

**PROJECT KUSILE RAIL AND ASSOCIATED
INFRASTRUCTURE**

STANDARD ENVIRONMENTAL SPECIFICATION

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1 SCOPE AND INTERPRETATIONS

1.1 GENERAL

This section covers the requirements for controlling the impact of construction activities on the environment. Environmental management is concerned not only with the results of the Contractor's operations to carry out the Works but also, and most importantly, with the manner in which his operations are carried out. It is thus a requirement that the Contractor shall comply with the environmental requirements on an ongoing basis.

The Contractor shall take full responsibility for protecting the natural environment and eliminating or minimising the negative impacts of construction on the environment during construction. The Contractor shall prevent or limit the occurrence of accidents which may cause damage to the environment, prevent or limit the consequences of such accidents and shall return the environment to a state as close as possible to its condition prior to any such accident occurring. Nothing specified herein shall relieve the Contractor of any obligations or responsibilities in this regard.

The requirements of this Specification apply to all areas under the Contractor's control, including but not limited to the Working Area, the construction camp and offices, all access/ haul routes and all labour accommodation areas (if applicable).

1.2 ENVIRONMENTAL POLICY

The Contractor shall prepare and implement an Environmental Protection Policy, in line with various statutory regulations and this Specification. The Policy shall be submitted to the Engineer within 28 days after the Commencement Date. Upon the Engineer's approval, the Contractor shall immediately implement the policy and any amendments, and keep it in operation for the full duration of the Contract. The policy shall be communicated to all personnel and copies of the policy shall be prominently displayed at all places of work.

The Contractor shall keep the policy updated in accordance with his Quality Management Procedures and make amendments as required by the Engineer and the circumstances prevailing at the time. Upon such revision, the Contractor shall immediately supply the Engineer with two copies of an updated Environmental Policy, which shall clearly indicate the revisions undertaken.

1.3 INTERPRETATIONS

1.3.1 Supporting specifications

This Specification must be read in concert with the NEC Engineering and Construction Contract.

1.3.2 Application

In the event of any difference or discrepancy between the provisions of the other specifications forming part of the Tender Document and the provisions of this Specification, where such difference or discrepancy has environmental implications, the latter shall prevail.

2 DEFINITIONS

For the purposes of this Specification, the following definitions shall apply:

Borrow area means any areas within designated boundaries, approved for the purpose of obtaining borrow material.

Borrow material means any material, be it gravel, sand or soil obtained from designated areas for use as bedding material or fill. It does not include rock or stone or any material obtained from commercial sources.

Botanical specialist for the purposes of this Specification, means a specialist suitably qualified to deal with the type of vegetation occurring in the affected environment. This should be the specialist who undertook the botanical investigation as part of the Environmental Impact Assessment (EIA), or where he/ she is unavailable, a suitable replacement identified by the Engineer.

Clearing means the clearing and removal of vegetation, whether partially or in whole, including trees and shrubs, as specified.

Contaminated water means water contaminated by the Contractor's activities, e.g. concrete water as well as runoff from equipment, construction camps, ablution facilities and personnel wash areas.

Demolish means the demolition and complete removal and disposal of buildings, sheds, poles, concrete and any other objects and structures.

Engineer means a qualified person who uses scientific knowledge to solve practical problems (must be certified)

Environment means the surroundings within which humans exist and that are made up of:

- i) The land, water and atmosphere of the earth;
 - ii) Micro-organisms, plant and animal life;
 - iii) Any part or combination of i) and ii) and the interrelationships among and between them;
- and

- iv) The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being (*i.e.* the social environment).

Establishment period means the period that commences from the time of actual planting or revegetation until at least six months after planting.

Flood plain means the area encompassed by the 1:100 year flood line.

Grubbing means the removal and disposal of roots and stumps of trees and vegetation already cleared.

Hazardous substance means a substance governed by the Hazardous Substances Act as well as the Hazardous Chemical and Substances Regulations. In addition, any other substance that, in the reasonable opinion of the Engineer, can have a deleterious effect on the environment will be regarded as a potentially hazardous substance.

Heritage resource as per the provisions of the National Heritage Resources Act (No 25 of 1999), means those heritage resources that are of cultural significance or other special value for present and future generations, and which are accordingly considered part of the national estate. In this regard, the national estate includes those items identified in terms of Section 2 of the Act.

Heritage specialist for the purposes of this Specification, means a specialist suitably qualified to deal with the type of heritage resource discovered. For example where the resource is an archaeological artefact or site, the heritage specialist would be an archaeologist and where it is a fossil the specialist would be a palaeontologist.

Invasive alien vegetation means vegetation which either does not naturally occur in the country and/or region or which under certain conditions proliferates and becomes problematic since it outgrows other plants and may represent a significant maintenance cost.

Maintenance period means the period after the establishment period up to and until the end of the defects liability period, during which the contractor shall be responsible to maintain the vegetation, and shall be one growing season.

Method Statement means a written submission by the Contractor to the Engineer in response to this Specification or a request by the Engineer, setting out the equipment, plant, materials, labour and method the Contractor proposes using to carry out an activity identified by this Specification or the Engineer when requesting the Method Statement, in such detail that the Engineer is able to assess whether the Contractor's proposal is in accordance with this Specification and/ or will produce results in accordance with this Specification.

The Method Statement shall cover applicable details with regard to:

- i) Construction procedures;
- ii) Plant, materials and equipment to be used;
- iii) Transporting the equipment to and from site;
- iv) How the plant/ material/ equipment will be moved while on site;
- v) How and where the plant/ material/ equipment will be stored;
- vi) The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- vii) Timing and location of activities;
- viii) Compliance/ non-compliance with this Specification; and
- ix) Any other information deemed necessary by the Engineer.

Natural vegetation means all existing species, indigenous or otherwise, of trees, shrubs, groundcover, grasses and all other plants found growing on the site.

Oil Separator means a trap that separates oil from the water and prevents oil from being carried from the Works into watercourses and water bodies.

Pollution Incident means any incident that may or has caused damage to or the contamination of the natural environment.

Reasonable means, unless the context indicates otherwise, reasonable in the opinion of the Engineer after he has consulted with a person, not an employee of the Employer, suitably experienced in environmental management practices.

Sensitive area means any area that is denoted as sensitive by this Specification or Engineer due to its particular attributes, which could include the presence of rare or

endangered vegetation, the presence of heritage resources (e.g. archaeological artefact or graves), the presence of a unique natural feature, the presence of a watercourse or water body, the presence of steep slopes (in excess of 1:4) etc.

Slope means the inclination of a surface expressed as one unit of rise or fall for so many horizontal units.

Solid waste means all solid waste, including construction debris, chemical waste, excess cement/ concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

Spoil means excavated material which is unsuitable for use as material in the Works or is material which is surplus to the requirements of the Works.

Topsoil means a varying depth (up to 300 mm) of the soil profile irrespective of the fertility appearance, structure, agricultural potential, fertility and composition of the soil.

Watercourse means any river, stream and natural drainage channel whether carrying water or not.

Water body means body containing any form of water and includes dams and wetlands, whether ephemeral or permanent. In this regard, wetland means any area that is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the area is covered by shallow water. Specifically, an area is classified as a “wetland” if it meets at least one of the following criteria:

- i) The area predominantly supports hydrophytes, at least periodically;
- ii) The substrate(soil) is predominantly undrained hydric soil;
- iii) Permanent water can be found within 50cm of the surface of the soil; and/ or
- iv) The substrate is non-soil, and is saturated with water or covered by shallow water at some time during the growing season.

Works means the Works to be executed in terms of the Contract and in accordance with

this Specification.

Working Area

means the land and any other place on, under, over, in or through which the Works are to be executed or carried out, and any other land or place made available by the Employer in connection with the Works. The Working Area shall include the site office, construction camp, stockpile and laydown areas, batching areas, all access routes and any additional areas to which the Engineer permits access.

3 GENERAL REQUIREMENTS

3.1 GENERAL AND LEGAL OBLIGATIONS

All construction activities shall observe and obey any relevant environmental legislation and in so doing shall be undertaken in a manner that will minimise impacts on the surrounding environment, the public and adjoining landowners. The Contractor shall absolve the Employer of any and all risk or liability in terms of compliance with all relevant statutory obligations.

The Contractor shall construct and/ or implement all the necessary environmental protection measures in each area before any production work will be allowed to proceed. The Engineer may suspend the Works at any time in terms the Conditions of Contract should the Contractor, in the Engineer's opinion, fail to implement, operate or maintain any of the environmental protection measures adequately.

3.2 ENVIRONMENTAL MONITORING

A suitably qualified senior staff member employed full time on site by the Contractor shall be responsible for environmental monitoring and control. This position shall be designated as the Environmental Officer (EO). The EO shall be a person with adequate environmental knowledge to understand and implement these Specifications, as determined by the Engineer. As a minimum requirement the EO should possess a tertiary qualification in a relevant field and two years of experience in environmental monitoring and control. The duties of the EO will include:

- i) Liaison with the Environmental Control Officer (ECO);
- ii) Monitoring of all of the Contractor's activities for compliance with the various environmental requirements contained in this Specification;
- iii) Monitoring of compliance with other relevant environmental legislation;
- iv) Development of requisite environmental Method Statements;
- v) Instituting remedial action in the event of non-compliance;
- vi) Implementation and management of environmental protection measures;
- vii) Keeping a register of public complaints and recording and addressing any public comments or issues;
- viii) Routine recording and reporting of environmental activities on a daily basis;
- ix) Recording and reporting of environmental incidents; and
- x) Environmental induction and presentation of the Environmental Awareness Training courses to the Contractor's staff.

The Contractor's attention is drawn to the fact that, as a result of the statutory authorisation process in terms of the Environment Conservation Act (No 73 of 1989), an Environmental Control Officer (ECO) will be appointed by the Employer to monitor compliance by the Contractor and his staff with the environmental requirements of this Specification (either a new ECO will be appointed or the existing Kusile Power Station ECO).

3.3 SITE MEETINGS

Compliance with this Specification will be an item on the agenda of the monthly site meetings.

3.4 ENVIRONMENTAL INDUCTION

The Contractor shall ensure that all of his employees, and those of his Sub-Contractor's, attend Environmental Awareness Training course/s. The Environmental Awareness Training course/s shall be structured to ensure that attendees:

- i) Acquire a basic understanding of the key environmental features within the Working Area and its immediate environs;
- ii) Become familiar with the environmental controls contained within this Specification; and
- iii) Receive pertinent, written instructions regarding compliance with the relevant environmental management requirements (*viz.* environmental "do's" and "don'ts"); and
- iv) Are made aware of any other environmental matters as deemed necessary by the Engineer.

The initial Environmental Awareness Training course shall be held within 14 days from the Commencement Date, and subsequent courses shall be arranged for new employees coming onto site after the initial training course. Provision shall also be made for refresher courses to be undertaken on a quarterly basis during the course of the Contract.

The Contractor shall provide a suitable venue with facilities and ensure that the specified employees attend the Environmental Awareness Training course/s. The course/s shall be held in the morning during normal working hours. No more than 30 people shall attend each course and the Contractor shall allow for sufficient sessions to train all personnel. The Contractor shall provide proof of attendance by all of his employees in the form of a signed attendance register for each session.

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 this Specification.

3.5 ENVIRONMENTAL METHOD STATEMENTS

Unless indicated otherwise by the Engineer, the Contractor shall provide the following Method Statements no less than 14 days prior to the programmed Commencement Date of the subject Works or activity:

- i) Logistics for the Environmental Awareness Training course/s, including the date, time and location of the course/s, the course content and provision for refresher courses;
- ii) Location and layout of the construction camp in the form of a plan showing the location of key infrastructure and services, including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and laydown areas, hazardous storage areas (including fuels), the batching plant/s, designated access routes, equipment cleaning areas and the placement of any staff accommodation, cooking and ablution facilities. This Method Statement shall include the Materials Safety Data Sheets (MSDS's) for all fuels, lubricants, paints, solvents and other chemicals to be used or stored on site
- iii) Location and structure of the fuel storage area, including the type and volume of storage container and the design and capacity of the bund, and procedures for the filling and dispensing of fuel both at the fuel storage area and on Site;
- iv) Location, layout and preparation of concrete batching facilities including the methods employed for the mixing of concrete and the management of runoff water from such areas. An indication shall be given of how concrete spoil will be minimised and cleared;
- v) Solid waste (refuse) control and removal of waste from the Site, including the number, type and location of rubbish bins, the manner and frequency with which the waste will be removed from site and a description of the identified disposal site;
- vi) Contaminated water management system, including an indication of the source and volume of contaminated water and how this would be disposed of;
- vii) Method for dealing with runoff, including a stormwater management plan, mechanisms for the control of erosion and sedimentation, location and layout of settlement ponds (including the treatment of sludge), approach to the treatment and control of all contaminated return water to watercourses and approach to water quality monitoring;
- viii) Drainage and stormwater planning showing procedures for the control of erosion due to stormwater on Site;
- ix) Details of water abstraction, including the site of abstraction, the envisaged volume of water to be pumped and what methods would be implemented to prevent spillage/pollution during the refuelling and operation of the abstraction pumps. The Contractor shall be responsible for obtaining the requisite permissions/ authorisations to enable

abstraction and copies of these permissions/ authorisations shall be attached to the Method Statement;

- x) Extent of areas to be cleared within the Working Area (including the construction camps, batching plants, access roads *etc.*), the method of clearing and the preparation for this clearing so as to ensure minimisation of exposed areas;
- xi) Method of undertaking earthworks, including topsoil handling and erosion, dust and noise controls;
- xii) Use of herbicides, pesticides and other poisonous substances, including means of storage;
- xiii) Dust control, including methods to prevent dust generation and method to reduce dust where its generation is unavoidable;
- xiv) Emergency procedures for spillages of hazardous substances, fire and serious accidents;
- xv) Motivation and method for undertaking any construction related activities within a “no-go” area, including requisite emergency procedures. Unless a clearly motivated and proposed methodology exhibiting an obvious focus on environmentally sensitive construction practice is provided, no activity will be permitted within the defined “no-go” areas.

The Contractor shall not commence the activity until the Method Statement has been approved and, except in the case of emergency activities, shall allow a period of two weeks for approval of the Method Statement by the Engineer. Such approval shall not unreasonably be delayed or withheld.

The Engineer may require changes to a Method Statement if the proposal does not comply with this Specification or if, in the reasonable opinion of the Engineer, the proposal may result in, or carries a greater than reasonable risk of, damage to the environment in excess of that permitted by this Specification.

Approved Method Statements shall be readily available on the site and shall be communicated to all relevant personnel. Where necessary the requisite training shall be give to the personnel to facilitate compliance with the approved Method Statement. The Contractor shall carry out the Works strictly in accordance with the approved Method Statement. Approval of the Method Statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the Contract.

3.6 INTERFACE WITH LANDOWNERS AND LOCAL COMMUNITIES

The Contractor shall respect the property and rights of landowners and communities at all times and shall treat all such persons with courtesy. Disruption to the communities and landowners abutting the Working Area shall be minimised. The removal of tenants and squatters currently occupying the

affected properties will be undertaken by the Employer, and no communities shall be displaced by the Contractor after the Commencement Date. The Contractor shall, however, make provision for delays in his construction programme associated with the removal of the tenants/ squatters.

The Contractor shall take every effort to ensure that private property abutting the Working Area is not damaged as a result of his activities, and that access for landowners and communities residing within the area is maintained. The Contractor shall absolve the Employer of any and all risk and liability in this regard.

The Fencing Act (Act 63 of 1963) regulates matters relating to fences between properties. In terms of this legislation, it is a criminal offence to dismantle fences without the landowner's permission or to leave gates open. Accordingly, in the execution of the Works the Contractor shall:

- i) Install gates (standard or game gates) on all fence crossings, subject to the requirements of the landowner, as approved by the Engineer. Provide all gates with a Contractor's lock. No work shall commence prior to the erection of the requisite gates;
- ii) Use the gates provided to gain access to all parts of the defined Working Area;
- iii) Ensure that all gates properties are kept locked at all times;
- iv) Not drop or dismantle any fence or gate without the Engineer's permission.

Where existing fences have to be dismantled and re-erected, they shall be erected to the same design as the original, but with such modifications as may be required by the Engineer.

The Contractor shall maintain a "complaints register" that records all complaints raised by landowners, communities or the general public about construction activities. The register shall be regularly updated and shall be used to record the name of the complainant, his or her domicile and contact details, the nature of the complaint and any action taken to rectify the problem. The Contractors shall ensure that any complaints are appropriately addressed, and the complaints registered shall merely serve as a record of the complaint and its remediation. All complaints, as well as the remedial actions taken, shall be brought to the attention of the Engineer, who shall be the sole arbiter regarding the adequacy of such actions.

3.7 SAFETY OF THE PUBLIC

The Contractor shall recognise that the Site is situated close to inhabited areas and shall therefore take all reasonable measures to ensure the safety of people in the surrounding area. Where the public could

be exposed to danger by any of the Works or Site activities, the Contractor shall as appropriate provide suitable flagmen, barriers and/ or warning signs in English to the approval of the Engineer.

All unattended open excavations shall be adequately demarcated (fencing shall consist of a minimum of three strands of wire wrapped with danger tape). Adequate protective measures must be implemented to prevent unauthorised access to the Working Area and access/ haul routes. No firearms shall be permitted on Site without the prior approval of the Engineer.

3.8 PROTECTION OF NATURAL FEATURES AND HERITAGE RESOURCES

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 Engineer. Any features affected by the Contractor in contravention of this clause shall be restored/ rehabilitated to the satisfaction of the Engineer.

The infrastructure associated with the Project Kusile Rail have either been sited to avoid known sites of heritage significance, or the requisite permits for the demolition/ disruption of these sites has been obtained by the Employer. The Contractor shall, however, make provision for accidental discovery of further heritage resources. The Contractor shall take reasonable precautions to prevent any person from removing or damaging any heritage resources (including but not limited to fossils, coins, articles of value or antiquity, graves and structures and other remains of archaeological interest) discovered on the Site, immediately upon discovery thereof and before removal. The Contractor shall inform the Engineer immediately of such a discovery and carry out the Engineer's instructions for dealing therewith. In the event that Works within the vicinity of the discovery are suspended, the area shall be cordoned off until such time as the Engineer authorises resumption of the Works in writing. The Engineer will take all necessary actions to ensure that delays are minimised.

Upon notification by the Contractor, the Engineer will contact the South African Heritage Resources Agency (SAHRA) and will arrange for the excavation to be examined by an appropriate heritage specialist as soon as practicable. Acting upon the advice of SAHRA and the heritage specialist, the Engineer will advise the Contractor of the requisite actions. A Provisional Sum has been included in the Schedule of Quantities for the appointment of a heritage specialist, together with any assistance required, to identify heritage resources and for the appropriate treatment of such resources. This sum will be under the control of the Engineer.

3.9 PROTECTION OF WATERCOURSES, WATER BODIES AND WETLANDS

The Contractor shall ensure that all watercourses and water bodies (including but not necessarily limited to those areas identified in the specialist ecological assessment undertaken by Zitholele Consulting (Terrestrial) and Golder Associates (Aquatic) and any subsequent studies) are protected from contamination or degradation as a result of his activities. All watercourses and water bodies shall be protected from direct or indirect spills of pollutants such as solid waste, sewage, cement, oils, fuels, chemicals, wash and contaminated water or organic material resulting from the Contractor's activities. In the event of a spill, prompt action shall be taken to clear the polluted or affected areas, and the Engineer shall be notified immediately.

The Contractor shall not work within the 50 m buffer zone or any watercourses or waterbodies without the written approval of the Engineer as required for the execution of the work. The Contractor shall not permit his employees to make use of any natural watercourse or waterbody for the purposes of swimming, personal washing and the washing of machinery or clothes.

When working in or near any watercourses, the Contractor shall be cognisant of the following environmental controls and considerations:

- i) When planning work in or near watercourses the Contractor shall take into account possible river levels during the period of construction;
- ii) The Contractor shall program the execution of the Works such that Construction within flowing water is minimized. All diversions shall be in place, water diverted away from the Working Area and the area sandbagged prior to excavations commencing;
- iii) Construction equipment shall not ford any watercourse or operate from within the river channel unless it is essential to the execution of the Works. All works within flowing water shall be subject to prior authorisation from the Engineer;
- iv) When working in flowing water, the Contractor shall ensure that downstream sedimentation is controlled by installing and maintaining the necessary temporary sedimentation barriers, e.g. geotextile silt curtains or sedimentation weirs constructed out of suitably secured straw bales. Sedimentation barriers shall be a maximum of 25 m downstream of the construction activities;
- v) During the execution of the Works, the Contractor shall take appropriate measures to prevent pollution and contamination of the riverine environment e.g. including ensuring that construction equipment is well maintained, using drip trays, provision of bins, monitoring etc;

- vi) Where earthwork is being undertaken in close proximity to any watercourse, slopes shall be stabilised using sandbags or geotextile fabric to prevent sand and rock from entering the channel; and
- vii) Appropriate rehabilitation and revegetation measures for the riverbanks shall be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilized as soon as construction allows.

No excavation or construction shall be permitted within any wetland area, unless exceptional circumstances require that such excavation or construction cannot be avoided, such as for bridges, in which regard the Engineer shall be the sole arbiter of whether or not such excavation or construction in a wetland area can or cannot be avoided. Where, in the opinion of the Engineer, excavation or construction within a wetland area cannot be avoided in the execution of the Works, the extent of any disturbances shall be kept to an absolute minimum. The various soil layers shall be removed and stockpiled separately. Following the completion of the construction activities, the soil layers shall be returned in the reverse order to which they were removed.

Where possible, the Contractor shall ensure that no construction equipment traverses any seasonal or permanent wetland. Where seasonally wet areas must be traversed, the Contractor shall obtain the prior approval of the Engineer and shall ensure that this only occurs during the dry season.

3.10 PROTECTION OF FLORA AND FAUNA

Except to the extent necessary for the execution of the Works, flora shall not be removed, damaged or disturbed nor shall any vegetation be planted without authorisation. At the commencement of the Contract, the Engineer will identify to the Contractor indigenous flora or any rare or endangered flora that shall be preserved. The Contractor shall thereafter demarcate such and undertake all necessary measures to ensure the protection of such flora.

In areas where needless destruction of vegetation has occurred, the Contractor shall, at his own expense, reinstate those areas to the standard specified by the Engineer. In this regard, the Engineer will arrange for the disturbed area to be examined by an appropriate botanical specialist. Acting upon the advice of the botanical specialist, the Engineer will advise the Contractor of the requisite actions. A Provisional Sum has been included in the Schedule of Quantities for the appointment of a botanical specialist, together with any assistance required, to identify sensitive vegetation and for the relocation of such vegetation. This sum will be under the control of the Engineer.

The Contractor shall protect fauna living within the corridors and shall ensure that trapping, poisoning, shooting and/ or other hunting of animals is strictly prohibited, including the collection of the carcass of any domestic or wild animal. The Contractor shall ensure that no domestic pets or livestock are permitted on Site, and the keeping of pets by the Site staff shall be strictly prohibited (with the exception of security guard dogs). The requisite measures shall be put in place to ensure that domestic and native animals belonging to surrounding landowners are kept away and are safe from the unprotected Works.

The Contractor shall ensure that the Working Area is kept clean, tidy and free of rubbish that would attract animal pest species, and that no feeding of animals occurs. The Contractor's employees shall be prohibited from collecting firewood from the surrounding areas, and this shall be supplied by the Contractor from a legitimate supplier.

3.11 PREVENTION AND CONTROL OF FIRES

The Contractor shall take adequate precautions to ensure that the fire hazard on and near the Site / Corridor is reduced to a minimum. Fires may only be lit at sites specifically prepared for the purpose and approved by the Engineer. The Contractor shall ensure that there is basic fire-fighting equipment available on Site at all times, and any fires that occur shall be reported to the Engineer immediately.

Smoking shall not be permitted in those areas where it is a fire hazard. Such areas shall include the workshop and fuel storage areas, any areas where the vegetation or other material is such as to make likely the rapid spread of an initial flame and any other areas not designated as smoking areas. All eating areas shall include provision for a smoking area.

The Contractor shall not be permitted to use burning as a disposal method.

3.12 EMERGENCY PROCEDURES

Telephone numbers of emergency services, including the local fire fighting service, shall be posted conspicuously in the Contractor's office near the telephone.

The Contractor shall develop emergency procedures that will enable rapid and effective response to all types of environmental emergencies. The Contractor's procedures for the following emergencies shall include:

3.12.1 Fire

The Contractor shall advise the relevant authority and affected landowners of a fire as soon as one starts and shall not wait until he can no longer control it. The Contractor shall ensure that his employees are aware of the procedure to be followed in the event of a fire.

3.12.2 Accidental leaks and spillages

The Contractor shall ensure that his employees are aware of the emergency procedure(s) to be followed for dealing with spills and leaks, which shall include notifying the Engineer and the relevant authorities. The Contractor shall ensure that the necessary materials and equipment for dealing with spills and leaks is available on Site at all times. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the Engineer.

In the event of a spill, the source of the spillage shall be isolated, and the spillage contained. The area shall be cordoned off and secured. The Contractor shall maintain spill kits on site at all times and shall ensure that there is always an adequate supply of absorbent material available in the spill kits to absorb/ breakdown 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 spillage.

3.13 TEMPORARY SITE CLOSURE

If the site is closed for a period exceeding one week, the Contractor, in consultation with the Engineer, shall carry out a checklist procedure, which should as a minimum address the following:

Hazardous substances storage

- i) Outlet secure/ locked;
- ii) Bund empty (where applicable);
- iii) Fire extinguishers serviced and accessible;
- iv) Secure area from accidental damage e.g. vehicle collision;
- v) Emergency and contact details displayed; and
- vi) Adequate ventilation.

Safety

- i) Fencing and barriers in place as per the Occupational Health and Safety Act (No 85 of 1993);
- ii) Emergency and Management contact details displayed;
- iii) Security personnel have been briefed and have the facilities to contact or be contacted by relevant management and emergency personnel;

- iv) Night hazards such as reflectors, lighting, traffic signage etc have been checked;
- v) Fire hazards identified and the local authority notified of any potential threats e.g. large brush stockpiles, fuels etc;
- vi) Stockpile appropriately secured; and
- vii) Structures vulnerable to high winds secure.

Erosion

- i) Wind and dust mitigation in place;
- ii) Slopes and stockpiles at stable angle; and
- iii) Revegetated areas watering schedules and supply secured.

Water contamination and pollution

- i) Cement and materials stores secured;
- ii) Toilets empty and secured;
- iii) Refuse bins empty and secured;
- iv) Drip trays empty and secure (where possible); and
- v) Structures vulnerable to high winds secure.

4 PLANT AND MATERIALS

4.1 PLANT AND MATERIALS HANDLING, USE AND STORAGE

The Contractor shall ensure that any delivery drivers are informed of all procedures and restrictions (including "no go" areas) required to comply with this Specification. The Contractor shall ensure that these delivery drivers are supervised during off loading, by someone with an adequate understanding of the requirements of this Specification.

Plant and materials shall be appropriately secured to ensure safe passage between destinations. Loads that pose a risk of dust generation or spillage during transit, including but not limited to sand, stone chip, fine vegetation, refuse, paper and cement, shall have appropriate cover. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to secure transported plant and materials properly.

All manufactured and/ or imported plant and material shall be stored within the Contractor's camp. All stockpiling and laydown areas outside of the construction camp shall be subject to the Engineer's approval, which will not be unreasonably withheld.

4.2 HAZARDOUS SUBSTANCES

4.2.1 General

The storage and disposal of hazardous chemical substances (as defined in the Regulations for Hazardous Chemical Substances) and their waste, is regulated through other legislation, which should be complied with *i.e.* the Occupational Health and Safety Act. All hydrocarbons, including petrol, diesel, engine oil, hydraulic oil, shutter oil and curing compound, pose a risk of causing water and soil contamination and accordingly shall be regarded as potential hazardous substances from an environmental perspective. Specific requirements in this regard are outlined below.

4.2.2 Fuel (petrol and diesel)

Fuel may be stored on site in an area approved by the Engineer. The fuel storage area shall be located in a portion of the construction camp where it is unlikely to pose a significant risk in terms of water pollution or traffic safety. The Contractor shall ensure that diesel is stored in appropriate storage tanks or in bowsers. The tanks/ bowsers shall be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 130% of the total capacity of all the storage tanks/ bowsers (110% statutory requirement plus an allowance for rainfall). The floor of the bund shall be sloped, draining to an oil

separator. Provision shall be made for refuelling at the fuel storage area, by protecting the soil with an impermeable layer, appropriate for the type of traffic.

If fuel is dispensed from 200 ℓ drums, only empty externally clean drums may be stored on the bare ground. All empty externally dirty drums shall be stored on an area where the ground has been protected. 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/ oil storage drum shall be stored in a waterproof container when not in use.

The Contractor shall prevent unauthorised access into the fuel storage area. No smoking shall be allowed within the vicinity of the fuel storage area. The Contractor shall ensure that there is adequate fire-fighting equipment at the fuel stores.

Where reasonably practical, equipment shall be refuelled at the fuel storage area or at the workshop as applicable. If it is not reasonably practical then the surface under the refuelling area shall be protected against pollution to the reasonable satisfaction of the Engineer prior to any refuelling activities. The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/ breakdown and, where possible, be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle a minimum of 200 ℓ of hydrocarbon liquid spill. This material must be approved by the Engineer prior to any refuelling or maintenance activities.

4.2.3 Oils and curing compound

The Contractor shall ensure that engine oil, hydraulic oil, shutter oil, lubricants and curing compound containers that are in use are stored within a bunded area consisting of a smooth impermeable base (concrete or 250 µm plastic) with an earth bund. The fuel bund may be used for this purpose as long as the capacity of the bund remains 130% of all of the fuel storage tanks/ bowsers it contains. The unopened storage containers shall be inspected regularly to ensure that no leakage occurs. When oil/ curing compound is dispensed, the proper dispensing equipment shall be used, and the storage container shall not be tipped in order to dispense the oil/ curing compound. The dispensing mechanism of the oil/ curing compound storage container shall be stored in a waterproof container when not in use.

Oil/ curing compound shall be used in moderation and shall be applied under controlled conditions using appropriate equipment. The Contractor shall take all reasonable precautions to prevent accidental and incidental spillage during the application of these compounds.

In the event of an oil/ curing compound spill, the source of the spillage shall be isolated, and the spillage contained. The Contractor shall clean up the spill, either by removing the contaminated soil or by the application of absorbent material in the event of a larger spill. Treatment and remediation of the spill area shall be undertaken to the reasonable satisfaction of the Engineer.

4.2.4 Paints, solvents and other chemicals

The Contractor shall ensure that the use of oil based paints, chemical additives, cleaners and other chemicals is strictly controlled, and that no contamination of the environment, particularly of watercourses and water bodies, occurs as a result of their use.

4.2.5 Herbicides and pesticides

Where the use of herbicides, pesticides and other poisonous substances has been specified or approved by the Engineer, they shall be stored, handled and applied with due regard to their potential harmful effects and in adherence with the approved Method Statement. The Contractor shall strictly adhere to the manufacturer's specifications regarding applications rates, storage and safety precautions.

Herbicides shall not be used within 50 m of the edge of any watercourse.

Unused chemicals shall not be disposed of on site, but shall be disposed of at a waste site licensed for such disposal.

5 EQUIPMENT

5.1 GENERAL

The Contractor shall be cognisant of the requirements of this Specification in the selection and operation of his equipment, to ensure that environmental degradation is kept to a minimum. To this end, the Contractor shall ensure that his equipment operators are made aware of the environmental requirements and any other reasonable controls.

In sensitive areas, wheeled equipment shall be used in preference to tracked equipment. Reasonable speeds, as specified, shall be maintained at all times, but particularly where construction activities are taking place near to populated areas.

5.2 WORKSHOP, EQUIPMENT MAINTENANCE AND STORAGE

All vehicles and equipment shall be kept in good working order. Leaking equipment shall be repaired immediately or removed from Site. Where practical, all maintenance of equipment and vehicles on Site shall be performed in the workshop. The workshop shall have a smooth impermeable (concrete) floor. The floor shall be bunded and sloped towards an oil separator to contain any spillages.

If it is necessary to do maintenance outside of the workshop area, the Contractor shall obtain the approval of the Engineer prior to commencing activities. The Contractor shall ensure that in his workshop and at other equipment maintenance facilities, including those areas where, after obtaining the Engineer's approval, the Contractor carries out emergency equipment maintenance, there is no contamination of the soil or vegetation.

When servicing equipment on Site, portable drip trays shall be used to collect the waste oil and other lubricants. Drip trays shall also be provided in construction areas for stationary equipment (such as compressors) and for "parked" equipment (such as excavators, loaders and cranes). 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. Oil from the drip trays shall be stored in externally clean drums in a bunded area as required for fuel storage. These shall be removed on a regular basis to an oil-recycling centre.

The washing of equipment shall be restricted to urgent or preventative maintenance requirements only. Vehicle cleaning shall be undertaken in designated wash bays, which have an impermeable floor and are bunded to contain runoff and direct it into a sump. Oil and diesel shall be skimmed off the sump

water on a monthly basis and recycled or disposed of at an appropriately licensed recycling or waste disposal site.

5.3 BATCHING PLANTS

The siting of batching plants shall take cognisance of the requirements of this Specification and shall be subject to the Engineer's approval. The Contractor's attention is specifically drawn to the requirements related to hazardous substances, dust and noise control, site demarcation, site clearing and refuse and waste control. The Contractor shall be responsible for obtaining the Engineers approval prior to the siting and establishment of any batching plants.

No batching activities shall occur directly on unprotected ground. Batching plants shall be located on a smooth impermeable surface (concrete or 250 µm plastic covered with 5 cm of sand). 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. To this end, either the batching area shall be bunded and sloped towards a sump or diversion berms shall be installed to direct all contaminated water to a storage area. 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. 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 or cement is used, the Contractor shall ensure that the delivery vehicles do not wash their chutes directly onto the ground, but that the chutes are washed off into a hole dug into the stockpiled subsoil from the foundation excavations. This contaminated subsoil shall be used as backfill for the foundations excavations, and covered with topsoil as part of the landscaping and

rehabilitation process. Any spillage resulting from the “readymix” delivery shall be immediately cleared and disposed of via the solid waste management system.

5.4 PUMPING

Where dewatering is required, pumps shall be placed over a drip tray in order to contain fuel spills and leaks. The Contractor shall take all reasonable precautions to prevent spillage during the refuelling of these pumps. The Contractor shall ensure that none of the water pumped during any dewatering activities, is released into the environment without the Engineer’s approval.

5.5 DUST AND EMISSIONS

5.5.1 Dust control programme

A dust control programme shall be implemented by the Contractor to maintain a safe working environment, minimise nuisance for surrounding residential areas, prevent damage to the natural vegetation of the area and protect topsoil. The Contractor’s shall take all reasonable and appropriate measures to minimise the generation of dust because of his activities, and his dust control programme shall, as a minimum, address the following:

- i) Schedule of spraying water on dust prone portions of the Working Area, particularly gravel access roads, paying due attention to the control of runoff. High traffic sections shall either be paved or treated via the application of suitable dust suppressing agents;
- ii) Speed limits for vehicles on unpaved roads and minimisation of haul distances;
- iii) Measures to ensure that material loads are properly covered during transportation;
- iv) Schedule for wheel cleaning and measures to clean up public roads that may be soiled by construction vehicles;
- v) Minimisation of the area disturbed at any one time and protection of exposed soil against wind erosion, e.g. dampening with water, covering with straw or applying suitable dust suppressing agents;
- vi) Location and treatment of material stockpiles taking into consideration prevailing wind directions and location of sensitive receptors; and
- vii) Reporting mechanism and action plan in case of excessive wind and dust conditions.

An appropriate number of water tankers shall be permanently available for the control of dust generation, and the Contractor shall ensure that the sprays do not generate excess run off. There shall be sufficient water tankers of adequate capacity to enable the dampening of all working areas and access/ haul roads at least four times daily. During high wind conditions, the Contractor shall comply with the Engineer’s instructions regarding additional dust-dampening measures.

5.5.2 Dust measurement

The Contractor shall extend the existing Kusile Power Station construction site fall out dust monitoring network and maintain and calibrate the fall out dust collectors for the measurement of dust fallout. The directional dust collector devices shall consist of at least an additional one to two removable dust collectors placed at right angles mounted at a height of 2 metres above ground.

Dust measurement will only be required at those portions of the Working Area where working is actively occurring. The exact number and location of individual collectors shall be established in consultation with the Engineer. The Engineer may from time-to-time instruct the Contractor to carry out testing of dust levels at additional locations.

The Contractor shall arrange for the collection of dust from the dust collectors on a weekly basis (or more frequently if required by the Engineer) and calculate the dust fallout according to the following formula:

$$Fallout = M \div (A \times d)$$

Where M = mass of dust sample, A = area of opening of dust collector and d = number of days over which sample was collected

The Contractor shall keep records of all dust level measurements for the duration of the Contract. These records shall be submitted each week and month to the Engineer.

5.5.3 Vehicle emissions

All vehicles and equipment shall be kept in good working order and serviced regularly. Vehicles noticeably emitting excessive fumes will not be permitted to continue working on site.

5.6 NOISE

5.6.1 Noise control

The Contractor's attention is drawn to the requirements of the Noise Induced Hearing Loss Regulations No 307 of the Occupational Health and Safety Act of 1993. Appropriate directional and intensity settings are to be maintained on all hooters and sirens, and the Contractor shall provide and use suitable and effective silencing devices for pneumatic tools and other plant to reduce noise levels associated with his activities. The Contractor shall restrict any of his operations that may result in undue noise disturbance to those communities and dwellings abutting the Site to the hours of 06h00 to 18h00 on weekdays and Saturdays or as otherwise as agreed with the Engineer. However in some instances the Contractor may require to work shifts from 6h00 to 6h00 and on Sundays.

No amplified music shall be allowed on Site. The use of radios, tape recorders, compact disc players, television sets etc shall not be permitted unless the volume is kept sufficiently low as to avoid any intrusion on members of the public within range. The Contractor shall not use sound amplification equipment on site other than in emergencies.

The Contractor shall ensure that environmental awareness and training for all employees includes the need to minimise noise. The Contractor shall provide suitable ear protectors to all of his staff and others entering areas with high noise levels. Zones of risk shall be clearly identified with warning signs.

5.6.2 Noise measurement

The Contractor shall be responsible for monitoring noise levels as detailed in this specification. Noise monitoring equipment shall meet the IEC Publication 651 standard for a Class 1 integrating sound level meter. The meter shall be recalibrated at yearly intervals by an acoustics laboratory approved by the Engineer. A set of sound measuring equipment shall be made available for use by the Engineer as required.

No fixed monitoring stations are proposed for noise measurements, and an *ad hoc* approach is recommended, depending on which activities are in progress and their respective locations on the site in relation to sensitive receptors. At least 14 days prior to the onset of construction activities various noise level readings shall be recorded throughout the Working Area to serve as controls. During construction, noise levels shall be measured at weekly intervals (or more frequently if so required by the Engineer) at the closest sensitive receptor to the Site locations agreed with the Engineer. These locations shall include the closest sensitive receptor to the; (1) construction camp, (2) batching plants; (3) active construction areas (particularly during the execution of noise generating activities like

blasting), (4) stockpiling and laydown areas, (5) access routes and (6) additional areas identified by the Engineer

Noise recordings shall reflect typical ambient noise levels during construction and accordingly noise levels shall be recorded during normal construction operations and not during periods of reduced activity (e.g. lunch break, Sundays, site closure). The Contractor shall keep records of all noise level measurements for the duration of the Contract. These records shall be submitted each month to the Engineer, or on the request of the Engineer.

Noise levels measured at the aforementioned locations shall not exceed the SANS standard of 70 dBA in the day and 60dBA at night. Where noise levels exceed this standard, the Contractor shall comply with the Engineer's instructions in this regard. Such instructions may include the cessation of the operations causing the unacceptable noise level until remedial measures have been put in place.

5.7 LIGHTING

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 indigenous fauna, surrounding communities or other users of the area.

6 SITE ESTABLISHMENT

6.1 SITE LAYOUT

The Contractor shall inform the Engineer of the intended actions and programme for site establishment and of the proposed location of the construction camp/s and provide him with a plan showing the layout of the construction camp, including the positions of all buildings, stockpile and laydown areas, vehicle wash and service areas, fuel storage areas, batching areas and other infrastructure. The Construction camp shall occupy as small an area as possible, and no site establishment shall be allowed within 100 m of any watercourse or water body unless otherwise approved by the Engineer. The construction camp is only permitted to be located within the approved railway corridor or within the Kusile Power Station Construction Site. 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 final site layout shall be subject to the Engineer's approval, which shall not be unreasonably withheld.

6.2 SITE DEMARCATION

6.2.1 General

The Contractor shall maintain in good order all demarcation fencing and barriers for the duration of construction activities, or as otherwise instructed by the Engineer.

6.2.2 Construction camp

The Contractor shall erect fencing around the construction camp and batching plants in accordance with this Specification and the Engineer's instructions. The material and erection shall be in accordance with the provisions of this Section, but the material need not necessarily be new. Where used materials are offered, they shall nevertheless be in a good condition and approved in advance by the Engineer. When no longer required, the fencing and gates shall be dismantled and removed.

Temporary fencing shall be 1.8 m in height and unless otherwise approved by the Engineer, shall comprise the following:

- i) Metal or wooden standards at 20 m centres, with three wooden droppers spaced evenly between the standards;
- ii) Four equally spaced strands of double strand high tensile wire, with the lowest strand being at a height of 50 mm above natural ground level and the highest being at 1.8 m;
- iii) Diamond mesh or bonnix type fencing, of 1.8 m in height, secured to the wire strands and posts; and

- iv) Gates to suit the width of access as required.

6.2.3 “No go” areas

Unless otherwise agreed to by the Engineer, the Contractor shall ensure that all activities are restricted to within the defined Working Area. The areas outside of the defined Working Area as well as any other areas identified by the Engineer or in this Specification shall be regarded as “no go” areas. Insofar as he has the authority, the Contractor shall ensure that no unauthorised entry, stockpiling, dumping or storage of equipment, plant or materials shall be allowed within the “no go” areas.

Unless demarcated with other fencing, the boundary of the Working Area shall be demarcated using “no go” fencing consisting of wooden posts at 3 m centres. The top 300 mm of each wooden post shall be painted with white paint and each post shall be long enough so that at least 1.5 m protrudes above the ground once it has been installed.

The Engineer may also identify patches of natural vegetation or any other natural, sensitive or special features inside the Working Area as “no go” areas. These areas shall be demarcated using “no go” fencing consisting of wooden posts at 2 m centres. The top 300 mm of each wooden post shall be painted with white paint and each post shall be long enough so that at least 1.5 m protrudes above the ground once it has been installed.

Once construction within an area has been completed and the area has been rehabilitated, it shall be considered a “no go” area.

6.3 SITE CLEARING

6.3.1 Demolition and removal of existing structures

Clearing shall consist of the removal of all vegetation, crops, rubbish, fences and all other material prohibiting the execution of the Works, including the disposal of all resultant materials, subject to the requirements of this Specification and the Engineer. Any existing structures located within the Working Area, including but not limited to buildings, dams, graves and services, shall only be damaged or demolished and removed with the prior approval of the Engineer.

6.3.2 Identification and management of sensitive vegetation

6.3.2.1 General

At the commencement of the Contract, the Engineer will identify to the Contractor the areas of natural vegetation that may be disturbed during the execution of the Works as well as the areas of natural

vegetation or any rare or endangered flora that shall be preserved. The latter areas shall be designated as “no-go” areas and treated as per the requirements of Subclause 6.2.3.

Prior to the onset of construction activities within any areas occupied by natural vegetation, a search and rescue operation shall be undertaken by the Contractor, in consultation with the Engineer, to collect rare and endangered plants identified for transplanting or use in the revegetation of affected area. Search and rescue operations will occur under the direction of the botanical specialist appointed by the Employer and accordance with the requirements outlined in Subclause 6.3.2.2.

6.3.2.2 Search and rescue

When plant material is rescued, the Contractor shall accept full responsibility for maintaining the plants in good condition. The plants shall either be transplanted to the location(s) indicated by the Engineer or shall be fully maintained in an on-site nursery (preferably the Kusile Power Station construction site nursery) until they are utilised for revegetation. Maintenance of stored plants shall include regular watering, and any plant losses due to lack of maintenance, including diseases developed during the construction period and the Defects Notification Period, shall be replaced at the Contractor's expense.

Each plant shall be handled and packed in the approved manner for that species or variety, and all necessary precautions shall be taken to ensure that plants arrive at the on-site nursery or transplant location(s) in a condition for successful growth. Vehicles used for transporting plants shall be equipped with covers to protect plants from windburn. Containers shall be in a good condition.

6.3.2.3 On-site nursery

On-site nursery facilities shall be erected for the holding and maintenance of rescued plant material and the propagation of appropriate species for revegetation. The location of the nursery shall be to the approval of the Engineer (preferably the Kusile Power Station construction site nursery). The Contractor shall provide adequate labour, shade, water and all things necessary to sustain the plants in the nursery.

A record of stock relevant to the Project that is held in the nursery shall be provided to the Engineer on a monthly basis.

6.3.3 Clearing of vegetation

The object of vegetation clearing is to trim, cut or clear the minimum number of trees and vegetation necessary for the safe construction and operation of the railway and associated infrastructure (specifically the railway track, power line servitude and substations). No clearing of trees or vegetation shall occur prior to the Contractor obtaining written permission from the Engineer, who shall designate in detail the exact areas to be cleared and the time at which it shall be done.

The Contractor shall ensure that the clearance of vegetation is strictly restricted to that required to facilitate the execution of the Works. Any natural vegetation, particularly trees, within or immediately adjacent to the Working Area, which do not require removal, shall be fully protected against damage. Vegetation clearance shall be restricted to the construction camp, approved railway servitude, approved power line servitude, approved access road, approved substation sites, approved stockpiling and laydown areas, batching plant sites and portions of the Working Area where vegetation interferes with construction activities.

Site clearance shall occur in a planned manner, and cleared areas shall be stabilised as soon as possible. The detail of vegetation clearing shall be subject to the Principal Agent's approval. All cleared vegetation shall either be mulched and mixed into the topsoil stockpiles or disposed of at an approved disposal site. The disposal of vegetation by burying or burning is prohibited without the requisite permit from the local authority.

Should fauna be encountered during site clearance, activities shall cease until such fauna have been safely relocated.

6.3.4 Stockpiling, removal and disposal of vegetation and trees

All cleared vegetation shall be mulched and mixed into the topsoil stockpiles, used as brush-packing (depending on the type of vegetation) or disposed of at an approved disposal site. The disposal of vegetation by burying shall be strictly prohibited.

Trees shall be cut into manageable logs (no more than 400 mm) and, where appropriate, distributed to local communities for use as firewood. Failing this, logs shall be disposed of at an appropriate landfill site. Under no circumstances shall members of the public be allowed to collect logs from the Working Area.

6.3.5 Stripping and stockpiling of topsoil

The Contractor shall strip the topsoil, which includes the top 300 mm of soil (or to the depth of the bedrock where the soil is shallower than 300 mm) and root material of cleared vegetation, for subsequent use during rehabilitation and revegetation. Topsoil shall be stripped from all areas of the Working Area where topsoil will be impacted by construction activities, including areas for temporary facilities, as directed by the Engineer. If the Contractor fails to conserve topsoil as instructed, he shall obtain suitable substitute material from other sources, approved by the Engineer, without any additional payment.

Topsoil collected from different areas shall be stockpiled separately and replaced in the same areas from which it was taken. Furthermore, topsoil shall be stockpiled separately from subsoil.

Where possible, stockpiles shall be located on previously disturbed areas or in areas where they pose the minimum risk of causing further environmental degradation. Topsoil and subsoil stockpiles shall not exceed 18 m in height and shall be so placed as to occupy the minimum width compatible with the natural angle of repose of the 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 are themselves washed away. If the stockpiles start to erode significantly or cause dust problems, they shall be covered with Hessian or any measures approved by the engineer.

Where practical, topsoil shall not be left for longer than six months before being used for rehabilitation. If stored for longer than six months, the topsoil shall be analysed and, if necessary, upgraded before placement.

6.3.6 Erosion and sedimentation control

The Contractor shall take all reasonable measures to limit erosion and sedimentation due to the construction activities and shall include in the design of the site works measures to prevent such occurrences. The Works shall be phased, and development staged so that stripped areas are kept to a minimum. The Contractor shall ensure that the stabilisation of cleared areas is actively managed in order to prevent and control erosion.

Surface stormwater shall not be allowed to be concentrated and to flow down cut or fill slopes, access roads or other areas prone to erosion without erosion protection measures being in place. Accordingly, the necessary temporary and permanent drainage works shall be installed as soon as

possible. For access roads on sloping terrain, water diversion berms shall be installed immediately after the road is opened and shall be 4 m in width with a minimum compacted height of 350 mm and outlets of 2 m in length. The spacing of the water diversion berms shall be inversely proportional to the slope of the access road, ranging from a spacing of 60 m for a 2% slope to 10 m where the slope is greater than 15%.

Erosion shall not be allowed to develop on a large scale before repairs are affected and all erosion damage shall be repaired as soon as it has been detected. In this regard, any runnels or erosion channels that develop during the construction shall immediately be backfilled and compacted and the areas restored to a proper stable condition.

The landscaping and rehabilitation of disturbed areas shall occur as soon as practically possible following the cessation of the work in a specific area. In this regard, the Contractor's Works Programme shall clearly indicate that the rehabilitation will immediately be executed, per phase, upon the completion of the works within a specific area. Traffic and movement over stabilised areas shall be restricted and controlled, and damage to stabilised area shall be repaired and maintained to the satisfaction of the Engineer.

6.3.6.1 *Alien invasive vegetation*

The Contract shall remove all alien invasive vegetation from the Working Area for the duration of the construction and maintenance period. In general, clearance of alien invasive vegetation shall be undertaken by hand, using chainsaws and hand held implements, with vegetation being cut off at ground level, and not uprooted. To prevent re-growth, cut stumps of resprouting alien invasive species, such as gums (*Eucalyptus* species), Port Jackson (*Acacia saligna*), Golden wattle (*Acacia pycnantha*) and Australian myrtle (*Leptospermum laevigatum*), shall be treated with *Chopper* herbicide, at the application rate specified by the manufacturers. The Contractor shall ensure that the person applying the herbicide is certified to do so and shall provide the Engineer with proof of such certification.

Topsoil that is contaminated with seeds of alien invasive species shall not be used for rehabilitation purposes.

6.4 TEMPORARY SERVICES AND FACILITIES

6.4.1 Site structures

All site structures shall be of a temporary nature and shall be removed at the end of the contract. All site establishment components (as well as equipment) shall be located within previously disturbed

areas where possible, and shall be positioned to limit visual intrusion on neighbours and to limit the extent of the area disturbed. The type and colour of roofing and cladding materials of the Contractor's temporary structures shall be selected to reduce reflection.

6.4.2 Accommodation of site staff

With the exception of the night watchmen, none of the Contractors staff shall be accommodated on Site overnight. The Contractor shall make adequate provision for his staff to be accommodated in nearby towns.

6.4.3 Services

Temporary services, including pipelines, power lines and telephone lines, shall be located in a manner which will cause the least disturbance to the environment. In particular, care shall be taken to ensure that the route alignment for temporary services avoids identified sensitive areas. Where possible, the Contractor shall ensure that service infrastructure is accommodated within the same trench.

6.4.4 Stockpiling and stockpile areas

Plant and materials shall be stored within the demarcated construction camp or batching areas. Where this is not feasible, the Engineer will identify additional sites for stockpiling within the Working Area. Where possible, stockpiled materials shall be stored off the ground on scaffolding and care shall be taken to minimise disturbance to the vegetation and topsoil. Where this is not possible, the stockpile areas shall be treated as specified under Subclause 6.3.

Soil, sand and gravel stockpiles shall be convex in shape, shall be no higher than 18 m and shall be located so as to cause minimal disturbance. Stockpiles shall be so placed as to occupy the minimum width compatible with the natural angle of repose of the material, and measures shall be taken to prevent the material from being spread over too wide a surface. The Contractor shall ensure that all stockpiles do not cause the damming of water or run off, or are themselves washed away.

The Contractor shall ensure that material is not stockpiled within 50 m of any watercourse. Stockpiles shall be placed so that watercourses are not obstructed or polluted and shall not obstruct any stormwater or drainage paths.

6.4.5 Access roads

Only designated access roads shall be used to access the Working Area. If required, the Engineer will, together with the Contractor, negotiate access to construction camp and Working Area with the affected landowners. The access agreement will be reduced to writing. Where private roads are

utilised, the Contractor shall record the condition of the road prior to its use. The Contractor shall maintain the designated access roads during the course of the Contract. Maintenance includes ensuring the provision of adequate drainage and dust control. Damage to the existing access roads because of construction activities shall be repaired to the satisfaction of the Engineer, using material similar to that used in the original construction of the infrastructure.

Where a new access road is required, these shall be subject to prior approval by the Engineer and shall be planned and constructed to ensure that as small an area as possible is disturbed (maximum width of 5 m, with splays where appropriate and required), that they avoid all “no-go” areas and, as far as possible, that they follow the natural contours. As required, access roads shall be watered to control dust nuisance to the local communities as well as possible hazards resulting from the dust. Watering shall occur on instruction of the Engineer and shall be undertaken using a water tanker at an application rate of 1.5 ℓ/m².

All temporary access roads shall be rehabilitated to their original (i.e. pre-construction) condition at the end of the Contract, including ripping the disturbed area parallel with the contours to a depth of 300 mm and spreading back of previously stripped topsoil. Temporary access roads across cultivated land shall be ripped to a depth of 600 mm.

All vehicle turning-areas shall be located within the Working Area and shall be subject to the prior approval of the Engineer. The Contractor shall ensure that horse and trailer vehicles transporting plant and materials only turn within the designated turning-areas, and not within cultivated lands or areas of natural vegetation.

Mud and sand deposited onto public roads by construction activities shall be cleared on a daily basis.

6.4.6 Ablution facilities

The contractor shall provide adequate ablution facilities for his staff in the construction camp. Mobile chemical toilets shall be provided at all other locations within the Working Area, as directed by the Engineer. Acts of excretion and urination are strictly prohibited other than at the facilities provided. The ratio of the available toilets to the site staff at any particular location should not exceed 1: 15 and toilet paper shall be provided in all toilets at all times.

The Contractor shall not install pit latrines or septic tanks for the ablution facilities at the Construction Camp. Where mobile chemical toilets are utilised, the Contractor shall ensure the following:

- i) Toilets shall be located within 100 m from any point of work but no closer than 50 m to any watercourse or water body;
- ii) Toilets shall be secured to the ground to prevent them from toppling due to wind or any other cause;
- iii) Toilets situated close to the site boundaries or within sight of residential areas shall be hidden behind screens or other cover as approved by the Engineer;
- iv) No spillage shall occur when the toilets are cleaned or emptied and the contents shall be properly stored and removed from Site;
- v) Discharge of waste from toilets into the environment and burial of waste is strictly prohibited;
- vi) Toilets shall be provided with an external closing mechanism to prevent toilet paper from being blown out; and
- vii) Toilets shall be emptied before long weekends and builders' holidays, and shall be locked after working hours.

6.4.7 Eating areas

The Contractor shall designate eating areas for his staff at a location within the Working Area where work is taking place. These eating areas shall be clearly demarcated and shall be provided with bins with lids. The Contractor shall ensure his employees do not consume meals anywhere other than at these eating areas and that noise is limited. All eating areas shall include provision for a smoking area.

Any cooking on Site shall be done on well-maintained gas cookers with fire extinguishers present. No cooking shall be permitted to occur on open fires.

6.4.8 Water use

Water is a scarce resource in South Africa and water shall be conserved wherever possible. The Contractor shall minimise the use of water and shall immediately attend to any wastage.

Subject to the prior approval of the Engineer, water for construction purposes may be abstracted from either watercourses/ water bodies or agricultural sources in the surrounding area. Abstraction of water from a watercourse or water body will require a permit from the Department of Water Affairs and Forestry, and abstraction from an agricultural source will require the owner's permission. The Contractor shall be responsible for obtaining the necessary authority and landowner approvals prior to undertaking such abstraction. The Contractor shall absolve the Employer of any and all legal obligation and risk in this regard.

Where water is abstracted from a watercourse, the Contractor shall abstract the water either from a naturally occurring scour hole located upstream or downstream of the river crossings or from a temporary sump, as directed by the Engineer. During water abstraction, the Contractor shall ensure the following:

- i) The vehicle abstracting water does not enter or cross the river and does not operate from within the river;
- ii) No damage occurs to the river bed or banks and that the abstraction of water does not entail stream diversion activities;
- iii) All reasonable measures to limit pollution or sedimentation of the downstream watercourse are implemented e.g. construction equipment is well maintained, use of drip trays, provision of bins, monitoring of personnel and activities.

The quantity of all water abstracted from any watercourses/ water bodies or agricultural sources shall be measured by way of water meters or other devices approved by the Engineer. The total quantity of water abstracted shall be recorded on a daily basis and reported to the Engineer each week in writing.

6.4.9 Solid waste management

The management of solid waste on site shall be strictly controlled and monitored. The quantities of waste generated on site shall be minimised. Littering shall be avoided.

The Contractor shall provide sufficient weatherproof and scavenger-proof bins on Site to store the solid waste produced on a daily basis. Solid, non-hazardous waste shall be disposed of in the bins provided and no on-site burying, dumping or burning of any waste materials, vegetation, litter or refuse shall occur. Bins shall not be allowed to become overfull and shall be emptied a minimum of twice weekly. The waste may be temporarily stored on the Site in a central waste area that is weatherproof and scavenger-proof, and which the Engineer has approved.

All solid waste shall be disposed of off-site at an approved landfill site. The Contractor shall supply the Engineer with a certificate of disposal.

6.4.10 Contaminated water management

6.4.10.1 General

Pollution could result from the release, accidental or otherwise, of contaminated runoff from construction camps and batching areas, discharge of contaminated water, chemicals, paints, solvents, oils, fuels, sewage, runoff from stockpiles, solid waste, litter, etc. Accordingly, the Contractor shall

establish a contaminated water management system to address the prevention of pollution as well as suitable methods for the disposal of contaminated water. In this regard:

- i) Appropriate pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into watercourses or water bodies shall be designed and implemented;
- ii) Runoff from the cement/ concrete batching areas shall be strictly controlled, and contaminated water shall be collected, stored and either treated or disposed of off-site, at a location approved by the Engineer. The approval of the Engineer shall be required prior to the release of treated runoff from batching areas into any watercourse;
- iii) Runoff from vehicle wash bays, workshops and diesel/ fuel tank areas shall pass through oil traps. The oil sludge thus collected shall be disposed of at an approved waste disposal site, *i.e.* licensed for such material;
- iv) All spillage of oil onto concrete surfaces shall be controlled by the use of an approved absorbent material;
- v) Water collected during the dewatering activities shall be pumped to settlement ponds complying with the requirements of Subclause 6.4.10.2.

Natural stormwater runoff not contaminated by construction operations and clean water can be discharged directly to watercourses and water bodies, subject to the Engineer's approval. Water that has been contaminated with suspended solids, like soils and silt, may be released into watercourses or water bodies only once all suspended solids have been removed from the water by settling out these solids in settlement ponds. The release of settled water back into the environment shall be subject to the Engineers approval.

The Contractor shall notify the Engineer immediately of any pollution incidents on Site. Verbal reports must be followed up by a written report, which shall be submitted within 24 hours of the incident.

6.4.10.2 Settlement ponds

The Contractor shall construct, operate and maintain settlement ponds at key locations within the Working Area, including at washing areas, batching areas, vehicle washing areas, areas where dewatering is occurring and any other areas where a significant volume of contaminate water is discharged from the Works. The size, location, layout and operation of the settlement ponds shall be to the satisfaction of the Engineer.

The Contractor shall ensure that settlement ponds are located outside of the floodplain and riparian vegetation zones of watercourses and that the area is rehabilitated pursuant to the cessation of the operation of the pond. Each settlement pond shall have sufficient capacity for their purpose and shall be fitted with suitable oil traps. Settlement ponds shall be constructed using suitable materials and shall be made watertight using a liner approved by the Engineer. They shall be sub-divided to enable alternative sections to be cleaned while other sections are in operation. Plant and materials used in the construction of the settlement ponds shall themselves not cause pollution or effluent of an unacceptable quality.

All natural ground water and stormwater must be prevented from flowing into the ponds, and must be diverted around the settlement ponds to ensure that accumulated sludge is not washed into natural watercourses by stormwater.

If the Engineer is not satisfied that the provisions for the settlement ponds are adequate, he may order the Contractor to carry out such additional work as is necessary in order to comply with this Specification without any additional payment.

6.4.10.3 *Water quality monitoring*

(a) Point source

All effluent emanating from settlement ponds, batching plants, washing areas and any other areas of effluent and water discharge shall be sampled and tested as indicated in Table 1 at point of source. Quality of water at monitoring points shall comply with the criteria given in Table 1. Monitoring points for effluents shall be determined in agreement with the Engineer when the locations of specific areas and treatment works have been established in terms of the Contractor's Method Statements. Monitoring of point source effluent disposal into the watercourse/ water body will be the final effluent at the point of discharge into the watercourse/ water body.

Table 1: Required effluent standards/ water quality guidelines for effluent from the sedimentation ponds, batching plants, washing areas or any other areas of effluent and water discharge to be returned to the environment.

Variable	Required Effluent Standard
COD	Not to exceed 75 mg/l
Conductivity	Not to be increased by more than 75 mS/m above influent, and shall not exceed 250 mS/m

Variable	Required Effluent Standard
Fecal coliforms	No <i>E. coli</i> (0/100 ml)
Free & saline ammonia (as N)	Not to exceed 10.0 mg/l
Nitrate (as NO ₃)	Not to exceed 25.0 mg/l
Nitrite	Not to exceed 1.0 mg/l
pH	Between 5,5 and 9,5
Phosphate (as PO ₄)	Not to exceed 5.0 mg/l
Residual Chlorine (as Cl)	Not to exceed 0.1 mg/l
Soap, oil, grease	Not to exceed 2.5 mg/l
Suspended solids	Not to exceed 250 mg/l
Temperature	Water discharged into a watercourse shall not raise the water temperature at a point 500 m downstream of the point of discharge by more than 2°C above the temperature of the water 500 m upstream of the point of discharge.

(b) Diffuse source

Diffuse source monitoring shall be undertaken whenever there is a disturbance to any watercourse or water body as a result of construction activities within or adjacent to said watercourse/ water body. Sampling and monitoring shall take place 50 m upstream and 50 m downstream of the area where disturbance to the river has occurred and at 4 points equidistant across the river at each location. Sampling shall occur on a monthly basis and the following variables shall be measured:

- i) Temperature;
- ii) Conductivity;
- iii) Dissolved Oxygen;
- iv) pH;
- v) Suspended Solids; and
- vi) Hydrocarbons.

Based on a comparison of the sampling variables, the quality of the water in the watercourse downstream of the activities in the watercourse shall be no worse than the quality of the water upstream of the activities.

(c) Sampling protocol

The Contractor shall ensure that persons taking water samples are correctly trained and standard sampling techniques are followed. Depending on the variable being measured, water quality monitoring shall either be undertaken *in situ* using approved handle-held instruments or at a SANS accredited laboratory in terms of SANS 10259.

6.5 ACCESS TO SITE

The Contractor shall ensure that access to the Site and associated infrastructure and equipment is off-limits to the public at all times during construction.

6.6 ACCOMMODATION OF TRAFFIC

The Contractor shall ensure vehicle traffic safety at all times and shall implement safety measures to this end. The Contractor shall control the movement of all his vehicles and equipment including that of his suppliers so that they remain on designated routes, are distributed so as not to cause an undue concentration of traffic, are routed and operated in a manner that minimises disruption to other users and that all relevant laws are complied with. On gravel or earth roads on the Site and within 500 m of the Site, the vehicles of the Contractor and his suppliers shall not exceed a speed of 40 km/hr.

7 SURFACE EXCAVATIONS AND BLASTING

7.1 SITE PREPARATION

The Contractor shall ensure that the measures specified for site clearing (Subclause 6.3), specifically as they relate to the identification and management of sensitive vegetation, clearing of vegetation and the stripping and stockpiling of topsoil, are implemented prior to the onset of earthworks.

7.2 DUST AND NOISE

The Contractor shall ensure that the dust and noise control measures specified in Subclauses 5.5 and 5.6 of this Specification are implemented during excavation and blasting operations.

7.3 EXTENT OF DISTURBANCE

All earthworks shall be undertaken in such a manner so as to minimise the extent of any impacts caused by such activities, particularly with regards to loss of natural vegetation, erosion and dust/noise generation. No equipment associated with earthworks shall be allowed outside of the approved corridors or site and defined access routes unless expressly permitted by the Engineer. Cuts into sloping terrain shall be minimised to eliminate the potential erosion risks associated with such operations.

7.4 STABILISATION

The Contractor shall ensure that the slopes of all excavations are stable. The most effective stabilisation mechanism is the retention of existing vegetation, where possible. Accordingly, clearing of any area shall be programmed to occur immediately prior to the onset of construction activities within the subject area. Moreover, disturbed areas shall be revegetated, as per the landscaping and rehabilitation provisions outlined in Clause 9, as soon as is reasonably possible.

Excavation at all the sites shall be carried out in such a way that slopes are not made dangerously steep. In general excavated slopes should be no steeper than 1:3 (approx 18 degrees), but where this is unavoidable appropriate measures shall be undertaken to stabilise the slopes. No materials, equipment or other load shall be placed so close to any excavation that the stability of the sides of the excavation is endangered.

7.5 BLASTING

The Contractor shall take appropriate precautions to minimise damage to the surrounding environment, including persons, private property and terrestrial and aquatic flora and fauna. The Contractor shall accept responsibility for all injury or damage occasioned by any blasting operations and shall make good such damage to the satisfaction of the Engineer. The following environmental considerations shall be applicable to blasting operations:

- i) Topsoil shall be stripped and stockpiled before the commencement of drilling for the setting of charges.
- ii) Precautions to minimise damage to the surrounding environment shall include measures to reduce the deposition of flyrock. Flyrock greater than 150 mm in diameter that falls beyond the cleared Working Area, shall be collected and removed.
- iii) Each separate blast shall be designed to break out rock with the minimum explosive force. In this regard, blasting work shall be monitored using a tri-axial particle velocity meter,

and the amount of explosives that may be detonated shall not result in a ground vibration with a peak particle velocity in excess of 20 mm/sec to limit damage to the fragile root systems of plants adjacent to the areas where blasting may take place.

- iv) For multiple charges, time-delay detonators shall be used to reduce the overall detonation to a series of single explosions separated by a minimum 25 milliseconds (1/1000 seconds) delay.
- v) Prior to blasting, the Contractor shall notify the relevant occupants of surrounding land and address any concerns.
- vi) The Contractor shall notify emergency services, in writing, a minimum of 24 hours prior to any blasting activities commencing on Site.
- vii) Adequate warning must be issued to all personnel on site prior to blasting activities taking place. All legally required signals are to be clearly indicated. The Engineer shall be issued daily updates of the days intended blasting activities.

7.6 TRENCHING

Trenching shall be undertaken in accordance with the engineering specifications with the following environmental amplifications, where applicable:

- i) Soil shall be excavated and immediately used for refilling trenches i.e. soil from the first trench section shall be excavated and stockpiled, thereafter soil from the second excavated trench length shall be used to backfill the trench behind it once the infrastructure has been laid. The last trench shall be filled using the soil stockpiled from the first trench.
- ii) Trench lengths shall be kept as short as practically possible before backfilling and compacting. No trench shall exceed 1 000 m in length without the prior approval of the Engineer
- iii) Trenches shall be re-filled to the same level as (or slightly higher to allow for settlement) the surrounding land surface to minimise erosion.

7.7 TREATMENT OF SPOIL

Surplus or unsuitable material obtained from any excavations as well as rubble not required elsewhere in the Works shall be spoiled at designated spoil sites. In operating the spoil sites, the Contractor shall ensure that:

- i) Topsoil that would have been buried as a result of the spoiling of material is moved to one side and either replaced over the spoil site on completion or used for rehabilitation elsewhere on the site.

- ii) The spoil disposed of in the spoil sites is free of contamination, including explosive residues and detonators.
- iii) The spoil sites are shaped to blend with the local topography as far as is practicable and do not have slopes with a gradient exceeding 1:3.
- iv) Drainage is provided to control ground water exit gradients within the spoil dumps such that migration of fines is kept to a minimum.
- v) Surface water runoff is appropriate channelled through or around the spoil sites to prevent erosion damage resulting from stormwater runoff. In this regard, perimeter drainage channels shall be provided, and lined with rock or other suitable material to prevent scour, so that runoff will be collected and conducted past the spoil dumps.
- vi) The surface of the spoil dump is rehabilitated as per the landscaping and rehabilitation provisions outlined in Clause 9.

8 LANDSCAPING AND REHABILITATION

8.1 SCOPE

All areas disturbed as a result of the construction activities, irrespective of whether they occur within the defined Working Area or not, shall be subject to the landscaping and rehabilitation requirements outlined in this Specification. This includes, but is not limited to, Construction Camps, all stockpiling and laydown areas, the batching plants, the railway track, power line footings, the access road and all other areas from which topsoil has been stripped.

The type and number of plant and tree species to be planted at various locations throughout the Working Area will be guided by a landscaping plan developed by others, and not included here. For the purposes of this Specification, the landscaping and rehabilitation of disturbed areas shall entail the clearing, shaping, trimming and scarification of the area, as well as the replacement of the stockpiled topsoil. For areas where plant material has been rescued and stored in the on-site nursery, landscaping and rehabilitation shall also include the replanting of the rescued plants.

8.2 TIMING OF LANDSCAPING AND REHABILITATION

Vegetation is the most effective control against surface erosion. Accordingly, taking cognisance of the fact that the optimal timing for revegetation is during the summer rainfall period (September to March), the Contractor shall programme for the landscaping and rehabilitation of disturbed areas to occur as soon as practically possible following the cessation of the work in a specific area. In this regard, the Contractor's Works Programme shall clearly indicate how rehabilitation will be executed, per phase, upon the completion of the works within a specific area. The period between the cessation of

activities associated with the construction a particular infrastructural component and the onset of landscaping and rehabilitation for the area affected by these activities shall not exceed 1 month (28 days).

8.3 DEMOLITION AND REMOVAL OF STRUCTURES

Prior to landscaping and rehabilitation, the Contractor shall demolish and remove from Site everything not forming part of the Permanent Works. This includes, but is not limited to, temporary services and facilities (including foundations), temporary fences, temporary access routes, protective works, equipment, materials (nut, bolts, washers, wire, wood, bricks, cement *etc.*) and settlement ponds. All material generated from the demolition and removal of structures from site shall be appropriately disposed off.

8.4 SHAPING

All slopes which do not form part of the Permanent Works shall be graded so that no slope exceeds a maximum gradient of 1:3 or as otherwise directed by the Engineer. Contour drains shall be provided to control erosion where required by the Engineer.

Excavation and fills for Temporary Works and spoil dumps shall be formed in such a manner that the final profile shall appear as a natural extension to the adjacent, undisturbed ground profiles.

8.5 TRIMMING

Trimming shall consist of bringing the existing or previously shaped ground to a smoothly flowing surface with the final levels generally following the original surface as directed by the Engineer. Both mechanical and hand trimming shall be undertaken.

Trimming of any areas requiring grass shall be done in such a way that, after cultivation and application of any Topsoil, the finished surface of the area shall be approximately 25mm below the top of adjacent kerbing, channelling or pavement.

8.6 SCARIFYING

Prior to the application of topsoil, the ground surface shall be scarified by hand, plough or a mechanical ripper to a depth of approximately 150 mm to breakdown soil clods.

8.7 RIPPING

Compacted soil that has become too hard to scarify, shall be ripped with a mechanical ripper to a depth of 250 mm. No section of ground shall remain undisturbed after ripping.

8.8 TOPSOILING

Before placing topsoil, the Contractor shall remove all visible weeds from the placement area and from the topsoil. The previously stockpiled topsoil (Subclause 6.3.5) shall generally be spread evenly over the prepared surface to a depth of 150 mm on flat ground or to a minimum of 75 mm on slopes. Topsoil placement shall occur concurrently with construction or as soon as construction in a given area has ceased.

Topsoil shall be placed in the same soil zone from which it was stripped. However, if there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other soil zones of similar quality, subject to the approval of the Engineer.

8.9 RE-PLANTING

As part of the landscaping and rehabilitation programme, the Contractor may be required to re-plant rescued plants stored in the on-site nursery, either at their sites of origin or at a location identified by the Engineer. The transplanting of stored small trees (1 to 1½ m in height) and stored small shrubs (less than 1 m in height) shall entail the following

- i) Trees and shrubs shall only be transplanted between the months of April and September;
- ii) Trees shall be planted in holes of 1 m x 1 m x 1 m and shrubs shall be transplanted in holes of 600 mm x 600 mm x 600 mm;
- iii) Trees and shrubs shall be planted so that their stems or trunks are at the same depth as in their original location. The orientation of the transplanted plants must be the same as in their original location (i.e. the north-facing side of the plant must remain north-facing after it has been planted); and
- iv) Transplanted plants shall be watered once directly after transplanting (the planting hole shall be filled with water) and thereafter as required for establishment.

The transplanting of succulents and bulbous plants shall entail the following:

- i) Succulents and evergreen bulbous plants may be transplanted at any time of the year. Deciduous bulbous plants shall be transplanted when they are leafless;

- ii) Bulbous plants shall be planted in similar soil conditions and to the same depth as they were before removal; and
- iii) Transplanted bulbs shall be watered once directly after transplanting to settle the soil.

In all cases, the soil around the roots of the plants being planted shall not be disturbed. Topsoil and subsoil from the hole shall be stored nearby to be replaced to the same depth intervals from which it was originally removed. Plants shall be carefully planted into holes.

8.10 ESTABLISHMENT AND MAINTENANCE OF REVEGETATED AREAS

8.10.1 Establishing of vegetation

The establishment of vegetation on landscaped and rehabilitated areas shall include maintaining the surface to the required slopes and levels without erosion or sedimentation, watering, weeding and any other procedure consistent with good horticultural practice necessary to ensure normal, vigorous and healthy growth of the plant material on site.

Notwithstanding the fact that the method of landscaping and rehabilitation may be specified or agreed to by the Engineer, the Contractor shall be solely responsible for rescuing, storing, establishing and maintaining the replanted material.

8.10.2 Maintenance of vegetation

The Contractor's liability with regard to the maintenance of the vegetation shall commence when the vegetation has been planted over the whole of the area subject to revegetation, and shall be not less than one year.

8.10.3 Watering and weeding

All landscaped and rehabilitated areas shall be adequately watered to ensure proper growth until the vegetation has become established and thereafter as required to sustain growth. The amount and frequency of watering shall be agreed with the Engineer.

The landscaped and rehabilitated areas shall be kept free of weeds. Weeds shall be controlled by means of pulling, or any other approved means.

8.10.4 Traffic on landscaped and rehabilitated areas

The Contractor shall not undertake the landscaping and rehabilitation of any areas until all operations that may require construction material and equipment to pass over those areas has been completed. All landscaped and rehabilitated areas shall be regarded as “no go” areas (as per Subclause 6.2.3), and no equipment, other than that required for establishment and maintenance purposes, shall be allowed to operate on these areas.

9 TOLERANCES

9.1 COMPLIANCE

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. Moreover, the Contractor and his Subcontractors shall not direct any person to undertake any activities which would place such a person in contravention of this Specification.

9.2 COST OF NON-COMPLIANCE

Where environmental damage occurs as a result of the failure of the Contractor to comply with the requirements of this Specification, the requisite remediation shall be effected to the satisfaction of the Engineer and at the cost of the Contractor.

Compliance with this Specification will be assessed as part of the certification of each Payment Certificate. Payment for specific items related to environmental compliance will be withheld if it can be shown that the Contractor has failed to comply with his obligations for said items. Should the Contractor fail entirely to provide or fulfil for a period of time all or part of the continuing services, obligations and liabilities required of him in respect of this Specification, the amount, or part of the amount for the item, which in the opinion of the Engineer fairly reflects such failure, will be omitted and the Contract Price reduced accordingly.

9.3 PENALTIES

Penalties will be issued for the various transgressions listed Table 2 below. Penalties may be issued per incident at the discretion of the Engineer. Such penalties will be issued in addition to any remedial costs incurred as a result of non-compliance with this Specification. The Engineer will inform the

Contractor of the contravention and the amount of the penalty, and will deduct the amount from monies due under the Contract.

Table 2: Identified transgressions and associated penalties.

Nature of transgression	Penalty
Any employees, vehicles, plant or equipment related to the Contractor's operations operating within the designated boundaries of a "no-go" area.	R 5 000
Any vehicle driving in excess of designated speed limits.	R 5 000
Persistent and un-repaired oil leaks from machinery.	R 10 000
Persistent failure to monitor and empty drip trays timeously.	R 5 000
The use of inappropriate methods for refuelling.	R 5 000
Litter on site associated with construction activities.	R 5 000
Deliberate lighting of illegal fires on site.	R 10 000
Employees not making use of the site ablution facilities.	R 5 000
Failure to implement specified noise controls, particularly during blasting	R 10 000
Failure to empty waste bins on a regular basis.	R 5 000
Inadequate dust control.	R 10 000
A spillage, pollution, fire or any damage to the environment resulting from negligence on the part of the Contractor.	R 25 000
Any damage or degradation to a designated "no go" area	R 50 000

For each subsequent similar offence the fine shall be doubled in value to a maximum value of R 250 000

The Engineer shall be the judge as to what constitutes a transgression in terms of this clause, subject to the provisions of the NEC.

9.4 REMOVAL FROM SITE AND SUSPENSION OF WORKS

The Engineer may instruct the Contractor to remove from Site any person who in their opinion is guilty of misconduct, or is incompetent, negligent or constitutes an undesirable presence on Site. The Contractor shall ensure that within 24 hours of such instruction, the employee has no further connection with the Contract.

All Equipment must be in good working order, and accordingly the Engineer may order that any Equipment not complying with this Specification be removed from Site. Where the Engineer deems

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.

10 MEASUREMENT AND PAYMENT

10.1 BASIC PRINCIPLES

Except as noted below as scheduled items, no separate measurement and payment will be made to cover the costs of complying with the provisions of this Specification 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.

The Contractor shall tender a rate or sum against each scheduled item and shall not price any item as nil or "0-00" and shall not indicate that the cost of any of the items listed in this schedule as being included elsewhere. In the event that the Contractor fails to provide a rate or sum, prices an item as nil or "0-00", or indicates an item as being included elsewhere, the Engineer shall assign what he believes to be reasonable price to each of these items and the Tendered Sum shall not be adjusted to accommodate any additional costs.

10.2 FIXED VERSUS TIME-RELATED CHARGES

The scheduled items below have been categorised as Fixed Charges, Time-Related Charges, Quantity-Proportional Charges or Provisional Sums:

- i) A Fixed Charge is a charge for a scheduled item which is deemed to remain unaltered throughout and which is deemed to be expended and due upon the fulfilment of the requirements under the item, irrespective of any time duration or any quantity measured;
- ii) A Time-Related Charge is a charge for a scheduled item which is deemed to be expended and due in linear proportion to the time expended in the execution of the work or service or obligation in relation to the total length of time duration tendered for that item;
- iii) A Quantity-Proportional Charge is a charge for a scheduled item which is deemed to be expended and due in linear proportion to the volume of work executed, the quantity of material, number of articles supplied, or services rendered, etc., as defined by the unit scheduled for the item; and
- iv) Where required by this Specification, Provisional Sum items have been included in the Schedule of Quantities.

The sum tendered for each Fixed Charge item will be authorised for payment in terms of the first certificate issued after the Contractor's obligations have, in the opinion of the Engineer, been discharged as far as that item is concerned.

Payment for Time-Related Charge items will be certified by way of incremental amounts (calculated by the division of the tendered sum by the tendered duration) in each of the subsequent progress certificates until the sums tendered have been fully certified.

10.3 SCHEDULED ITEMS

10.3.1 General environmental obligations (Fixed Charge)

General environmental obligations

Unit: lump sum (Sum)

All facilities and equipment not measured elsewhere, associated with complying with any requirement of this Specification will be measured as a sum.

The tendered sum shall cover any fixed costs associated with complying with this Specification not measured elsewhere.

10.3.2 General environmental obligations (Time-Related Charge)

General environmental obligations

Unit: lump sum (Sum)

All work not measured elsewhere, associated with complying with any requirement of this Specification will be measured as a sum.

The tendered sum shall cover any time-related costs associated with complying with this Specification not measured elsewhere. Payment will be effected only after payment of the Fixed Charge has been made, and in accordance with the provisions of the NEC.

10.3.3 Environmental monitoring equipment and facilities

Environmental monitoring facilities and equipment

Unit: lump sum (Sum)

The provision of all equipment and facilities related to fulfilling the environmental monitoring requirements of this Specification will be measured as a sum.

The tendered sum shall cover the fixed costs associated with procuring, fitting, operating and maintaining all equipment and facilities associated with the noise, water quality, dust and general environmental monitoring requirements of this Specification.

10.3.4 Environmental monitoring functions

Environmental monitoring functions

Unit: lump sum (Sum)

The work related to undertaking environmental monitoring requirements of this Specification, including the provision of an Environmental Officer, will be measured as a sum.

The tendered sum shall cover all time-related costs associated with the noise, water quality, dust and general environmental monitoring requirements of this Specification, as well as the management of “no go” areas and the drafting and revision of the Contractor’s Environmental Policy. Payment will be effected only after payment of the Fixed Charge has been made, and in accordance with the provisions of the NEC.

10.3.5 Environmental awareness training

Environmental awareness training

Unit: lump sum (Sum)

The provision of environmental awareness training to the Contractor’s staff will be measured as a sum.

The tendered sum shall cover all costs incurred by the Contractor in providing the venue and facilities as detailed in the Specification, in preparing and presenting the initial and refresher courses and in ensuring the attendance of his staff, including site management staff, at the courses.

10.3.6 Method statements: Additional work

Method statements: Additional work

Unit: lump sum (Sum)

No separate measurement and payment will be made for the provision of Method Statements but, where the Engineer requires a change on the basis of his opinion that the proposal may result in, or carries a greater than warranted risk of damage to the environment in excess of that warranted by this

Specification, then any additional work required, provided it could not reasonably have been foreseen by an experienced contractor, shall be valued in accordance with the NEC.

A stated sum is provided in the Schedule of Quantities to cover payment for such additional work.

10.3.7 Dealing with public complaints

Dealing with public complaints

Unit: lump sum (Sum)

The monitoring and remediation of public complaints will be measured as a sum.

The tendered sum shall cover the costs of all labour, materials, plant and equipment required to address public complaints, including maintaining a complaints register and implement the requisite measures to address public complaints, in accordance with the Specification and the instructions of the Engineer, where relevant. The tendered sum will be divided by the number of months of the tendered project duration, and payment will be made against this sum for each month

10.3.8 Dealing with heritage resources

Dealing with heritage resources

Unit: provisional sum (PS)

Engaging a heritage specialist to identify heritage resources and guide the appropriate treatment of these resources, as well as the provision of any assistance to the heritage specialist, will be measured in Dayworks and paid against this Provisional Sum.

10.3.9 Dealing with watercourses, water bodies and wetlands

Dealing with watercourses, water bodies and wetlands

Unit: lump sum (Sum)

The provision of the conservation and protection measures, as required by this Specification, when working within or adjacent to watercourses, water bodies and wetlands will be measured as a sum.

The tendered sum shall cover the costs of all labour, materials, plant and equipment associated with providing the requisite conservation and protection measures, as well as their subsequent removal.

10.3.10 Dealing with sensitive vegetation

Dealing with sensitive vegetation

Unit: provisional sum (PS)

Engaging a botanical specialist to identify sensitive vegetation and guide the appropriate treatment of this vegetation, including assisting with the requisite rehabilitation or conservation measures, as well as the provision of any assistance to the botanical specialist, will be measured in Dayworks and paid against this Provisional Sum.

10.3.11 Fire control

Fire control

Unit: lump sum (Sum)

The compliance with fire control requirements will be measured as a sum.

The tendered sum shall cover the cost of all labour, materials, equipment and any other operation or thing necessary to comply with the requirements of the Specification related to the prevention and control of fires.

10.3.12 Pollution control measures

Pollution control measures

Unit: lump sum (Sum)

The provision of the requisite pollution control measures will be measured as a sum.

The tendered sum shall cover the fixed costs of materials, plant and equipment required to implement the necessary pollution control measures required by the environmental management specification, including facilities for the storage of fuel, oils, curing compounds, herbicides and pesticides, bunding of the workshop, the provision of drip trays, the provision of absorbent materials, the provision and subsequent removal of the settlement ponds, the installation of erosion control structures and the removal and disposal of sediment, contaminated soil and contaminated water.

10.3.13 Pollution management

Pollution management

Unit: lump sum (Sum)

The implementation of the requisite pollution management requirements of the Specifications will be measured as a sum.

The tendered sum shall cover all time-related costs associated with the management of pollution, including the monitoring, emptying and overall management of oil separators, sumps and drip trays, the identification and remediation of leaks and spillages, the repair or removal from site of leaking equipment, the maintenance and management of erosion control structures, the maintenance of all settlement ponds and other facilities and plant that may be required for the effective treatment of water returned to the environment and incident reporting. Payment will be effected only after payment of the Fixed Charge has been made, and in accordance with the provisions of the NEC.

10.3.14 Dust control

Dust control

Unit: lump sum (Sum)

The implementation of the requisite dust control measures will be measured as a sum.

The tendered sum shall cover the costs of all labour, materials, plant and equipment required to implement the necessary measures to control dust, including watering of dust prone areas, enforcement of speed limits, securing of material loads, wheel cleaning, minimisation of disturbed areas, management of stockpile *etc.* The tendered sum will be divided by the number of months of the tendered project duration, and payment will be made against this sum for each month.

10.3.15 Noise control

Noise control

Unit: lump sum (Sum)

The implementation of the requisite noise control measures will be measured as a sum.

The tendered sum shall cover the costs of all labour, materials, plant and equipment required to implement the necessary measures to control noise. The tendered sum will be divided by the number of months of the tendered project duration, and payment will be made against this sum for each month.

10.3.16 Temporary fencing

Temporary fencing

Unit: linear metre (m)

The erection of temporary fencing will be measured per net length of fencing erected as specified. Where fences have been dismantled and re-erected at other locations full payment will only be due if the re-erected fence complies in all aspects with this Specification. Payment for temporary fencing shall be certified as follows:

- i) 85% of the rate tendered when the fencing is erected
- ii) 15% of the rate tendered when the fencing is removed from site.

The tendered rate shall cover the costs of all labour, materials, plant and equipment required for furnishing fencing materials, transporting it to the point of application, erecting the fence, and for any other work which may be necessary to establish and maintain the temporary fencing as specified. The rate tendered shall also include full compensation for removing the temporary fencing, either to be erected at some other location or removing it from site, on completion of the Works.

10.3.17 “No go” fencing

“No go” fencing

Unit: number (No)

The erection of “no go” fencing will be measured per pole erected/ removed as specified. Where “no go” fences have been dismantled and re-erected at other locations full payment will only be due if the re-erected fence complies in all aspects with this Specification. Payment for “no go” fencing shall be certified as follows:

- iii) 85% of the rate tendered when the fencing is erected
- iv) 15% of the rate tendered when the fencing is removed from site.

The tendered rate shall cover the costs of all labour, materials, plant and equipment required for furnishing fencing materials, transporting it to the point of application, erecting the fence, and for any other work which may be necessary to establish and maintain the “no go” fencing as specified. The rate tendered shall also include full compensation for removing the “no go” fencing, either to be erected at some other location or removing it from site, on completion of the Works.

10.3.18 Plant search and rescue

Plant search and rescue

Unit: provisional sum (PS)

Plant search and rescue, as guided by the botanical specialist and including the replanting of rescued plants, will be measured in Dayworks and paid against this Provisional Sum.

10.3.19 Maintenance of rescued plants

Maintenance of rescued plants

Unit: lump sum (Sum)

The maintenance of rescued plants, in terms of the requirements of this Specification, will be measured as a sum.

The tendered sum shall cover the costs of all labour, materials, plant and equipment required to maintain the rescued plants until they are replanted, including establishment, maintenance and removal of the on-site nursery and watering, weeding and general maintenance of rescued plants. The tendered sum will be divided by the number of months of the tendered project duration, and payment will be made against this sum for each month.

10.3.20 Vegetation clearance

Vegetation clearance

Unit: linear metre (m)

The area designated by the Engineer and cleared will be measured per line route metre.

The tendered rate shall cover the costs of all labour, materials, plant and equipment for all work necessary for the clearing of vegetation from the specified areas, including the trimming and cutting of shrubs and trees by hand, uprooting of tree stumps, the treatment of alien/ invasive species to prevent re-sprouting and the removal, transporting and disposal of all cleared vegetation.

10.3.21 Removal, stockpiling and re-spreading of topsoil

Removal, stockpiling and re-spreading of topsoil

Unit: lump sum (Sum)

The removal, stockpiling and re-spreading of topsoil will be measured as a sum. Payment for removal, stockpiling, and re-spreading of topsoil shall be certified as follows:

- i) 50% of the sum tendered when the topsoil is removed
- ii) 50% of the sum tendered when the topsoil is replaced

The tendered sum shall cover the costs of all labour, materials, plant and equipment required for removing, loading, transporting to stockpile, stockpiling, and subsequent replacement of topsoil as well as ripping of areas prior to replacing the topsoil.

10.3.22 Maintenance of topsoil stockpiles

Maintenance of topsoil stockpiles

Unit: lump sum (Sum)

The maintenance of topsoil stockpiles, in terms of the requirements of this Specification, will be measured as a sum.

The tendered sum shall cover the costs of all labour, materials, plant and equipment required to maintain the topsoil stockpiles until the topsoil is loaded for re-spreading, including separation of topsoil stockpiles from those of other materials, ensuring topsoil stockpiles are appropriately located and meet the requirement of the specification with regard to height and ensuring that the requisite erosion measures have been installed. The tendered sum will be divided by the number of months of the tendered project duration, and payment will be made against this sum for each month.

10.3.23 Solid waste management

Solid waste management

Unit: lump sum (Sum)

The collection, management and disposal of solid waste will be measured as a sum.

The tendered sum shall cover the costs of all labour, materials, plant and equipment required for the collection, management and disposal of solid waste, including the provision of weatherproof and scavenger-proof bins, the collection of waste and its temporary storage and the removal of waste from site to an approved landfill. The tendered sum will be divided by the number of months of the tendered project duration, and payment will be made against this sum for each month.

10.3.24 Environmental requirements for Blasting

Environmental requirements for blasting

Unit: cubic metre (m³)

The implementation of the specified environmental requirements for blasting will be measured per cubic metre of rock removed.

The tendered sum shall cover the costs of all labour, materials, plant and equipment required for “cover blasting” or blast mats, as well as the removal of fly rock from areas beyond the Working Area. The tendered sum will be divided by the number of months of the tendered project duration, and payment will be made against this sum for each month.

10.3.25 Treatment of Spoil

Treatment of spoil

Unit: lump sum (Sum)

The treatment of spoil as per the requirements of this Specification will be measured as a sum.

The tendered sum shall cover the costs of all labour, materials, plant and equipment required for loading, transporting and off-loading spoil, irrespective of haul distance, and for finishing and rehabilitating the spoil areas.

10.3.26 Shaping and trimming

Shaping and trimming

Unit: lump sum (Sum)

Shaping and trimming will be measured as a sum. No payment will be made for shaping and trimming within cuts, fills and spoil areas, as this is measured elsewhere.

The tendered sum shall cover the costs of all labour, materials, plant and equipment required for trimming the areas to the specified finish, including the moving of a small amount of material which would be inherent in this process and the removal of surplus material and stones. For payment purposes, a distinction shall be made between machine trimming that can reasonably be carried out by bulldozer or motor grader and hand trimming that cannot be done by machine owing to confined space, steep slopes, difficult shapes or sensitive areas.

10.3.27 Scarifying

Scarifying

Unit: lump sum

Scarifying will be measured as a sum. Payment will only be made for areas scarified on the written instructions of the Engineer.

The sum tendered shall include full compensation for scarifying, removing stones and smoothing off the surface as specified.

10.3.28 Establishment and maintenance of vegetation

Establishment and maintenance of vegetation

Unit: lump sum (Sum)

The establishment and maintenance of vegetation, in terms of the requirements of this Specification, will be measured as a sum.

The tendered sum shall cover the costs of all labour, materials, plant and equipment required to establish and maintain the vegetated areas, including preventing erosion and sedimentation, watering, weeding, prevention of traffic on revegetated areas and any other procedure consistent with good horticultural practice. The maintenance period shall commence when the vegetation has been planted and shall be not less than one year. The tendered sum will be divided by the number of months of the tendered project duration, and payment will be made against this sum for each month.