

GENERAL ENVIRONMENTAL SPECIFICATION FOR CONSTRUCTION

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¹ GENERAL

1.1 SCOPE

This Specification covers the standard requirements for controlling the impact of construction activities on the environment. It contains clauses that are generally applicable to the undertaking of civil engineering works to impose pro-active controls on the extent to which the construction activities impact on the environment. This Specification contains only generic specification clauses which may be augmented or superseded by project specific specifications contained in an Environmental Management Plan or Environmental Clearance Certificate (ECC).

The Specifications contained herein shall apply to contractors undertaking work as part of the project. The Principle Contractor shall be responsible for the implementation of these Specifications.

Interpretations and variations of this Specification are set out in the Specification Data.

1.2 DEFINITIONS

For the purposes of this Specification the definitions and abbreviations given in the applicable specifications listed in 1.4 and the following definitions shall apply:

Environment: 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.

Potentially hazardous Substance: A substance that, in the reasonable opinion of the Engineer, can have a deleterious effect on the environment. Any substance or mixture containing such substances as listed in the Labour Act No. 11 of 2007: Regulations relating to the health and safety of employees at work.

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

The Method Statement shall cover applicable details with regard to: construction procedures, materials and equipment to be used, transportation of equipment/materials to and from site, movement of equipment/material on site, storage of materials on site, containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur, timing and location of activities, areas of non-compliance with the Specifications, and any other information deemed necessary by the Engineer.

Reasonable: Unless the context indicates otherwise, reasonable in the opinion of the Engineer after he has consulted with a suitably experienced person, not an employee of the Employer, in "environmental implementation plans" and "environmental management plans" (both as defined in the Environmental Management Act No. 7 of 2007.

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

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

Top material: The top 150 mm of soil (topsoil) and root material of cleared vegetation.

1.3 **NORMATIVE REFERENCES**

1.4 **Supporting specifications and legal framework**

The following specifications shall, *inter alia*, form part of the Contract Document.

- a) An approved Environmental Management Plan;
- b) The conditions associated with any relevant ECC or Permit;
- c) SANS 1200 Series of Standardized Specifications;
- d) SANS 1200 A or SANS 1200 AA, as applicable;
- e) SANS 10103 Measurement and Rating of Noise and Speech Communication;
- f) SANS 10210 Calculating and Predicting Road Traffic Noise;
- g) Occupation Health and Safety Act (OHSA): Specification AO;
- h) Construction Regulations, 2003;
- i) Hazardous Substances Ordinance No. 14 of 1974;
- j) Standards listed in Appendix A.

1.5 **Management and administration**

This Specification and any supporting document containing project specific specifications shall be provided to a perspective Contractor's at the tender / quoting stage. The implementation of this General Specification (or subsequent agreements as the case may be) is non-negotiable and every perspective contractor shall cost for and make the necessary provisions available to ensure implementation of these General Environmental Specifications and any associated documents (i.e. Environmental Management Plan and or ECC). The Contractor may defer responsibility for implementation and oversight of environmental requirements onto a third party, but may not defer liability and will held accountable for any non-compliances and associated damages.

The Contractor shall construct and/or implement all the necessary environmental protection measures in each area before any construction work may proceed under the direction of the Engineer or delegated official. The Engineer may suspend the Works at any time should the Contractor, in the Engineer or delegated official's opinion, fail to implement, operate or maintain any of the environmental protection measures adequately. The costs of such suspension shall be to the Contractor's account.

2 CONTRACTOR MOBILISATION AND GENERAL PROVISIONS

2.1 **Baseline photography**

Following official handover of the site to the Contractor and prior to the commencement of mobilisation activities, the Contractor shall take photographs of all areas that will be impacted by construction activity and their immediate surrounds. Photographs shall include, *inter alia*, all works areas, site establishment and laydown areas, access roads, gates, No-go and natural areas, debris, boundary fences, existing structures and infrastructure on the site and any defects or issues to any of the foregoing. These photographs shall be provided to the Engineer for reference purposes.

2.2 **Method statements**

Method statements shall be produced and submitted for approval by the Engineer at least five working days prior to the commencement of the activities. The Contractor shall not commence the activity until the Method Statement has been approved. Approval of method statements shall not unreasonably be withheld. The Engineer may approve, reject or approve with conditions any method statement.

The Engineer may request, on an *ad hoc* and reasonable basis, that a method statement be produced for any activity or component of the works which carries significant risk. All method statements must comply with the provisions of this Specification, unless, if there is a need to deviate from the provisions of the

specification such deviation must be clearly articulated in the method statement or letter, a motivation provided for the need for such deviation and proposed mitigation measures that will be implemented to ensure that such deviation will not pose a undue risk to the environment. The Engineer shall, without risk of prejudice, retain the right to reject any proposed deviation and is under obligation to consult with and confirm the acceptability of such deviation with an Environmental Specialist or Government Official. A method statement containing a proposed deviation must also be approved in writing by the Client. Method statements containing proposed deviations shall be submitted at least 15 working days prior to the commencement of the activity.

The following is a provisional list of required method statements:

- 1) Mobilisation Plan, with consideration to the following:
 - a. A plan indicating the layout of the site establishment area, laydown and staging areas, workshops, fuel storage and dispensing areas, stores (including explosives), offices, ablutions, recess areas, roads and sidings, fences and gates, signboards, central waste storage area and any other temporary structure or use area that will be directly affected by site establishment or routine project administration.
 - b. Provisions to address and maintain housekeeping throughout the site.
 - c. A detailed plan and design for the fuel storage site, including the type and volume of storage container and the design and capacity of the bund. The plan shall include procedures and measures to prevent spills and leaks of fuels and oils during transference.
 - d. A provisional list of major vehicles, plant and equipment that will be permanently based on site and where plant, equipment and vehicles will be parked when not in use.
 - e. A list of the bulk construction materials and a description of how they will be transported to site and where they will be staged prior to use.
 - f. A description of all temporary stormwater control measures to be installed around yards and site establishment areas.
 - g. A description of the proposed security and access control measures.
 - h. A description and plan of roads to be used during construction and the proposed traffic safety measures.
 - i. A provision list of potentially hazardous materials that will be used during construction phase and a description of how and where these will be stored.
 - j. A detailed description of a waste management plan giving consideration to:
 - i. Measures relating to recycling, reducing and reusing any waste.
 - ii. A description of the type and the proposed number and location of rubbish bins.
 - iii. The location and design of the central waste storage area including hazardous wastes.
 - iv. A plan for dealing with inert waste including building rubble and spoil.
 - k. Provisional Construction Programme.
 - l. Outline of the Contractor's staff recruitment policy.
 - m. Description of the construction staff accommodation provisions and policy.
 - n. Any special arrangements or agreements made between the Contractor, the landowner, municipality, local businesses/ service providers and or neighbouring land owners.
- 2) Emergency preparedness and response plan, detailing the following:
 - a. A telephone contact list of personal responsible for emergency prevention and response, including the relevant Client and Engineer representatives and local emergency services.
 - b. A list and description of the types of emergencies that may arise on site.
 - c. Site evacuation procedures and emergency assembly point.
 - d. Procedures to be followed in the event of a fire.
 - e. Safeguard measures to prevent fire, with special reference to hazardous materials, fuels and lubricants and explosives stores.
 - f. A plan showing the following:
 - i. The location and type of firefighting equipment.
 - ii. Emergency assembly point
 - iii. Evacuation routes.
 - g. Measures for the handling use and storage of hydrocarbons and other hazardous substances, aimed at preventing spills and leaks.
 - h. Procedures to be followed after a spill or leak of hydrocarbon or other hazardous substances including:
 - i. Training of plant and equipment operators in the procedures.

- ii. A description and location of spill containment, clean up materials, personal protective equipment and specialist handling equipment of site or in plant and equipment.
 - iii. Procedure for reporting a spill, containment, clean up, remediation and disposal.
- 3) Earthworks plan, detailing the following:
- a. A layout drawing indicating the following:
 - i. Location and extent of all areas to be cleared.
 - ii. Location of topsoil stockpiles.
 - iii. Location of temporary and final spoil areas.
 - b. A description of how cleared vegetation and other debris will be dealt with.
 - c. A description of how dust will be controlled.
 - d. A description of and plans for dealing with water:
 - i. Preventing ingress of water into excavations.
 - ii. Approach to dewatering.
 - iii. Stormwater and erosion control measures.
 - iv. Pollution and sediment control and treatment measures and disposal of contaminated water.
- 4) Concrete works plan, detailing the following:
- a. How concrete will be produced on site (batched on site or ready-mix). If batched on site then detailed procedures and plans must be produced as to how much, where and how this will be undertaken.
 - b. Measures to avoid the contamination of water and measures to treat contaminated water, including stormwater control interventions and cleaning of tools and equipment, including drum wash, that used in the concrete operations;
 - c. Measures to prevent and clean up spillage of concrete spills and over pours.
 - d. Measures for dealing with concrete mixtures, shutter oil and any other chemical substances that may be employed in the concrete works.
 - e. Any other measure employed during the batching, transport or pouring of concrete to avoid pollution or contamination of the environment.

2.2.1 Environmental awareness training

Within seven days of the Commencement Date, the Contractor's site staff including foremen and site management staff shall attend an environmental awareness training course. The Contractor shall liaise with the Engineer prior to the Commencement Date to fix a date and venue for the course. The environmental awareness training course shall be held in the morning during normal working hours. The Contractor shall provide a suitable venue and ensure that the specified employees attend the course. The Contractor shall keep a register of attendance and attendees must sign that they were in attendance and shall provide the Engineer with a copy of the attendance register the day after each course as part of their monthly submissions. The environmental awareness course will be included in the general orientation of any new employees, who must also sign acknowledgement of receiving the course and any associated materials.

Subject to the implementation of a written warning system and any appropriate disciplinary interventions, repetitive failure to observe the requirements set out in this specification by any one member of staff should be treated as a dismissible offence. Should recurring non-compliances occur as a result of the actions or omissions of one individual, the Engineer may instruct the Contractor to remove such person from site.

2.2.2 Toolbox talks

Relevant environmental site matters, incidents and issues shall form part of the Contractor's tool box talks. The Contractor shall make a note of what environmental subjects were discussed

2.2.3 Construction personnel information posters

The Contractor shall erect and maintain information posters for the information of his employees depicting actions to be taken to ensure compliance with aspects of the Specifications. Such posters will be supplied by the Engineer and shall be erected at a location specified by the Engineer.

2.3 Surveying and setting out

2.3.1 **Site establishment**

The Engineer shall be advised of the area that the Contractor intends using for his site establishment by way of the Mobilisation plan discussed under item 1) of Clause 2.2. The Contractor's camp shall occupy as small an area as possible, and no site establishment shall be allowed within 50 m of any watercourse unless otherwise approved by the Engineer.

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

2.3.2 **Site fencing and demarcations**

As may be required, the Contractor shall erect and maintain permanent and/or temporary fences of the type and in the locations directed by the Engineer. Such fences shall, if so specified, be erected before undertaking designated activities. The Contractor shall not damage or remove any boundary fences without the agreement of the adjoining landowner. Where property fences are replaced these shall, at the minimum, meet specification of the fencing it replaces, in terms of top height, sturdiness and rigidity (pole foundations and supports and strength and wire gauge), security (barbed or razor wire) and size of the largest openings (i.e. distances between horizontal wires or mesh dimensions).

2.3.3 **No Go Areas**

If required, certain areas shall be considered "no go" areas and these may be detailed in the Environmental Management Plan or as conditions attached to an ECC. The Contractor shall ensure that, insofar as he has the authority, no unauthorised entry, stockpiling, dumping or storage of equipment or materials shall be allowed within the demarcated "no go" areas. "No go" area demarcation fencing shall be established prior to the commencement of construction in the vicinity.

"No go" areas shall be demarcated with fencing consisting of wooden or metal posts at 3 m centres with 1 plain wire strand tensioned horizontally at 900 mm from ground level. Commercially available danger tape shall be wrapped around the wire strand. The Contractor shall maintain the fence for the duration of construction and ensure that the danger tape does not become dislodged.

2.4 **Overarching environmental requirements**

The following provisions relate to all areas of construction.

2.4.1 **Protection of natural features**

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

The Contractor shall ensure that plant, equipment, materials and staff are not permitted to enter any designated "no go" area.

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

2.4.2 **Protection of flora and fauna**

Except to the extent necessary for the carrying out of the Works (as per an approved method statement), flora shall not be removed, damaged or disturbed nor shall any vegetation be planted without the Engineer's approval. Firewood may not be collected from the site unless written approval is provided by the Engineer.

Trapping, poisoning and/ or shooting of animals is strictly forbidden. No domestic pets or livestock are permitted on Site.

The use of biocides is subject to the approval of the Engineer unless provided for in the project specification. Where the use of biocides and other poisonous substances has been specified, they shall be stored, handled and applied with due regard to their potential harmful effects. Persons using any biocide or poisonous substances shall have received training in the appropriate handling, use and storage of such materials. Care will be taken to ensure no movement or drift occurs into non-target areas. Dyes shall be mixed into sprayed biocide so that the treatment areas may be inspected and the risk of over spray / re-spraying is avoided.

2.4.3 Protection of archaeological and palaeontological remains

The Contractor shall take reasonable precautions to prevent any person from removing or damaging any fossils, coins, articles of value or antiquity and structures and other remains of archaeological interest discovered on the Site, immediately upon discovery thereof and before removal. The Contractor shall inform the Engineer immediately of such a discovery and carry out the Engineers instructions for dealing therewith. All construction within the vicinity of the discovery shall cease immediately and the area shall be cordoned off until such time as the Engineer authorises resumption of construction in writing.

The Engineer will contact and follow due process as required by the relevant authority.

2.4.4 Noise control

The applicable regulations framed under the Labour Act No.11 of 2007: Schedule 135 shall apply to all areas within audible distance of residents whether in urban, peri-urban or rural areas.

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 such that the noise level in inhabited areas and dwellings adjacent to the work areas will not increase by more than 7 dB(A)Leq above residual background sound levels. Similarly in habituated areas adjacent to access roads maximum noise levels shall not exceed 85 dB(A).

Where excess noise generation is unavoidable, the area must be clearly marked with conspicuous notices specifying the range of noise levels measured. The Contractor shall provide effective means to protect employees from harmful effects caused by the noise and such means must be documented so as to be readily available for inspection by the inspector. The contractor shall, by means of barriers, isolate the source of any such noise in order to comply with the said regulations. The Contractor shall restrict any of his operations that may result in excessive noise disturbance to those communities and dwellings abutting the Site to the hours of 08:00 to 17:00 on weekdays and 08:00 to 14:00 on Saturdays. No work will be permitted on Sundays unless otherwise agreed to with the Engineer.

Where loud construction operations or plant are required, that cannot be practically barricaded (i.e. Pile driving, hydraulic breakers or rock crushing), nearby residents that may be disturbed by the operation will be notified and provided with a program for the works prior to commencement. The Contractor shall be reasonable in accommodating the needs of neighbours and take reasonable measures to minimise the impact of noise on neighbouring communities.

With the exception of warning and emergency sirens and public address systems used during an emergency, no sound is to be broadcast across the site with approval from the Engineer.

2.4.5 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 the surrounding community or other users of the area. Subject to meeting the minimum requirements of the Labour Act No. 11 of 2007 and general security, lighting shall be kept to the minimum. Care will be taken to ensure lighting is task specific and does not spill into the surrounding environment through appropriate placement and shielding. Floodlighting of expansive work areas or up- or down lighting of vertical structures or natural features shall only be permitted if approved by Engineer.

2.4.6 Fuel (petrol and diesel) and oil

Unless otherwise specified, fuel may be stored on site in an area approved by the Engineer. The Contractor shall ensure that all liquid fuels (petrol and diesel) are stored in tanks with lids, which are kept firmly shut or in bowsers. The tanks/bowsers shall be situated on a smooth impermeable surface (concrete or 250 µm

plastic) with an earth bund (plastic must have a 5 cm layer of sand on top to prevent damage and perishing). 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. The bunded area shall be covered to protect it from rain. Provision shall be made for refuelling at the fuel storage area, by protecting the soil with 250 µm plastic covered with a minimum of a 5 cm layer of sand.

If fuel is dispensed from 200 litre 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 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, plant 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 employ the use of appropriate non-spill dispensing equipment and drip trays to prevent spills during refuelling. 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. The Contractor shall ensure that staff responsible for refuelling of plant are trained to clean up any fuel or oil spills as they occur. The Contractor shall obtain the Engineer's prior approval for any refuelling or maintenance activities. The fuel bowsers and stores must be inspected daily by the Contractor and any contaminated soil shall be collected and disposed of via the hazardous waste system. Care will be taken to ensure that oil contaminated soil, rags or other materials are not disposed of as part of domestic waste system due to the fire risk.

2.4.7 Contaminated water

The Contractor shall take reasonable measure to prevent the contamination of water and where this is not possible will set up a contaminated water management system, which shall include collection facilities to be used to prevent pollution, as well as suitable methods of disposal of contaminated water. The Contractor shall prevent the discharge of water contaminated with any pollutants, such as soaps, detergent, cements, concrete, lime, chemicals, glues, solvents, paints and fuels, into the environment.

The Contractor shall notify the Engineer immediately of any pollution incidents on Site. The Engineer's approval is required prior to the discharge of contaminated water to any Municipal sewer system.

2.4.8 Stormwater and drainage

The Contractor shall ensure that stormwater is managed in such a way that prevents erosion. The Contractor shall install temporary stormwater control measures which may include cut off drains, berms, side drains, retention ponds or similar needed to divert stormwater away from earthworks areas, or as directed by the Engineer.

2.4.9 Solid waste management

The Contractor shall provide sufficient bins with lids on Site to store the waste produced on a daily basis. Solid, non-hazardous waste shall be disposed of in the bins provided and no onsite 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 once daily. The waste may be temporarily stored on 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 offsite at an approved landfill site. The Contractor shall supply the Engineer with a certificate of disposal.

2.4.9.1 Shutter oil and curing compound

Shutter oil and curing compound pose a risk of causing water and soil contamination and accordingly are

regarded as potential hazardous substances. The Contractor shall ensure that shutter oil and curing compound containers in use are stored within the fuel bund. The remaining containers shall be inspected regularly to ensure that no leakage occurs. When shutter oil or 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/compound. The dispensing mechanism of the shutter oil/curing compound storage container shall be stored in a waterproof container when not in use.

Shutter oil and curing 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 a shutter oil or 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.

2.4.9.2 Bitumen

The Engineer shall be advised of the area that the Contractor intends using for the storage of bitumen drums/products. The storage area shall have a smooth impermeable (concrete or 250 µm plastic covered in sand) floor. The floor shall be bunded and sloped towards a sump to contain any spillages of substances. The bund shall be inspected and emptied daily, and serviced when necessary. The bund shall be closely monitored during rain events to ensure that it does not overflow.

2.4.9.3 Hazardous substances

Procedures detailed in the Material Safety Data Sheets (MSDSs) shall be followed in the event of an emergency situation.

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

2.4.10 Workshop, equipment maintenance and storage

The Contractor shall ensure that all items of plant and equipment are inspected daily prior to commencement. Any maintenance requirements shall be seen to before start-up. Inspection checklists shall be retained and submitted to the Engineer on request.

Leaking equipment shall be repaired immediately or removed from the Site. Where practical, all maintenance of equipment and vehicles on Site shall be performed off Site or in the workshop. 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 other plant maintenance facilities, including those areas where, after obtaining the Engineer's approval, the Contractor carries out emergency plant maintenance, there is no contamination of the soil or vegetation. The workshop shall have a smooth impermeable (concrete or 250 µm plastic covered with sand) floor. The floor shall be bunded and sloped towards an oil trap or sump to contain any spillages of substances (e.g. oil).

When servicing equipment on site, drip trays shall be used to collect the waste oil and other lubricants. Drip trays shall also be provided in construction areas for stationary plant (such as generators, pumps and compressors) and for Transport and Earthmoving Equipment (such as scrapers, diggers, loaders, trucks, cranes, etc.). 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.

The washing of equipment shall be restricted to urgent or preventative maintenance requirements only. All washing shall be undertaken off Site or in the workshop. The use of detergents for washing shall be restricted to low phosphate and nitrate containing, low sudsing-type detergents.

2.4.11 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 the Specifications. The Contractor shall ensure that these delivery drivers are supervised during off loading, by someone with an adequate understanding of the requirements of the Specifications.

Materials shall be appropriately secured to ensure safe passage between destinations. Loads including, but not limited to sand, stone chips, fine vegetation, refuse, paper and cement, shall have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.

2.4.12 **Dust**

The Contractor shall take reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the Engineer. The Contractor's dust management planning shall, as a minimum, take cognisance of the following:

- Schedule of spraying water on unpaved roads paying due attention to control of runoff.
- Speed limits for vehicles on unpaved roads and minimisation of haul distances.
- Measures to ensure that material loads are properly covered during transportation.
- Schedule for wheel cleaning and measures to clean up public roads that may be soiled by construction vehicles.
- Minimisation of the areas disturbed at any one time and protection of exposed soil against wind erosion, e.g. by dampening with water or covering with straw
- Location and treatment of material stockpiles taking into consideration prevailing wind directions and location of sensitive receptors.
- Controlled blasting techniques to minimise dust and fly rock during blasting.
- Adherence to the dust loads and protective gear stipulated in the Labour Act 11 of 2007
- Reporting mechanism and action plan in case of excessive wind and dust conditions.

During dry and, or windy periods, a water tanker shall be available for the control of dust, and the Contractor shall ensure that the sprays do not generate excess run off.

During high wind conditions, the Contractor shall comply with the Engineer's instructions regarding dust-damping measures. The Engineer may request the temporary cessation of all construction activities where wind speeds are unacceptably high, and until such time as dust levels return to acceptable levels.

Namibia's Atmospheric Pollution Prevention Ordinance No. 11 of 1976 has not included compliance to any ambient air standards and has instead adopted the South African Atmospheric Pollution Prevention Act¹. As such relevant South African control measures pertaining to air quality and dust control as well as international best practice standards in this regard shall apply.

All items of plant capable of generating significant volumes of dust (i.e. crusher plants, concrete batching plants) shall be equipped with necessary equipment (bag filters in cement silos, sprayers and conveyor transfer and fall points and hoppers) to ensure that fugitive dust is minimised.

2.4.13 **Aesthetics**

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

The Contractor shall take reasonable measures to ensure that construction activities do not have an unreasonable impact on the aesthetics of the area. Measures will be taken to obscure construction yards and associated plant and equipment from onlookers as far as is reasonable. Refer also to 2.4.4 regarding requirements for lighting.

2.4.14 **Disruption to existing and neighbouring land use activities**

The Contractor shall take measures to limit the disruption of any existing land use activities occurring on the

¹ South African Atmospheric Pollution Prevention Act (Act No. 45 of 1965).

site or neighbouring sites as far as reasonable. Where construction may impact on access routes, safe alternative access shall be provided to the satisfaction of the Engineer. Refer also to clauses 2.4.4, 2.4.5, 2.4.11 and 2.4.13 regarding dust, noise, lighting and aesthetics. Where construction will result in disruptions to activities, the Contractor shall notify the affected landowner and inform him of the construction activity, the program and what mitigations measures will be implemented to minimise the disruptions. The Client, Contractor and Engineer shall make compensations and or accommodate landowner's requests and to maintain the *status quo*, as far as is reasonable.

2.4.15 Temporary site closure

If the site is closed for a period exceeding one week, the Contractor, in consultation with the Engineer shall carry out the following checklist procedure.

Hazardous materials stores:

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

Safety:

- All trenches and manholes secured.
- Fencing and barriers in place as per the Labour Act No.11 of 2007.
- Emergency and management contact details for at least two standby staff displayed.
- Pipe stockpile wedged/ secured.
- Emergency equipment, including firefighting and spill response materials and equipment remain readily accessible to standby staff.
- Site security measures in place.
- All plant and equipment have their keys removed or are disabled to prevent unauthorised start-up / theft.

Erosion:

- Wind and dust mitigation in place.
- Slopes and stockpiles at stable angle.
- Revegetated areas watering schedules and supply secured.

Water contamination and pollution:

- Cement and materials stores secured.
- Toilets empty and secured.
- Refuse bins empty and secured.
- Drip trays empty and secure (where possible).
- Structures vulnerable to high winds secure.
- All plant and equipment not in use are withdrawn from areas prone to flooding.

2.4.16 Public roads

The Contractor shall control the movement of all vehicles and plant including that of his suppliers so that they remain on designated routes, are distributed so as not to cause an undue concentration of traffic and that all relevant laws are complied with. In addition such vehicles and plant shall be so routed and operated as to minimise disruption to regular users of the routes not on the Site. Where road safety may be impacted on the Contractor shall notify the relevant roads authority and arrange for the necessary road warning signage and appoint trained points men to control traffic around any hazards. Any damage caused to the public road system as a result of construction or as a direct result of construction vehicles and equipment shall be repaired to the satisfaction of the Engineer.

On gravel or earth roads on Site and within 500 m of the Site, the vehicles of the Contractor and his suppliers shall not exceed a speed of 20 km/h. Mud and sand deposited onto public roads by construction activities

shall be cleared on a daily basis.

2.4.17 Security and access control

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. If so required, as directed by the Engineer, the Contractor shall fence the site to ensure effective control of access to the site. This fence shall be a diamond mesh fence or similar with a minimum height of 1.8 m, and it shall be erected around the site and shall be maintained for the duration of construction.

All authorised personnel and visitors shall be issued with an identification card (or similar) to ensure that the security personnel may identify authorised persons.

2.4.18 Access routes / haul roads

Access to the construction camp and working areas shall utilise existing roads or tracks as far as possible. Entry/exit points onto public roads shall take cognisance of traffic safety. Traffic safety measures shall include appropriate signage and signalmen where relevant.

Where temporary roads are required for construction the route, design and layout shall be subject to the approval of the Engineer. Roads shall be routed to limit environmental impact by avoiding sensitive environmental features including rivers, wetlands, areas of botanical significance or any other areas as identified through environmental planning processes. Roads shall follow routes that minimise stormwater related risks (i.e. steep gradients, cuts and fills, drainage lines, marshy areas). Where temporary roads cross drainage lines the reasonable provision shall be made to accommodate flooding without structural damages to the road crossing, approaches or to the river banks, the design of crossings shall be subject to approval by the Engineer. Subject to the preceding requirements, roads shall be designed to have the least possible footprint needed to meet project objectives. All temporary roads shall undergo full rehabilitation at project completion and the expense of such shall be to the Contractor's account.

2.4.19 Housekeeping

The Contractor shall make available the time and resources needed to undertake routine housekeeping of the works areas and site establishment areas at a minimum of a weekly interval. Housekeeping shall include maintenance of barriers, structures, signage, material stockpiles to ensure that they are safe and aesthetically acceptable and to the satisfaction of the Engineer. Construction materials shall be stacked in a safe, neat and orderly fashion and shall comply with the requirements of the OHSWA. Windblown litter, construction debris and spoil shall be collected and removed for disposal.

2.4.20 Ablution facilities

The Contractor shall deploy an adequate number (as per the requirements of the Labour Act 11 of 2007 of portable toilets at the various works areas and site establishment area, including provision for security and access control personal. Toilets should be located within 100 m from any point of work but not closer than 50 m to any drainage line. Toilets should be placed in shaded areas wherever possible. The Contractor shall make provision to have the toilets cleaned and maintained in a hygienic fashion and shall supply toilet paper. Toilets shall be secured to the ground to ensure they are not blown over during high winds or bumped over by some other means. The Contractor shall also make available a hand washing facility. Where portable toilets are located within view of the public or neighbouring residences or places of business, efforts should be taken to screen such facilities from view and provide privacy to users.

The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are properly stored and removed from Site. Discharge of waste from toilets into the environment and burial of waste is strictly prohibited and must be treated at a registered wastewater treatment works. The Contractor shall keep record, and provided such records upon request, of the location and volumes of waste disposed. The use of pit latrines and soak-a-ways are prohibited unless approved by the Engineer.

Washing, whether of the person or of personal effects, and acts of excretion and urination are strictly prohibited other than at the facilities provided. The Contractor shall take disciplinary action against any staff member found in contravention of this requirement.

2.4.21 **Recess areas and canteens**

The Contractor shall provide covered recess areas at the site establishment area and at various working areas, which are situated too far from the site establishment area to allow staff to return for recesses. The recess area should be located in an area that provides natural shade but should not be located within 32m of a drainage lines or wetland, in or adjacent to a “no go” area, in dense combustible vegetation or near any neighbour or activity to which they may cause disturbance. The recess areas should also be located away from construction noise, dust, waste storage areas, hazardous materials stores, fuel storage and dispensing areas and any other activity that may contaminate food or impair comfort. The recess areas shall provide adequate seating to accommodate the staff stationed at that area of the works. Recess areas shall be located near, but not next to, ablution and hand washing facilities. Recess areas should also have an adequate supply of cool potable water, as determined by the number of staff working in that area. An adequate number of rubbish bins shall be provided to contain the waste generated by this facility in a day. The recess areas shall make provision for a smoking area, including seating and a fire proof sand filled container for extinguishing cigarettes. Smoking shall otherwise be prohibited across the site and in the works areas. The recess areas shall be equipped with an appropriate sized fire extinguisher to deal with a fire at this location. Subject to implementation of reasonable fire protection measures and the presence of fire fighting equipment, the Contractor may establish a purpose built warming or cooking fire in an area cleared of all combustible material near the recess area (note in terms of Clause 2.4.2 however that firewood may not be collected from the surrounding area). Staff shall not be permitted to eat or rest during recess times in any other areas other than the designated recess or canteen area.

The following specifications will apply to a site canteen. The Canteen will be situated according to the principles for recess areas, as provided above. The Canteen shall be designed to ensure the hygienic preparation of food and cleaning of cooking utensils cutlery and crockery. Water decanted from cooking processes or that from the washing shall not be disposed of into the environment but rather via a storage tank and then the sewage disposal system. The Canteen shall be equipped with the appropriate size and type of fire extinguisher needed to deal with type and nature of fire that may arise. The Canteen shall have an adequate number of scavenger and weather proof rubbish bins needed to deal with the days' waste. Rubbish bins shall be cleared daily to the central waste storage area. The Contractor shall take measure to ensure that housekeeping and maintenance of hygienic conditions are strictly observed.

2.4.22 **Site clinic or first aid station**

Should the scale of construction warrant the need for a first aid station (clinic, sick bay, medical bay) the following requirements shall apply. The design and maintenance of the first aid station shall be such that the hygienic safety of the patients can be assured. The first aid station shall be operated by a certified first aider or paramedic. All waste arising from the first aid station or site ambulance shall be treated as hazardous waste and shall not be disposed of via the domestic waste system. A safe potable water supply shall be provided. Effluents from washing shall be directed to a tank, collected and disposed via the sewage disposal system.

2.5 **Emergency procedures**

In addition to the emergency procedures set out in the Contractor method statement titled Emergency preparedness and response plan as dealt with under Item 2) of Clause 2.2, the Contractor's procedures for the following emergencies shall include:

2.5.1.1 **Fire**

No fires may be lit on site. 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 and any areas where the vegetation or other material is such as to make liable the rapid spread of an initial flame. Burning is not permitted as a disposal method.

The Contractor shall ensure that there is basic fire-fighting equipment available on Site at all times. This shall include at least rubber beaters when working in urban open spaces and veld areas, and at least one fire extinguisher of the appropriate type when welding or other “hot” activities are undertaken.

The Contractor shall advise the relevant authority 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. The Contractor shall provide adequate fire protection measures at each work area and the site establishment area to deal with the type and nature of fire that may arise. On large construction sites located in a wilderness area or adjoining commercial forestry or agricultural land use that may be prone to and susceptible to veld fires the Engineer may specify that the Contractor install fire breaks along boundary fences together with any other fire protection measure deemed necessary to protect property and lives of site staff and neighbours.

2.5.1.2 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 hydrocarbon spill, the source of the spillage shall be isolated, and the spillage contained. The area shall be cordoned off and secured. 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.

2.6 Community relations

The Contractor shall erect and maintain information boards in the position, quantity, design and dimensions specified. Such boards shall include contact details for complaints by members of the public in accordance with details provided by the Engineer.

The Contractor shall keep a "Complaints Register" on Site. The Register shall contain all contact details of the person who made the complaint, and information regarding the complaint itself and any measures or agreements made in resolution to such complaint.

The Contractor shall develop an employment policy and shall disseminate this to interested communities, informing them of how many opportunities are available and the skills required for such opportunities. Depending on the scale of the project and the proximity and populace of nearby communities, the Contractor shall consider appointing a community liaison officer and an employment desk in the interested communities to manage the recruitment of staff. Local Namibians should be given first priority with regard to any employment opportunities and the Contractor's recruitment policy and nature and number of job opportunities should be communicated timeously and clearly to manage expectations and avoid conflict.

2.7 Construction Methods and procedures

2.7.1 Site clearance

The Contractor shall ensure that the clearance of vegetation is restricted to that required to facilitate the execution of the Works. Site clearance shall occur in a planned manner, and cleared areas shall be stabilised as soon as possible. The detail of vegetation clearing shall be to the Engineer'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.

The Contractor shall strip the Topmaterial within the working areas. The Topmaterial shall be stockpiled separately from subsoil and used for subsequent rehabilitation and revegetation. Topmaterial stockpiles shall not be compacted.

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

2.7.2 Demolition

Hazardous and non-hazardous materials shall be separated at site and disposed of in a manner approved by

the Engineer.

2.7.3 **Cement and concrete batching**

Where applicable, the location of the batching plant (including the location of cement stores, sand and aggregate stockpiles) shall be as approved by the Engineer. The concrete/cement batching plant shall be kept neat and clean at all times.

No batching activities shall occur directly on unprotected ground. The batching plant shall be located on a smooth impermeable surface (concrete or 250 µm plastic covered with 5 cm of sand). The area shall be bunded and sloped towards a sump to contain spillages of substances. All wastewater resulting from batching of concrete shall be disposed of via the contaminated water management system and shall not be discharged into the environment. 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 wind blown cement dust and water contamination. Empty cement bags shall be disposed of on a regular basis via the solid waste management system, and shall not be used for any other purpose. Unused cement bags shall be stored so as not to be affected by rain or runoff events. In this regard, closed steel containers shall be used for the storage of cement powder and any additives. The Contractor shall ensure that sand, aggregate, cement or additives used during the mixing process are contained and covered to prevent contamination of the surrounding environment.

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

Where “readymix” concrete is used, the Contractor shall ensure that the delivery vehicles do not wash their chutes directly onto the ground. Any spillage resulting from the “readymix” delivery shall be immediately cleared and disposed of via the solid waste management system. Readymix trucks shall not be permitted to dump drum wash on site unless into contaminated water pond which must be fully rehabilitated at completion and the sediment collected for disposal.

2.7.4 **Earthworks**

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 erosion and dust generation. No equipment associated with earthworks shall be allowed outside of the Site and defined access routes unless expressly permitted by the Engineer.

2.7.5 **Dewatering**

Pumps shall be placed over a drip tray in order to contain fuel spills and leaks. Pumps shall be located sufficiently above the water line to ensure that it does not become inundated if pumping is discontinued. The Contractor shall take all reasonable precautions to prevent spillage during the refuelling of these pumps.

The Contractor shall ensure that, unless of similar to the upstream water quality, none of the water pumped during any dewatering activities, including well points, is released into the environment without the Engineer's approval. The Engineer's approval is required prior to the discharge of this water into the Municipal sewer system.

2.7.6 **Bitumen**

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

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

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

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

2.7.7 Erosion and sedimentation control

The Contractor shall take all reasonable measures to limit erosion and sedimentation due to the construction activities. Where erosion and/or sedimentation, whether on or off the Site, occurs despite the Contractor complying with the foregoing, rectification shall be carried out in accordance with details specified by the Engineer. Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the Engineer.

Any runnels or erosion channels developed during construction or during the defects liability period shall be backfilled and compacted. Stabilisation of cleared areas to prevent and control erosion shall be actively managed. Consideration and provision shall be made for various methods, namely, brushcut packing, mulch or chip cover, straw stabilising (at a rate of one bale/ 20 m² and rotovated into the top 100 mm of the completed earthworks), watering, soil binders and anti-erosion compounds, mechanical cover or packing structures (e.g. Hessian cover).

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.

2.7.8 Crane operations

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

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

2.7.9 Trenching

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

- Topmaterial shall be removed and stockpiled separately from and not mixed with the subsoil. Preferably topsoil should be placed on the upslope side of the trench while subsoil is placed on the downslope side of the trench, levelled and used for construction access. The areas used for topmaterial and subsoil stockpiling should not be cleared of shorter herbaceous vegetation and must not be grubbed. Only once the trench is backfilled and shaped will the topmaterial be spread across the trench area,
- Soil shall be excavated and used for refilling trenches i.e. soil from the first trench shall be excavated and stockpiled, thereafter soil from the second excavated trench length shall be used to backfill the trench behind it once the services have been laid. The last trench shall be filled using the soil stockpiled from the first trench.
- Trench lengths shall be kept as short as practically possible before backfilling and compacting.
- Trenches shall be re-filled to the same level as (or slightly higher to allow for settlement) the surrounding land surface to minimise erosion.
- Stormwater control measures shall be used to reduce the ingress of stormwater into the trench. Where needed the Contractor shall provide temporary stormwater pipes to allow stormwater to cross the open trench.

2.7.10 Drilling and jack hammering

The Contractor shall take all reasonable measures to limit dust generation and noise as a result of drilling operations. The Contractor shall ensure that no pollution results from drilling operations, either as a result of oil and fuel drips, or from drilling fluid.

Any areas or structures damaged by the drilling and associated activities shall be rehabilitated by the Contractor to the satisfaction of the Engineer.

2.7.11 Stockpiling

The Engineer will identify suitable sites for stockpiling. Stockpiles shall be convex in shape and shall be limited in height so that it does not result in undue visual impacts or significant dust, as approved by the Engineer. Stockpiles shall be placed so as to occupy the minimum area compatible with the natural angle of repose of material, and measures shall be taken to prevent the material from being spread over too wide a surface. Unless otherwise stipulated, areas for temporary stockpiling will not be cleared of shorter herbaceous vegetation as this compacted vegetation layer will serve to protect the topsoil and serve as a marker during stockpile reclamation. 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 result in the damming of water or run off, or is itself washed away.

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

2.7.12 Site closure and rehabilitation

Any areas that the Engineer believes may have been impacted upon or disturbed, shall be rehabilitated to the satisfaction of the Engineer, which includes all areas where Topmaterial has been stripped or compacted. Once construction is complete the Contractor shall clear all construction debris and materials not forming part of the Permanent Works from the Site. The area to be rehabilitated shall first be landscaped to match the topography of the surrounding area as it was prior to construction. The composition of vegetation to be used for any rehabilitation shall be specified.

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

All rehabilitated areas shall be considered “no go” areas and the Contractor shall ensure that none of his staff or equipment enters these areas. The Contractor shall undertake irrigation of rehabilitated areas for a minimum period of six to eight weeks to encourage germination. They may elect to extend the irrigation programme or the Engineer may specify ongoing irrigation programme if required. However any irrigation programme must taper off over a period of four to eight weeks before complete cessation as an abrupt cessation is likely to result in high seeding mortality rates (depending on local soil and climatological factors).

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

2.7.13 Temporary revegetation of the areas disturbed by construction

Where there is likely to be a delay of greater than two weeks in the landscaping and revegetation of a disturbed area or where that site is likely to be the subject of further construction activities at a later stage, the Contractor shall ensure that the area is temporarily revegetated to combat dust generation and prevent erosion. This revegetation shall occur incrementally immediately upon completion of the construction activities at the subject location.

Prior to revegetation structures and material not forming part of the Permanent Works, including remnants of building materials, concrete foundations, timber and foreign debris, shall be removed and disposed of via the solid waste management system. The area shall be revegetated as follows:

- a) Compacted areas, such as roads, stockpile areas and construction platforms shall be ripped or scarified to depth of 30 cm.
- b) The surface shall be levelled by hand or machine as far as practically possible.
- c) Alien vegetation shall be cleared by cutting the plants off at ground level, and painting the stump with 0.5% Garlon in diesel.
- d) For areas with a slope of greater than 1:3, straw shall be utilised as a binding material to stabilise the soil during revegetation and rehabilitation of the site. Straw shall consist of natural, dried fibres of hay or

chaff of various lengths between 50 mm and 400 mm, delivered to Site in bales, and shall be applied evenly by hand or machine at a rate of 1 bale per 20m² over the area to be revegetated. It shall then immediately be rotovated into the upper 100 mm layer of soil.

- e) The prepared area shall be hydro- or hand-seeded at a rate of 40 kg/ha using suitable indigenous grass species. In the event of hand-seeding, the seed mixture as specified shall be mixed with two parts per volume of clean dry plaster sand, then divided in half and applied evenly in two successive applications, one after the other, by means of an approved hand seeding machine (known colloquially as a "tefsaaier"). On completion of the seeding the surface shall be lightly raked to cover the seed with no more than 5 mm of soil.
- f) Water used for the irrigation of vegetated areas shall be free of pollutants that will have a detrimental effect on the plants. The vegetated area shall only be watered once, immediately following seeding. Watering should be carried out from a tanker, using a fine nozzle spray to avoid erosion and disturbance of the vegetation. Water for irrigation purposes must be from an approved source.

No construction equipment, vehicles or unauthorised personnel shall be allowed onto areas that have been vegetated. Only persons or equipment required for the preparation of areas, application of fertiliser and maintenance of revegetated area shall be allowed to operate on these areas.

3 COMPLIANCE WITH REQUIREMENTS AND PENALTIES

3.1 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 and any failure on his part to do so will entitle the Engineer to certify the imposition of a penalty as detailed below.

3.2 Penalties

Penalties will be issued for certain transgressions. 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 shall be entitled to deduct the amount from monies due under the Contract.

3.3 Removal from site and suspension of Works

The Engineer may instruct the Contractor to remove from Site any person(s) who in their opinion is guilty of misconduct, or is incompetent, negligent or constitutes an undesirable presence on Site. Subclause 2.4.10 of this Specification requires that all Plant be in good working order, and accordingly the Engineer may order that any Plant not complying with the Specifications be removed from Site. Where the 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.