minutes from the meetings.

Any non-compliance with the agreed procedures of the CEMP is a transgression of the various statutes and laws that define the manner by which the environment is managed. Non-conformance identified during monitoring must be recorded. This Report must describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor/s and could stand as evidence should legal action be required. If possible, photographs should also be included as evidence to substantiate the report. This report will also suggest mitigation measures to correct the non-conformance (if necessary) and contemplate revisions to any of the strategies used in the construction phase, whether they pertain to monitoring or to construction methods used on site. The non-conformance shall be documented and reported as part of the Monthly Monitoring Report.

2.8 NON-COMPLIANCE AND PENALTIES

The ESM shall issue the Contractor a notice of non-compliance whenever transgressions are observed. The contractor/s shall act immediately when such notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the construction site pertaining to the environment shall be recorded in a dedicated register and the response noted with the date and action taken.

Failure to redress the cause shall be reported to the Environmental Forum for them to deal with the transgression, as it deems fit.

The Contractor is deemed not to have complied with the CEMP if, inter alia:

- There is evidence of contravention of the CEMP specifications within the boundaries of the construction site, site extensions and roads;
- There is contravention of the CEMP specifications which relate to activities outside the boundaries of the construction site;
- Environmental damage ensues due to negligence;
- Construction activities take place outside the defined boundaries of the site; and/or

- The Contractor fails to comply with corrective or other instructions issued by the ESM and/or Engineer within a specific time period.

It is recommended that the engineers/contractors institute penalties for the following less serious violations, and any others determined during the course of work as detailed below:

- Littering on site.
- Lighting of illegal fires on site.
- Persistent or un-repaired fuel and oil leaks.
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated "no-go" areas.
- Excess dust or excess noise emanating from site.
- Possession or use of intoxicating substances on site.
- Any vehicles being driven in excess of designated speed limits.
- Removal and/or damage to fauna, flora or cultural or heritage objects on site.
- Urination and defecation anywhere except at designated facilities.
- Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the CEMP, the Developer and/or Contractor shall be liable.

The following violations, and any others determined during the course of work, should be penalized:

- Hazardous chemical/oil spill and/or dumping in non-approved sites.
- Damage to sensitive environments.
- Damage to cultural and historical sites.
- Unauthorized removal/damage to indigenous trees and other vegetation, particularly in identified sensitive areas.
- Uncontrolled/unmanaged erosion.
- Unauthorized blasting activities (if applicable).
- Pollution of water sources.
- Unnecessary removal or damage to trees.

2.9 ENVIRONMENTAL COMPLETION STATEMENT

An Environmental Completion Statement will be prepared by the ESM for submission to the Developer indicating completion of the project and compliance with the CEMP and conditions. This statement will be prepared after the final audit following rehabilitation of the Site.

2.10 ROLE PLAYERS AND THEIR RESPONSIBILITIES

2.10.1 Environmental Forum

Elisenheim Property Development Company (PTY) Ltd will be responsible for the establishment of an Environmental Forum.

The core function of this Forum will be to –

- Provide feedback to stakeholders regarding the Project and implementation of the CEMP;
- Highlight stakeholder concerns regarding implementation and to address stakeholder concerns; and
- Handle any disputes or disagreements between role players on Site (with regard to environmental management).

Regular meetings will be held by the Environmental Forum, the purposes of the meetings shall be:

- To establish the suitability of the Contractors' methods and machinery in an effort to lower the risk involved for the environment.
- To discuss possible non-conformance to CEMP guidelines or environmental legislation.
- To discuss the general state of the environment on site and discuss any environmental problems which may have materialized.

This forum should ideally comprise of a representatives from the Developer, Engineer, Resident Engineer, Landscape Architect and Environmental Site Manager (ESM), or any other nominee in the event of one of the members not being able to attend.

If so desired the Environmental Consultant, Urban Design and Landscape Consultants can also serve on this Forum from time to time as it may become necessary.

2.10.2 Responsibilities of the ESM

Prior to the commencement of construction a suitably qualified and experienced Environmental Site Manager (ESM) shall be appointed by the Developer to ensure that the mitigation measures and recommendations are implemented and to ensure compliance with the provisions of the CEMP.

The responsibilities of the ESM are –

- Liaison with the Developer, Engineer, Resident Engineer and Environmental Authorities.

- The ESM shall make recommendations independent of the Engineer; take immediate action on Site when (i) prescriptive conditions are violated, or in danger of being violated, and to inform the Engineer, Resident Engineer/s and Contractor/s immediately of the occurrence and to take action, e.g. issuing of fines; and (ii) where clearly defined and agreed 'no go' areas are violated, or in danger of being violated, and to inform the Engineer, Resident Engineer/s and Contractor/s of the occurrence and action taken.
- The ESM must oversee the mitigation measures and ensure compliance with the conditions of approval and the CEMP.
- Frequent monitoring of construction activities as per the specifications of this CEMP (Part II).
- Ordering the removal of, or issuing spot fines for person/s and/or equipment not complying with the specifications of the CEMP.
- Involve specialists to advise on environmental management issues as they emerge during the construction phase.
- Advise the Engineer, Resident Engineer/s and Contractor/s on environmental issues within the defined work areas.
- Recommend corrective action to the Engineer, Resident Engineer/s and Contractor/s where construction activities are not in compliance with the Landscape Framework Plan.
- To environmentally educate and raise the awareness of the Engineer, Resident Engineer/s and Contractor/s and his staff as to the sensitivity of the Site and to facilitate the spread of the correct attitude during works on Site.
- To keep a comprehensive environmental record of activities on Site.
- Review the site logbook with regard to records of site activities that may pertain to the environment.
- To be reachable by the public regarding matters of environmental concern as they relate to the development (register of complaints and actions to be kept).

The ESM must have:

- a good working knowledge of all relevant environmental policies, legislation, guidelines and standards;
- the ability to conduct inspections and audits and to produce thorough and informative reports;
- the ability to manage public communication and complaints;
- the ability to think holistically about the structure, functioning and performance of environmental systems; and
- proven competence in the application of the following integrated environmental management tools:
    - EIAs.
    - EMPs.
    - Environmental auditing.

- Mitigation and optimization of impacts.
- Monitoring and evaluation of impacts.

2.10.3 Responsibilities of the Developer

- Attain all necessary approvals.
- Liaise with the ESM and Engineer regarding environmental management and provide the ESM and Engineer with all relevant documentation and plans.
- Support and comply with the CEMP specifications.

2.10.4 Responsibility of the Engineer

- Assisting the ESM and Resident Engineer in ensuring that the conditions of the CEMP are being adhered to and implemented.
- Promptly issuing instructions requested by the ESM and Resident Engineer to the Contractor/s.
- Deduct environmental penalties from certificate payments as agreed and instructed by the ESM.
- Assisting the ESM in making decisions and finding solutions to environmental problems that may arise during the construction phase.
- Oversee the responsibilities of the Resident Engineer and Contractor/s, and assist in all required matters.

2.10.5 Responsibilities of the Contractor/s

- Be responsible for the overall implementation of the CEMP in accordance with the requirements of the Developer and CEMP.
- Inform both the Resident Engineer and ESM should environmental issues on Site go wrong, e.g. erosion, dumping and pollution, etc.
- Assist in finding solutions to environmental problems that may arise during construction.
- Carry out instructions as given by the ESM and Resident Engineer.
- Ensure that all third parties who carry out all or part of the Contractor's obligations under the Construction Contract comply with the requirements of this CEMP;

2.10.6 Responsibilities of the Landscape Architect/Biologist/Ecologist

A Landscape Architect/Biologist/Ecologist will need to be employed to undertake the rehabilitation for the Project where disturbed sites will not be developed. The Landscape Architect must be qualified to set up and manage an on-site nursery (if necessary), to propagate required plant material and to rehabilitate disturbed areas. The Landscape Architect/Biologist/Ecologist will need to be instructed by a Botanist, who will compile the

Rescue and Translocation programme for removal of species of special concern, where necessary.

2.11 EMERGENCY PREPAREDNESS

The Contractor shall compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the construction period. Such activities may include, inter alia:

- Accidental discharges to water and land.
- Accidental exposure of employees to hazardous substances.
- Accidental veld or forest fires.
- Accidental spillage of hazardous substances.
- Accidental toxic emissions into the air (e.g. at asphalt plants).
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans shall include:

- Emergency organization (manpower) and responsibilities, accountability and liability.
- A list of key personnel and contact details.
- Details of emergency services available (e.g. the fire department, spill clean-up services, etc.).
- Actions to be taken in the event of different types of emergencies.
- Incident recording, progress reporting and remediation measures required to be implemented.
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.

2.12 FINANCING OF ENVIRONMENTAL CONTROL

Financing of the environmental requirements as outlined in this document is the sole responsibility of the Developer or the appointed Contractor. Any responsibilities not defined in this document or where any uncertainties arise in this matter will be the responsibility of the Developer.

2.13 DISPUTES AND DISAGREEMENTS

Any disputes or disagreements between role players on Site (with regard to environmental management) will be referred to the Environmental Forum. If no resolution on the matter is possible it must be presented to an outside party agreed by all parties involved or to the Directorate of Environmental Affairs for clarification.

2.14 POST-CONSTRUCTION ENVIRONMENTAL AUDIT

A post-construction environmental audit must be carried out and submitted to the Environmental Forum, in order to fulfil conditions of this CEMP.

PART 3: ENVIRONMENTAL SPECIFICATIONS

3.1 SCOPE

These specifications cover the requirements for controlling the impact of construction activities on the natural and social environment.

3.2 CONSTRUCTION

3.2.1 Site Division

The ESM and Resident Engineer shall be advised of the area that the Contractor intends using for his site establishment. The Contractor's camp shall occupy as small an area as possible, and no site establishment shall be allowed within 50m of any watercourse unless otherwise approved by the ESM.

The Contractor shall inform the ESM and Resident Engineer of the intended actions and programme for site establishment. The site layout shall be planned to facilitate ready access for deliveries, facilitate future works and to curtail any disturbance or security implications for neighbours.

The Contractor/s shall restrict all his activities, materials, equipment and personnel to within the specified area.

3.2.2 Site Demarcation

As required by the Specification Data, the Contractor shall erect and maintain permanent and/or temporary fences of the type and in the locations directed by the ESM and Resident Engineer. Such fences shall, if so specified, be erected before undertaking designated activities.

(i) Contractor's Camp

The Contractor shall discuss with the ESM and Resident Engineer the layout and preparation of the Contractor's Camp (this shall include the positioning of any fuels/hazardous materials stores). The extent and location of the Contractor's Camp shall be approved by the ESM and Resident Engineer.

The planning and design for the Construction Camp must ensure that there is minimal impact on the environment. The following should apply –

- The Construction Camp will be placed within an existing disturbed area as far as possible.
- The Contractor's Camp shall be located in an area of low environmental and social sensitivity.

- The construction camp must preferably be located away from existing and proposed roads to minimize visual impact.
- With the decommissioning of the structures all compacted platforms and slab foundations must be ripped up and be removed.

(ii) Vehicle Parking Area

- All vehicles will be allocated a dedicated parking area in the Contractor's Camp.
- No storage of vehicles will be allowed outside of the designated area.

3.2.3 Aesthetics

The Contractor shall take reasonable measures to ensure that construction activities do not have an unreasonable impact on the aesthetics of the area.

3.2.4 Cement and Concrete Batching

Where applicable, the location of the batching plant (including the location of cement stores, sand and aggregate stockpiles) shall be as approved by the ESM and Resident Engineer. The concrete batching activity shall be located in an area of low environmental. The concrete/cement batching plant shall be kept neat and clean at all times.

No batching activities shall occur directly on unprotected ground. The batching plant shall be located on a smooth impermeable surface (concrete or 250 µm plastic covered with 5 cm of sand). The area shall be bunded and sloped towards a sump to contain spillages of substances. All wastewater resulting from batching of concrete shall be disposed of via the contaminated water management system and shall not be discharged into the environment. Cleaning of equipment and flushing of mixers shall not result in pollution of the surrounding environment: Care shall be taken to collect contaminated wash water from cleaning activities and dispose of via the contaminated water management system and shall not be discharged into the environment.

All runoff from batching areas shall be strictly controlled, and cement-contaminated water shall be collected, stored and disposed of at a site approved by the ESM and Resident Engineer. Dagga boards, mixing trays and impermeable sumps shall be used at all mixing and supply points.

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

Empty cement bags shall be stored in weatherproof containers to prevent windblown cement dust and water contamination. Empty cement bags shall be disposed of on a regular basis via the solid waste management system, and shall not be used for any other purpose.

Unused cement bags shall be stored so as not to be affected by rain or runoff events. In this regard, closed steel containers shall be used for the storage of cement powder and any additives. The Contractor shall ensure that sand, aggregate, cement or additives used during the mixing process are contained and covered to prevent contamination of the surrounding environment.

The Contractor shall take all reasonable measures to prevent the spillage of cement/ concrete during batching and construction operations. During pouring, the soil surface shall be protected using plastic and all visible remains of concrete shall be physically removed on completion of the cement/ concrete pour and appropriately disposed of. All spoiled and excess aggregate/ cement/ concrete shall be removed and disposed of via the solid waste management system.

Where “readymix” concrete is used, the Contractor shall ensure that the delivery vehicles do not wash their chutes directly onto the ground. Any spillage resulting from the “readymix” delivery shall be immediately cleared and disposed of via the solid waste management system.

3.2.5 Crane Operations

Drive plants shall be well maintained and drip trays shall be positioned at potential leak areas. Over-greasing of crane cables shall be avoided.

Movement and lifting of hazardous materials shall be undertaken such that they do not cause a pollution, spillage or safety risk (in particular were concrete buckets are in use).

3.2.6 Earthworks

All earthworks shall be undertaken in such a manner so as to minimize the extent of any impacts caused by such activities. The Contractor/s shall take all reasonable measures to limit dust generation as a result of earthworks. Earthworks are to be phased so that no areas are left exposed for longer than is necessary. This is especially important during the rainy season where runoff causes siltation downstream & overall erosion and loss of topsoil, etc.

(i) Borrow Pits

- If borrow pits are required, the Engineer need to obtain approval from the ESM and Engineer.

(ii) Trenching

- Trenching for services shall be undertaken in accordance with the engineering specifications with the following environmental amplifications, where applicable:
    - Soil shall be excavated and used for refilling trenches i.e. soil from the first trench shall be excavated and stockpiled, thereafter soil from the second excavated trench length shall be used to backfill the trench behind it once the services have been laid. The last trench shall be filled using the soil stockpiled from the first trench.
    - Trench lengths shall be kept as short as practically possible before backfilling and compacting.
    - Trenches shall be re-filled to the same level as (or slightly higher to allow for settlement) the surrounding land surface to minimize erosion.

(iii) Drilling and Jackhammering

- The Contractor/s shall ensure that no pollution results from drilling operations, either as a result of oil and fuel drips, or from drilling fluid. The Contractor/s shall take all reasonable measures to limit dust generation and noise as a result of drilling operations.
- Any areas or structures damaged by the drilling and associated activities shall be rehabilitated by the Contractor/s to the satisfaction of the ESM and Resident Engineer.

3.2.7 Bitumen

Over spray of bitumen products outside of the road surface and onto roadside vegetation or the surrounding environment shall be prevented using a method approved by the Resident Engineer.

When heating bitumen products, the Contractor shall take cognizance of appropriate fire risk controls. Heating of bitumen products shall only be undertaken using LPG or similar zero emission fuels and appropriate fire fighting equipment shall be readily available.

Stone chip/gravel excess shall not be left on road / paved area verges. This shall be swept / raked into piles and removed to an area approved by the ESM and Resident Engineer.

Water quality from runoff from new/ fresh bitumen surfaces will be monitored visually by the ESM and Resident Engineer and remedial actions taken where necessary by the Contractor.

3.2.8 Fencing

It is important that excavation works are conducted within a limited area to facilitate control and to minimize impacts on the surrounding environment. The purpose of the fenced areas is to control construction and personnel activity within the designated areas, and limit unauthorized access.

Where deemed necessary by the ESM and Resident Engineer, sensitive areas shall be fenced off by the Contractor/s by means of a two-strand wire fence on which danger tape has been securely placed.

Fencing of the labour campsite (if applicable) and construction area shall be suitably secured to prohibit access by livestock and local fauna. Full shade cloth demarcation of 1.8m in height is recommended for the Contractor's Camp.

Fences will be constructed around Heritage resources (should these be present) and/or no-go areas to prevent access into such areas during construction.

No unauthorized pedestrian or vehicular access shall be allowed into fenced, off-limit areas. If fencing is removed temporarily for the execution of work, the Contractor/s shall reinstate it as soon as practicable. Until re-instatement, the contractor/s shall demarcate the working area by surrounding it with danger-tape marking.

Breaches in the fencing must be repaired immediately.

The Contractor/s to the satisfaction of the ESM and Resident Engineer shall erect and maintain all fencing. Such fences shall be erected before the start of any construction works.

3.2.9 Access Routes

Roads in the direct vicinity of the site will be subject to continual use by construction vehicles, particularly heavy vehicles, carrying building materials, waste, etc.

Special care should be taken to prevent spillages on the roads. Vehicles should be equipped with drip trays to prevent oil and fuel spillages. In the event of spillages, it should be reported to the ESM and Resident Engineer immediately and cleaned as soon as possible.

Notices should be placed on visible locations in the vicinity of the construction site to warn public of construction activities and indicating that heavy vehicles may be using the road. On the Site, the Contractor/s shall control the movement of all vehicles and plant machinery so that they remain on designated/demarcated routes.

Existing roads will be used as far as possible. No temporary access roads will be permitted, unless negotiated with the ESM and Resident Engineer and Developer.

Any temporary roads required shall be decommissioned by the Contractor/s and rehabilitated using stockpiled topsoil. Topsoil shall be removed as described under 'Clearing and Grubbing' prior to the construction of the road/s.

During construction of roads the Contractor/s shall protect all areas susceptible to erosion by installing all necessary temporary and permanent drainage works as soon as possible.

3.2.10 Clearing and Grubbing for Construction Purpose

Clearing should first be discussed with the ESM and Resident Engineer before commencement.

(i) Plant Location and Rescue

- If considered necessary, the location and rescue of endemic plants, and their transfer to a specified location shall be conducted by a suitably qualified contractor prior to the onset of any site clearing operations.
- Where possible direct transplantation of rescued plant material, into areas earmarked and prepared for revegetation, shall occur. Transplantation shall only occur in areas of similar habitat and soil type from which rescued plant material originates.
- Where direct transplantation is not feasible, plant material shall be moved to a nursery for transplantation once the permanent revegetation areas become available.
- Rescued plants, which are to be stockpiled at a nursery, shall be stored under damp shade cloth/hessian until they are transported to these sites. They shall be watered and bagged in the topsoil from the area.

(ii) Vegetation Clearance

- The Contractor shall ensure that the clearance of vegetation is restricted to that required to facilitate the execution of the Works. Site clearance shall occur in a planned manner, and cleared areas shall be stabilized as soon as possible. The detail of vegetation clearing shall be to the Landscape Architect and ESM’s approval.
- Areas that are, in the opinion of the Landscape Architect, less stable, shall be stabilized immediately following vegetation clearance.
- The disposal of vegetation by burying or burning is prohibited. Cleared vegetative material shall:
    - be removed from Site and disposed of at an approved disposal site;
    - be chipped and mulched, where suitable.
- Vegetation shall be cleared mechanically. Care shall be taken to minimize the disturbance to topsoil during this process.

- During site clearance, any old concrete, rubble or refuse shall be removed from the Site, or stockpiled for disposal at an approved disposal site. All stockpiles shall be managed so as to avoid damage to vegetation.
- Where practical, indigenous plant material shall be kept separate from alien material. The vegetative material shall be reduced either by mechanical means (chipper) or by hand axing to sticks of no longer than 100 mm.
- All indigenous vegetation cleared from the Site shall be collected and stored at the on-site nursery. Where appropriate, with permission from the Landscape Architect, the indigenous material shall be collected simultaneously with the topsoil.
- The Contractor shall store the mulched vegetation in bags. The bags shall be approved by the Landscape Architect and shall allow air to pass through the enclosed material. Mulch shall be protected from wetting.
- Subject to the approval of the Landscape Architect, seed-free material from exotic invasive plants (should these occur on site) shall be chipped and used to prepare mulch.
- The Contractor shall stabilize soil in unstable areas in order to control wind-blown dust and sand.
- The following methods shall be considered for soil stabilization:
    - Mulch stabilization
        - Mulch shall be applied by hand to achieve a layer of uniform thickness. The mulch shall then be lightly worked into the topsoil layer so that it mixes with the soil and serves to bind it.
        - The mulch shall be spread at a coverage rate of 100 kg per 250 m².
        - Where brush-cut material is to be utilized as mulch, this material shall be evenly spread across the area to a uniform depth of 25mm. The mulch shall then immediately be rotated into the upper 100 mm layer of soil. This operation shall not be attempted when the wind strength is such as to remove the mulch before it can be rotated in.
        - If the area is exposed to strong wind (August winds in the case of the Site) the mulch stockpile shall be covered with a fine nylon net with 100mm × 100mm openings.
    - Straw stabilization
        - Straw shall be utilized as a binding material in sandy areas. Baled straw shall be placed on the cleared area, opened and spread evenly by hand or machine at a coverage rate of 1 bale per 20 m² over the area to be stabilized. It shall then immediately be rotovated into the upper 100 mm layer of soil. This operation shall not be attempted when the wind strength is such as to remove the straw before it can be rotovated into the sand.
    - Stabilization of steep slopes
        - The Contractor shall take measures to protect all areas susceptible to erosion by installing all the necessary temporary and permanent drainage works as soon as possible. The Contractor shall take any

other measures that may be necessary to prevent surface water from being concentrated in streams and from scouring the slopes, banks or other areas.

- If runnels or erosion channels develop, they shall be back-filled and compacted, and the areas restored to a proper (stable) condition. The Contractor shall not allow erosion to develop on a large scale before effecting repairs.
- Where artificial slope stabilizers are used, these should be applied to the slope before top soiling.
- Near vertical slopes shall be stabilized using natural rock wall structures, stacked precast concrete blocks or rock-filled gabion baskets. All structures shall have a 'natural' look and facilities for plants to grow in.
- Where the slopes are 1:3 to 1:6 they should be logged or otherwise stepped (using stabilization cylinders or similar) in order to prevent soil erosion. Logs/cylinders must be laid in continuous lines following the contours and spaced vertically 0.8-1.2 m apart, depending on the steepness of the slope. These logs/cylinders must be secured by means of steel pegs and wire in rocky areas, and treated wooden pegs in other areas.
- In areas where slopes are less than 1:6, horizontal grooves, shallow steps or ledges parallel to contours should be made on the cut slopes.
- In areas where slopes are less than 1:6 these slopes should be stabilized by using logs in parallel rows, or stabilization cylinders fastened randomly into position or using biodegradable netting. These structures shall hold the top-material on the slopes and serve as erosion prevention structures.
- Shallow slopes shall be stabilized using commercial available and approved anti-erosion compounds.
- Conservation of Topsoil.
- The Contractor shall at all times carefully consider what machinery is appropriate for the task while minimizing the extent of environmental damage.
- Topsoil shall be cleared of woody vegetation, and specifically exotic vegetation (should this occur), before ripping and removing. Identification of these species should be done by a competent person qualified accordingly.
- The topsoil is regarded as the top 300 mm of the soil profile.
- Topsoil is to be handled twice only – once during clearing and stockpiling & once during rehabilitation.
- The topsoil, including the existing grass cover is to be shallowly ripped (only the depth of the topsoil) before removal. This is to ensure that organic plant material, and the natural seed base is included in the stripping process.

- Soil stockpiles shall not be higher than 2.5m or stored for a period longer than one year. The slopes of soil stockpiles shall not be steeper than 1 to 2.5 (vertical/horizontal).
- No vehicles shall be allowed access onto the stockpiles after they have been placed.
- Stockpiles shall not be allowed to become contaminated with oil, diesel, petrol, garbage or any other material, which may inhibit the later growth of vegetation.
- The Contractor shall apply soil conservation measures to the stockpiles to prevent erosion. This can include the use of erosion control fabric or grass seeding.

3.2.11 Stockpiling

The ESM will identify suitable sites for stockpiling. Stockpiles shall be convex in shape, shall be no higher than 2 m and shall be located so as to cause minimal disturbance. Stockpiles shall be so placed to occupy minimum width compatible with the natural angle of repose of material, and measures shall be taken to prevent the material from being spread over too wide a surface. Where required, appropriate precautions shall be taken to prevent the erosion and limit the compaction of the stockpiles. The Contractor shall ensure that all stockpiles do not cause the damming of water or run off, or is itself washed away.

Top material stockpiles shall not be covered with any material (e.g. plastic) that may kill seeds or cause it to compost. If the stockpiles start to erode significantly or cause dust problems, they shall be covered with hessian. Where practical, Top material shall not be left for longer than six to eight months before being used for rehabilitation. If stored for longer than six months, the Top material shall be analyzed and, if necessary, upgraded before placement.

3.2.12 'No-go' Areas

If so required by the Landscape Architect, certain areas shall be considered "no go" areas. All areas outside the demarcated working areas and Contractor's Camp as well as areas on the Site identified as sensitive by the ESM and/or Landscape Architect, are 'no go' areas. All Public Open Spaces are regarded as 'no-go' areas.

The Contractor shall ensure that, insofar as he has the authority, no unauthorized entry, stockpiling, dumping or storage of equipment or materials shall be allowed within the "no go" areas.

"No go" areas shall be demarcated with fencing consisting of wooden or metal posts at 3m centers with 1 plain wire strand tensioned horizontally at 900 mm from ground level. Commercially available danger tape shall be wrapped around the wire strand. The ESM

shall maintain the fence for the duration of construction and ensure that the danger tape does not become dislodged.

3.2.13 Protection of Natural Features

The Contractor shall not deface, paint, damage or mark any natural features (e.g. rock formations) situated in or around the Site for survey or other purposes unless agreed beforehand with the ESM and Landscape Architect. Any features affected by the Contractor in contravention of this clause shall be restored/ rehabilitated to the satisfaction of the Landscape Architect.

The Contractor shall not permit his employees to make use of any natural water sources (e.g. springs, streams, open water bodies) for the purposes of swimming, personal washing and the washing of machinery or clothes.

3.2.14 Protection of Indigenous Fauna and Flora

Except to the extent necessary for the carrying out of the Works, flora shall not be removed, damaged or disturbed nor shall any vegetation be planted without authorization.

Disturbance and protection of fauna and flora within the boundaries of the Site must be approved by the Landscape Architect.

Where the use of herbicides, pesticides and other poisonous substances has been specified, they shall be stored, handled and applied with due regard to their potential harmful effects. The use of these substances should be kept to an absolute minimum.

Collecting of wood and/or killing trees in the area for the purpose of fire wood is prohibited.

Trapping, removal, harming and/or killing of animals (reptiles, amphibians, mammals, avian/birds) are forbidden.

No domestic pets are permitted on Site.

All alien vegetation (Appendix D) identified along the route alignments (should this occur) will be cleared by the Contractor. An effort must be made to remove the entire root system, and the plant left to dry out on a hard surface to prevent seed germination.

3.2.15 Erosion and Sedimentation Control

During construction works the Contractor shall protect all areas susceptible to erosion and siltation (e.g. stream banks) by installing the necessary drainage or retaining works and by taking other measures necessary to prevent the surface water from being concentrated in

streams and from scouring the stream banks and depositing silt outside the demarcated work areas.

Any runnels or erosion channels developed during construction or during the defects liability period shall be backfilled and compacted, and the areas restored. Stabilization of cleared areas to prevent and control erosion shall be actively managed. Traffic and movement over stabilized areas shall be restricted and controlled, and damage to stabilized areas shall be repaired and maintained to the satisfaction of the Engineer.

Anti-erosion compounds shall consist of an organic or inorganic material to bind soil particles together and shall be a proven product able to suppress dust and erosion. The method of stabilization shall be determined in consultation with the Engineer and Landscape Architect.

Consideration and provision shall be made for the following methods (or combination):

- Brush cut packing.
- Mulch or chip cover.
- Straw stabilizing (at the rate of one bale/20m² and, if required, additional straw should be added and rotated into the top 100 mm of the completed earthworks).
- Watering.
- Planting/sodding.
- Hand seeding sowing.
- Hydroseeding.
- Soil binders and anti-erosion compounds.
- Mechanical cover or packing structures, e.g. gabions and mattresses, geofabric, hessian cover, armourflex, log/pole fencing and retaining walls.

3.2.16 Landscaping and Rehabilitation

Any areas that the Landscape Architect believes may have been impacted upon or disturbed, shall be rehabilitated to his/her satisfaction, which includes all areas where Top material has been stripped. Once construction is complete the Contractor shall clear everything from the Site not forming part of the Permanent Works. The area to be rehabilitated shall first be landscaped to match the topography of the surrounding area as it was prior to construction. The composition of vegetation to be used for any rehabilitation shall be as specified in the Specification Data.

The Contractor may not use herbicides, pesticides, fertilizers or other poisonous substances for the rehabilitation process unless otherwise agreed with the Landscape Architect.

All rehabilitated areas shall be considered “no go” areas and the Contractor shall ensure that none of his staff or equipment enters these areas.

The Contractor shall undertake to remove all alien vegetation re-establishing on the area and shall implement the necessary temporary or permanent measures to combat soil erosion.

(i) Plant Location and Rescue

- If considered necessary, the location and rescue of endemic plants, and their transfer to a specified location (on-site nursery) shall be conducted by a suitably qualified ecologist prior to the onset of any site clearing operations.
- Where possible direct transplantation of rescued plant material, into areas earmarked and prepared for revegetation, shall occur. Transplantation shall only occur in areas of similar habitat and soil type from which rescued plant material originates.
- Where direct transplantation is not feasible, plant material shall be moved to the on-site nursery for transplantation once the permanent revegetation areas become available.
- Rescued plants, which are to be stockpiled at a nursery, shall be stored under damp shade cloth/hessian until they are transported to these sites. They shall be dipped into a moisture-retaining agent and bagged in the topsoil from the area.

(ii) Vegetation Clearance

- All cleared areas shall be stabilized as soon as possible. Areas that are, in the opinion of the Landscape Architect, less stable, shall be stabilized immediately following vegetation clearance. It is recommended that a phased vegetation clearance plan and strategy be drafted, accompanied with a map.
- The disposal of vegetation by burying or burning is prohibited. Cleared vegetative material shall:
    - be removed from Site and disposed of at an approved disposal site;
    - be chipped and mulched, where suitable.
- Vegetation shall be cleared mechanically. Care shall be taken to minimize the disturbance to topsoil during this process.
- During site clearance, any old concrete, rubble or refuse shall be removed from the Site, or stockpiled for disposal at an approved disposal site. All stockpiles shall be managed so as to avoid damage to vegetation.
- Where practical, indigenous plant material shall be kept separate from alien material. The vegetative material shall be reduced either by mechanical means (chipper) or by hand axing to sticks of no longer than 100 mm.
- All indigenous vegetation cleared from the Site shall be collected for later use. Where appropriate, with permission from the Landscape Architect, the indigenous material shall be collected simultaneously with the topsoil.
- The Contractor shall store the mulched vegetation in bags. The bags shall be approved by the Landscape Architect and shall allow air to pass through the enclosed material. Mulch shall be protected from wetting.

- Subject to the approval of the Landscape Architect, seed-free material from exotic invasive plants shall be chipped and used to prepare mulch.
- The Contractor shall stabilize soil in unstable areas in order to control wind-blown dust and sand.

(iii) Fertilization

- Fertilizer shall be added to the soil on seeding or planting.
- The rate of application shall be as directed by the Landscape Architect after he has had the opportunity of testing the requirements of the soil in which the vegetation is to be planted.
- Because of the high phosphate level in the canals, fertilizers containing fast-release phosphates, such as Super Phosphate, should not be used. Fertilizers to be considered must be approved by the Landscape Architect prior to purchase and application.

(iv) Time of Planting

- The Contractor shall not begin planting work until all construction activities in the area to be revegetated have been completed.
- Reseeding and replanting shall occur at a time as indicated by the Landscape Architect by taking the summer rainfall period of the area into account.
- If planting occurs in the dry periods it shall be necessary to irrigate plants to ensure their successful establishment.

(v) Revegetation

- The area shall be revegetated as follows:
    - The surface shall be levelled by hand or machine as far as practically possible.
    - Alien vegetation shall be cleared by cutting the plants off at ground level, and painting the stump with 0.5% Garlon in diesel.
    - For areas with a slope of greater than 1:3, straw shall be utilized as a binding material to stabilize the soil during revegetation and rehabilitation of the site. Straw shall consist of natural, dried fibers of hay or chaff of various lengths between 50 mm and 400 mm, delivered to Site in bales and shall be applied evenly by hand or machine at a rate of 1 bale per 20 m² over the area to be revegetated. It shall then immediately be rotovated into the upper 100 mm layer of soil.
    - The prepared area shall be hydro- or hand-seeded at a rate of 40 kg/ha using Rye grass (*Lolium multiflorum*). In the event of hand-seeding, the seed mixture as specified shall be mixed with two parts per volume of clean dry plaster sand, then divided in half and applied evenly in two successive applications, one after the other, by means of an approved hand seeding

machine (known colloquially as a “tefsaaier”). On completion of the seeding the surface shall be lightly raked to cover the seed with no more than 5 mm of soil.

- Water used for the irrigation of vegetated areas shall be free of pollutants that will have a detrimental effect on the plants. The vegetated area shall only be watered once, immediately following seeding. Watering should be carried out from a tanker, using a fine nozzle spray to avoid erosion and disturbance of the vegetation. Water for irrigation purposes may not be drawn from any water body.

(vi) Soil Stabilization

The same methods as discussed under point 3.2.10 above will be applicable.

3.2.17 Protection of Archaeological and Paleontological Remains

Archaeological sites are protected by the National Heritage Act No 27 of 2004. Generally, it is an offence to disturb, destroy or remove from its original site any archaeological material, or excavate any such site without permission.

The Contractor shall take reasonable precautions to prevent any person from removing or damaging any fossils, coins, articles of value or antiquity and structures and other remains of archaeological interest discovered on the Site, immediately upon discovery thereof and before removal.

Should any archaeological materials works shall cease immediately and the area shall be cordoned off until such time as the ESM authorizes resumption of construction in writing. The ESM shall immediately report the findings to the National Monuments Council. The latter will inspect the area within 24 hours of a find being reported (to prevent unnecessary delays in works) and make further recommendations. Mitigation measures should be implemented if required.

3.2.18 Safety

Relevant occupational Health and Safety requirements shall be adhered to. Telephone numbers of emergency services, including the fire safety officer, shall be displayed conspicuously in the Contractor's office near a telephone. No firearms are permitted.

Staff must be made aware of their responsibilities to ensure that impacts such as fire, safety and pollution are taken care of. This must form part of the Environmental Education. The movement of construction workers must be controlled and access to adjacent properties must be prohibited.

The contractor's personnel must be adequately trained and informed in the tasks that they are expected to perform. This is required for their own safety as well as the safety of colleagues and other interested and/or affected parties.
All excavated areas and/or holes should be clearly demarcated.

3.2.19 Fire Control

No fires may be lit on site. Any fires that occur shall immediately be reported to the ESM.

Smoking shall not be permitted in those areas where it is a fire hazard. Such areas shall include the workshop and fuel storage areas and any areas where the vegetation or other material is such as to make liable the rapid spread of an initial flame. Cigarette butts must be disposed of in designated containers.

In terms of the Atmospheric Pollution Prevention Act (No. 45 of 1965), burning is not permitted as a disposal method.

The Contractor shall appoint a competent fire safety officer who shall be responsible for ensuring immediate and appropriate actions in the event of a fire and shall ensure that employees are aware of the procedure to be followed. The Contractor shall ensure that there is basic fire-fighting equipment (e.g. fire buckets, extinguishers, fire beaters, etc.) available on Site at all times. This shall include at least rubber beaters when working in urban open spaces and one fire extinguisher of the appropriate type when welding or other "hot" activities are undertaken.

Open fires for cooking purpose are not allowed, except within the Contractor's camp under controlled conditions.

3.2.20 Emergency Procedures

The Contractor's procedures for the following emergencies shall include:

(i) Fire

- The Contractor shall inform all relevant parties of a fire as soon as one starts and shall not wait until it can no longer be controlled.
- The Contractor shall ensure that his employees are aware of the procedure to be followed in the event of a fire.

(ii) Accidental Leaks and Spillages

- The Contractor shall ensure that his employees are aware of the procedure to be followed for dealing with spills and leaks, which shall include notifying the ESM and Resident Engineer.
- The Contractor shall ensure that the necessary materials (e.g. chemcap, spill-sorb, drizzat pads, enretech and peat moss) and equipment for dealing with spills and leaks are available on Site at all times.
- The source of the spillage shall be isolated. The Contractor shall contain the spillage using sand berms, sandbags, pre-made booms, saw dust or absorbent materials. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the ESM and Resident Engineer.

3.2.21 Community Relations

The Contractor shall erect and maintain information boards in the position, quantity, design and dimensions specified. Such boards shall include contact details for complaints by members of the public in accordance with details provided by the Engineer. The Contractor shall also keep a "Complaints Register" on Site. The Register shall contain all contact details of the person who made the complaint, and information regarding the complaint itself.

3.2.22 Construction Personnel Information Posters

The Contractor shall erect and maintain information posters for the information of his employees depicting actions to be taken to ensure compliance with aspects of the specifications. Such posters shall be erected at the eating areas, 'no go' areas and any other locations specified by the Resident Engineer and/or ESM.

3.2.23 Temporary Site Closure

If the Site is closed for a period exceeding one week, the following checklist procedure shall be carried out by the Contractor in consultation with the ESM and Resident Engineer. Contractor's Safety Officers (in terms of the relevant Occupational Health and Safety Act) to check the Site and report.

- Fuels/flammables/hazardous materials stores
    - Ensure fuel stores as low in volume as possible.
    - No leaks.
    - Outlet secure/locked.
    - Bund empty (where applicable).
    - Fire extinguishers serviced and accessible.
    - Secure area from accidental damage, e.g. plant collision.
    - Emergency and contact numbers to be available and displayed.

    - Adequate ventilation.
- Safety
    - All trenches and manholes secured.
    - Fencing and barriers in place as per the relevant Occupational Health and Safety Act.
    - Notice boards applicable and secured.
    - Emergency and management contact details displayed.
    - Security persons briefed and have facility for contact.
    - Fire hazards identified.
    - Scaffolds secure.
    - Inspection schedule and log by security staff.
- Erosion and siltation
    - Wind and dust mitigation in place.
    - Stockpiles at stable angle.
    - Detention ponds or channels in place.
    - Erosion protection measures in place.
    - Revegetated areas watering schedules and supply secured.
- Water contamination and pollution
    - Fuels hazardous stores secure.
    - Cement and materials stores secured.
    - Toilets empty and secured.
    - Refuse bins empty and secured (lids).
    - Bunding clean and treated.
    - Drip trays empty and secure (where possible).
- Structures vulnerable to high winds secure.

3.3 MATERIALS

3.3.1 Hazardous Substances

Petroleum, chemicals, harmful and hazardous waste shall be stored in an enclosed and bunded area. This area shall be subject to the approval of the Engineer. The waste shall be disposed of at a hazardous waste disposal site as approved by the ESM.

3.3.2 Handling, Use and Storage of Construction Materials

The Contractor shall ensure that delivery personnel are informed of all procedures and restrictions (including 'no go' areas) required to comply with the Specifications. The Contractor shall ensure that delivery personnel are supervised during offloading by someone with an adequate understanding of the requirements of the Specifications.

Materials shall be appropriately secured to ensure safe passage between destinations. Loads including, but not limited to sand, stone chip, cement and refuse, shall have appropriate cover to prevent them spilling during transit. The Contractor shall be responsible

for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.

All manufactured and/or imported material shall be stored within the Contractor's Camp, and, if so required, out of the rain. All lay down areas outside of the Contractor's Camp shall be subject to the ESM's approval, which shall not unreasonably be withheld.

(i) Importation of fill/soil/sand materials

- Imported materials shall be free of weeds, seeds, litter and contaminants.
- Sources of imported material shall be listed and approved by the ESM and Resident Engineer.
- Stockpile areas will be identified by the Resident Engineer and agreed upon by the ESM and Landscape Architect before any stockpiling commences.

(ii) Topsoil

- The top 30 cm of topsoil must be stripped before any grading or bulk earthworks begin and stockpiled separately for use in rehabilitation. Topsoil may not be compacted or covered in any way during stockpiling.
- Topsoil shall be stockpiled in the area where it was removed and should be used again in the vicinity where it was removed.

(iii) Spoil material

- The location of spoil stockpiles shall be identified by the Engineer and agreed upon by the ESM and Landscape Architect prior to any stockpiling.
- No spoil material shall be dumped outside the defined site unless it is being removed from the Site, as approved by the ESM and Resident Engineer.
- Spoil stockpiles shall be convex and should not exceed 2 m in height. The Contractor shall ensure that the spoil material does not blow or wash away. If it is in danger of being washed or blown away, the Contractor shall cover it with a suitable material, such as hessian or plastic.

3.3.3 Plant Material

For all landscaping and rehabilitation work only plants approved by the Landscape Architect may be used (Appendix C). No declared invasive alien species may be used (Appendix D).

(i) Shrubs and trees

The Contractor shall ensure that each plant is handled and packed in the approved manner for that species or variety, and that all necessary precautions are taken to ensure that the plants arrive on Site in a proper condition for successful growth.

Trucks used for transporting plants shall be equipped with covers to protect the plants from windburn. Containers shall be in a good condition. Plants shall be protected from wind during the transportation thereof.

The Landscape Architect shall ensure that the plants are in a good condition and free from plant diseases and pests. The Landscape Architect in support of the Contractor shall immediately remove plants containing any diseases and/or pests from the Site.

There shall be sufficient topsoil around each plant to prevent desiccation of the root system. Where plants are stored on Site prior to planting they shall be maintained to ensure that the root systems remain moist.

3.4 CONSTRUCTION PLANT

3.4.1 Fuel and Oil

If so required, fuel may be stored on Site in a depot complying with the requirements listed below. Where reasonably practical, construction vehicles and equipment shall be refuelled at the depot or at the workshop as applicable. The surface under the refuelling area shall be protected (bunded) against pollution to the satisfaction of the Resident Engineer and ESM prior to any refuelling activities.

The Contractor shall ensure that there is always a supply of absorbent material (e.g. chemcap, spill-sorb, drizzat pads, enretech and peat moss) readily available to neutralize and where possible be designed to encapsulate minor spillage. The quantity of such materials shall be able to handle a minimum of 200 ℓ of liquid spill.

(i) Fuel storage areas

- The ESM and Resident Engineer shall be advised of the area that the Contractor intends using for the storage of fuel. Fuels shall be stored at a suitable location inside the Contractor's Camp.
- The fuel storage area must not be located near (i.e. less than 100m) any water resource, including a river, stream or surface water body, or borehole.
- The Contractor shall ensure that all liquid fuels (petrol and diesel) are stored in tanks with lids, which are kept firmly shut.
- The tanks shall be situated on a smooth impermeable surface (250 µm plastic or concrete) base with an earth bund (plastic must have a 5cm layer of sand on top to

prevent perishing). The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 110% x the total capacity of all the storage tanks.

- The floor shall be bunded and sloped towards a sump to contain any spillages of substances. The bund shall be inspected and emptied daily, and serviced when necessary. The bund shall be closely monitored during rain events to ensure that it does not overflow.
- The Contractor shall keep fuel under lock and key at all times. No smoking shall be allowed in the vicinity of fuel tanks.
- The Contractor shall educate workers on the appropriate methods for workshop maintenance and fuel points to prevent fuel and oil being washed out of containment areas.
- Only empty and externally clean tanks may be stored on the bare ground. All empty and externally dirty tanks shall be sealed and stored on an area where the ground has been protected. In addition, if fuel is dispensed from 200 ℓ drums, the proper dispensing equipment shall be used, and the drum shall not be tipped in order to dispense fuel. The dispensing mechanism of the fuel storage tank shall be stored in a waterproof container when not in use.
- Symbolic safety signs depicting “No Smoking”, “No Naked Lights” and “Danger” are to be provided, and are to conform to the requirement of SABS 1186.
- The product contained within the tank shall be clearly identified; using the emergency information system detailed in SABS 0232 part 1.
- Any electrical or petrol-driven pump shall be equipped and positioned, so as not to cause any danger of ignition of the product.
- Areas for storage of fuels and other flammable materials shall comply with standard fire safety regulations and may require the approval of the fire safety officer.
- The Contractor shall ensure that there is adequate fire-fighting equipment at the fuel stores and that staff are adequately trained to use this equipment.

(ii) Fuel storage tanks

- Temporary above ground storage tanks may be permitted at the discretion of the ESM and Resident Engineer based on the merit of the situation, provided that the following requirements are met:
- All such tanks are to be designed and constructed in accordance with a recognized Act and code (Petroleum Product and Energy Act, No. 13 of 1990, as amended).
- The rated capacity of such a tank shall provide sufficient capacity to permit expansion of the product contained therein by the rise in temperature during storage.
- The tank shall be erected at least 3.5 m from buildings, boundaries and any other combustible or flammable materials.
- Adequate precautions shall be provided to prevent spillage during the filling of any tank.
- Soil contaminated by oil, fuel or chemicals shall be removed and disposed of at a registered Hazardous Waste Disposal Site or rehabilitated *in-situ*.

- If larger capacity tanks are required then an acceptable rational design based on a relevant national or international code or standard shall be submitted to the Directorate Energy, Petroleum and Downstream (Ministry of Mines and Energy).

3.4.2 Ablution Facilities

Washing, whether of the person or of personal effects and acts of excretion and urination are strictly prohibited other than at the designated facilities provided. Provision shall thus be made for ablution and washing facilities.

The exact location of the facilities shall be approved by the ESM and Resident Engineer prior to establishment. All temporary portable toilets shall be secured to the ground to prevent them toppling due to wind or any other cause.

Toilets supplied by the Contractor for the workers shall occur at a maximum ratio of 1 toilet per 30 workers (preferred 1:15) and be within walking distance of the staff. These facilities shall be maintained in a hygienic state and serviced regularly. Toilet paper shall be provided. The Contractor shall ensure that toilets are emptied regularly, as well as before the builders' holidays. The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are removed from Site. Discharge of waste from toilets into the environment is prohibited.

3.4.3 Eating Area

The Contractor shall provide bins with lids at the eating areas for his staff, which shall be emptied on a daily basis. The waste may be temporarily stored inside the Contractor's Camp in a facility that is weatherproof and scavenger-proof and which has been approved by the Engineer. The feeding or discarding of food for animals is strictly prohibited.

3.4.4 Solid Waste Management

No burying or dumping of any waste materials, rubble, vegetation or refuse shall occur on Site. The Contractor shall set up a solid waste control and removal system to fit into the larger Project waste management system. The waste may be temporarily stored on Site in a central waste area that is weatherproof and scavenger-proof, and which the ESM and Resident Engineer has approved. The accumulation of construction waste materials must be avoided as far as possible. The system shall comply with the following detailed requirements:

(i) Dumping

- Receipts for hazardous waste disposal shall be copied to the ESM and Engineer.

- Refuse shall be disposed of into scavenger- (baboons, dogs, rodents, etc.) and weather-proof bins. The Contractor shall then remove the refuse collected from the working areas, from Site at least once a week or depending on necessity.
- Refuse must be disposed of at an authorized municipal landfill site.
- The Contractor shall make provision for workers to clean up the Contractor's Camp and working areas at least once a week.

(ii) Recycling

- Wherever possible, materials used or generated by construction shall be recycled.
- Containers for glass, paper, metals and plastics shall be provided (a four bin recycling system). Office and camp areas are particularly suited to this form of recycling process.
- Where possible and practical, such as at stores and offices, waste shall be sorted for recycling purposes.

3.4.5 Waste Water Management

The Contractor shall set up a contaminated water management system, which shall include collection facilities to be used to prevent pollution, as well as suitable methods of disposal of contaminated water to fit into the larger waste water management system. The Contractor shall prevent the discharge of water contaminated with any pollutants, such as soaps, detergent, cements, concrete, lime, chemicals, glues, solvents, paints and fuels, into the environment. The Contractor shall notify the ESM and Resident Engineer immediately of any pollution incidents on Site.

Water from kitchens, showers, sinks, etc. shall be discharged into a conservancy tank for removal from Site. Runoff from fuel depots/workshops/truck washing areas and concrete swills shall be directed into a conservancy tank and disposed of at an approved municipal hazardous waste site.

Wash areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas are not polluted. This includes, but is not limited to, concrete batching areas, vehicle washing, workshop wash bays, paint wash and cleaning. Wash areas for domestic use shall ensure that the disposal of contaminated water is sanctioned by the ESM.

3.4.6 Workshop, Equipment Maintenance and Storage

Where practical, all maintenance of plant and equipment on Site shall be performed in the workshop. If it is necessary to do maintenance outside of the workshop area, the Contractor shall obtain the approval of the ESM prior to commencing activities.

All plant and equipment shall be kept in good working order and serviced regularly. Equipment shall be removed immediately from the Site and repaired. When the Contractor carries out emergency plant maintenance it is essential that there is no pollution to the environment. This will be overseen by the ESM and Resident Engineer.

The workshop shall have a smooth impermeable (concrete or 250 µm plastic covered with sand) floor, which is bunded and sloped towards an oil trap to contain any spillages. When servicing equipment, drip trays shall be used to collect the waste oil and other lubricants. The floor shall be bunded and sloped towards an oil trap or sump to contain any spillages of substances (e.g. oil). Drip trays shall also be provided in construction areas for stationary plant (such as compressors) and for "parked" plant (such as scrapers, loaders, vehicles). Drip trays shall be inspected and emptied daily. Drip trays shall be closely monitored during rain events to ensure that they do not overflow. Where practical, the Contractor shall ensure that equipment is covered so that rainwater is excluded from the drip trays.

All washing shall be restricted to a minimum. If essential, washing must be undertaken in the workshop or maintenance areas. The use of detergents for washing shall be restricted to low phosphate and nitrate containing and biodegradable-type detergents. Runoff should be collected, contained and disposed of at an approved municipal hazardous waste site.

3.4.7 Noise

Construction activities can cause environmental noise pollution. A disturbing noise is one that exceeds the zone sound level or the ambient sound level by 7 dB or more. A noise nuisance is defined as meaning “any sound that disturbs or impairs or may disturb or impair the convenience or peace of persons”. This includes the use of power tools, movement of vehicles, etc.

Where excess noise generation is unavoidable, the Contractor shall, by means of barriers, effectively isolate the source of any such noise in order to comply with the said regulations. The Contractor shall limit noise levels (e.g. install and maintain silencers on machinery). Appropriate directional and intensity settings are to be maintained on all hooters and sirens. No amplified music shall be allowed on Site. The use of radios, tape recorders, compact disc players and television sets shall not be permitted unless the volume is kept sufficiently low. The Contractor shall not use sound amplification equipment on Site unless in emergency situations.

The following specific measures must therefore be adhered to:

- Limit construction times to the following hours:
- 07:00 to 18:00 during the week (Monday to Friday);
- 08:00 to 17:00 on Saturdays, and
- No noisy activities on a Sunday.

- Should blasting be required during the construction phase, the necessary permits must be obtained from the local authority and any other relevant authority.
- The contractor must comply with all applicable occupational health and safety requirements.
- Blasting times must be limited to the hours from 08:00 to 17:00 during weekdays only.
- Screen construction activities from residential, social and business entities with soil berms to limit noise.

3.4.8 Dust

The Contractor shall take all reasonable measures to minimize the generation of dust as a result of construction activities to the satisfaction of the ESM.

The Contractor's dust management planning shall, as a minimum, take cognizance of the following:

- Schedule of spraying water on unpaved roads paying due attention to control of runoff.
- Speed limits for vehicles on unpaved roads and minimization of haul distances.
- Measures to ensure that material loads are properly covered during transportation.
- Schedule for wheel cleaning and measures to clean up public roads that may be soiled by construction vehicles.
- Minimization of the areas disturbed at any one time and protection of exposed soil against wind erosion, e.g. by dampening with water or covering with straw.
- Location and treatment of material stockpiles taking into consideration prevailing wind directions and location of sensitive receptors.
- Controlled blasting techniques to minimize dust and fly rock during blasting.
- Reporting mechanism and action plan in case of excessive wind and dust conditions.
- Removal of any vegetation shall be avoided as far as possible, while handling and transport of erodible materials shall be avoided under high wind conditions.
- During high wind conditions, the ESM and Resident Engineer will evaluate the situation and make recommendations as to whether dust-damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level. Where possible, stockpiles shall be located in sheltered areas. Where erosion of stockpiles becomes a problem, erosion control measures shall be implemented at the discretion of the ESM and Resident Engineer.
- Appropriate dust suppression measures shall be used when dust generation is unavoidable, e.g. straw, brush packs and chipping, particularly during prolonged dry periods in summer. Such measures shall also include the use of temporary stabilizing measures (e.g. chemical soil binders and dustex).

3.4.9 Lights

The Contractor shall ensure that any lighting installed on the site for his activities does not interfere with road traffic or cause a reasonably avoidable disturbance to the surrounding community or other users of the area.

3.4.10 Site Structures

All site establishment components (as well as equipment) shall be positioned to limit visual intrusion on neighbours and the size of area disturbed. The type and colour of roofing and cladding materials to the Contractor's temporary structures shall be selected to reduce reflection.

3.4.11 Groundwater

The abstraction of groundwater for use during the construction phase should precede an approval from Water Affairs with the Ministry of Agriculture, Water and Forestry.

3.5 POST CONSTRUCTION

3.5.1 Ripping of Compacted Soil

All areas where soil has been compacted due to construction activities must be ripped in two perpendicular directions to a depth of 0.15m.

3.5.2 Site Rehabilitation

The site must be cleared of all construction equipment, waste and associated materials by the end of the construction phase of the project.

Areas that were cleared for construction purposes such as the contractor’s camp should be restored to its original condition.

Stockpiled topsoil and indigenous vegetation should be used for all rehabilitation purposes.

All burrow pits that were utilized for the abstraction of building materials should be rehabilitated to the minimum requirements of the Department of Minerals and Energy.

The rehabilitation plan must ensure that erosion by runoff water does not occur.

3.6 COMPLIANCE WITH REQUIREMENTS AND PENALTIES

Environmental management is concerned not only with the final results of the Contractor's operations to carry out the works but also with the control of how those operations are carried out. Tolerance with respect to environmental matters applies not only to the finished product but also to the standard of the day-to-day operations required to complete the works. It is thus required that the Contractor shall comply with the environmental requirements on an ongoing basis and any failure on his part to do so will entitle the ESM to certify the imposition of a fine subject to the details set out below. Moneys from fines/penalties will be managed and allocated at the discretion of the Environmental Forum.

3.6.1 Penalties

Penalties will be issued for certain transgressions. Penalties may be issued per incident and per individual at the discretion of the ESM and Resident Engineer. Such penalties shall be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental Specifications.

The ESM will inform the Contractor of the contravention and the amount of the penalty, and will be entitled to deduct the amount from monies due under the Contract.

Spot fines of between N$100.00 and N$2,000.00, including but not limited to those activities detailed below, shall be imposed by the ESM and Resident Engineer on the Contractor for contraventions of the environmental specifications by individuals or operators employed by the Contractor and/or his subcontractors. Where there are ranges, the amount shall depend on the severity and extent of the damage done to the environment:

An individual walking outside the demarcated boundaries of the Site or within a 'no-go' area	N$ 100.00
An individual operating any plant outside the boundaries of the Site	N$ 500.00 to N$ 2,000.00
An individual driving off earmarked roads, outside the boundaries of the Site or within a 'no-go' area	N$ 2,000.00
A plant operator ignoring a verbal warning to have an oil leak from his machinery repaired	N$ 200.00
An individual littering on Site	N$ 100.00
An individual not making use of the ablution facilities	N$ 100.00
An individual making an illegal fire on Site	N$ 1,500.00
An individual polluting the environment due to poor waste management, cement mixing on bare ground, paint washing, etc.	N$ 1,000.00 to N$ 2,000.00

For each subsequent similar offence committed by the same individual, the fine shall be doubled in value to a maximum value of N$ 4,000.00. Repeat offenders may also face disciplinary and/or legal action and/or dismissal.

3.6.2 Penalty Fines

Where the Contractor inflicts non-repairable damage upon the environment or fails to comply with any of the environmental specifications, he shall be liable to pay a penalty fine over and above any other contractual consequence.

The Contractor is deemed NOT to have complied with these specifications if:

- within the boundaries of the Site, site extensions and access routes there is evidence of contravention of these specifications;
- environmental damage ensues due to negligence;
- the Contractor fails to comply with corrective or other instructions issued by the Engineer within a specific time; and
- the Contractor fails to respond adequately to complaints from the public.

The amount of penalty shall be determined by the ESM and Resident Engineer.

Payment of any fines in terms of the contract shall not absolve the offender from being liable from prosecution in terms of any law.

The following penalties are suggested for transgressions:

a.	Erosion and siltation	A penalty equivalent in value to the cost of rehabilitation plus 20%.
b.	Unnecessary damage to vegetation outside the demarcated works area (no-go areas)	A penalty equivalent in value to the cost of rehabilitation plus 20%.
c.	Unnecessary damage to archaeological material	A penalty to a maximum of N$10,000.00 shall be paid for any damage to archaeological material without permission.
d.	Injuring or killing of wildlife	A penalty to a maximum of N$10,000.00 shall be paid for any wildlife injured or killed. The Contractor shall also be liable for all the costs of rehabilitation to all wildlife if they become injured as a direct result of neglect at the Site.

3.6.3 Removal from Site and Suspension of Works

The Engineer in consultation with the ESM and approved by the Environmental Forum may instruct the Contractor to remove from Site any person(s) who in their opinion is guilty of misconduct, or is incompetent, negligent or constitutes an undesirable presence on Site. These Specifications requires that all Plant be in good working order, and accordingly the Engineer may order that any Plant not complying with the Specifications be removed from Site. Where the ESM and Resident Engineer deem the Contractor to be in breach of any of the requirements of this Specification, he may order the Contractor to suspend the progress of the Works or any part thereof.

3.7 MEASUREMENT AND PAYMENT

No separate measurement and payment will be made to cover the costs of complying with the CEMP and such costs shall be deemed to be covered by the rates tendered for the items in the Schedule of Quantities completed by the Contractor when submitting his tender.

3.8 MITIGATION MEASURES AND PROPOSED MANAGEMENT PROGRAMME

The table below outlines those specific mitigation measures required in order to fulfil the recommendations. These measures must be implemented during the construction phase (including future construction) of the Bulk Infrastructure Services for the Elisenheim Township. The responsibility for these measures is included in Column 4.

This forms a general code of conduct for all contractors operating on the sight.

While responsibilities have been assigned to various other parties, it must be borne in mind that ultimately the applicant and his/her successor are held responsible for any damage to the environment as a result of the development and that non-compliance with the CEMP will be regarded as non-compliance in terms of the Environmental Authorization.

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
PLANNING & DESIGN				
Contractor Requirements	Ensure that the Contractor is aware of his/her responsibility.	Provide the contractor with the CEMP.	ESM	
Environmental Site Manager	Ensure that activities on site are compliant with the requirements of the CEMP.	Appoint an independent Environmental Site Manager to oversee environmental aspects of the development.	Elisenheim Property Development Company (PTY) Ltd	
Visuals & Aesthetics	Ensure that the visual aspects of construction are taken into consideration to lessen impacts on neighbouring activities.	Screen construction areas with shade cloth or other suitable material from adjacent properties.	Contractor	
Waste Management	Ensure the effective and efficient separation, storage and removal of waste from the site.	Develop a Waste Management Plan for the construction phase which will detail: • Schedules for collection • Responsible parties for collection • Details regarding waste separation (hazardous vs. general) • Provision of facilities for the separation and storage of waste • Details regarding the disposal of the waste (hazardous and general) • Assigns responsibilities for these activities	ESM & Resident Engineer	
Loss of habitat/eco-systems	Conserve tall indigenous trees.	Indigenous trees should be preserved to recreate and improve some important habitats.	Contractor	
SITE ESTABLISHMENT				
Construction activities	Ensure that there is no unnecessary disturbance to areas on the site and that construction activities take environmental considerations into account.	A layout plan for construction activities needs to be developed and approved by the Environmental Site Manager.	Engineer Contractor Environmental Site Manager	
Contractor's Camp	Ensure that the contractor's camp does not pollute the environment and is not located on a sensitive site.	Staff facilities, ablutions, and chemical toilets, potable water must be provided for the staff.	Contractor	
Contractor's Camp	Ensure that camp does not infringe on adjacent property owners.	Locate the camp away from immediately adjacent property owners.	Contractor	
Soil	Ensure preservation of the top soil.	Top soil stockpiles must be established in disturbed zones.	Contractor	
Soil	Ensure that erosion impacts and siltation is kept under control.	Areas scheduled for construction should be cleared only 1 week prior to construction.	Contractor	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
Training	Improve the awareness of all construction personnel with regard to environmental matters.	Develop and implement a training programme to address environmental issues and responsibilities.	Environmental Site Manager Contractor	
CONSTRUCTION				
Archaeological Evidence	Ensure the protection of archaeological sites.	Construction must be stopped and a professional archaeologist consulted should any archaeological remains be uncovered.	Contractor Environmental Site Manager Archaeologist	
Borrow Pits	Ensure that the soil resources are not over exploited.	No borrow pit may be excavated from any sensitive or open space areas.	Contractor & Environmental Site Manager	
Blasting	Ensure blasting does not pose a danger to workers or staff, or neighbouring activities.	Authorization to undertake blasting activities must be obtained from the relevant authority.	Contractor	
Blasting	Ensure blasting does not pose a danger to workers or staff.	All conditions relating to blasting and the Occupational Health & Safety Act must be complied to.	Contractor	
Cleaning of equipment	Ensure that spillages are minimized and that where these occur, that they are appropriately managed.	Proper cleaning trays should be used for the cleaning of cement mixing and handling equipment.	Contractor	
Communication	Ensure that interested and affected parties are provided with a medium through which to lay complaints with regard to activities on site.	A complaints register should be kept in the site office. The Environmental Forum needs to be informed of all complaints and corrective action must be taken where required.	Contractor	
Contaminated Soil	Ensure that soils that are contaminated do not pollute the environment.	All soils that have been contaminated by fuel spills, paints spills, etc. must be appropriately removed from the site.	Contractor	
Contractor's camp	Ensure that the contractor's camp is secure.	All materials and equipment that can be moved must be stored overnight in the contractor's camp.	Contractor	
Dust	Ensure dust does not cause nuisance to neighbouring activities.	Wet all exposed sand areas such as roadways, stockpiles and working areas that give rise to dust. This must ensure adequate dust suppression.	Contractor	
Environmental Site Manager and RE	Ensure that there is compliance with the CEMP on site.	An Environmental Site Manager may inspect the site at any time during the construction phase.	Environmental Site Manager	
Effect of the CEMP	Ensure that the CEMP is enforced on all contractors.	Each contractor and subcontractor must be notified on the content of this CEMP.	Resident Engineer & Environmental Site Manager	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
Effect of the CEMP	Ensure that the CEMP is enforced on all contractors	All contractors and subcontractors must be bound by the content and requirements in this CEMP.	Resident Engineer & Environmental Site Manager	
Ground Water	Prevent the contamination of groundwater resources.	Vehicles must be equipped with drip trays to prevent spillages of oils and fuels.	Contractor	
Loss of surrounding habitat and sensitive species	Prevent the destruction of protected, medicinal or sensitive plant species.	Protected, medicinal and/or sensitive plants that are likely to be destroyed or affected by construction activities should be relocated to more suitable areas.	Contractor	
Installation of Services	Ensure that all points for water provision are regularly inspected for erosion impacts.	Implement adequate mitigating measures to curtail any erosion impacts.	Contractor	
Installation of Services	Ensure that water used to wash machinery and any other “grey” water does not pollute the site.	Provide a wash bay with a impermeable floor to contain such water.	Contractor	
Litter	Ensure that the site remains clean and clear of litter.	All litter must be collected into rubbish bins located on the site. These bins must be regularly (i.e. weekly) collected and transported to a registered waste disposal facility.	Contractor	
Noise	Ensure that nuisance noise from construction activities does not disrupt the surrounding landowners.	Limit construction time to the following hours: 07:00 to 18:00 during week; 08:00 to 15:00 on Saturdays, and no noisy activities on Sundays.	Contractor	
Noise	Ensure that nuisance noise does not disrupt the surrounding land owners.	Jack hammering and blasting, if required, must take place between the hours of 08:00 and 17:00 during the week only.	Contractor	
Noise	Ensure that nuisance noise from construction vehicles does not disrupt the surrounding landowners.	No heavy vehicles may be permitted to move on site on Sundays.	Contractor	
Road Works and Traffic	Ensure that soil does not erode from culverts or similar structures.	All culverts or similar structures must be stabilized with gabions and/or indigenous grasses.	Contractor	
Road Works and Traffic	Ensure that local residents are not inconvenienced by the movement of construction vehicles off-site.	The movement of heavy vehicles from the site must occur outside of peak traffic hours (after 08h30 and before 16h30).	Contractor	
Road Works and Traffic	Ensure that local residents are not inconvenienced by the movement of construction vehicles off-site.	Spillages on the roads should be avoided. When these occur, they should be cleaned immediately.	Contractor	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
Road Works and Traffic	Ensure that local residents are not inconvenienced by the movement of construction vehicles off-site.	Notices should be placed on the B6 Road during the construction period indicating that heavy vehicles are using the road.	Contractor	
Safety & Security	Ensure the safety and security of staff and the public.	All local authority by-laws must be adhered to.	Contractor	
Safety & Security	Ensure the safety and security of staff and the public.	All contractors must take cognizance of and abide by the Occupational Health and Safety Act.	Contractor	
Safety & Security	Ensure the safety and security of staff and the public.	Trenches to a depth greater than 1.5 m must be supported or appropriate warning must be provided.	Contractor	
Safety & Security	Ensure the safety and security of staff and the public.	Provided fencing needs to be checked and maintained.	Contractor	
Safety & Security	Ensure the safety and security of staff and the public.	The movement of construction workers through the neighbouring area should be restricted wherever possible.	Contractor	
Soil	Ensure that storm water cannot erode the top soil stockpile.	Construct and maintain a berm around top soil stockpiles.	Contractor	
Storage Facilities	Ensure that hazardous materials are stored according to legislative requirements.	Specifically designed storage facilities need to be provided and used for hazardous materials.	Contractor	
Storage Facilities	Ensure that fuel stored on site does not pose a pollution and fire hazard.	Fuels stored on site shall be bunded to 110% of the capacity of the largest container.	Contractor	
Storage Facilities	Ensure that fuel stored on site does not pose a pollution hazard.	The fuel storage area must not be located less than 100m from any water resource.	Contractor	
Storm Water Run-off	Ensure that run-off does not contribute to erosion & siltation.	Construct and maintain berms on the site to contain storm water run-off or establish riffle beds or retention ponds, as appropriate.	Contractor	
Vehicle repairs	Ensure that spillages are minimized and that where these occur, that they are appropriately managed.	Minor vehicle repairs on an appropriate work surface may only take place within the provided area in the contractors camp	Contractor	
Waste	Ensure the adequate removal of solid waste.	All wastes (hazardous or general) must be collected and disposed of at an appropriate registered facility.	Contractor	

Issue	Objective	Mitigation Measure	Responsibility	Compliance Notes
Waste	Ensure the adequate management of waste	Refuse shall be disposed of into scavenger-(baboons, dogs, rodents, etc.) and weather-proof bins. The Contractor shall then remove the refuse collected from the working areas, from Site at least once a week or depending on necessity. Refuse must be disposed of at an authorized landfill acceptable to the DEA.	Contractor	
Waste	Ensure the adequate management of waste.	No waste should be burnt on site.	Contractor	
POST CONSTRUCTION				
Site Rehabilitation	Ensure the site is left clean, orderly and free of rubble after construction activities.	Remove all rubble, rubbish, litter, unused building equipment, contaminated soils or any other relevant articles from the site following the end of the construction phase.	Contractor	
Soil	Promote the rehabilitation of the site back to its original condition as far as possible.	Soil that has been compacted during construction activities must be ripped in two perpendicular directions.	Contractor	
Soil	Ensure the re-use of top soil for rehabilitation.	Top soil that is stockpiled on site must be used to rehabilitate the disturbed areas.	Contractor	
MONITORING				
Audit Reports	Ensure adequate reporting of progress with the development	Regular reports, monthly and and construction end are proposed, and should be forwarded to the DEA.	Environmental Site Manager	
Monitoring	Ensure compliance with the requirements of the CEMP.	Undertake monitoring activities on a monthly basis.	Environmental Site Manager	

APPENDIX A

ENVIRONMENTAL METHOD STATEMENT

A method statement forms the baseline information on which sensitive area work takes place and is thus considered a “live document” in that modifications can be negotiated between the Contractor and ESM if or as required. The Contractor (and, where relevant, any subcontractors) must also sign the Method Statement, thereby indicating that the works will be carried out according to the approved methodology. Changes in the methodology must be reflected by amendments to the original approved Method Statement. Amendments must be signed by both the ESM and RE, denoting that the change is environmentally acceptable. The Contractor must also sign the amended Method Statement.

All method statements will form part of the CEMP documentation and are subject to all terms and conditions contained within the CEMP main document.

A Method Statement describes the scope of the intended work in a step-by-step description in order for the ESM or Engineer to understand the Contractor’s intentions. This will enable them to assist in devising any mitigation measures, which would minimize environmental impact during these tasks. The Method Statement should also clearly stipulate mitigation methods of the intended works, against which the contractor’s performance will be measured.

For each instance wherein it is requested that the Contractor submit a Method Statement to the satisfaction of the ESM and Engineer, the format should clearly indicate the following:-

What - a concise, description of the task/work to be undertaken;
How - a detailed description of the process of work, methods, materials and mitigation strategies;
Where - a description/sketch map of the locality of work (if applicable); and
When - the sequencing of actions with due commencement dates and completion date estimates.

The Contractor must submit the Method Statement two weeks before any particular construction activity is due to start, especially with respect to impacts on sensitive ecosystems. Work may not commence until the method statement has been accepted by the ESM and Engineer, and clearly communicated to the workforce. The Contractor shall, except in the case of emergency activities, allow 14 days for consideration and approval of the Method Statement. The Engineer or ESM may require changes to a Method Statement if the proposal does not comply with the specifications or if, in the reasonable opinion of the Engineer and ESM, the proposal may result in damage to the environment in excess of that permitted by the specifications. Approved Method Statements shall be communicated to all relevant personnel.

Method Statements may be required by the ESM for the following, if so required:

- Construction procedures;
- Materials and equipment to be used;

- How and where materials will be stored;
- The containment of accidental leaks or spills;
- Timing and location of activities; and
- Construction activities
    - *Bunding*
        - *Method of bunding for static plant and bulk fuel storage.*
    - *Camp establishment and fencing*
        - *Location and layout of the Contractor's Camp.*
        - *Method of installing fences required for working areas and Contractor's Camp.*
    - *Concrete batching*
        - *Location, layout and preparation of concrete batching facilities, including the methods employed for mixing of concrete including the management of runoff water from such areas.*
    - *Bulk earthworks*
        - *Location, layout, silt/sediment management and the management of runoff from bulk earthworks areas.*
    - *Demolition*
        - *Proposed method of demolition, including handling and disposal of materials.*
    - *Dust*
        - *Dust control protocol.*
    - *Fire and hazardous substances*
        - *Handling and storage of hazardous wastes.*
        - *Emergency spillage procedures and compounds to be used.*
        - *Emergency procedures for accidental fire.*
        - *Methods for the disposal of hazardous materials.*
    - *Fuels and fuel spills*
        - *Methods of refuelling vehicles.*
        - *Details of methods for fuel spills and cleanup operations.*
    - *Protection of archaeological resources*
        - *Methods for dealing with archaeological resources in the event that any are found.*
    - *Protection of environmentally sensitive resources (fauna and flora)*
        - *Methods for dealing with conservation areas or areas identified as environmentally sensitive requiring protection.*
        - *Locality and preparation of onsite nursery to house vegetation relocated from construction areas or propagated locally for replanting purposes.*
        - *Details of methods dealing with the identification, transportation and transplanting of flora species of conservation value.*
        - *Details of methods dealing with the identification, capture and relocation of fauna species of conservation value.*

- *Rehabilitation*
  - *Rehabilitation of disturbed areas after construction is complete.*
- *Settlement ponds and sumps*
  - *Layout and preparation of settlement ponds and sumps.*
- *Solid waste management*
  - *Solid waste control and removal of waste from Site.*
- *Sources of materials*
  - *Details of materials imported to the Site (where applicable).*
- *Topsoil handling and stockpiling*
  - *Details on stripping, handling and stockpiling of topsoil.*
- *Wash areas*
  - *Location, layout, preparation and operation of all wash areas.*
- *Storm water management*
  - *Details of how storm water is to be handled on Site.*

A pro-forma Method Statement is given below.

METHOD STATEMENT

CONTRACT: ..... **DATE**: .....

WHAT WORK IS TO BE UNDERTAKEN? (give a brief description of the works)

WHERE ARE THE WORKS TO BE UNDERTAKEN? (where possible, provide an annotated plan and a full description of the extent of works)

START AND END DATE OF WORKS FOR WHICH THE METHOD STATEMENT IS REQUIRED

Start Date:	End Date:

HOW ARE THE WORKS TO BE UNDERTAKEN? (provide as much detail as possible, including annotated sketches and plans where possible) *Note: please attach extra pages if more space is required.

APPENDIX B

PRO-FORMA: ENVIRONMENTAL MONITORING REPORT

PRO-FORMA: ESM ENVIRONMENTAL MONITORING REPORT

Zone: ..... **Contractor:.....**

Report No:..... **Date:.....**

Environmental Education	**Contractor:**	**Date undertaken:**

Issue	**Observation**	**Remedial action**	**Compliance**
2.1 Construction			
2.1.1 All plant, personnel, etc. restricted to works area?			
2.1.2 Contractor's Camp located in area of low environmental sensitivity as indicated by the Engineer?			
2.1.3 Where needed, sensitive areas adequately fenced off?			
2.1.4 Fencing well maintained?			
2.1.5 No unauthorized entry, stockpiling, etc. outside work areas?			
2.1.6 All vehicles and plant remain on designated routes?			
2.1.7 Information posters put up and maintained where needed?			
2.1.8 No smoking in hazardous areas?			
2.1.9 Basic fire fighting equipment available on Site?			
2.1.10 No burning of wastes as a means of disposal?			

Issue	Observation	Remedial action	Compliance
2.1.11 Staff aware of procedures in the event of spills/leaks?			
2.1.12 Materials for dealing with spills/leaks available?			
2.1.13 Emergency contact numbers displayed at Contractor's office?			
2.1.14 Complaints Register up to date?			
2.1.15 Archaeological material found on Site mitigated?			
2.1.16 No animals trapped or harmed?			
2.1.17 No flora removed or damaged outside work areas?			
2.1.18 Adequate drainage and retaining works in place to control erosion/siltation?			
2.1.19 Restricted traffic over stabilized areas?			
2.1.20 No concrete mixing on bare ground?			
2.1.21 Concrete batching restricted to area of low environmental sensitivity?			
2.1.22 All wastewater from concrete mixing area disposed of via wastewater management system?			
2.1.23 Concrete mixing area kept neat and clean?			
2.1.24 Suitable screening and containment of cement silos?			
2.1.25 All visible remains of excess concrete removed on completion of concrete work?			
2.1.26 No pollution from drilling operations?			

Issue	Observation	Remedial action	Compliance
2.1.27 Location and rescue of plants undertaken by suitably qualified contractor?			
2.1.28 Rescued plants moved to nursery if direct transplantation not possible?			
2.1.29 After vegetation clearance, all unstable areas are properly stabilized?			
2.1.30 Cleared vegetation properly disposed of?			
2.1.31 All wastes removed from cleared area and disposed of?			
2.1.32 Mulched vegetation stored in bags?			
2.1.33 Fertilisers containing phosphates not used?			
2.1.34 No planting undertaken where construction works have not yet been finished?			
2.1.35 No unauthorised traffic on revegetated areas?			
2.2 Materials			
2.2.1 Construction materials adequately secured to ensure safe deliveries?			
2.2.2 All materials being stored inside Contractor's Camp?			
2.2.3 All imported materials free of weeds, litter, etc.?			
2.2.4 Stockpile areas approved?			
2.2.5 Topsoil stripped and stockpiled at a suitable site prior to earthworks?			
2.2.6 No spoil stockpiled outside agreed areas?			

Issue	Observation	Remedial action	Compliance
2.2.7 Spoil stockpiles correctly shaped and protected?			
2.2.8 All plants used for landscaping/rehabilitation listed in the approved plant list?			
2.2.9 Plants adequately protected during transit and at storage facilities?			
2.2.10 Plants healthy and free from diseases and pests?			
2.3 Plant			
2.3.1 Fuel/oil storage facilities adequately secured and protected against leakage?			
2.3.2 Safety signage provided at fuel storage areas?			
2.3.3 All electrical/petrol pumps suitably equipped and placed not cause any danger of ignition?			
2.3.4 Fuel storage areas comply with fire safety regulations?			
2.3.5 Necessary authorisations obtained for temporary above ground fuel tanks?			
2.3.6 Capacity of a fuel tank does not exceed 9000 ℓ?			
2.3.7 Fuel tanks erected at least 3.5 m away from buildings, boundaries or other flammable materials?			
2.3.8 Adequate toilet facilities provided for staff (min. 1 toilet per 30 workers)?			
2.3.9 Toilets adequately maintained?			
2.3.10 All workers use toilets?			
2.3.11 Scavenger-proof bins with lids provided at eating areas?			

Issue	Observation	Remedial action	Compliance
2.3.12 Waste temporarily stored inside Contractor's Camp in weather- and scavenger-proof bins?			
2.3.13 No burying or dumping of wastes on site?			
2.3.14 Waste management system in place?			
2.3.15 Refuse disposed of at licensed landfill?			
2.3.16 Adequate waste-water management system in place?			
2.3.17 Approval for discharge of contaminated water into municipal sewer system?			
2.3.18 Runoff from workshops, fuel depots, etc. directed into conservancy tanks for disposal at approved site?			
2.3.19 Wash areas placed and built in such a way that does not cause any pollution?			
2.3.20 All maintenance of plant and equipment takes place in workshop?			
2.3.21 All plant is well maintained (no leaking)?			
2.3.22 Workshop has a bunded, impermeable floor sloping towards oil trap?			
2.3.23 Contractor's Camp tidy?			
2.3.24 All plant and machinery have drip trays, which are checked and emptied daily?			
2.3.25 All repairs on machinery using fuels or lubricants done over a drip tray?			
2.3.26 Static plant located within a bunded area?			
2.3.27 Measures in place to minimise dust generation?			

Issue	Observation	Remedial action	Compliance
2.3.28 No handling/transport of erodible materials under high wind conditions?			

1. EMP Transgressions	Contractor:	Date:	Fine issued: (N$)

2. Complaints	Date received:	Action taken:

3. Other Issues	

APPENDIX C

LIST OF APPROVED PLANT SPECIES

All the indigenous trees occurring in the proposed development area could/should be used in the landscaping of the area as this would:

i) not detract from the overall ambiance of the area,
ii) be ecologically prudent & sound,
iii) best suited to the local environment,
iv) require least water and maintenance,
v) require the least financial input.

The following table indicates the indigenous trees/shrubs that could/should be used in the landscaping as they make outstanding features and are known and/or expected to occur in the general area of the Elisenheim Township (Curtis & Mannheimer 2005).

Species: Scientific name	**Status**	**Sensitivity**
Acacia erioloba	Protected (F)	High
Acacia hereroensis		Low
Acacia karroo		Low
Acacia nebrownii		Low
Acacia reficiens		Low
Acacia tortilis		Low
Adenium boehmianum		Low
Albizia anthelmintica	Protected (F)	High
Aloe litoralis	NC, C2	High
Boscia albitrunca	Protected (F)	High
Boscia foetida		Low
Catophractes alexandri		Low
Combretum apiculatum		Low
Combretum imberbe	Protected (F)	High
Commiphora africana		Low
Commiphora angolensis		Low
Commiphora glandulosa		Low
Commiphora glaucescens		Low
Commiphora pyracanthoides		Low
Commiphora tenuipetiolata		Low
Cordia sinensis		Low
Dombeya rotundifolia		Low
Euphorbia avasmontana	C2	Medium
Euphorbia guerichiana	C2	Medium
Euphorbia virosa	C2	Medium
Faidherbia albida	Protected (F)	High
Ficus cordata	Protected (F)	High
Ficus sycomorus	Protected (F)	High
Maerua schinzii	Protected (F)	High

Moringa ovalifolia	NC	High

Endemic *(Craven 1999)*
F *– Forestry Ordinance No. 37 of 1952 and/or Forest Act No. 72 of 1968 (Curtis & Mannheimer 2005)*
NC *– Nature Conservation Ordinance No. 4 of 1975 (Curtis & Mannheimer 2005)*
C2 *– CITES Appendix 2 (Curtis & Mannheimer 2005)*

There are a variety of other tree species indigenous to southern Africa (including other parts of Namibia) that could be used as ornamental plants in the Elisenheim Township landscaping although not found in the immediate area and include:

- *Acacia* species – e.g. *A. galpinii*, *A. nigrescens*, *A. sieberiana*, *A. xanthophloea*
- *Adansonia digitata*
- *Albizia* species – e.g. *Albizia versicolor*
- *Bauhenia* species – e.g. *B. galpini*
- *Combretum* species – e.g. *C. erythrophyllum*
- *Diospyros mespiliformis*
- *Hyphaene petersiana*
- *Kigelia africana*
- *Peltophorum africanum*
- *Phoenix reclinata*
- *Philenoptera nelsii*
- *Schinziophyton rautanenii*
- *Sclerocarya birrea*
- *Securidaca longependunculata*

Although a number of the species indicated above grow in gardens in Windhoek – e.g. *B. galpini*, *C. erythrophyllum*, *Kigelia africana, Sclerocarya birrea* – how they will adapt to the Elisenheim Township area is unknown.

APPENDIX D

DECLARED INVASIVE ALIEN SPECIES

No known or potential invasive alien tree/shrub/grasses, although even in cases naturalized species, should be used in the landscaping at the Elisenheim Township. The threats they pose are unacceptable and using these species in landscaping would compromise the environmental commitment that should be shown to this project.

The following list – although not comprehensive and exclusively so – is some of the more problematic invasive alien species found in Namibia and that should not be incorporated in the landscaping at Elisenheim Township:

Scientific name	**Common name**
Caesalpinia gilliesii	Yellow Bird of Paradise
Schinus mole	Brazilian Peppertree
Datura sp.	Stink weed
Dodonaea viscose & *D. angustifolia*	Purple Hop-bush/Hopseed bush
Eucalyptus sp.	Blue gum species
Euphorbia tirucalli	Pencil Euphorbia
Jatropha curcas	Physic nut
Lucena leucocephala	Lucena
Lantana camara	Lantana or Spanish Flag
Melia azedarach	Chinaberry tree
Nicotiana glauca	Brazilian Tree Tobacco
Opuntia sp.	Prickly Pear sp.
Parkensonia aculeatea	Jerusalem Thorn
Pennisetum setaceum	Fountain Grass
Pinus sp.	Pine tree sp.
Prosopis sp.	Mesquite sp.
Ricinus communis	Castor oil plant
Tecoma stans	Yellow Trumpetbush

Source: Cunningham (2008), Cunningham, Joubert & Adank (2004), Curtis & Mannheimer (2005), Joubert & Cunningham (2002), Shipaka, Joubert & Cunningham (2008)