DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

(EMPr)

for the

management of activities relating to the protection of the natural environment during the construction- and maintenance phases relating to the

Prince Albert Municipality: The proposed upgrade of the Klaarstroom Oxidation Pond Wastewater Treatment System,

RE Portion 32 & RE Portion 34 of Farm Klaarstroom 178,Prince Albert, Western Cape

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INDEPENDENCE & CONDITIONS

EnviroAfrica is an independent consulting firm that has no interest in the proposed activity other than fair remuneration for services rendered. Remuneration for services is not linked to approval by decision making authorities and EnviroAfrica has no interest in secondary or downstream development as a result of this project. There are no circumstances that compromise the objectivity of this EMP. The findings, results, observations and recommendations given here are based on the author's best scientific and professional knowledge and available information. EnviroAfrica reserves the right to modify aspects of this report, including the recommendations if new information becomes available which may have a significant impact on the findings of this report.

RELEVANT QUALITFICATIONS & EXPERIENCE OF THE EAP

This EMP was prepared by Ms Inge Erasmus. Inge completed her BA Honours Degree in Geography and Environmental Studies at Stellenbosch University in 2016. Before completing her honours degree Inge gained practical experience as a junior environmental consultant at Hatch Goba in Johannesburg from 2014 until 2015. Inge acted as an environmental control officer on a variety of projects in the Northern Cape, conducting environmental compliance audits, as well as being part of a project team working on a major resettlement project for Kumba Iron Ore.

Inge joined EnviroAfrica in February 2017, generally performing duties as an environmental assessment practitioner with regards to NEMA EIA applications. Inge is currently busy with a variety of projects of which include Basic Assessments and Waste License Applications for mining and development related projects in the Northern Cape. She is also in the process of conducting a variety of Scoping and Environmental Impact Assessments for projects in the Western Cape, obtaining Environmental Authorisation for new storage dams as well as new agricultural developments.

Bernard: After qualifying with a B. Sc. in Forestry and a B. A. (Hons) in Public Administration at the University of Stellenbosch Bernard joined the Department of Forestry as an Indigenous Forest Planner in 1983, going on to become Manager of the Table Mountain Reserve with the Cape Town Council. He then joined Cape Nature Conservation (CNC) and headed its Conservation Planning Section before taking up the position of District Manager of the Boland area (inc. the Hottentots Holland and Kogelberg). As a Regional Ecologist, he co-ordinated managerial and scientific inputs into Provincial Nature Reserves in the Boland, Overberg and West Coast regions. For the last four years of his employment he assessed and evaluated development applications, from an environmental perspective, on behalf of CNC (now DEA&DP). Since he left DEA&DP 10 years ago he has been involved in environmental consulting in the private sector as a member of EnviroAfrica.

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1. INTRODUCTION

The main purpose of this Environmental Management Plan or Programme (EMP) is to prevent avoidable damage and/or minimise or mitigate unavoidable environmental damage associated with any construction, maintenance, or demolition work where there is a risk of environmental damage and to enhance positive benefits of the project.

The EMP forms part of the contractual obligations to which all contractors/employees involved in construction, maintenance, or demolition work must be committed. It serves as a guideline and baseline information document for the construction and operational of the proposed project and aims to comply with Section 24N of the National Environmental Management Act (Act no 107 of 1998) also known as NEMA, as well as the Environmental Impact Assessment Regulations Notice No R 982 and any additional specific information requested by any State Department, including the Department of Environmental Affairs and Development Planning (D:EA&DP) for specific projects.

This EMP:

- identifies project activities that could cause environmental damage (risks) and provides a summary of actions required;
- identifies persons responsible for ensuring compliance with the EMP and provides their contact information;
- provides standard procedures to avoid and/or minimise the identified negative environmental impacts and to enhance the positive impact of the project on the environment;
- provides site and project specific rules and actions required, including a site plan/s showing:
    - areas where construction, maintenance, or demolition work may be carried out;
    - areas where any material or waste may be stored;
    - allowed access routes, parking and turning areas for construction or construction related vehicles;
- forms a written record of procedures, responsibilities, requirements and rules for Contractor/s, their staff and any other person who must comply with the EMP;
- provides a monitoring and auditing programme to track and record compliance and identify and respond to any potential or actual negative environmental impacts; and
- provides a monitoring programme to record any mitigation measures that are implemented;

The EMP is partly prescriptive (identifying specific people or organisations to undertake specific tasks, in order to ensure that impacts on the environment are minimised), but it is also an open-ended document in that information gained during the construction activities and/or monitoring of procedures on site could lead to changes in the EMP.

1.1 TERMS OF REFERENCE

EnviroAfrica (Pty) Ltd was appointed by Department of Agriculture, Land Reform & Rural Development, as the independent Environmental Assessment Practitioner (EAP) to draft the EMP. In terms of the special conditions of the contract (specifications) the EMP must include the following:

- Details of the EAP (Refer to Page ii of this document)
- Purpose of the EMP (Refer Par. 1.2)
- Legal requirements (Refer Par. 4 & 6.1)
- Management of possible impacts (Refer Par. 5-7)
- Institutional arrangements (Refer Par. 7.1)
- EMP operational & implementation procedures (Refer Par 5-9)

- Conclusion (Refer Par. 6)
- Annexures (Refer to Appendices)

1.2 PURPOSE OF THE EMP

The purpose of this Environmental Management Plan or Programme (EMP) is to give direction and guidance to all responsible parties, and binds all contractors, sub-contractors and other persons working on the site to adhere to the terms and conditions of the EMP during the construction and operational phase of the project. Any additional Site Specific conditions decided and agreed upon during the "On Site Start-Up Meeting" shall be included and will become a part of the EMP.

The overall aim of the EMP is to prevent avoidable damage and/or minimise or mitigate unavoidable environmental damage associated with the construction, and to a lesser degree the operational, phases of the proposed project.

The EMP forms part of the contractual obligations to which all contractors/employees involved in construction, maintenance, or demolition work must be committed. It serves as a guideline and baseline information document for the construction, operational and decommissioning phases of the proposed project and aims to comply with Section 24N of the National Environmental Management Act (Act no 107 of 1998) also known as NEMA, as well as the Environmental Impact Assessment (EIA) Regulations and any additional specific information requested by any State Department, including the Department of Environmental Affairs (DEA) for specific projects.

This EMP:

- identifies project activities that could cause environmental damage (risks) and provides a summary of actions required;
- identifies persons responsible for ensuring compliance with the EMP;
- provides standard procedures to avoid and/or minimise the identified negative environmental impacts and to enhance the positive impact of the project on the environment;
- provides site and project specific rules and actions required, through the start-up report;
- forms a written record of procedures, responsibilities, requirements and rules for Contractor(s), their staff and any other person who must comply with the EMP;
- provides for monitoring of compliance and record keeping.

The EMP is partly prescriptive (identifying specific people or organisations to undertake specific tasks, in order to ensure that impacts on the environment are minimised), but it is also an open-ended document in that information gained during the construction activities and/or monitoring of procedures on site could lead to changes in the EMP.

1.3 SCOPE

This EMP addresses the construction- and operational phases and all activities associated with this project. Compliance to the EMP shall be monitored by an independent Environmental Control Officer (ECO) who will visit the site on a regular basis during the construction phase (at least twice monthly).

The Client or the Construction Engineer or Project Manager, on behalf of the Client, will be responsible to ensure the implementation of the requirements of this EMP by all contractors and sub-contractors.

2. DEFINITIONS AND ABBREVIATIONS:

2.1 DEFINITIONS

Applicant: the person or responsible person from an organization who applied for the proposed activity described in the ROD.

Audit (Site Completion): environmental evaluation (audit) of compliance of the construction phase to the conditions of the EMP.

Bund: enclosure under / around a storage facility to contain spillage.

Batch plant: a concrete or plaster mixing facility and associated equipment and materials.

Construction: means the construction period of the project during which the actual works are carried out, deemed to include site establishment, site preparation, the works, maintenance period and decommissioning and is defined as from commencement of site establishment until site handover (practical completion).

Construction site: means the area influenced and affected by the construction activities or under the control of the Contractor often referred to as "the Site".

Construction Supervisor: The person responsible (appointed by the owner) to ensure that the construction is carried out to completion on time, within budged and that the Contractor fulfils his obligations in terms of the EMP.

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

Contractor: the principal persons / company and all other sub-contractors involved in the construction of the project.

Contractor's camp: means the designated and suitably demarcated areas on the Site within which all site offices and staff facilities are situated and within which equipment will be stored, for instance, borrow areas, batching plant, crusher plant, sand washing plant, workshop, offices, rest areas, ablution areas, etc., whichever is applicable.

Declaration of understanding: Form that is signed by all contractors involved in the construction works of their understanding and acceptance of the EMP and site-specific additions to the EMP.

Development site: boundary and extent of development works and infrastructure.

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

- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part of the combination of the above two bullets and the interrelationships between them;
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being

Environmental Aspect: Any element of any construction activity, product or services that can interact with the environment.

Environmental Audit Report: report done by the ECO and submitted by the Applicant to the satisfaction of the Chief Directorate Environmental Affairs, within six months after construction has been completed and also after the site(s) has been rehabilitated.

Environmental Control Officer: The ECO must be independent and suitably qualified (a diploma or degree in environmental management with at least 5 or more years of environmental site management experience) and must have a sound knowledge of the environment in which the activity will take place. The ECO should be registered as an Environmental Scientist (*in terms of section 20(3) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003)*).

Environmental Completion Statement: A report by the ECO to the relevant authorities stating completion of the project and compliance with the EMP and its conditions.

Environmental Impact: Any change to the environment, whether adverse or beneficial, wholly or partially resulting from any construction activity, product or services.

Method statement: A statement by the Contractor, describing the scope of intended construction works step-by-step, in order for the ECO and Construction Supervisor to understand the Contractors intentions and be able to comment on, so that they could assist with devising mitigating measures should it be necessary to avoid environmental impact.

No-Go Area(s): An area of such (environmental/aesthetical) importance that no person or activity are allowed within a designated boundary surrounding this area.

Owner: The owner, or dedicated person, responsible for the management of the property on which the proposed activity (in terms of the EA) will be performed.

Stop Works Order: An order which can be issued either by the ECO or Construction Supervisor to the Contractor (or any sub-contractor) if serious environmental damage is about to happen or is happening as a result of construction activities. On receiving such an order the Contractor must immediately stop all activities (or planned activities) relevant to the specific issue until an environmentally friendly resolution has been approved by the ECO.

Site meetings: Periodic (weekly or monthly) meetings between the ECO, Construction Supervisor and Contractor to discuss construction activities that relate to the environment or any other environmental issues that might arise.

Works: The works to be executed in accordance with a contract.

On-site start-up meeting: a start-up meeting held on site, before any construction has begun to discuss EMP and determine site specific additions that will be included as the basis for the EMP.

Potentially hazardous substance: is a substance, which, in the reasonable opinion of the Engineer, can have a deleterious (detrimental) effect on the environment.

Precautionary principle: means the basic principle, that when in doubt or having insufficient or unreliable information on which to base a decision, to then undertake actions that will have minimum risk.

Reasonable: means unless the context indicates otherwise, reasonable in the opinion of the Engineer/Project Leader after he has consulted with a person, not an employee of the client, suitably experienced in "environmental implementation plans" and "environmental management plans", both as defined in the Environmental Management Act (Act No 107, 1998).

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).

2.2 ABBREVIATIONS

CARA	Conservation of Agricultural Resources Act no. 43 of 1983
DEA	Department Environmental Affairs
DENC	Department of Environmental and Nature Conservation
DTEC	Department of Tourism, Environment And Conservation [Northern Cape Province]
EA	Environmental Authorization (Record Of Decision) issued by relevant authority for the authorisation to commence construction under certain environmental compliances
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer - Must be a suitably qualified independent environmental consultant appointed to ensure compliance to the EMP
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan or Programme
ER	Engineers representative or Main contractors representative
ESO	Environmental Site Officer - . Must be a person with adequate environmental knowledge to understand and implement the EMP by conducting onsite inspections determined by the ECO and the client.
MSDS	Material Safety Data Sheet(s)
NCNCA	Northern Cape Nature Conservation Act 9 of 2009.
NEMA	National Environmental Management Act no. 107 of 1998.
NEM:AQA	National Environmental Management: Air Quality Act 39 of 2004.
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004.
NEM:PAA	National Environmental Management: Protected Areas Act 57 of 2003
NEM:WA	National Environmental Management: Waste Act 59 of 2008.
NFA	National Forest Act 84 of 1998.
NHRA	National Heritage Resources Act 25 of 1999.
NVFFA	National Veld and Forest Fire Act 101 of 1998.
NWA	National Water Act 36 of 1998
OSSM	On-site Start-up Meeting
ROD	Record of Decision
SAHRA	South African Heritage Resources Agency

3. PROJECT LOCATION & DESCRIPTION

This application is for the proposed upgrade of the exiting Klaarstroom Waste Water Treatment Works on Remainder of Portion 32 of Farm Klaarstroom 178,Prince Albert, Western Cape to produce to increase the capacity and improve the quality of the Final Effluent. It is further proposed that the Final Effluent be used for irrigation of the sport fields in Klaarstroom village. It is proposed to construct a pipeline from the WWTP ponds which will terminate in a new galvanized dam at the sports field on Remainder of Portion 34 of Farm Klaarstroom 178, Prince Albert, Western Cape.

The village of Klaarstroom is located south of the N12 National Road and the existing wastewater treatment plant is located north of the N12. All wastewater from the village is pumped to the wastewater treatment plant.

The village of Klaarstroom is fairly well serviced in terms of water, sewage, electricity and roads. The wastewater is collected at a central pump station in the village and then pumped through a 100mm diameter rising main over a distance of 800m to the wastewater treatment plant.

The current disposal of effluent takes place by means of overhead sprinklers discharging the treated effluent onto the veld north of the existing treatment plant. Any drainage from this area will eventually end up in the Groot River south of Klaarstroom.

Existing Infrastructure:

The existing wastewater treatment plant comprises of only two ponds. The first pond is an anaerobic pond followed by a single facultative pond from where the final effluent is discharged onto the ground. The design capacity of the pond system is given as 50m^3/day and it was constructed in 1970. Records indicate a measured peak daily flow of 80 m^3/day which is approximately 60% higher than the current design capacity.

According to an analysis of the treated effluent dated August 2015 the current effluent is non-compliant with all important parameters. The total suspended solids on the final effluent is very high at 88mg/l and far exceeds the allowable minimum of 25mg/l. the COD and Ammonia levels are much higher than the allowable limits. The existing Klaarstroom WWTP is both hydraulically (flow) and organically (chemical load) overloaded.

Bvi Consulting Engineers' brief was to provide a proposal for the upgrade of the oxidation pond system to increase the capacity and improve the quality of the Final Effluent. The current plant has a footprint of approximately 4446.83m^2

Figure 1: Layout of Existing Waste Water Treatment Works (Bvi Technical Report)

The existing system has a design capacity of 50m³ per day. The final effluent is currently chlorinated and then irrigated in the veld north of the plant by means of two overhead sprinklers. It is proposed that the current capacity of the Klaarstroom WWTP be upgraded to a new capacity of 61m³ per day (11m³/ day expansion) for dry weather and The Peak Wet Weather Flow was calculated to be 127m3/day or 1.47 l/s.

Given the existing layout of the plant, it is proposed that the existing plant be converted to a system comprising an inlet works, duel anaerobic ponds, duel aerobic ponds, and a reed bed.

Figure 2: Proposed layout of refurbishment and improvement works of Klaarstroom WWTP (BVI Technical Report)

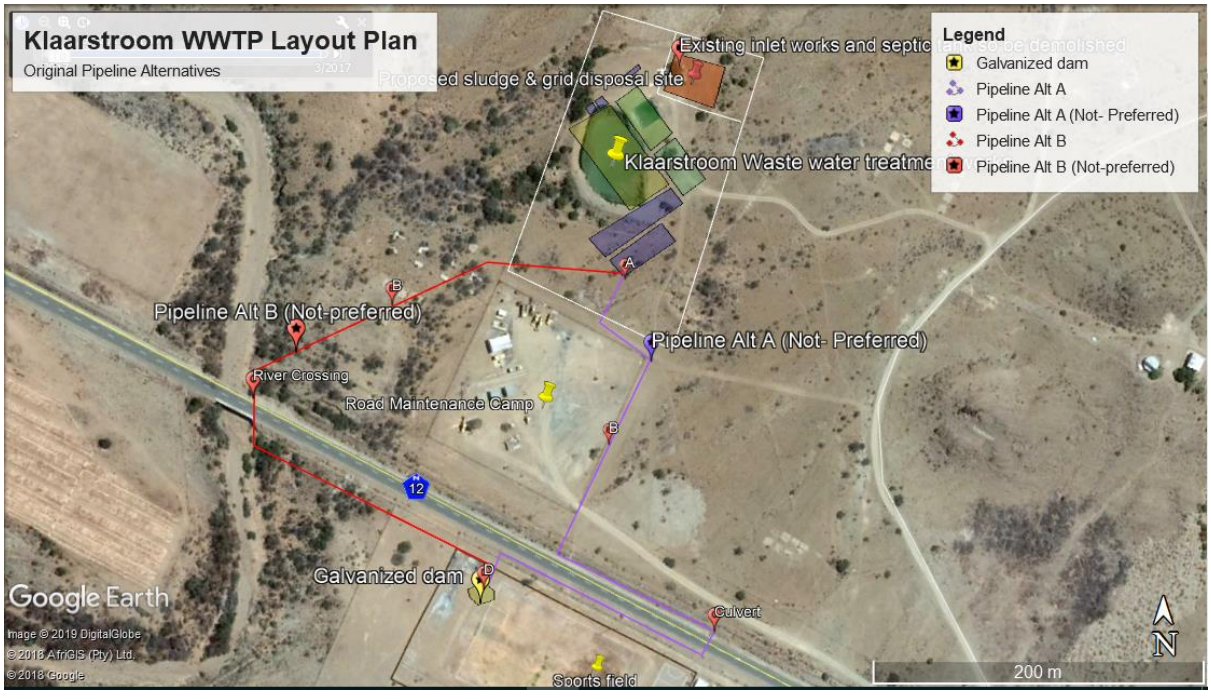

Figure 3: Originally proposed pipeline routes investigated. Alternative A was considered the preferred alternative. After consultation with PGWC it was found that this option is not viable. Pipeline Alternative

B, was investigated. It is proposed this pipeline route will cross the N12 via an existing bridge on private land, not preferred.

Figure 4: New proposed pipeline alternatives. Alternative C, blue line, is considered the new preferred alternative. It is proposed this route cross the N12 by means of horizontal directional drilling. Alternative D is also considered, the proposed pipeline to follow the route of Alternative A and C up until point C, to remain mostly within the N12 road reserve and to cross the N12 attached to the existing bridge.

Proposed works:

1. The Inlet works will be rebuilt and comprise of a hand-raked screen in a channel, approximately 0.5m x 2m x 1m deep, followed by duel grit removal channels with approximate dimensions of 0.3m x 5m x1m deep, followed by a Parshall measuring flume with dimensions of 0.3m x 0.7m x 1m deep. The flume outlet will drop off into a concrete chamber approximately 0.1 m x 0.1m. From this box, a 160mm diameter 25m gravity sewer will feed the Anaerobic ponds.

   Approx. footprint for inlet works are: 25m²

2. The depth of the current single anaerobic pond is unknown and probably competently filled with sludge. It is proposed that two new anaerobic ponds are constructed. The anaerobic ponds are suggested to have a combined retention period of 24hours which should be sufficient to break down the organic fraction of the waste water by at least 50%.

   Dimensions for each new anaerobic pond is proposed to be 5.5m x 5.5m x 3.5m depth.

   Approx. footprint for both anaerobic ponds are: 60.5m² or 211.75m³.

3. The existing anaerobic pond is to be modified and reshaped to create a new secondary aerobic pond with dimensions of 38m x 15m x 100m deep
4. A second aerobic pond of 38m x 15m x 100m deep is proposed. Each of the secondary ponds to provide a retention period of 5.5day or a total of 11 days.

   Approx. footprint for both aerobic ponds are: 1140 m² or 1140 000 m³
5. The existing facultative pond (large pond) to be refurbished and reshaped to encourage plug flow. Proposed final dimensions: 58m x 30m x1.2 m deep. A total retention of 25 days is provided for.

   Approx. footprint for the facultative pond is: 1740 m² or 2088 m³.

6. Construction of a single horizontal reed bed for polishing of the final effluent and to facilitate denitrification Proposed dimensions: 60m x 20m x 0.6m deep

   Approx. footprint of the reed bed is: 1200 m² or 720 m³

7. Construction of a storage pond with a capacity to store at least 7 days of flow. Proposed dimensions include: 40m x 20m x 1.5m deep.

   Approx. footprint of the storage pond is: 800 m² or 1200 m³
8. The final effluent is to be utilized for irrigation of sports fields in Klaarstroom village. This will be made possible by using a gravity system as the waste water treatment plant is located at a higher elevation that the village. It is proposed to construct a ±160mm ø uPVC pipeline of ±500-600m in length from the effluent storage point which will terminate in a new galvanized dam at the sports field.

Various pipeline alternatives are investigated. Please refer to the layout maps, Appendix 13 and Figure 3 & 4 above.

- The purple line (Alternative A) was originally the preferred route. It was proposed that this route will cross the N12 road through an existing culvert. However, after consultation with SANRAL and PGWC: Department of Transport and Public Works it was decided that this route is not viable as the PGWC will not consider an application proposing to cross the road via a culvert or by means of trenching, only trenchless technology will be considered. Please refer to the Comment and Response Report (Appendix F1 of the BAR) and Original Comments (Appendix F1.3 of the BAR).

- The other original alternative investigated, was Alternative B, represented by the red line. It was proposed that the pipeline will cross the N12 on private land under the bridge and run parallel to the Sand river. This route will impact on the banks of the Sand River and is therefore not preferred Land owner consent from will also need to be obtained as pipeline Alternative B will cross private land.

- Pipeline route Alternative C, represented by the blue line on the locality maps, is now considered the Preferred Alternative.. The route changed slightly and is shorter,

approximately ±270m. It is proposed that the pipeline will follow the same route as Alternative A up until point c on Figure 4 above. It is proposed that this route will cross the N12 via Horizontal Directional Drilling from where it will terminate in the proposed irrigation dam.

- Pipeline route Alternative D, represented by the green lines on the locality maps, was also considered. This proposed pipeline follows the same route as Alternative A and C until the point where it is proposed that Alternative C crosses the N12 (point c in Figure 4). It is proposed that pipeline route Alternative D follows the road reserve on the Northern side of the N12 until the existing bridge to the west of the site. From here it is proposed that the pipe be attached to the bridge to cross the road and river to the South of the N12. From here it will remain within the road reserve until the point where it crosses into the school property and terminated within the proposed storage dam. No listed activities will be triggered as the pipeline is to remain within the road reserve. Approximate length of the pipeline is ±590m

    9. The proposed galvanized irrigation dam will have a storage capacity of ±121m³ and dimensions of ±10m diameter ±1.55m high. It is proposed the be covered with a galvanized sheeting roof structure. The dam will be fire retardant and manufactured from Aluzinc corrugated sheets of 0.8mm thickness. The dam to be provided with an 800g/m² supported PVC Liner which carries a 12 year warrantee. The liners are UV stabilised and contain biocides to minimise fungus growth thus making it suitable for water storage
    10. A small pump station (2m²) will be provided at the dam to provide a flow of 4.5l/s at a head of 3.5bar feeding a crawling irrigator which will be used to irrigate the sports field.
    11. A chip doser for the dosing of a calcium hypochlorite solution into the circular dam will be provided to disinfect the final effluent prior to irrigation to avoid any pathogens from remaining in the irrigation water.

The proposed pipeline from the effluent storage pond to the proposed galvanized dam at the sports field will be approximately ±500-600mm long with a diameter of 160mm. The pipeline route will have a construction footprint of minimum 5000-6000m².

The current plant has a footprint of approximately 4446.83m²

The total area of the plant on completion of the proposed upgrade will be approximately 9510 m²

Thus, a new area of approximately 5064m² will need to be cleared for the upgrade.

It is proposed that the works be fenced of for security and safety reasons. The footprint of the fenced of area is proposed as 18 0086m² or 1,8ha.

Please refer to Appendix 13 for Locality maps and proposed layout plans as well as design drawings.

Sludge & Grid Management

The current anaerobic pond has approximate dimensions of 12.5m x 12.5m and an average depth of 1.5m which is common for this type of design. The side slopes are 1 : 1.5. This equates to a total usable volume of 160m3. Lets make an assumption and say that the pond is 60% filled with sludge. This equates to a volume of 96m3, say 100m3 that needs to be dealt with. The pond need to be de-sludged. This sludge is considered difficult to handle, with a black jelly-like consistency and difficult to pump. It

is therefore suggested that the existing sludge be buried on site and contained within the fenced off area. The sludge is to be mixed with soil to make it more stable and manageable.

The new Anaerobic Ponds will also accumulate sludge. At normal rates, it would be required that these ponds be de-sludged once in 5 to 7 years. Based on comments Bvi (Appendix F1 of the BAR for C&RR) the volume of sludge expected after 7 years equates to approximately 43m³ after 7 years. Typically this is done by taking one pond out of operation and physically removing the sludge by hand and disposing of it at a registered landfill site or burying the sludge in pre-excavated trenches (Bvi Technical Report 2018).

It is proposed that non-biodegradable waste collected daily in die grid channels at the inlet works be disposed of in trenches on the site, within the fenced off area. This practise of disposal is as per The Department of Water and Sanitation's Green Drop Manual for disposal of screenings and grid at small WWTPs. It is proposed to dig two trenches of about 1.8m deep and 10m long. Each day's solids are then placed in the length of the trench, sprinkled with lime and then covered with a layer of soil. When the trench is full up to 300mm, it is completely closed and a new trench is dug.

The area selected for the disposal of the existing sludge from the decommissioning of the existing facultative pond & disposal of grid and screening solids is considered completely transformed. The existing inlet works and septic tank is currently located within the selected area, but will be demolished.

Please refer to the image below indicating the area proposed for disposal of the existing sludge and non-biodegradable waste within the fenced of footprint. The area proposed for disposal is approximately 500m² and is proposed within a fenced off area of 2005m² (0,2ha).

Figure 5: Google image indicating area proposed for sludge & grid disposal within a fenced off area

Stormwater Management:

It is proposed that a low earth embankment (1.0m high) be placed on the northern side of the proposed works to channel any stormwater around the proposed works. The primary concentrated runoff from the drainage lines will them be mitigated. It is further proposed that the second drainage line from the east be diverted using a trench along the toe-line of the eastern ponds to ensure that stormwater is diverted to the south of the works.

The natural slop of the ground is from East to West. It will therefore be pertinent to have a trench with a flat side slope on the Eastern Side and steeper side slope on the western site. As illustrated in the Stormwater Management Plan images, Appendix 13. The trench is proposed to have a length of 254m. The slope along the length of the proposed trench will approximate the natural slope of the ground in a north to south direction as follows:

From Chainage 0.00 where trench commences up to Chainage 100.00, the trench will have a slope of 1 : 100; From Chainage 100.00 up to Chainage 200.00, the slope will be 1 : 33, and over the last section from Chainage 200.00 to Chainage 254.00 the slope will be 1 : 54.

The trench is proposed to have a depth no more than 300mm deep on the low side of the slope and will be 1500mm wide. The trench will be formally shaped, but will not be lined. As the cross-sectional area is quite large in relation to the expected run-off, low flow velocities are expected which decrease the chance of erosion in the trench. The Inlet Structure and the Outlet Structure will be formally shaped and lined with stone pitching to avoid scour of the natural ground.

Coordinates Storm water trench starts: 33°19’18.13’’S 22°31’45.43’’E

Coordinates Storm water trench ends: 33°19’22.11’’S 22°31’40.69’’E

Please refer to the Stormwater Management Plan Layout, **Alternative 13.**

Environmental considerations:

From the Vegetation Map on Cape Farm Mapper (Appendix 13) vegetation that would have been present on site is Prince Albert Succulent Karoo vegetation. This type of vegetation does not fall under the *National Environmental Management: Biodiversity Act 2004, National List of Ecosystems that are threatened and in need of protection (NEMBA).* From google images vegetation on the site is sparse.

The Biodiversity Overlay Map from Cape Farm Mapper (Appendix 13) indicate that the existing WWTP does fall within a CBA and ESA2.

From the Water Resources Map on Cape Farm Mapper (Appendix 13) a non-perennial river/ drainage line runs through the site. No wetlands present on site. The maps indicate that pipeline routes Alternative A and C will cross a non-perennial river.

Site Description:

The Klaarstroom WWTP is located on Remainder of Portion 32 of Farm Klaarstroom 178,Prince Albert, Western Cape. The sport field to be irrigated Remainder of Portion 34 of Farm Klaarstroom 178, Prince Albert, Western Cape

The SG Digit code is: C06100000000017800032 and C06100000000017800034

The existing Klaarstroom WWTP coordinates are: 33° 19’ 20.09”S; 22° 31’ 43.44”E

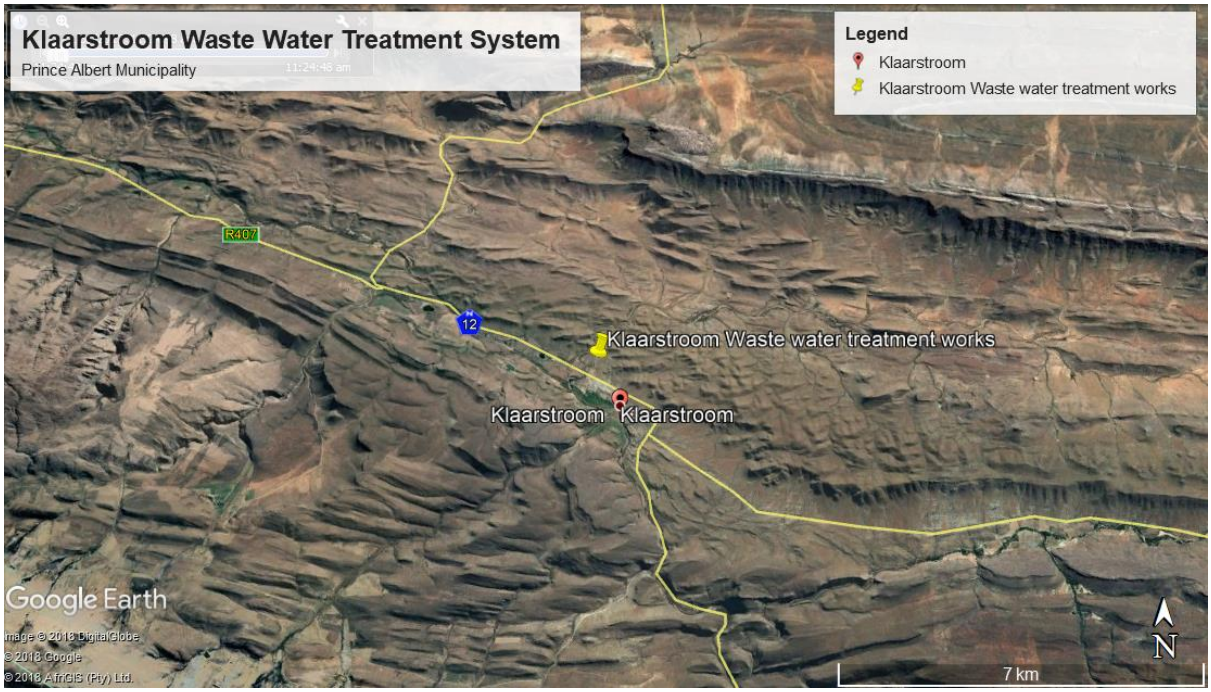

Figure 6: Locality Map

Services:

Existing roads, electricity connections and freshwater infrastructure is available at the site.

4. APPLICABLE LEGISLATION

Constitution of the Republic of South Africa (1996): of special relevance in terms of environment is section 24

Conservation of Agricultural Resources Act 43 of 1983 (CARA): supports conservation of natural agricultural resources (soil, water, plant biodiversity) by maintaining the production potential of the land and combating/preventing erosion; for example, by controlling or eradicating declared weeds and invader plants.

Hazardous Substances Act 15 of 1973: to control substances that may cause injury, ill-health, or death through their toxic, corrosive, irritant, strongly sensitizing or flammable nature, or by the generation of pressure

National Environmental Management Act 107 of 1998 (as amended): replaces the Environmental Conservation Act (ECA) and establishes principles for decision-making on matters affecting the environment, and for matters connected therewith.

- **Environmental Impact Assessment Regulations**: identifying activities (listed activities) for which environmental authorisation must be obtained.

National Environmental Management: Air Quality Act 39 of 2004 (NEMAQA): replaces the Atmospheric Pollution Prevention Act (No. 45 of 1965).

National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA): supports conservation of plant and animal biodiversity, including the soil and water upon which it depends.

- **National list of ecosystems that are threatened and in need of protection** (GN 1002 of 9 December 2011).

National Environmental Management: Protected Areas Act 57 of 2003 (as amended Act 31 of 2004) (NEMPAA): To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes.

National Environmental Management: Waste Act 59 of 2008 (NEMWA): To reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.

- **List of Waste Management Activities that have, or are likely to have a detrimental effect on the environment**: Identifies activities in respect of which a waste management license is required.

National Forests Act 84 of 1998 (as amended): supports sustainable forest management and the restructuring of the forestry sector.

- **List of protected tree species** (GN 716 of 7 September 2012)

National Heritage Resources Act 25 of 1999: supports an integrated and interactive system for the management of national heritage resources, including supports soil, water and animal and plant biodiversity.

National Veld and Forest Fire Act 101 of 1998 (NVFFA): protects soil, water and plant life through the prevention and combating of veld, forest, and mountain fires

National Water Act 36 of 1998 (NWA): promotes the protection, use, development, conservation, management, and control of water resources in a sustainable and equitable manner.

Northern Cape Nature Conservation Act 9 of 2009 (NCNCA): which provides for the sustainable utilization of wild animals, aquatic biota and plants.

- Schedule 1 – 3 listing protected and specially protected species for which authorisation must be obtained if they are to be impacted upon.

5. SITE SPECIFIC ENVIRONMENTAL CONCERNS

The purpose of this section of the EMP is to discuss possible significant environmental impacts that may be encountered. In other words, this section aims to give site specific guidance for impact minimisation in the context of the proposed development.

5.1 VEGETATION ENCOUNTERED

From the Vegetation Map on Cape Farm Mapper (Appendix 13 & figure below) vegetation that would have been present on site is Prince Albert Succulent Karoo vegetation. This type of vegetation does not fall under the *National Environmental Management: Biodiversity Act 2004, National List of Ecosystems that are threatened and in need of protection (NEMBA).* From google images vegetation on the site is sparse.

The following information was taken from the Biodiversity Impact report (**Appendix 14**).

The area that will be impacted by the proposed WWTW upgrade and pipeline is very small. If it is taken into account that the existing WWTW is already basically transformed, the additional footprint will be only about 5000 m2, while the pipeline will have a temporary impact on between 500- 800 m of veld of which most is located in already disturbed or transformed (within the urban edge) veld portions.

Originally Preferred Pipeline Route (Alternative A):

The preferred pipeline route will start within at the extended WWTW within the area described above. It is proposed to be placed next to the fence of the Road camp within an area that has been cleared of vegetation (potentially a fire break)

From the road camp the pipeline will follow the N14 south for about 250 – 300 m where it will cross underneath the N14 (through an existing culvert), after which it turns north again back towards the sporting grounds (within the urban edge, with no vegetation of significance). The vegetation in this area has also been subject to past disturbance. As a result only a few small Vachellia karroo and hardy or weedy pioneer species were observed like *Augea capensis*, *Galenia africana*, young *Lycium cinereum*, *Kali* species, and *Tetraena simplex.*

It is expected that the preferred pipeline route, Alternative C, will have similar biodiversity impact.

Alternative Pipeline Route (Alternative B, not preferred):

The alternative pipeline route will start at the same point as the preferred route, but will run to the west onto private land; from where it will take the shortest route to the bridge were the Sand River runs underneath the N14. It is proposed that the pipeline will be attached to the bridge where it crosses underneath the road.

It is proposed that Pipeline route Alternative D will start as the same point as Alternative A and C up until the point where it is proposed that Alternative C will cross the road. Hence, similar biodiversity impacts are expected. It is proposed that the pipeline remains within the road reserve to the North of the N12 towards the bridge, attach to the bridge to cross the road and river, and remain within the road reserve to the south of the N12 to where it will terminate n the proposed dam. As the proposed route will remain in the road reserve and attach to the existing bridge, biodiversity impacts are considered low with no natural vegetation or watercourses to be disturbed.

Galvanised dam/ reservoir:

A small storage tank or reservoir will be placed within the existing Klaarstroom sport fields from where the sport fields can be irrigated. This reservoir will be located in this site with no natural veld remaining.

CBA/ ESAs:

The Biodiversity Overlay Map from Cape Farm Mapper (Appendix 13) indicate that the existing WWTP does fall within a CBA and that the alternative pipeline route (Alternative B, not preferred) will also impact on the ESA associated with the Sand River/ Groot river.

Please note that although the proposed infrastructure will be located within a terrestrial CBA for the purposes of the impact assessment it was taken into account that the pipeline will be located in areas already very much disturbed and that with the current CBA map, there is no alternative location that will fall outside of the CBA. It was also taken into account that the permanent enlargement of the footprint will be relatively small (5000 m2) and that the impact associated with the pipeline route will be temporary. It is also expected that with mitigation and rehabilitation the impact associated with the construction of the pipeline can be minimal.

According to the Biodiversity Specialist Report (**Appendix 14**) the main impacts associated with the proposed development will be on (1) a disturbed conservation priority area (CBA) and (2) a potential impact on a seasonal watercourse (if the alternative pipeline route is chosen)

Because of the degraded status of the site and the temporary nature of the impact, the cumulative impact from a biodiversity point of view, (even without mitigation), is expected to be relatively low, but this can be further reduced with mitigation.

Figure 7: Vegetation Map, Cape farm mapper

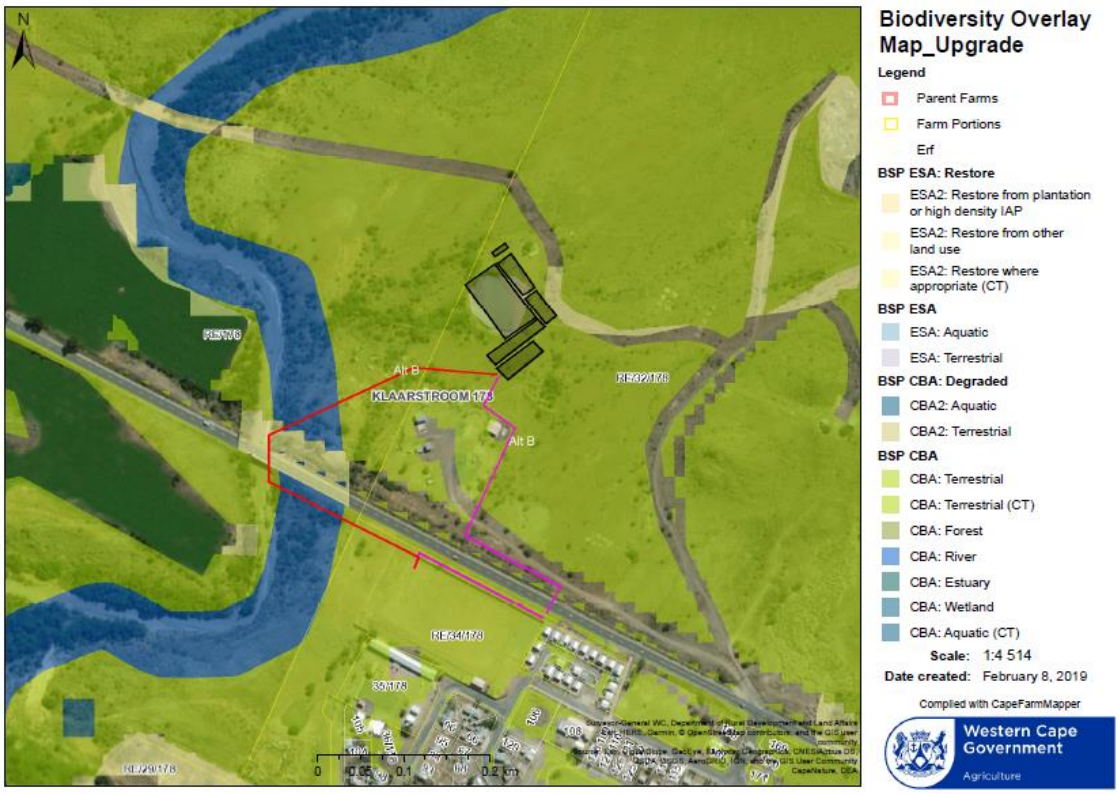

Figure 8: CBA Map

5.2 PROTECTED PLANT SPECIES

According to the Biodiversity Impact Assessment (Appendix 14) no threated and protected plant species were observed in terms of The Red List of South African; The National Environmental Management: Biodiversity Act, Act 10 of 2004, "Lists of critically endangered, endangered, vulnerable and protected species" (GN. R. 152 of 23 February 2007); or The National Forests Act (NFA) of 1998 (Act 84 of 1998) provides for the protection of forests as well as specific tree species (as updated).

5.3 FRESHWATER RESOURCES

From the Water Resources Map on Cape Farm Mapper (Appendix 13) a non-perennial river/ drainage line runs through the site. No wetlands present on site. Proposed pipeline route (Alternative A, C &D) will cross a non-perennial river/ drainage line.

However, according to the Freshwater Report (Appendix 14) this drainage line was not observed during the site visit on 23 January 2019. The report states that the ground is very level, leaving uncertainty to where the storm water flows. Instead of the drainage line, a culvert (refer to Figure 7 & Figure 8 above) was observed under the N12 for letting stormwater through that might have accumulated against the northern shoulder of the road. A swale with a hard surface stretches from the culvert to the south into the Klaarstroom township. This is part of the storm water system that releases its water into the Groot River south of the township.

Therefore, the preferred pipeline route Alternative C will not impact on any drainage lines.

Pipeline route Alternative B (red line in Figure 19 above) is not considered the preferred alternative as it is proposed to cross the N12 under the bridge and run parallel on the banks of Grootrivier. This proposed route will cross the Groot River and a S21 (i) WUL will be required. Land owner consent will also need to be obtained as pipeline Alternative B will cross private land. (Refer to the Freshwater specialist report Appendix 14 as well as Sensitivity Maps Appendix 13).

It is proposed that Pipeline route Alternative D will start as the same point as Alternative A and C up until the point where it is proposed that Alternative C will cross the road. Hence, similar biodiversity impacts are expected. It is proposed that the pipeline remains within the road reserve to the North of the N12 towards the bridge, attach to the bridge to cross the road and river, and remain within the road reserve to the south of the N12 to where it will terminate n the proposed dam. As the proposed route will remain in the road reserve and attach to the existing bridge, biodiversity impacts are considered low with no natural vegetation or watercourses to be disturbed.

The existing WWTP straddles a drainage line, although the drainage line is very faint. The upgrade of the works will thus occur within this drainage line. The freshwater report states that during a very high rainfall event, the flow of water can be expected to be fast, with a high erosion potential evident from the deeply incised Groot Rivier and most drainage lines. The drainage line is separated from the next drainage line towards the east with a low ridge. The next drainage line is emphasised and clear.

The freshwater report (Appendix 14) further assess the Present Ecological State (PES) and Ecological Importance (EI) of these drainage lines as well as the Groot river.

According to the assessment, the upper part of the drainage line (Figure 20) is natural, with no impacts. Lower down, the drainage line is impacted by the municipal waste disposal site and irrigated area and the existing WWTP straddles the drainage line. Evidence of seepage exist downstream from the WWTP as there is a dense stand of shrub trees, more so than in the direct surroundings. The PES of both the instream habitat and riparian zone score a C (Moderately modified). The habitat has been impacted, but the basic ecological functioning remain intact. The PES of the Groot river has been classified as an A (Unmodified, natural), unimpacted and pristine.

The Ecological Importance (EI) is based on the presence of especially fish species that are endangered on a local, regional or national level. There are no indigenous fish in the Groot River at Klaarstroom and its associated drainage lines, as there is no permanent water. According to freshwater assessment, which is prescribed for WULA's, the site and surrounds are not ecologically important. No other endangered species, either plant or animal, were detected in or near the drainage line.

The Ecological Sensitivity (ES) is often is often described as the ability of aquatic habitat to assimilate impacts. The Ecological Sensitivity refers to the potential of aquatic habitat to bounce back to an ecological condition closer to the situation prior to human impact. If it recovers, it is not regarded as sensitive. The Groot River at Klaarstroom and its associated drainage lines can probably be rated as moderately sensitive.

The freshwater specialist is of the opinion that A WWTP is an ongoing operation. Therefore the possibility of an impact is an ongoing risk as well. The Upgrade of the Klaarstroom WWTP is not considered to detract from the river services, if it is properly managed. The freshwater specialist suggests that it is unlikely that the impacted conditions south of Klaarstroom may creep upstream to the confluence of the KLaarstroom drainage line. It is also unlikely that the small anaerobic pond system is to overflow into the adjacent river, if the upgrade is to be done as planned.

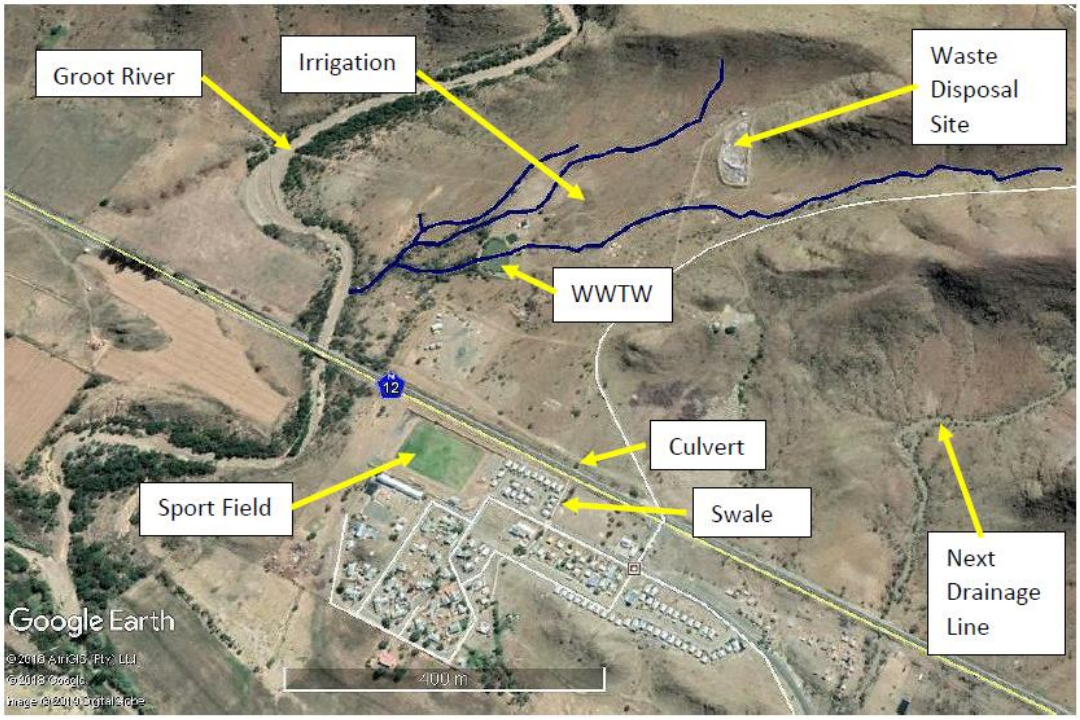

Figure 9: Image indicating the existing WWTP, affected drainage line, culvert & swale (Freshwater report, WATSAN 2019)

5.4 HERITAGE ASSESSMENT

CTS Heritage conducted a Heritage Screener (Appendix 14) as well as submitted the Heritage Notice of Intend to Develop (NID) to Heritage Western Cape.

According to the CTS Heritage Klaarstroom is situated on the outskirts of a small Karoo town, and alongside a river, it is likely that Early, Middle and Later Stone Age artefacts are present within the WWTP site. In addition, some of the area has been surveyed for rock art by Nardell and a number of rock art sites have been identified within 20km of the proposed development area. However, as this site is already developed, and as this site is located far from any rocky outcrops, it is unlikely that any significant archaeological resources or rock art sites will be impacted by the proposed development.

The area proposed for development is underlain by siltstone, shale and arenaceous shale sediments of the Traka Subgroup of the Bokkeveld Group of the Cape Supergroup, of very high palaeontological sensitivity according to the SAHRIS Palaeosensitivity Map. According to SAHRIS, the Traka Subgroup is known for its fossils of fish (sharks, acanthodians, placoderms, bony fish, recorded especially from Da), bivalves and vascular plants (psilophytes, lycopods), common but low diversity trace fossils, including

Spirophyton , and rare brachiopods. Tectonic deformation often limits fossil collection, especially within mudrock-rich horizons, and distorts fossils. Biostratigraphically and

palaeoecologically important fossil assemblages are known from high palaeoaltitudes (such as the Klipbokkop and Adolphspoort Fms). These sensitive formations may be impacted by the proposed development, and as such it is recommended that the HWC Fossil Finds Procedure be implemented throughout the development phase.

Heritage Western Cape provided comment and no further studies are required (**Appendix 14**).

6. RECOMMENDATIONS

The following are site specific recommendations, as per the various specialist assessments of the project. Please note that if there is any contradiction between the following specialists' recommendations and/or the conditions of the Environmental Authorisation, and the recommendations in Section 7 and 8 below, the Environmental Authorisation and specialist recommendations take precedent.

Recommendations on Impact minimisation

- The construction and operational phase of the project must be done in accordance with this environmental management programme, the aim of which is, to minimise environmental impact during the construction and operational phases.
- A suitable qualified ECO must be appointed to oversee the construction phase.

6.1.1 Botanical

Botanical specialist, Mr Peet Botes suggest the following impact minimization recommendations should be considered as part the construction phase:

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must include the recommendations made in this report.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and any other conditions pertaining to specialist studies.
- If required, water course should be crossed in such a manner as to minimise the disturbance footprint and potential erosion as a result of construction
- **Before any work is done** the development footprint and access routes must be clearly demarcated and approved by the ECO. The demarcation must include the total footprint necessary to execute the work, but must aim at minimum disturbance.
- Lay-down areas or construction sites must be located within already disturbed areas or areas of low ecological value and must be pre-approved by the ECO.
- Indiscriminate clearing of any area outside of the construction footprint must be avoided.
- All areas impacted as a result of construction must be rehabilitated on completion of the project.
    - This includes the removal of all excavated material, spoil and rocks, all construction related material and all waste material.
    - It also included replacing the topsoil back on top of the excavation as well as shaping the area to represent the original shape of the environment.
- An integrated waste management approach must be implemented during construction.
    - Construction related general and hazardous waste may only be disposed of at Municipal approved waste disposal sites.
    - All rubble and rubbish should be collected and removed from the site to a suitable registered waste disposal site.

- All alien invasive species within the footprint and at least 5 m to the side of the footprint must be removed.

6.1.2 Freshwater

Fresh water specialist, Dr Dirk van Driel, suggest the following impact minimization recommendations should be considered as part the planning, construction and operations.

Mitigation in terms of planning:

- The WWTW should be re-designed and re-constructed in future before it runs out of capacity because of population growth and subsequent a larger volume of sewage production. This demands ongoing planning.
- The berms of the ponds should be high enough, wide enough and structurally sound to withstand the onslaught of a sudden flood. These berms should answer to all the official provisions of dam safety.

Mitigation in terms of construction:

- An ECO should be appointed to oversee the construction of the new WWTP. This person should be independent and knowledgeable.
- Construction of the new WWTP should commence in winter when the chances for flash floods are at its least. Construction should be completed prior to the onset of summer thunder storms.
- Building rubble and scrapped equipment should be removed from the site and properly disposed of. None of this should be allowed to be washed down the drainage line and into the Groot River during thunder storms.

Mitigation in terms of operations:

- Anaerobic pond systems produce sludge only once in five years or more. Ponds must be allowed to dry and are then excavated. In this event removed sludge should be immediately removed from the site and composted or disposed of in a licensed waste disposal site. Sludge should be chemically analysed prior to excavation. Care should be taken that sludge that exceeds official quality requirements are disposed of appropriately and not end up in the environment.
- Ponds should not be allowed to fill up and overflow. A free board of 500mm should be maintained.
- Land should not be over-irrigated. Ponding of treated sewage effluent should be prevented. Sprinklers should be moved around according to a schedule.
- Treated sewage effluent should be chemically and microbiologically analysed according to a schedule. Effluent that does not meet national quality guidelines should not be irrigated in urban areas. Should guidelines not be met, the operation of the WWTP should be adjusted in order to improve the quality.
- Pumps, pipelines and other equipment should be regularly inspected and maintained. Spare parts should be readily available. Downtime should be kept to a minimum in order to prevent

spillages and adverse environmental impacts. Flow meters should be kept in working order and calibrated if necessary.
- When reeds are harvested on the horizontal flow reed bed, harvested material should be removed for use or composting elsewhere and not be allowed to accumulate on the site or move down the drainage line.
- The staff should be appropriately qualified. At the moment the WWTW is operated by a specialised and contracted company, Alveo. It is assumed that the company will have the experience to do justice to the new WWTW.
- Audits should be undertaken as officially prescribed for WWTW's in South Africa. The results should be made publicly available, should it be necessary.
- Bury grid on site and cover with soil

Mitigation in terms of decommissioning of the existing ponds:

- Keep fluids and sludge out of the drainage lines and the river.
- Bury sludge on site

6.1.3 Heritage

CTS Heritage conducted a Heritage Screener, as well as submitted the Heritage Notice of Intend to Heritage Western Cape. Heritage Western Cape commented that there is no reason to believe that the proposed development will have an impact on any heritage resources.

The following is recommended:

- It is recommended that the HWC Fossil Finds Procedure be implemented throughout the development phase.
- Should any heritage resources, including evidence of graves and human burials, archaeological material and paleontological material be discovered during the execution of the activities, all works must be stopped immediately and HWC must be notified without delays.

Additionally:

Should any other Heritage resource be discovered:

- No measures should be taken to cover up the suspected heritage resource with soil, or to collect any remains such as bone, ceramics or stone.
- If a heritage practitioner has been appointed to monitor the project, s/he should be contacted, and a site inspection arranged as soon as possible.
- All parties concerned should respect the potentially sensitive and confidential nature of the heritage resources, particularly human remains, and refrain from making public statements until a mutually agreed time.
- Any extension of the project beyond its current footprint involving vegetation and/or earth clearance should be subject to prior assessment by a qualified heritage practitioner, taking into account all information gathered during this initial heritage impact assessment.
- It is recommend the appointment of a Stone Age Specialist if any large finds of stone tools are discovered during construction.

6.2 ENVIRONMENTAL AUTHORIZATION

Please ensure that DEADP confirm their approval of this project in writing.

7. CONSTRUCTION PHASE EMP

7.1 MITIGATION MEASURES FOR CONSTRUCTION:

Objective 1: Avoid erosion of soil

Potential Impacts:

1. Soil erosion from earth clearing
2. Soil erosion form stormwater

Mitigation measures:

- Earth works and site preparation to take place during the drier winter season;
- Storm water to be channelled away from the exposed area for the duration of construction;
- Soil stockpiles (if any) not to be placed in drainage lines and must be protected from erosion as stated section 7 & 8 of the EMPr;
- Erosion should be remediated if erosion does take place as per section 7 & 8 of the EMPr.
- It must be ensured that storm water does not reach excessive speeds, as that would increase the potential for soil erosion;
- Storm water runoff must not be concentrated in any one place or channel where it flows over unpaved (erodible) surfaces;
- Should any signs of erosion be found, remedial action such as backfilling, compaction and re-vegetation should be taken immediately to avoid exacerbation of the erosion;
- Monthly monitoring for erosion should take place, especially after heavy rainfall,

Objective 2: Avoid contamination of soils

Potential Impacts:

1. Contamination of soil with sewage/ semi-treated sewage/ waste water
2. Contamination of soil form construction waste

Mitigation measures:

- Construction and lining of the secondary and tertiary ponds must take place first (the ponds that does not fall within the existing footprint), so that the incoming sewage which is currently held in the primary facultative pond can be safely transferred/ diverted to these ponds when construction work commences on the primary facultative pond;
- No pit toilets on site, workers to be provided with temporary chemical toilets; toilets not to be placed within the drainage lines on site;
- Workers not to use the veld for sanitary purposes;
- Suitable washing facilitates must be proved for the workers and should be established in a suitable manner that environment is not polluted any soil contamination on site must be remediated and disposed of in a responsible manner
- The Contractor must prevent the discharge of any pollutants, such as cement, concrete, lime, chemicals, fuel, oil, waste water, etc; Inspects all construction vehicles/ machinery daily for early detection of deterioration or leaks;
- The Contractor should ensure drip trays are placed under stationary vehicles/ machines;

- All spills should be reported to the ECO so that he/ she can investigate the incident and recommend the appropriate mitigation;
- Any significant spills must be reported to the Department of Water and Sanitation who may conduct a site visit to recommend appropriate mitigation;
- Spill kits must be available on site & workers should be trained how to use spill kits to rectify a spill immediately;
- Records of spills should be kept on site;
- Mixing of cement not to take place on impermeable surfaces;
- Potentially contaminated water may not be allowed to flow into drainage lines or infiltrate into the soil.

Objective 3: Protect freshwater resources

Potential Impacts:

1. Contamination of freshwater resources from sewage leaks/ spills
2. Contamination of freshwater from construction activities

Mitigation:

- Construction and lining of the secondary and tertiary ponds must take place first (the ponds that does not fall within the existing footprint), so that the incoming sewage which is currently held in the primary facultative pond can be safely transferred/ diverted to these ponds when construction work commences on the primary facultative pond;
- No pit toilets on site, workers to be provided with temporary chemical toilets; toilets not to be placed within the drainage lines on site; workers not to use the veld for sanitary purposes; suitable washing facilitates must be proved for the workers and should be established in a suitable manner that environment is not polluted; any soil contamination on site must be remediated and disposed of in a responsible manner;
- All spills should be reported to the ECO so that he/ she can investigate the incident and recommend the appropriate mitigation;
- Any significant spills must be reported to the Department of Water and Sanitation who may conduct a site visit to recommend appropriate mitigation;
- Appropriate measures must be implemented to prevent a recurrence of a spillage event.
- The Contractor must prevent the discharge of any pollutants, such as cement, concrete, lime, chemicals, fuel, oil, waste water, etc;
- Inspects all construction vehicles/ machinery daily for early detection of deterioration or leaks;
- The Contractor should ensure drip trays are placed under stationary vehicles/ machines;
- All spills should be reported to the ECO so that he/ she can investigate the incident and recommend the appropriate mitigation;
- Any significant spills must be reported to the Department of Water and Sanitation who may conduct a site visit to recommend appropriate mitigation;
- Spill kits must be available on site & workers should be trained how to use spill kits to rectify a spill immediately;

- Records of spills should be kept on site; Mixing of cement not to take place on impermeable surfaces;
- Potentially contaminated water may not be allowed to flow into drainage lines or infiltrate into the soil;
- Ponds to be lined to prevent infiltration;
- Daily visual inspection of plant for signs of leakage or particular greening of grass in certain areas which may be indicative of leakage

Objective 4: Avoid unnecessary impact on fauna and flora

Potential Impacts:

1. Unnecessary killing of fauna e.g. snakes and spiders out of fear
2. Unnecessary loss of vegetation/ Temporary impacts on disturbed Prince Albert Succulent Karoo Vegetation

Mitigation measures

- Environmental Awareness training to be conducted with all labourers, educating the importance of not simply killing fauna that is perceived as dangerous;
- Keep contact details in the site office for someone who can be called if catching and relocation of fauna is required, no hunting/ snaring allowed on site.
- A suitably qualified ECO must be appointed to monitor the construction of phase in terms of the EMPr and any other conditions pertaining to specialist studies;
- Environmental Awareness training to be conducted with all workers;
- Before any work is done, the development footprint and access routes must be clearly demarcated and approved by the ECO.
- Demarcation must include the total footprint necessary to execute the work, but must aim at minimum disturbance;
- Lay-down areas or construction sites must be located within already disturbed areas or areas of low ecological value and must be pre-approved by the ECO;
- Indiscriminate clearing of any area outside of construction footprint must be avoided; Access roads should be limited to a single circular route in and out;
- Ensure construction vehicles stay on existing roads;

Objective 5: Prevent the loss of any Heritage Resources

Potential Impacts:

1. Potential loss of heritage resources

Mitigation:

- It is recommended that the HWC Fossil Finds Procedure be implemented throughout the development phase;
- In the case of any significant new fossil finds exposed during construction, these should be safeguarded - preferably in situ - and reported by the ECO as soon as possible to Heritage Western Cape.

Objective 6: Safe disposal of waste

Potential Impacts:

1. Incorrect disposal of waste during construction

Mitigation:

- Solid waste management as per Section 7.11 of the EMPr
- All solid waste to be disposed of at a licensed landfill/ waste disposal site;
- No dumping or burning on near the site; any soil contaminated during construction (e.g. by cement) to be disposed of at a suitable disposal site;
- If hazardous waste is generated, this must be contained and disposed of by suitably licensed hazardous waste contractors at a suitable site;
- Sufficient refuse bins are to be provided on site for disposal of general waste; refuse bins to be emptied regularly;
- Conduct environmental awareness training with all staff and discourage littering.
- General solid waste must be disposed of at a general landfill site or another licensed waste disposal site;

Objective 7: Prevent odours, visual impacts and noise

Potential Impact:

1. Possible air pollution from construction vehicles and equipment
2. Potential high dust levels during construction
3. Visual impacts from untidy construction camp
4. Potential noise impacts during construction

Mitigation measures:

- All vehicles and machinery on the construction site must be in good working condition to prevent unnecessary emissions;
- Vehicles should not be allowed to idle for unnecessary long periods of time
- If necessary, exposed soil must be watered down at regular intervals to reduce levels of airborne dust;
- The Contractor must take all reasonable measures to minimise the generation of dust resulting from construction activities;
- Where possible stockpiles should be located in areas where they are not exposed to the erosive effects of the wind.
- Conduct environmental awareness training with all staff and discourage littering;
- Sufficient waste bins must be provided on site and must be emptied regularly;
- Litter picked up where necessary;
- Building rubble not allowed to accumulate on site, but must be removed at regular intervals and disposed of at a licensed disposal site;
- Stockpiles of soil or excavated material should be used for backfilling, rehabilitation or landscaping.
- Construction activities should be limited to daylight hours; a complaints register should be maintained in which any complaints about noise is noted.

Objective 8: Proper disposal of existing sludge from decommissioning of existing ponds.

Potential impacts:

1. Potential contamination of freshwater resources and surrounding soil.

Mitigation:

- Construction and lining of the secondary and tertiary ponds must take place first (the ponds that does not fall within the existing footprint), so that the incoming sewage which is currently held in the primary facultative pond can be safely transferred/ diverted to these ponds when construction work commences on the primary facultative pond
- Existing sludge from decommissioning the existing ponds only to be buried within the designated, approved area for disposal; sludge to be mixed with soil make it more stable and easier to handle;
- Sludge not allowed near any drainage lines or the river;
- Disposal area to be fenced off;
- Sludge to be covered with soil once disposed of. area to be levelled.
- No new sludge to be added to the disposal site.

Method Statement for the removal and disposal of the sludge:

1. Anaerobic Pond liquid fraction to be removed by pumping the water out of the pond using a suitable pump.
2. Pumping must continue until all visible liquid has been removed from the pond and the remaining sludge fraction is clearly visible.
3. The contractor must now prepare the area where the sludge is to be buried by excavating a hole of suitable size to accommodate all the sludge.
4. A portion of the excavated material not containing any rocks larger than 50mm diameter is then taken from the spoil heap and mixed into the wet sludge remaining in the pond.
5. The mixed material is the allowed to stand for two days to allow most of the moisture to be absorbed by the soil mixed into the sludge.
6. This will stabilize the material and make it easier to handle. If not mixed with soil, the sludge will run out of the excavator bucket faster than what the operator can scoop it up. In addition, streams of sludge will be spilled onto the surrounds as the excavator is rotated to move the sludge from the pond to the truck transporting it.
7. The soil/sludge mixture can then be removed mechanically with an excavator by scooping it out of the pond, and loading it onto a tipper truck for transport to the prepared excavation. If after the first attempt at loading, it appears as if the sludge is still to fluid, more soil can be added until a stable mixture that can be handled is reached.
8. The soil sludge mixture is then placed in the excavation in layers of 300mm thick. After each layer, a layer of clean soil is placed over the sludge 150mm thc, followed by another layer of soil/ sludge mixture.
9. Stop filling the excavation with the soil/sludge mixture approximately 300mm from the natural ground level.
10. Fill the remaining 300mm depth with clean excavated soil and course material such as rocks and stones to provide a cap over the excavation which stands 150mm proud of the

normal ground level. This is to accommodate for differential settlement of the soil, as it compacts the layers below due to gravity.

11. Continue this process until all the sludge has been removed from the pond in question.
12. On completion of the capping process, the area where sludge has been buried shall be clearly marked with posts and fenced off from access.
13. The site will be monitored for a period of 1 year after completion of the process for any signs of leaking, erosion or washout. In case of any of the above occurring, the contractor will make the needed repairs within his retention period.

7.2 STRUCTURE AND RESPONSIBILITY

Implementation of the EMP and environmental control and management of the construction phase will be achieved through the responsibility structure set out below. The role players include the Owner, the Construction Supervisor, the Environmental Control Officer (ECO) and the Contractor. All role players must familiarize themselves with the prescriptions of the EMP.

7.2.1 The client / applicant / owner

The client (or the designated responsible person appointed by him) is responsible for:

- appointing a suitably experienced ECO, the Construction Supervisor and the Contractor for the duration of the construction contract, and
- ensuring that the Construction Supervisor and Contractor fulfil their obligations in terms of this EMP.

7.2.2 The Construction Supervisor

The Construction Supervisor is responsible to ensure that the construction is carried out to completion on time, within budged and that the Contractor fulfils his obligations in terms of the EMP. In addition, the Construction Supervisor and the ECO are expected to develop a close working relationship and to stay in contact with each other.

The responsibilities of the Construction Supervisor include:

- To issues site instructions to the Contractor.
- To serve as conduit for all communication between the ECO and the Contractor [The only exception is where the ECO or the Construction Supervisor needs to issue a "**STOP WORKS**" order on the contractor if serious environmental harm is about to happen or is happening as a result of construction activity. The "STOP WORKS" order must be confirmed by the other party as soon as reasonably possible].
- Discussing any problems that might lead to environmental damage with the ECO.
- When the ECO is not on site the Construction Supervisor will be responsible for the implementation of the EMP.

7.2.3 The contractor

The Contractor shall be responsible to:

- ensure that all sub-contractors, employees, suppliers, agents etc. are fully aware and adhere to the environmental conditions detailed in the EMP;

- liaise closely with the Construction Supervisor and the ECO;
- ensure that works on the site are conducted in an environmentally sensitive manner and in full accordance with the EMP;
- carry out instructions issued in the site instruction book;
- assist with solutions to environmental problems that may arise during the construction phase; and
- ensure that all "**No-Go**" areas are adequately fenced off.
- will report any deviation from the requirements of this EMP to the Principal Agent, and any pollution or environmental contaminant spill events.
- agrees to work stoppage and/or payment of penalties as required by this EMP and directed by the ECO/Construction Supervisor.
- agrees bear full costs for any work stoppage resulting from contravention of the requirements of this EMP, and/or the costs of remedying environmental damage resulting from their or their sub-contractors or employee's contravention of the requirements of this EMP.

NB: All contractors must sign the "Declaration of understanding" (page ii of this document) of this Environmental Management Plan before construction commences.

7.2.4 The Environmental Control Officer (ECO)

ECO will be responsible for overseeing the environmental aspects of the Construction phase and will work in close co-ordination with the Construction Supervisor.

7.2.4.1 ECO qualifications

The ECO must be independent and suitably qualified (a diploma or degree in environmental management with at least 5 or more years of environmental site management experience) and must have a sound knowledge of the environment in which the activity will take place. The ECO should be registered as an Environmental Scientist (in terms of section 20(3) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003)).

7.2.4.2 ECO duties

An ECO must be appointed for the duration of the construction phase (as required by the EA). The ECO:

- will be primarily responsible for ensuring the implementation of the EMP and will perform regular site inspections/audits with the specific aim to ensure environmental conformance by the Contractor;
- to visit the site on a regular basis while construction is in progress;
- will keep environmental records (including photographs) of the construction activities;
- must ensure that "No-Go" and "Open Space" areas are adequately protected and adhered to;
- must approve and be present during the demarcation of the necessary areas for storage of materials, ablutions, eating areas of contract workers etc.;
- to conduct a start-up meeting before construction commences and will provide environmental training at the beginning of the project and will provide environmental awareness training throughout the life of the project;

- must be informed of site and technical meetings to be able to comment and report on environmental issues;
- will call for, and approve, method statements for construction activities that might pose an environmental impact and must ensure that method statements are approved before commencement of the work;
- must implement immediate mitigating action in the case of critical environmental impacts
- must deal with public complaints/queries regarding environmental issues;
- will record his findings and all environmental non-conformances in an environmental completion report (which will be forwarded to the Client and the Construction Supervisor);
- will conduct a closing down visit ASAP after completion of the Development;
- will commission an independent Environmental Compliance Audit within 6 months after completion of the contract.

7.2.4.3 ECO Authority

The ECO has the authority to stop works if there is a serious threat to or impact on, the environment as a direct cause of construction. However, this authority is limited only to emergency situations where immediate consultation with the Construction Supervisor is not possible.

- The ECO is to inform the client/developer and site representative of the reasons for the stoppage as soon as possible. A relevant reason should be supplied as soon as possible after stoppage of such works.
- Upon failure by the contractor or his employee to show adequate consideration to the environmental aspects of this contract i.e. wilful destruction of the environment, the ECO may recommend to the client/developer or site representative to have the contractor's representative or any employee(s) removed from the site or work suspended until the matter is remedied.
- No extension of time will be considered in the case of such suspensions and all costs will be borne by the contractor

7.2.5 Health & safety officer:

A health & safety (H&S) officer for the project must be designated or appointed by the Contractor or Principal Agent, and his/her role is to support the successful implementation of the EMP through:

- Site evaluation on a regular basis.
- Identifying issues relating to day to day construction activities and that can have a detrimental effect on the environment.
- Subcontractor audits to ensure compliance.
- Assist in the direct implementation of the EMP.
- Ensure that the requirements of the EMP are communicated understood by personnel on site *via* induction sessions.
- Ensure that the contractors on site develop, implement and monitor the required H&S management functions.
- Evaluate the applicability and accuracy of the EMP and the method statements throughout the construction phase.
- Coordinate all statutory requirements including permit authorisation and license requirements.
- Conduct or have conducted a hazard analysis and take the necessary corrective action.

- Where it is not possible to remove any remaining hazard's to inform employees thereof and what precautionary action is to be taken.
- Detail mitigation measures required to be taken, and the procedures for their implementation to the project manager.
- Representing H&S issues at the production meetings.
- Coordinate H&S training of personnel.
- Coordinating spill response personnel.
- The H&S officer shall inspect the integrity of the hazardous waste containers/bins/skips on a weekly basis.

7.2.5.1 Health & Safety Officer qualifications

The Health and Safety Officer must be independent and suitably qualified, with a sound knowledge of the Occupational Health & Safety Act (Act no. 85 of 1993), and must have experience of the implementation of the act with regards to the construction and environmental environments in which the activity will take place.

7.3 COMMENCEMENT OF WORKS

The site project contractors must timeously receive a copy of the construction phase EMP (CEMP) and any other further additional information that pertains to site conditions/amendments or deviations from original site plan.

- This EMP must be included to form part of the Contractors site specification documentation.
- A copy of the EMP must be on site at all times and available for presentation to any authority requesting to see such document.

NO WORK ON SITE MAY TAKE PLACE UNTIL

- The Declaration of Understanding/Environmental Contract is signed between the relevant parties.
- One week's written notice given to the Department before commencement of any construction activity (As per EA).
- On-Site Start-Up Meeting has been held
- Site and No-Go areas has been identified **and demarcated**.
- Contractors are in possession of the EMP and other relevant documentation
- Contractors/Sub contractors have signed the Declaration Of Understanding
- All mandatory site equipment is in place
- On Site Environmental Education & Awareness training session has taken place with all relevant construction personnel present.

NB: Work refers to: Camp Establishment, Earthmoving activities and any pre-limitary construction activities.

7.4 ISSUES OF CONCERN

Issues of concern that were identified in the Environmental Impact Assessment process and included in the EA or detailed in the Basic Assessment Report must be addressed during the "On Site Start-Up

Meeting" and must be included in the On-Site Start-Up Report. Issues of Concern include but shall not be limited or restricted to the following:

- Waste management and disposal;
- Mandatory site equipment;
- Establishment of construction site;
- Concrete works & batching plant facilities;
- Soil erosion & sediment control;
- Use and storing of hazardous substances; and
- Establishment of temporary laydown areas.

7.5 SITE SPECIFIC ARRANGEMENTS & CONSTRUCTION PROCEDURES

7.5.1 On-site start-up meeting

The mandatory **On-Site Start-Up Meeting** must be conducted prior to commencement of any site/camp establishment, earthworks and/or construction activities and will focus on site specific conditions and requirements that may be applicable to the project and may require additional or special measures of control.

On-Site Start-Up Meeting points of discussion are:

- The Construction EMP & other relevant site documents
- Project to be discussed and all uncertainties are cleared
- Method statement/s to be discussed
- Power line installation access routes (if applicable)
- Road and construction area to be demarcated
- Materials stockpile and lay down areas to be demarcated
- Method of stockpiling to be discussed
- Firefighting procedures
- Mandatory firefighting equipment & fire preventative measures
- Solid waste removal intentions
- Placement, type and service of toilets to be agreed on
- Placement and type of rubbish bins and removal of rubbish to be agreed on
- Labour camp to be demarcated and services agreed on
- Environmental Education and awareness training session to all contractors & onsite staff/labour.
- Location & establishment of concrete batching plant facility.

7.5.2 Start-up meeting participants

Minutes of the onsite Start-Up Meeting will be condensed to a report format and circulated to all attendees of the above named meeting for their perusal and comments. The On-site Start-up Meeting report will form part of this EMP. If any discrepancies between the start-up report and the EMP arise then the EMP will take precedence until clarification on the discrepancy is clarified. If any discrepancies between the EMP and the EA then the EA will take precedence until clarification on the discrepancy is clarified.

Participants to the start-up meeting can include:

- Applicants Representative.
- Main Contractor's Representative.
- Resident Engineer
- Site foreman.
- Environmental Consultant.
- Environmental Control Officer.

NB: It is the responsibility of the main contractors to ensure that all sub- contractors, that work on the site during and after the civils' contract, are informed of the environmental conditions pertaining to the site.

7.6 ENVIRONMENTAL AWARENESS TRAINING

7.6.1 Environmental awareness course

Environmental awareness training courses shall be run for all personnel on site. The ECO will be responsible for the initial awareness course which shall include all relevant management, the Construction Supervisor, the Contractor and all foremen. All attendees shall remain for the duration of the course.

The Contractor shall be responsible to ensure that all his personnel and subcontractors (if applicable) are informed and made aware of the environmental constraints and shall also supply the ECO with a monthly report indicating the number of employees used by him. If refresher courses are deemed necessary, for instance, where personnel disregard the requirements of the EMP, the time lost and the cost of the course would be for the account of the Contractor.

7.6.2 Specific training

All contractors and workers shall be informed about any special habitat, biodiversity feature, vegetation and/or rare plant species that might be present on the specific construction site (if applicable).

7.7 MEHTOD STATEMENTS

Method statements from the contractor will be required for specific sensitive actions on request of the authorities, the Applicant or ECO.

A method statement forms the base line information on which sensitive area work takes place and is a "live document" in that modifications are negotiated between the Contractor and ECO/applicant, as circumstances unfold.

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

These documents must be available to the authorities for inspection or on request.

A method statement describes the scope of the intended work in a step-by-step description in order for the ECO and Applicant to understand the contractor's intentions. This will enable them to assist in devising any mitigation measures, which would minimize environmental impact during these tasks.

The Contractor must submit the method statement before any particular construction activity is due to start. Work may not commence until the ECO and applicant have approved the method statement.

Method statements need to be compiled by the contractor for approval by Applicant and the ECO. The contractor must submit written method statements to Applicant for the purposes of the environmental specification, a "Method Statement" is defined as a written submission by the contractor to Applicant setting out the plant, materials, labour and method the contractor proposes using to carry out an activity, in such detail that Applicant and the ECO is able to assess whether the contractor's proposal is in accordance with the specifications and/ or will produce results in accordance with specifications.

The method statement must cover applicable details with regard to:

- Construction procedures
- Materials and equipment to be used
- Getting the equipment to and from site
- How the equipment/ material will be moved while on site
- How and where material will be stored
- Location & establishment of concrete batching plant facility.
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material (of any potential hazardous material) that may occur
- Timing and location of activities
- Compliance/ non-compliance with the Specifications, and
- Any other information deemed necessary by the Applicant and the ECO

The Contractor must abide by these approved method statements, and any activity covered by a method statement must not commence until Applicant and the ECO has approved of such method Statement.

NB: No work may commence or take place before the Method Statement has been approved by all relevant parties. List of possible Method statements include but shall not be limited or restricted to:

- Demarcation
- Entrance and haul roads
- Traffic management plan
- A traffic management plan for the site access roads.
- A transportation plan for the transport of larger components.
- A storm water management plan.
- An erosion management plan.
- Clearing of vegetation & topsoil removal
- Stockpiling
- Temporary storage facilities
- Construction camp & site offices
- Fuel storage
- Labourer's facilities
- Mandatory site equipment

- Waste control
- Cement mixing & batching areas
- Construction vehicle maintenance
- Heavy earthmoving equipment
- Dust control
- Noise control
- Rehabilitation

7.7.1 Additional method statements

Any additional method statements (with regards to a specific aspect of construction) that may be required must be **submitted** and approved before commencement of the specific works and must be available at the site offices.

7.8 NON-COMPLIANCE

Applicant (on recommendation by the ECO) reserves the right at all times for the duration of this agreement to impose restrictions and associate penalties on the contractor with respect to the specific nature, timing and extent of construction activities on environmentally sensitive sites.

7.8.1 Corrective action instruction

The ECO may issue an onsite corrective action instruction to the site agent, or, by means of an entry into the Site Instruction Register for remedial work to be carried out to rectify any non-compliance that has been carried out within a reasonable agreeable time frame to carry out and complete the remedial work.

7.8.2 Written warning

In instances of non-compliance with the EMP by the contractor (or any of their employees) or sub-contractor/s (or any of their employees) that move on or off the site, the onsite ECO must issue a written warning indicating the non-conformance to the contractor.

If repeated instructions by the ECO to the site agent to respond to the corrective action instruction have not been carried out the ECO can issue a Written Warning notation instructing the site agent to timeously carry out the corrective measures as per the original non-compliance.

7.8.3 Penalty fines

In the event of the site agent negligence to respond and correct the noted non-compliance the ECO may in collaboration with the relevant parties recommend that a Penalty Fine be imposed on the contractor.

- The applicant, in consultation with the ECO must determine the amount of the penalty applicable in accordance with the Penalties for Non-Compliance Schedule of Tariffs.

- Such penalty amount must be in writing and presented to the contractor within seven (7) days of the written warning.
- Applicant may recover penalties by deducting the fine from the offending contractor.
- The contractor will be responsible for all costs incurred where emergency procedures are implemented to deal with accidents impacting on the environment as well as the rehabilitation of such damage in conjunction with the ECO and site engineer.
- In serious cases, at the discretion of Applicant and the Environmental Consultant/ECO, any multiple offences can be added together.

7.8.4 Stop works

The ECO (after consultation with Environmental Consultant/Applicant/Engineer) may also stop the works or part thereof until the situation is resolved; no extension of time is claimable by the contractor.

These penalties do not preclude any prosecution under any law or regulation.

7.9 CHANGES TO EMP

Although care has been taken to address all known relevant environmental issues for the construction phase, it may become necessary to add or amend certain procedures or instructions to improve the efficiency of the Environmental Management Plan (EMP).

- Only those additions or amendments of this EMP that will either improve environmental protection or can be proved not to have any negative effect to the immediate and surrounding environment will be considered.
- Changes or deviations have to be motivated in writing by means of a Method Statement and the same procedures for a standard Method Statement have to be followed.
- Any additions or amendments must be submitted by the ECO to DEA (if so requested) after the ECO has consulted with the Environmental Consultant and Applicant.
- No deviation from the contents of the EMP will be allowed without following the above procedures.

7.10 RECORD KEEPING

All records relating to the implementation of this Environmental Management Plan must be kept together, be readily retrievable and available for scrutiny by any relevant authority. Records include the following:

- Declarations of understanding;
- ECO Checklist, audits and/or diary;
- Method statements
- Photographs (must be taken before, during and immediately after construction as a visual reference);
- The Environmental completion statement.

These records must be available for scrutiny by any relevant authorities.

7.11 STANDARD MANAGEMENT PROCEDURES

7.11.1 Access & haul routes

The Contractor must control all access (vehicles and plant) to and from the construction site, including that of his suppliers so that they remain on the pre-approved designated routes. In addition such vehicles and plant must be so routed and operated as to minimise disruption to regular users of the routes.

- Where heavy duty vehicles and construction plant are required, both the type of vehicles/machinery and the area/s these are to access shall be specified in a Method Statement.
- Access routes/haul roads will utilise only existing roads or tracks, unless such routes are not available or new routes are to be constructed as part of the project, in which case a Method Statement must be submitted for the construction of any new access/ haul roads (including temporary routes).
- No new roads or tracks may be created except where such routes are specifically approved by the ECO, in the EA or in this EMP.
- Any new access roads/haul roads must be designed so as to minimise erosion and must run across slopes and not directly up-hill.
- All vehicles and access to the site must remain within demarcated access routes and working areas on site.
- All reasonable measures must be implemented to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.
- On gravel or earth roads on site, the vehicles of the Contractor and his suppliers may not exceed a speed of 25 km/h.
- On public roads adjacent to the site vehicles will adhere to municipal and provincial traffic regulations.
- All temporary access routes must be rehabilitated at the end of the contract to the satisfaction of the ECO.

If so required by the owner of the land the following may also apply with regard to access and vehicular movement on site:

- All Contractors, subcontractors and staff shall be identified by clothing with company logos and be in possession of valid SA identity documents.
- Deliveries, removals etc. to be completed during normal working hours (unless otherwise agreed upon by the Construction Supervisor.
- No personnel shall stay permanently on site, unless permission to stay on site provided as part of the construction contract.
- Access routes must be demarcated by orange twine/danger tape on steel posts or temporary fencing.
- The Contractor shall at his cost document the existing condition of all access roads prior to commencement.
- Should any damage occur to the access road as a result of the upgrade activities, the road will be rehabilitated to its original state with all costs borne by the contractor.

7.11.2 Appropriate use of machinery

Contractor must at all times carefully consider what machinery is appropriate to the task while minimizing the extent of environmental damage.

- The contractor may not operate any machinery outside the demarcated area.
- All vehicles and equipment must be routinely inspected for fuel and oil leaks and kept in good working order and serviced regularly. Leaking equipment must be repaired immediately or removed from the Site. When servicing equipment, drip trays must be used to collect the waste oil and other lubricants. Drip trays must also be provided in construction areas for stationary plant (such as compressors) and for "parked" plant (such as scrapers, loaders, vehicles). Drip trays will be kept free of water that will float the oil to overspill. All drip trays / bungs to attain a 120% capacity of the plant fuel / oil capacity.
- Where practical, all maintenance of plant and machinery on Site must be performed in workshops. If it is necessary to do maintenance outside of a workshop area, the Contractor must obtain the approval of the Engineer and the ECO prior to commencing activities.
- Appropriate 9 kg (minimum requirement) dry powder SABS approved and service certified firefighting extinguisher must be a mandatory item on all vehicles working and moving on or off the construction site.
- The servicing, repairs and maintenance of all construction machinery must take place at the designated service and maintenance yard and not along the proposed new road construction route.

7.11.3 "No-Go" areas

Specifications of the Environmental Authorisation (EA), the Environmental Management Plan (EMP) or the On Site Start-Up Meeting (OSSM) can require that certain areas are to be considered as "No go" areas as a result of their environmental significance or proximity to environmental significant features.

- No-Go areas will be demarcated and indicated on a site plan.
- A Method Statement is to be submitted to the ECO by the Contractor, detailing the method of fencing for protection of such conservation areas.
- No-Go areas are out of bounds to the Contractor and his staff, sub-contractors and their staff or suppliers and their staff or any other person involved in the project, without the written permission specified by the ECO.
- The Contractor must ensure that, insofar as he has the authority, no person, machinery, equipment or material enters the designated "No Go" areas at any time.
- All contractors must be made aware of the importance of these features and the consequences of non-compliance.

7.11.4 Restriction of working areas

The approved layout plans will be used to establish the site demarcation (footprint). All relevant parties responsible for the day-to-day activities on the site will be present and made aware of the implication of the site demarcation. They include the:

- Environmental Consultant: EnviroAfrica
- Principle Agent
- Main Contractor: Project Site Manager
- Sub-contractor: Project contractor

- ECO: Environmental Control Officer

The proposed site will be demarcated prior to the commencement of any construction whatsoever, this includes site establishment, the moving of construction material or any other items onto the site, etc.

- The site will be demarcated with appropriate dropper poles. A single strand of orange baler twine is to be attached to the dropper poles to indicate boundaries and no-go areas for site personnel and vehicular movement. (Alternative fencing may be decided upon dependent on site requirements).
- The construction area i.e. road, stockpile areas and development footprint etc. must be demarcated and fenced off with dropper poles and orange baler twine approximately 1m high is considered adequate. **The demarcation will be agreed on during the start-up meeting.**
- All fencing and fence placement / positioning must be approved by the ECO on site.
- Work areas and access routes must be clearly demarcated to minimise environmental impact.
- In the event that sensitive features are threatened by construction activities, temporary fencing off of these areas (for individual areas such as trees or rocks) or the construction area (when working in a mainly natural environment) is recommended.
- NB: Also note the requirements discussed under the following paragraphs: 7.11.5; 7.11.6; 7.11.2; 7.11.9; 7.11.7; 7.11.8.
- The Contractor must maintain in good order all demarcation, fencing and barriers for the duration of construction activities, or as otherwise instructed.
- Demarcation may not be moved, re-located or altered or changed without the approval of the ECO.
- Any temporary fencing removed for the execution of any portion of the works is to be reinstated by the Contractor as soon as practicable.
- The Contractor at the end of the contract must remove all demarcation, fencing or barriers not forming part of the final works on Site.

7.11.5 Protection of natural veld

Habitat fragmentation is usually defined as a landscape-scale process involving both habitat loss and the breaking apart of habitat. Habitat loss has large, consistently negative effects on biodiversity. Habitat fragmentation per se has much weaker effects on biodiversity, but could be just as negative. As such the construction activities must endeavour to minimise its impact on any remaining natural features and natural corridors.

- All remaining natural corridors identified as significant biodiversity features during the environmental assessment stage, must be mapped and identified as “No-Go” areas on the site plans and protected measures must be installed (demarcated);
- Except to the extent necessary for the carrying out of the works, no flora may be removed, damaged or disturbed;
- Trapping, poisoning and/or shooting of animals is strictly forbidden. No domestic pets or livestock are permitted on Site;
- Where the use of herbicides, pesticides and other poisonous substances are to be used, the Contractor must submit a Method Statement;
- The Contractor may not deface, paint, damage or mark any natural features, if these should occur (e.g. trees, rock formations, buildings, etc.) situated in or around the Site for survey or other purposes unless agreed beforehand with the Engineer and the ECO. Any features

affected by the Contractor in contravention of this clause must be restored/rehabilitated to the satisfaction of the Engineer and the ECO.
- All incidents of harm to any animal or natural vegetation (apart from the agreed upon areas) must be reported to the ECO.

7.11.6 Protection of flora

A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed should be implemented, if possible. Please also refer to the specific recommendations in Section 6.2 above.

- The areas of vegetation that are to be protected during construction must be demarcated and indicated as "No-Go" areas on a site plan. Include the area under the canopy of trees so that tree roots will not be damaged by soil compaction.
- All flora identified to be rescued must be removed and placed in an area specifically allocated for these plants to ensure that the necessary care thereof will take place until being relocated and planted in designated areas.
- The specialist must also advise and oversee a re-vegetation and habitat rehabilitation plan during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
- Also refer to the requirements of the rehabilitation and restoration guidelines (Refer to paragraph 7.11.26).

7.11.7 Protection of fauna and Avi-fauna

Trapping, poisoning and/or killing of animals is strictly forbidden. No domestic pets or livestock are permitted on Site. Many slow moving animals, local amphibian and other species follow instinctive movements along roadside corridors where they travel from place to place.

- Every effort must be implemented on a daily on-going basis by the contractor to ensure that the construction areas have been checked for any animals and to ensure their removal and protection from direct and in-direct impacts during the construction activities.
- The removal of fauna from the site must be done in accordance with the requirements of the Nature Conservation Ordinance regulating these activities.
- Environmental corridors and "No-Go" areas must be demarcated and protected.

7.11.8 Clearing of vegetation, stripping & conservation of topsoil

The contractor shall take all reasonable steps to minimise the impact of his activities on the environment. If natural vegetation have to be removed for construction purposes, the natural vegetation shall be rescued, re-used (e.g. stabilizing the area after construction or re-vegetating other impacted areas) in such a way that it enhances the remaining natural veld. By the same principle topsoil (which contains the remaining natural seed store as well as possibly many bulb species) must be carefully removed and stored or re-used for rehabilitation or impacted areas in the immediate vicinity.

Vegetation clearing:

- A Method Statement must be submitted detailing the methods to be used for vegetation clearing.
- All cleared areas must be stabilised as soon as possible.
- Burning of cleared vegetation on site is prohibited.
- The burying of cleared vegetation or use as part of backfill or landscape shaping is prohibited unless written approval is obtained from the ECO.
- Cleared vegetation may be used for mulch or slope stabilisation of the Site.
- Should bulk vegetation be removed from the designated working areas (foot print area) then tall vegetation shall first be removed through brush cutting and chipping of larger shrub material; this may be added to the topsoil material stockpiles as mulch.
- Unless otherwise agreed upon, only indigenous plant material shall be used for this purpose.

Topsoil removal

- Prior to any activities within the demarcated work areas, topsoil material shall be removed to a depth of 300 mm or deeper if specified by the engineer in consultation with the ECO, and stockpiled in a designated area for use in rehabilitation of the site post construction.
- Any area where the topsoil will be impacted by construction activities, including the construction offices and storage areas, must have the topsoil stripped and removed and covered with herbaceous vegetation (other than alien species), overlying grass and other fine organic matter and stockpiled for subsequent use in rehabilitation.
- Topsoil storage areas must be convex and should not exceed 2 m in height. The Contractor must ensure that the material does not blow or wash away.
- Topsoil must be treated with care, must not be buried or in any other way be rendered unsuitable for further use (e.g. by mixing with spoil) and precautions must be taken to prevent unnecessary handling and compaction.
- In particular, topsoil must not be subject to compaction greater than 1 500 kg/m² and must not be pushed by a bulldozer for more than 50 m. Trucks may not be driven over the stockpiles.
- Topsoil from different soil types must be stockpiled separately and replaced in the same areas from which they were taken if this proves to be the case. Specific attention should be given to the areas that may house rare and threatened species.
- Topsoil areas must be demarcated in order to ensure the safekeeping of topsoil and to separate different stockpile types.
- Remove and stockpile topsoil and subsoil separately
- Stockpile topsoil within an area where no stormwater runoff is expected

Reestablishment of topsoil

- Replace soil in the correct order e.g. subsoil below and topsoil above, as soon as possible after construction activities has been completed
- During completion of construction within the watercourse natural material (coarse in the case of watercourse beds) should be used to re-surface the bed of the watercourse to re-instate habitat
- Compact subsoil while in a moist state ad spread topsoil as evenly as possible over the subsoil. The areas where the soil has been replaced should be at the same level as the immediate surroundings.
- Rip compacted areas, manually, within the immediate vicinity of the construction footprint to a depth of approximately 300mm and cover with topsoil and seed with *Cynodon dactylon*. The use of fertilizers and other chemical soil enhancers should be avoided.

7.11.9 Erosion & sedimentation control

The Contractor must take appropriate on-going and active measures to prevent erosion resulting from his own construction activities and operations as well as storm water control measures to the satisfaction of the ECO. During construction the Contractor must protect areas susceptible to erosion by installing all the necessary temporary and permanent drainage works as soon as possible.

In order to achieve erosion and sediment control, the following are applicable to all sites:

- No new development, without written authority approval, will be allowed on slopes greater than 12% (CARA, regulation 3). If applicable terraces will be made in accordance with agricultural regulations.
- Install erosion and sediment controls before work starts and maintain these features throughout the construction and operational phases (as applicable).
- Leave as much vegetation as possible.
- Install temporary fences to define "No Go" areas in those areas that are not to be disturbed.
- Divert run-off from upslope away from the site, but ensure that it does not cause downstream erosion. For example, dig drainage channels (catch drains sized to accommodate the upslope catchment).
- Install sediment controls down slope of the site to catch sediment (if applicable).
- Inspect and maintain erosion and sediment controls regularly.
- Limit vehicle movement to the site and control access points. Clearly mark such access points and inform all suppliers.
- Save and re-use topsoil during re-vegetation. Never store topsoil around trees as this may kill them. Spread the topsoil back when the work is finished and re-vegetate the site as soon as possible to control erosion. Remove the sediment and erosion controls only after re-vegetation was successfully implemented.
- Store all stockpiles and building materials behind sediment fences. Cover them with plastic to prevent erosion by wind.
- It is illegal to discharge water into a public stream if the quality does not conform to the required health or water standards. Other measures as may be necessary must be taken to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas. All potential hazardous fluids / materials must be protected from the rain to prevent them being washed into storm water channels. All such measures must be discussed with and approved by the ECO.

Please also refer to the method statements of the river maintenance and management plan. Please note that these Methodstatement only serve as guidelines and any changes to the method statements should be communicated to the Department of Environment and Development Planning.

7.11.10 Alien invasive management plan

In accordance with Regulation 15 and 16 of the Conservation of Agricultural Resources Act, 1983 (Act no. 43 of 1983) (CARA) as amended, all listed alien invasive plant species must management on any land in SA. As such an alien invasive management plan may be required to be implemented during construction and operation phase of the project. If such a plan is required, it must include mitigation measures to reduce the invasion of alien species and ensure that the removal of alien species is undertaken. Wetlands and rivers are especially susceptible to many of species.

- In accordance with CARA all identified alien invasive plants encountered on the property and its immediate surroundings must be controlled.

- All alien invasive species must be identified and removed from each site and its immediate surroundings. This is especially true for any remaining natural corridor on site.
- No vegetation may be buried or burned on site.
- Where the use of herbicides and other poisonous substances are to be used, the Contractor must submit a Method Statement.

Please also refer to the method statements of the river maintenance and management plan. Please note that these Methodstatement only serve as guidelines and any changes to the method statements should be communicated to the Department of Environment and Development Planning.

The invader status of the various invasive alien species in South Africa is described in accordance with Regulation 15 and 16 of the Conservation of Agricultural Resources Act, 1983 (Act no. 43 of 1983) (CARA) as amended (the 3 categories and its control are summarised underneath).

Category 1 (Declared Weed)

- Prohibited on any land or water surface in South Africa
- Must be controlled or eradicated (except in biological control reserves).

Category 2 (Declared Invader – commercial value)

- Allowed only in demarcated areas under controlled conditions
- Outside of controlled areas invaders must be controlled or eradicated where possible
- Prohibited within 30 m off the 1:50 year flood line of watercourses or wetlands unless authorization has been obtained

Category 3 (Plant Invaders – ornamental value)

- Allowed only in areas where they were already in existence with the promulgation of the regulations.
- Prohibited within 30 m of the 1:50 year flood line of watercourses or wetlands unless authorization has been obtained.
- All reasonable steps must be taken to ensure that they do not spread.
- Propagative materials of these plants (e.g. seeds or cuttings) may no longer be planted, propagated, imported, bought, sold or traded in any way.

7.11.11 Protection of archaeological & paleontological remains

Archaeological remains are ancient man-made objects, structures, or ancient burials that have been preserved on the earth's surface, underground, or underwater and serve as the historical sources that make it possible to reconstruct the history of human society, including mankind's prehistory. Palaeontology or Palaeontology, on the other hand, is the study of prehistoric life. It includes the study of fossils to determine organisms' evolution and interactions with each other and their environments (their paleoecology). Palaeontology lays on the border between biology and geology, and shares with archaeology a border that is difficult to define. Please refer to the specific recommendations in Section 6.2.

- Basic archaeological remains include work tools, weapons, domestic utensils, clothing, and ornaments; settlements including campsites, fortified and unfortified settlements, and separate dwellings; ancient fortifications; the remains of ancient hydraulic structures; ancient agricultural fields; roads; mining pits and workshops; ancient burial grounds and various burial and religious structures (stelae, stone figurines, stone fish monoliths (vishaps), menhirs, cromlechs, dolmens, sanctuaries); drawings and inscriptions carved into individual stones and cliffs; and architectural monuments. Archaeological remains also include ancient ships and

their cargoes that sank in rivers and seas and settlements that came to be underwater as a result of shifts in the earth's crust

- Should any unmarked human burials/remains or ostrich eggshell water flask caches be uncovered, or exposed during construction activities, these must immediately be reported to the ECO and South African Heritage Resources Agency (SAHRA) (At: Ms Mariagrazia Galimberti 021 462 4502) for information on the appropriate course of action to be taken. Burials, etc. must not be removed or disturbed until inspected by an archaeologist or without written approval from SAHRA.
- Should any substantial fossil remains (*e.g.* vertebrate bones and teeth, shells, petrified wood) be encountered during excavation, however, these should be reported to SAHRA for possible mitigation by a professional palaeontologist.
- Note that the Contractor may not, without a permit issued by the responsible heritage resource authority; destroy, damage, excavate, alter, deface or otherwise disturb any archaeological site or archaeological material. The latter is a criminal offence under the Heritage Resources Act.

SAHRA contact details:

PO Box 4637, CAPE TOWN, 8000

111 Harrington Street, Cape Town

Tel: (021) 462 4502

Fax: (021) 462 4509

Website: www.sahra.org.za

7.11.12 Storage of construction material & stockpiling

New construction material will be stored in demarcated areas on the affected properties prior to commencement construction. The Contractor must provide a method statement (for approval by the ECO) of the construction activities which will indicate:

- the type and quantity of material to be stored;
- whether any oil contaminated/containing equipment will be stored;
- how (including what type of vehicles will be required) it will be delivering the material on site at the necessary storage area; and
- whether there is any risk of spill or runoff of any building materials or chemicals and how this is to be mitigated.

In addition:

- The Contractor must ensure that any delivery drivers are informed of all procedures and restrictions (including "no go" areas) required to comply with the Specifications. The Contractor must ensure that these delivery drivers are supervised during off-loading, by someone with an adequate understanding of the requirements of the Specifications.
- All manufactured and/or imported material must be stored within the demarcated area, and, if so required, out of the rain. All lay down areas outside of the construction camp must be subject to the Engineer and the ECO's approval in such a way as not to cause a nuisance or environmental damage.
- All building materials are to be prepared at the batching plant, to enable the effects of cement and other substances, and the resulting effluent to be more easily managed.

- It is essential that any imported material i.e. base material for road works, building sand, bedding base sand for pipe / cable lines etc. must be screened and of which the origins must be identified prior to arriving at the receiving environment, this must be approved by the Engineer / ECO.
- Special care must be taken to prevent bringing in materials contaminated with seed of Invasive Alien Plants. Contractors shall not import construction materials such as sand, gravel or fill contaminated with seed of Invasive Alien Plants, or quarried from areas surrounded by Invasive Alien plant species such as Port Jackson or Rooikrans.
- The Contractor must negotiate appropriate space on for this purpose on an area away from natural vegetation and any wetland habitat with the ECO.
- The Contractor must ensure that all staff, contractors and subcontractors are aware of and keep material within these designated storage areas. The Construction Supervisor shall ensure that the consultant team is familiar with same.
- Contractors will not be allowed to store new construction material on the sides of the access road, or within natural vegetation or next to the existing access road.
- Stockpiling of gravel, cut, fill or any other material including spoil should only be allowed in degraded areas or areas below the future cover of buildings and tar or paved parking surface.
- Any area used for stockpiling and not covered by building development must be returned to at least the state they were in before stockpiling and it must be ensured that the erosion potential of these areas is not increased.
- The Contractor must ensure that the material does not blow or wash away or mix with each other. If the stockpiled material is in danger of being washed or blown away, the Contractor must cover it with a suitable material, such as hessian, netting or plastic.
- Also refer to the traffic- and transportation management plans and their requirements.

7.11.13 Oil storage and management

An important potential environmental impact is oil spills from any oil filled equipment and machinery that may occur during transportation or storage of decommissioned and new construction material/ equipment. The following conditions shall apply:

- Vehicles must be checked for oil leaks prior to going on site
- Care should be taken to prevent any potential oil spillage during upgrading activities.
- Sufficient measures should be put in place to ensure that any potential oil spills are mitigated.
- An oil spill kit should be available on site at all times during the construction activities;
- Oil containment facilities should be provided for any oil filled equipment onsite;
- All oil spills must be reported to the ECO within 24 hours, indicating the containment and rehabilitation measures implemented

Oil spill kits are available from:

- Drizit (021) 531 5335
- Enretech (021) 683 1858
- Pinelands Environmental Technology (021) 531 3749

7.11.14 Storing of petroleum products

Although no petroleum products will be stored on site it is important to know that petroleum fuels contain harmful substances known to cause health problems and can easily have adverse effects on water quality, and the environment. Petroleum spills can move rapidly into the soil and quickly contaminate drinking water. In order to prevent pollution it is important to, use proper methods when handling, using, and storing diesel fuel, gasoline, kerosene, or other petroleum products.

The South African National Standards pertaining to the installation of a storage tank include:

- Sans 310, which requires that an aboveground storage tank be of sufficient structural strength, based on sound engineering practices, to withstand normal operations and use;
- Sans 1668, for fibre-reinforced plastic tanks for the underground storage of petroleum products;
- Sans 10089-1, which deals with the storage and distribution of petroleum products in aboveground bulk installations; and
- Sans 1535, for glass- reinforced polyester-coated steel tanks, for the underground storage of hydro- carbons and oxygenated solvents, which are intended to be buried horizontally.

Storing of smaller quantities of fuel or oil

Any fuel storage proposals must be cleared by the ECO before any storage or stockpiling takes place. If the contractor proposes to use only small fuel storage facilities (< 200 litres) the following basic requirements must be adhered to:

- Fuels and oils must be safely located out of harm's way from the elements and safety and fire prevention must be strictly adhered to.
- All fuel oil containers must be placed within suitable drip trays to prevent accidental spillage of oils and fuels.
- A suitable leak proof container for the storage of oiled equipment (filters, drip tray contents and oil changes etc.) must be established.
- All spills are to be recorded in the ECO diary.

7.11.15 Storing of hazardous substances

Although no potentially hazardous substances will be stored on site it is important to understand how potentially hazardous substances are to be stored on site, the Contractor must submit a Method Statement detailing the substances and/or materials to be used, together with the storage, handling and disposal procedures of the materials to the ECO.

- Hazardous materials must be stored under lock and key in designated areas with properly displayed and visible warning signs.
- No works related to the submitted Method Statement may commence until the Method Statement has been studied and approved in writing.
- An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage must be implemented. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.
- Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants must be implemented.

- **Paints: -** No paint products may be disposed of on Site and brush/roller wash facilities must be established to the satisfaction of the Engineer and the ECO. Oil based paints and chemical additives and cleaners such as thinners and turpentine must be strictly controlled. A Method Statement detailing the paint management procedures is required.
- **Hazardous building materials: -**Hazardous building materials (e.g. asbestos, fibre claddings, refrigerants, coolants, sub-station cooling oils, etc.) must be identified and dealt with in accordance with the relevant safety and health legislation. All such material must be separated on Site and disposed of at appropriate licensed disposal sites. The Contractor must supply the ECO with a certificate of disposal.

7.11.16 Use of cement or concrete

All concrete will be imported from a local supplier and will not be mixed on site. Concrete will be transported on wheelbarrows to the weir site through alien vegetation and disturbed land.

The Contractor is advised that cement and concrete are highly hazardous to the natural environment because of the high pH levels of the material, and the chemicals contained therein. Wash-out water with high pH is the number one environmental issue for the ready mix concrete industry. The alkalinity levels of wash water can be as high as pH 12, which is toxic to fish and other aquatic life.

The Site Supervisor or Contractor must indicate the need for and the proposed location of concrete batching plants which includes the location of cement stores, sand and aggregate stockpile areas. No cement will be mixed on site for this project. A Method Statement indicating the layout, type of concrete batching preparation (dry or wet mix). The site agent must indicate on the Method Statement proposed total volume of concrete that is needed for the completion of the entire project.

Concrete/cement mixing:

- Concrete and cement may only be mixed on existing hard surfaced areas, or edged mortar boards or a suitable container. Concrete may not be mixed or stored directly on the ground under any circumstances;
- The visible remains of the batch and concrete, either solid, or from washings, must be physically removed immediately and disposed of as hazardous waste.
- Washing of equipment shall be done in a container to prevent any runoff of contaminated washing water.
- Extreme care must be taken to limit the amount of water contaminated by washing equipment. Water from concrete washing can be re-used in concrete mixes or must be stored in drums, then removed from the site and disposed of at a licensed municipal dump site.

Concrete batching plants

The following procedures must be implemented to control waste water run-off from concrete batching plant locations:

- The location of concrete batching areas must be approved by the ECO (if possible/appropriate, the use of ready-mix concrete is preferred).
- Concrete batching facilities must have suitable bunding methods in place to ensure minimal waste water run-off occurs during batching operations.

- Contaminated water may not enter a natural or man-made (e.g. trench / sloot or dam) water system. Preventative measures include establishing sumps from where contaminated water can be either treated in situ or removed to an appropriate waste site.
- Dry mixing batching areas to be carefully placed in consultation with the ECO.
- Cement bags are to be stored securely out of harm's way from the elements (wind and rain). Bags have to be covered and placed on plastic sheeting. Used cement bags must be disposed of on a regular basis via the solid waste management system, and must not be used for any other purpose.
- Sand and stone used for cement or concrete batching must be stored on plastic layers (or on ECO approved disturbed areas) in order to prevent contamination of the natural environment.
- Cleaning of equipment and flushing of mixers must not result in pollution of the surrounding environment. All wastewater resulting from batching of concrete must be disposed of *via* the contaminated water management procedure.
- Excess or spilled concrete must be confined within the works area and all visible remains of excess concrete must be physically removed and disposed of on completion of cement work. Washing the remains into the ground is not acceptable. All excess aggregate must also be removed.
- Wash-down areas must be confined to within the concrete batching areas only.

7.11.17 Blasting / drilling

In the event where blasting or rock drilling is required, the following must be implemented:

- A Method statement must be provided for each case separately **prior** to commencement of blasting works.
- The contractor must take all necessary precautions to prevent damage to special features and the general environment, which includes the removal of fly rock.
- The contractor must ensure that no pollution results from drilling operations, either as a result of oil and fuel drips, or from drilling fluid. The contractor must take all reasonable measures to limit dust generation as a result of drilling operations.
- The ECO must be given 24-hour notice before blasting events.

7.11.18 Fire fighting

Adequate firefighting equipment according to the fire hazard during the construction period must be available on site and in good working order (at least one type ABC (all purpose) 9 kg extinguisher and 3 fire beaters per working area). The persons on site must be trained in the use of such equipment.

- The main contractor must provide a list of all authorities involved in firefighting in the region. This list must include emergency contact numbers and must be visible at the site office.
- Welding, gas cutting or cutting of metal will only be permitted inside the working areas.
- The Contractor must pay the costs incurred to organizations called to put out any fires started by him. The Contractor must also pay any costs incurred to reinstate burnt areas as deemed necessary by the land owner.
- It is required that contractors have available [if there is cell phone reception] the emergency telephone numbers of the nearest local Fire Fighting Station and that an emergency firefighting re-action plan has been drawn up with onsite workers and the resident land-owner / farmer.

7.11.19 Emergency Procedures

It is the responsibility of the contractor to assess the potential risks to the environment as a result of the project. As such, the contractor must have the necessary standard emergency operating procedures in place to deal with any potential emergency such as oil spills or fire.

- All staff should be made aware of the necessary basic emergency procedures in the event of an emergency including injuries to staff. The appropriate equipment and identified personnel to deal with such basic emergencies should be available on site.
- **Fire:** The Contractor must advise the relevant authority of a fire as soon as one starts and must not wait until he can no longer control it. The Contractor must ensure that his employees are aware of the procedure to be followed in the event of a fire.
- **Hazardous Material Spills**: The Contractor must ensure that his employees are aware of the procedure to be followed for dealing with spills and leaks, which must include notifying the Engineer, the ECO and the relevant authorities. Treatment and remediation of the spill areas must be undertaken to the reasonable satisfaction of the ECO and Local Authority.

7.11.20 Solid waste management

Waste refers to all solid waste, including domestic waste, hazardous waste and construction debris. The Contractor are responsible for the establishment of a refuse control system (which must consider recycling wherever possible) that is acceptable to the ECO. Disposal arrangements must be made in advance and cleared with the ECO before construction starts.

- No littering or on-site burying or dumping of any waste materials, vegetation, litter or refuse may occur.
- All solid waste must be disposed of offsite at an approved landfill site in terms of section 20 of the Environment Conservation Act (Act No. 73 of 1989). The Contractor must supply the ECO with a certificate of disposal.
- The Contractor must provide problem animal- and weatherproof bins with lids of sufficient number and capacity to store the solid waste produced on a daily basis. The lids must be kept firmly on the bins at all times. Bins must not be allowed to become overfull and must be emptied regularly.
- Waste from bins may be temporarily stored on Site in a central waste area that is weatherproof and scavenger proof and which the Engineer and the ECO has approved.
- All hazardous waste must be disposed of at a registered hazardous waste disposal site and certificates of safe disposal must be obtained.
- All waste generated during the decommissioning and reconstruction activities must be removed by the Contractor as soon as possible, and within the period specified in the EMP and disposed of at a registered landfill site.
- The Contractor must make provision for workers to clean up the Contractor's camp and working areas on a daily basis so that no litter is left lying around and so that the site is in a neat and tidy state. The Contractor must remove from site the refuse collected at least once a week.

7.11.21 Toilets & Ablution Facilities

The Contractor must provide suitable sanitary arrangements at designated points of the construction site for all site employees. A minimum of one toilet must be provided per 15 persons at each working area (station) or as stipulated in the Management plan.

- Toilets must be at least 32m away from any watercourse
- The toilet must be within easy reach (max 300m) of the working area and be in good working condition and cleaned on a daily basis. Toilet paper must be provided. The toilets must be emptied on a weekly basis or when full or when instructed by the ECO on site.
- Disposal arrangements must be made in advance and cleared with the ECO before construction starts. Sanitation provision and servicing must be to the satisfaction of the ECO.
- The Contractor must ensure that toilets are emptied prior to any builders' holidays, and/or weekends.
- Toilets must be of a neat construction and must be provided with doors and locks and must be secured to prevent them blowing over.
- NB: No burying of any waste material on or near the construction site nor anywhere on the surrounding property is permitted.
- Eating areas that are allocated for workers must be established in an environmentally acceptable manner and in line with all OH & Safety Act regulations. All on site and on route workers temporary eating areas must be have acceptable toilet and refuse management systems in place and these areas must have suitable refuse receptacles' available for the containment and disposal of general litter and refuse.

7.11.22 Discharge of construction water

Potential pollutants of any kind and in any form must be kept, stored, and used in such a manner that any escape can be contained and the water table not endangered. This particularly applies to water emanating from runoff from fuel depots/workshops/truck washing areas.

- The contractor, being responsible for the construction and effective containment and maintenance of settlement ponds must ensure that the surrounding environment is not adversely affected as a result of construction activities.
- Wash down areas must be placed and constructed in such a manner so as to ensure that the surrounding areas are not polluted. Contaminated water includes water that is carrying excess sediment due to construction activities.
- Contaminated water storage facilities must not be allowed to overflow and appropriate protection from rain and flooding must be implemented.
- Contaminated water that is removed from site must be disposed of at a facility approved by the ECO and Local Authority.
- No contaminated water that does not meet the water quality standards and criteria under the National Water Act may be released into a natural system, whether it is to surface or groundwater.
- All cement effluent from mixer washings, and run-off from batching areas and other work areas must be contained in suitable sedimentation ponds.
- Sedimentation ponds must be allowed to dry out on a regular basis to allow for solid material to be removed.
- This material must be disposed of in a suitable manner, depending on the nature of the material, and to the discretion of the ECO

7.11.23 Treating (flushing / testing) of pipelines

Cleaning/sterilization/flushing of pipelines shall not impair surrounding environmental quality.

- Any contaminated water from such activities shall be contained until it complies with the standards contained in the National Water Act or other relevant Acts, as well as those laid down by the Local Authority.
- Alternatively, it shall be removed from site and disposed of at an approved waste disposal site.

7.11.24 Eating facilities

The Contractor must designate eating areas for the approval of the ECO, which must be clearly demarcated. No eating of meals must take place outside these designated areas without the approval of the Contractor/ESO.

- The feeding or leaving of food for animals is strictly prohibited.
- Sufficient waste bins must be present in this area and emptied regularly.
- The contractor must supply cooking facilities that are suitable for the environment and are not liable to cause the outbreak of fires.
- No overnight camping/stay on site allowed. If overnighting is necessary for security purposes then it must be cleared with the ECO on site.
- No washing in dams or streams are allowed.

7.11.25 Dust Control

The Contractor must take all reasonable measures to minimize the generation of dust as a result of construction activities resulting from along-construction-route activities (but must also take into account possible water constrictions of the area).

- The onsite construction site agent must take into account prevailing wind strength and wind direction and must have preventative measures on standby to minimize dust pollution that may cause damage to people and property.

7.11.26 Restoration and rehabilitation

The Contractor must ensure that all structures, equipment, materials and facilities used or created on site for or during construction activities are removed once the project has been completed. On completion of the project or phase, all areas impacted by the construction activities must be reinstated and/or rehabilitated to the satisfaction of the ECO with emphasis on the following:

- Immediately after the demolition of the camp site, the contractor shall restore the site to its original state, paying particular attention to its appearance relative to the general landscape.
- The contractor's procedure for rehabilitation shall be approved by the ECO and Engineer.
- Site offices must be removed and the areas rehabilitated or reinstated to the satisfaction of the ECO.
- Labourer's facilities (if applicable) must be removed and the areas rehabilitated or reinstated to the satisfaction of the ECO.
- All construction site areas must be rehabilitated or reinstated to the satisfaction of the ECO.
- All temporary fencing and demarcation must be removed and the areas reinstated to the satisfaction of the ECO.
- Temporary storage areas must be rehabilitated or reinstated to the satisfaction of the ECO.

- All remaining construction material must be removed and the areas rehabilitated or reinstated to the satisfaction of the ECO.

Any additional **disturbed** areas must be rehabilitated or reinstated to the satisfaction of the ECO. This shall include but not be limited to:

- Earthworks to reinstate the physical characteristics of the site. Here attention to the natural vertical and lateral heterogeneity in landform shall guide the reinstatement of natural areas.
- Replacement of topsoil material – care shall be taken to ensure that the same material that was removed from each area is replaced there, since this will carry the seed complement appropriate for re-establishment of each plant community type.
- Final landscaping by machine, but landscaping by hand may be required in many areas under rehabilitation.
- Re-seeding and / or replanting of rehabilitated areas.
- The Contractor shall not be permitted to use fertilisers or pesticides.
- It is imperative that any potential erosion problems are addressed. This may require subsequent site visits to monitor the efficacy of erosion control measures.

7.11.27 Land Management

- Vehicles accessing the construction site must be made aware of driving in hazardous road conditions, sharp bends, narrow roads, bad weather, on or near children or domestic animals along the road.
- Vehicle movements should be kept to a minimum during rain to avoid damage to access roads.
- No fences or gates on the relevant construction property must be damaged. All access gates to the property (construction site) to be kept closed at all times to prevent domestic and or wild animals from getting out. Access by unauthorised personnel should be controlled. The access gates to the construction areas must always be closed.
- Soil erosion must be prevented at all times along the access roads and around construction areas.

7.11.28 Socio-Cultural Issues

- Property owners or property occupiers must be treated with respect and courtesy at all times.
- The cultural lifestyles of the communities living in close proximity to the construction areas must be respected.

7.12 EMERGENCY PREPAREDNESS & RESPONCE

The following potential emergency situations have been identified and include the procedure for responding to, and for preventing and mitigating the environmental impacts that may be associated with them (also refer to Penalties and Fines).

7.12.1 Accidental fires

Fire safety in Fynbos Area is a very real risk and must be stringently controlled. No fires will be permitted on site for any reason. If required, a designated smoking area will be provided, and clearly demarcated and signposted, with a facility for safe containment and disposal of cigarette butts.

The following measures must be implemented:

- Adequate firefighting equipment must be available on site and in good working order (including at least one type ABC (all purpose) 9 kg fire extinguisher and 3 fire beaters per working area). The persons on site must be trained in the use of such equipment.
- The main contractor must provide a list of all authorities involved in firefighting in the region. This list must include emergency contact numbers and must be visible at the site office.
- The contractors must establish an emergency procedure (with contact numbers) to the satisfaction of ECO (whenever work is done in any fire prone areas).

7.12.2 Hydrocarbon spills

Since the project is in proportion relative small, no fuel storage or distribution facilities will be established. As a result the significance of any spill is much reduced. The following must be observed:

- Vehicles will arrive on site already fuelled for the project.
- If additional fuel is needed, it will be brought in as needed (minimal volumes) and refuelling will be done using a pump and not a funnel (to minimize the risk of spills).
- Spill trays shall be used during re-fuelling.
- In the case of accidental spillages or leakage, the contractor will be responsible for immediate containment and corrective action (e.g. stopping the leakage), and to inform the Construction Supervisor and ECO.
- The ECO will recommend the best possible environmental solution.
- The Contractor will be liable for any costs incurred.

7.12.3 Concrete/cement spillages

The Contractor/supplier will be liable for the safe and correct deliverance of substantial loads of concrete or cement.

- Should a spill occur the Contractor/supplier will be liable for all costs of the rehabilitation needed.

8. OPERATIONAL EMP (OEMP)

Please refer to the site specific Operations Manual for Klaarstroom WWTP, Appendix H2.

The most important part of the operational phase will be to ensure that the site is meticulously maintained and that the operations are carefully monitored. The applicant will remain overall responsible for the environmental performance of the site and must be aware of the legal requirements and obligations. The applicant must also be aware of the legal action that can be taken against **him as a person** with regards to negligence leading to environmental pollution.

The owner or delegated responsible person must implement an operational and maintenance management plan which must include:

Access management and control;
Energy management and monitoring;
Water management and monitoring;
Erosion management;
Waste and pollution management;
Sewerage management;
Fire Management;
Minimise dust and air emissions;
Protection of indigenous natural vegetation and fauna;
Specific monitoring and operational instructions;
Emergency plans which will cover all reasonable aspects of the operations which might lead to environmental pollution or degradation.

8.1 MITIGATION IN TERMS OF OPERATIONS:

Objective 1: Protect Freshwater Resources

Potential Impacts:

1. Potential Leakage or spillage of waste water from treatment works/ pipeline into drainage lines/river
2. Possible overflow of sewage polluting drainage lines
3. Possible contamination of surface water from inadequately treated waste water during irrigation

Mitigation:

- Daily visual inspection of plant for signs of leakage or particular greening of grass in certain areas which may be indicative of leakage.
- Visual inspection of the pipeline route for signs of leakage or particular greening of grass in certain areas which may be indicative of leakage; perhaps streamline leakage detection through mobilising the community to report any leakages along the pipeline route.
- Daily visual inspections of the plant to determine whether ponds are nearing full capacity and whether there is an overflow, remain freeboard;
- Keep sludge and waste water out of drainage lines and the river; Remove sludge periodically and dispose of properly;
- Harvest reeds annually and remove harvested reeds;
- A water monitoring programme must be in place to detect any contamination linked to the plant;
- Immediately institute appropriate mitigation measures if contamination is discovered;
- A groundwater quality monitoring programme must be in place to detect any contamination that may be linked with the plant.
- Treatment of waste water must take place strictly according to engineers' prescriptions in order to meet wastewater quality standards as set out by DWS;

- Treated water to be monitored on a regular basis to verify water quality. Treated water should be chlorinated to ensure that any remaining pathogens are eliminated before effluent is released;
- Hand screens & grid channels must be cleaned regularly and waste disposed of at in a suitable manner.

Objective 2: Avoid soil contamination:

Potential Impacts:

1. Potential Leakage or spillage of waste water from treatment works/ pipeline resulting in pollution of surrounding soil

Mitigation:

- Daily visual inspection of plant for signs of leakage or particular greening of grass in certain areas which may be indicative of leakage.
- Visual inspection of the pipeline route for signs of leakage or particular greening of grass in certain areas which may be indicative of leakage, perhaps streamline leakage detection through mobilising the community to report any leakages along the pipeline route.
- Daily visual inspections of the plant to determine whether ponds are nearing full capacity and whether there is an overflow, remain freeboard;
- Remove sludge periodically and dispose of properly; Harvest reeds annually and remove harvested reeds;
- A water monitoring programme must be in place to detect any contamination linked to the plant;
- Immediately institute appropriate mitigation measures if contamination is discovered;

Objective 3: Avoid unpleasant odours

Potential Impact:

1. Release of unpleasant odours associated with raw sewage and sludge cause by methane and hydrogen sulphide

Mitigation:

- Ensure that all components of the treatment plant are in good working order at all times. If the plant is functioning properly, the generation of odours should be minimised,

Objective 4: Proper Waste Management during operations:

Potential Impact:

1. Potential contamination of freshwater resources and surrounding soil from improper disposal of non-biodegrable waste (screening and grid) from the inlet works.

Mitigation Measures:

- Before any work is done, the area selected for disposal clearly fenced off and approved by the ECO. Indiscriminate clearing of any area outside of construction footprint must be avoided. Screening & grid from inlet works only to be buried within the designated, approved area for disposal;
- Screening & grid to be deposed of in trenches (10m ling, 1.8m deep).

- Each days solids to be placed in the length of the trench, sprinkled with lime ad covered with a layer of soil;
- Grid not allowed near any drainage lines or the river;
- Disposal area to be fenced off;
- Borehole testing to be done to evaluate impact on ground water.
- Method statements for disposal to be conducted and approved by the ECO.

8.2 TRAFFIC ACCESS ROUTES & HAUL ROADS

The Operator of the site must control the movement of all vehicles and plant including that of his suppliers so that they remain on designated routes. In addition such vehicles and plant must be so routed and operated as to minimise disruption to regular users of the routes not on the Site.

- On gravel or earth roads on Site, the vehicles of the Contractor and his suppliers must not exceed a speed of 25 km/h.
- On public roads adjacent to the Site vehicles will adhere to municipal and provincial traffic regulations.
- Only approved access roads may be used.
- All measures must be implemented to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.

8.3 ENERGY MANAGEMENT

All reasonable steps must be taken to ensure the efficient management of energy. Energy management and conservation measures must be propagated and encouraged. The objective of energy management will be to encourage the conservation of energy, for example:

- Ensure that cooling units are located and operated to conserve energy. If refrigerant are to be used, please note that R22 as a refrigerant are being phased out (due to negative impact on the ozone) and that the following gasses are more environmentally friendly options: ammonia, R134a, R143a, R404A, R407C, R410A, and R507A.
- Install energy-efficient appliances (e.g. a grade one refrigerator is at least 35% more energy-efficient than a grade three one).
- Install energy efficient lightning (which uses less energy to give the same amount of illumination and last longer than conventional incandescent bulbs).
- Insulate water heaters and hot water pipes (insulating hot water pipes from the water heater to the source are another way to conserve).
- Disconnect or switch- off units/appliances which are not in use.
- Monitor different energy uses (e.g. electricity, fuels and gas).

8.4 WATER MANAGEMENT

- Ensure that all additional water uses are correctly registered with the Department of Water Affairs (e.g. Agri-industrial use).
- Water conservation measures such as low flow taps, high pressure hoses, duel flush toilets, water wise gardens, rainwater tanks etc. must be encouraged and implemented.

- Every reasonable effort must be made to reduce the long term water demand.
- Environmental training of personnel must include water conservation awareness.
- A monthly water monitor program with the aim of ever reducing the water usage must be implemented (records must be kept).

8.5 EROSION & SEDIMENT CONTROL

Soil erosion (through wind & water) removes valuable top soil which is the most productive part of the soil profile (containing plant nutrients, seeds and bulbs). Development disturbs and loosens soils which can easily lead to erosion. The plants and animals that depended on that soil can no longer survive, and the plants that once grew that cannot re-establish itself because the seed store is gone. Soil may then have to brought back from elsewhere, increasing the cost of the project and the risk of importing weeds and other waste or toxic material. In accordance with the Conservation of agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA), the aim of erosion management is to prevent any form of soil erosion through proactive thinking and prevention as well as immediate rehabilitation.

In order to achieve erosion and sediment control, the following are applicable to all properties:

- Inspect and maintain erosion and sediment controls on a regular basis and ensure that it can accommodate the upslope catchment.
- Leave as much vegetation as possible.
- Install permanent fences to define 'no go' areas in those areas that are not to be disturbed.
- Install sediment catchment controls down slope of the site to catch sediment (if applicable).
- Limit vehicle movement to the site and control access points. Clearly mark such access points and inform all suppliers.

8.6 WASTEWATER MONITORING PROGRAM

In terms of the National Water Act, 1998 (Act 36 of 1998), the Discharge of waste or water containing waste is a controlled activity for which a Licence or General Authorization must be obtained. The applicant/legal operator must ensure that wastewater (if applicable) is legally disposed by applying for a General Authorization, a License or exemption in terms of the Water Act.

- Wash-water used for cleaning of instruments or equipment must not contain any chemicals or hazardous materials that will increase the risk of soil and water contamination.
- Wash-water used to clean panels must be recycled as far as possible.
- Measures to prevent erosion must be implemented.
- A wastewater monitoring program may be required, which must include monitoring of quantities disposed of (on a monthly basis) and compliance of treated wastewater quality after treatment but before disposal.

8.7 WASTE & POLLUTION MANAGEMENT

An integrated waste management approach based on waste minimisation (e.g. reduction, recycling, re-use and disposal) must be encouraged. Poor waste management can lead to adverse

environmental impacts (e.g. odours, pollution and visual impact) as well as health risks. Sound waste management is thus non-negotiable.

- No on-site burying or dumping of any waste materials, vegetation, litter or refuse may be allowed.
- Domestic waste must be stored in approved containers (e.g. bins with removable lids).
- All solid waste will be disposed of at a landfill licensed in terms of section 20 of the Environment Conservation Act (Act No. 73 of 1989).

8.7.1 Recycling

Whenever possible, a suitable recycle arrangement must be negotiated with a local recycle agent to ensure the re-use of recyclable material. Recycling should aim at sorting as much of the following materials as practical:

- Paper and cardboard
- Aluminium
- Copper
- Metals (other than aluminium and copper)
- Glass
- Organic waste
- Batteries
- Electronic equipment

8.7.2 Pollution management

All possible pollution sources must be identified and all reasonable steps taken to prevent pollution or accidental spillages.

- Ensure that all concentrated potential sources of pollution are protected (bunded) in order to minimise the risk of accidental spillage or pollution. Storage tanks should be bunded in such a way to contain at least 120% of the storage tank's capacity.

8.8 SEWERAGE MANAGEMENT

If applicable sewerage must be installed in accordance with the Municipal regulations and Department of Water Affairs (DWA) requirements.

- Sewerage management must aim at the prevention of pollution and must be maintained on a regular basis.
- Maintenance records must be kept.

8.9 FIRE MANAGEMENT

Refer to emergency preparedness and response paragraph 8.12.

8.10 MINIMISE DUST AND AIR EMISSIONS

Refer to erosion and sedimentation control paragraph 8.5.

8.11 MANAGEMENT OF NATURAL AREAS AND GARDENS

The objective regarding the management of natural areas and gardens are to identify critical or conservation worthy features and to manage such areas and gardens in such a manner as to promote biodiversity and ecological processes.

- Natural areas must be managed as close to natural as possible (no interference wherever possible).
- No garden areas will be allowed.
- All listed invasive alien vegetation must be removed in accordance with CARA legislation (The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)) as revised.

8.12 EMERGENCY PREPAREDNESS AND RESPONSE

The following potential emergency situations have been identified and include the procedure for responding to, and for preventing and mitigating the environmental impacts that may be associated with them.

8.12.1 Accidental fires

Fire safety in Fynbos Area is a very real risk and must be stringently controlled. No fires will be permitted on site for any reason. If required, a designated smoking area will be provided, and clearly demarcated and signposted, with a facility for safe containment and disposal of cigarette butts.

The following measures must be implemented:

- Adequate firefighting equipment must be available on site and in good working order (including at least one type ABC (all purpose) 9 kg fire extinguisher and 3 fire beaters per working area). The persons on site must be trained in the use of such equipment.
- The main contractor must provide a list of all authorities involved in firefighting in the region. This list must include emergency contact numbers and must be visible at the site office.
- The contractors must establish an emergency procedure (with contact numbers) to the satisfaction of ECO.

8.12.2 Hydrocarbon spills

Since the project is in proportion relative small, no fuel storage or distribution facilities will be established. As a result the significance of any spill is much reduced. The following must be observed:

- Vehicles will arrive on site already fuelled for the project. If additional fuel is needed, it will be brought in as needed (minimal volumes) and refuelling will be done using a pump and not a funnel (to minimize the risk of spills). Spill trays shall be used during re-fuelling.

- In the case of accidental spillages or leakage, the client will be responsible for immediate containment and corrective action (e.g. stopping the leakage) and will be liable for any costs incurred.

9. DECOMMISIONING EMP (DEMP)

The facility is expected to have a lifespan of 20+ years (i.e. with routine maintenance). The facility infrastructure would only be decommissioned and rehabilitated if it reaches becomes outdated or inadequate, in which case the facility will normally be upgraded and not decommissioned.

It is thus considered unlikely that the facility will be decommissioned. However, it is likely that the facility will may be upgraded or enlarged as part of maintenance and the replacement of individual components with more appropriate technology/infrastructure available at that time.

- **The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore is not repeated in this section.**
- Site preparation activities will include confirming the integrity of the access to the site to accommodate required equipment, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of construction equipment.
- Disassembled components will be reused, recycled, or disposed of in accordance
- Specific consideration must be given to ways to minimise waste and wastage in maintenance and the decommissioning phase of the proposed development.
- Equipment used in the plant must be recycled and re-used where possible to avoid the filling of already limited landfill space.
- Waste water contained in the system must be treated and discharged before dismantling of the system commences;
- If the system is no longer fully functional, the waste water still in the system must be removed to an appropriate licensed treatment facility for treatment before work commences on the site
- In case of a spillage spills should be reported to the ECO so that he/ she can investigate the incident and recommend the appropriate mitigation;
- Any significant spills must be reported to the Department of Water and Sanitation who may conduct a site visit to recommend appropriate mitigation.

APPENDIX 1: DECLARATION OF UNDERSTANDING

DECLARATION OF UNDERSTANDING

I _____

Representing: _____

Declare that the conditions of the EMP were brought to my attention and that I have read and understood the contents of this Environmental Management Plan and that a copy of this EMP has been made available to me.

Site: _____

Date: _____

I also declare that I understand my responsibility in terms of enforcing and implementing the Environmental Specifications as set out in this Environmental Management Plan.

I also undertake to inform all persons under my supervision of these specifications and the contents of the Environmental Management Plan.

Signed: _____

Place: _____

Date: _____

Witness 1: _____

APPENDIX 2: START-UP REPORT

To be included after start-up meeting.

APPENDIX 3: ENVIRONMENTAL EDUCATION

ENVIRONMENTAL TRAINING FOR CONSTRUCTION.

The why, what and how…

BUT WHY…

… should we care about the environment?

The environment provides us with everything we need to survive – food, water, fuel, air, etc. Human activity uses resources and has an impact on those resources. Managing our resource use and ensuring that our impact is minimized will ensure that these resources are not depleted.

The Constitution says that all people in South Africa have the right to a healthy environment. If you damage the environment, you are taking away that basic right of others as well as future generations – your children and grandchildren!

…environmental management if there is already conservation?

Historically, development and environmental conservation have been in conflict, because conservation was understood as the protection of resources, and development as the use, or exploitation of resources. The two competed for the same resources, but both are needed! Enter: *SUSTAINABLE DEVELOPMENT.*

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable development thus aims to improve the quality of human life while living within our ecological means = the wise use of resources!

…environmental management of construction?

South Africa's effort to attain sustainable development is based on the concept of Integrated Environmental Management (IEM). The purpose of IEM is to resolve or lessen any negative environmental impacts and to enhance positive aspects of development.

IEM is designed to ensure that the environmental consequences of development proposals are understood and adequately considered in the planning, implementation and management of all developments.

It is intended to guide, rather than impede the development process by providing a method of gathering, analysing and utilising information about the environmental impacts of development. IEM and other principles of Environmental Management are set out in the National Environmental Management Act (No. 107 of 1998) & National Environmental Management Amendment Act (No. 62 of 2008)

BUT WHAT…

…exactly is the 'environment'? What if we're not working near rivers or fynbos or leopard toad habitat?

The environment is not only the 'conservation-worthy' such as rare plants and endangered animals. The environment is everything around you!

It is made up of living things (e.g. people, plants & animals) and non-living things (e.g. soil, water, buildings & cars). People and man-made things are also important parts of the environment.

Protection of the environment means that all living and non-living things are protected. During construction, Environmental Management Programmes (EMP's) are implemented not only to protect fynbos or leopard toads but also to protect people (both on site and off), property (houses, cars, etc.) as well as natural resources such as water, air and soil.

…do Environmental Management Programmes (EMP's) do? What does this mean for my contract?

EMPs are tools to facilitate environmental management during the construction phase of development projects and thereby avoid *unnecessary* impacts to the environment.

In the past, the functionality and efficiency of EMPs was hampered by resistance from contractors and engineers, the difficulties of costing for compliance and the lack of legal enforceability.

Now Environmental Management Programmes (EMP's) are stipulated in the Environmental Authorisations (ROD) as a condition of the approval to go ahead with the development, in other words it is ***legally binding***.

When you sign a contract do work on a project with an EMP, you are legally bound to comply with that EMP!

Methods of implementing EMPs are becoming more and more stringent and issues of enforceability are being addressed. Those individuals and companies that are familiar with compliance with EMPs will be at a competitive advantage!

…do EMPs consist of?

EMPs usually contain an environmental policy statement, organisational structure detailing the responsibilities and authorities involved in the project, procedures for communication and record-keeping and environmental specifications.

EMPs are adapted to the scale and sensitivity of the construction project. They can be thick documents detailing specifications for every eventuality specifically adapted to the project, or they can be short and brief documents setting out standard environmental procedures and controls. Sometimes EMPs include extensive penalty and incentive schemes.

A WORD ON METHOD STATEMENTS:

A method statement can be requested or proposed when an activity is either not included in the EMP at all, if the EMP specifications for an activity are not deemed adequate, if an activity is required that is not allowed by the EMP, etc. In other words, when the EMP does no give enough information to manage the environmental impact of a specific activity.

A method statement is defined as a written submission by the Contractor setting out the plant, materials, labour and method proposed to carry out an activity. Method statements must provide enough detail that the environmental impact of the activity can be assessed. Method statements must therefore be submitted well in advance of the activity (usually at least 5 days but sometimes more).

Method statements are therefore an extension of the EMP, are also legally binding and are intended to ensure that the environmental implications of an activity outside of the EMP can be addressed.

Method statements usually require the approval by the engineer, the ECO/ESO/DEO, etc. before the activity can take place. If such an activity takes place without approval and result in environmental damage, the contractor is responsible for the cost of rehabilitation/clean-up/etc.

…is an ECO, ESO, DEO, etc.?

EMPs usually require the appointment of an ECO, ESO, DEO, etc. to oversee the implementation of and compliance with the EMP on behalf of the engineer or the contractor(s). Ultimate responsibility for compliance with the EMP lies with the contractor(s) and the engineer.

ESO = Environmental Site Officer – usually on site permanently or often. Can be independent consultant or from contractor/engineer.

ECO = Environmental Control Officer – usually visits site on a regular basis and audits compliance with the EMP. Usually independent consultant.

DEO = Designated Environmental Officer – usually on site permanently, usually member of contractor or engineer site staff.

Organisational structures and responsibilities differ from project to project and depend on environmental sensitivity of the project, scale of the project, etc. Increasingly nowadays, each party is required to appoint their own person responsible for environmental management on site, e.g. the engineer would have an ESO/ECO and the main contractor(s) would have an ESO/DEO etc.

It is therefore important to familiarise yourself with that part of the EMP that deals with organisation and responsibilities for each contract that you are involved in.

BUT HOW…

…do EMPs promote sustainable development?

They don't!

It is the people on site that protect the environment. The EMP, like any other plan or policy, is not worth anything if there isn't a commitment from those working on the project to compliance with the EMP.

…can I ensure my work comply with the EMP?

Environmental specifications in different EMPs can vary from vague to very detailed.

- Firstly, it is obviously important to know what those specifications are, vague or not, so READ THE DOCUMENT! Ignorance does not absolve you from your responsibility. A copy of the EMP must be kept at the site office at all times.
- It also helps to understand WHY those specifications are there – some things are obvious but others may not be. Some EMPs may have specifications that are not relevant. Don't be afraid to question the EMP; it can only increase its efficiency!
- Know where the sensitive areas on site are – watercourses, wetland areas, residential areas, etc. – and be extra vigilant when working in these areas.

Mostly environmental management of construction activities and compliance with EMPs require only common sense and with good housekeeping the battle is half won!

The enclosed environmental hand-out sets out the standard environmental specifications

DO'S AND DON'TS (1)

Workers & equipment must stay inside the site boundaries at all times.
Nobody may enter areas marked as No-go areas.

Why? Construction activities, equipment and people cause damage and disturbance to the area surrounding the site. As small an area as possible will be affected if all workers and equipment stay within the site boundaries. This is especially important if there are people who live around the site or natural areas around the site which should not be disturbed.

Do not swim in or drink from streams.
Do not throw oil, petrol, diesel, concrete or rubbish in streams.
Do not work in the stream without direct instruction.
Do not damage the banks or plants of streams.

Why? River water may be polluted which could make you sick.
Oil, petrol, diesel, concrete or rubbish will kill plants and animals living in the water. They may also make people who may drink the water downstream sick. Rubbish in the stream also makes it look ugly.
People and machinery working in the stream will damage it and kill plants and animals living in the stream. It may also cause erosion, which is expensive to repair.
The plants on the edge of the stream bind the soil together and prevent soil from getting washed away. Soil washed into a stream may affect people using the water downstream (e.g. for irrigation).

Protect animals on the site.
Ask your supervisor to remove animals found on site.

Why? Animals are an important part of the environment. All animals have a purpose, even snakes which catch mice and rats. Other important animals are owls, chameleons and frogs.

Do not damage or cut down any trees or plants without permission.
Do not pick flowers.

Why? Some plants are rare and may take a long time to grow back, if at all. Plants in the "no go" areas should not be damaged.
Some plants will die if their flowers are picked. Rare plants may be lost.

Put cigarette butts in a rubbish bin.
Do not smoke near gas, paints or petrol.
Do not light any fires without permission.
Know the positions of firefighting equipment.
Report all fires.
Do not burn rubbish/ vegetation without permission.

Why? Leaving a burning cigarette butt on the ground may lead to runaway fires which are dangerous to construction workers, people living around the site, equipment, houses, plants and animals.
Smoking near flammable material is dangerous and may cause an explosion.
Lighting a fire without permission may cause a runaway fire (see above).
Reacting quickly to fires that break out will prevent them from spreading and causing damage.

DO'S AND DON'TS (2)

Work with petrol, oil & diesel only in designated areas.
Report any petrol, oil & diesel leaks or spills.
Use a drip tray under vehicles & machinery.
Empty drip trays after rain & throw away were instructed.

Why? Designated areas should have measures to protect against petrol, oil & diesel spills. Oil, petrol and diesel can drip onto the soil and soak into it. Plants will not grow and animals will not live in dirty soil. It also looks ugly to people living around the area.
Drip trays will prevent oil, petrol or diesel from soaking into the soil and killing plants and animals.
If drip trays are not emptied they may overflow and pollute the surrounding soil. If oil, petrol or diesel is put into a stream, plants and animals living in the stream will be killed. They may also make people who may drink the water downstream sick. Ask your supervisor where drip tray water may be disposed of on site.

Try to avoid producing dust – wet dry ground and stockpiles.

Why? Dust can be irritating to people and can reduce production on site. It can cause problems such as eye irritations and coughs. It also reduces visibility on and around the site, which can be dangerous to drivers and pedestrians, and can cause damage to the surrounding environment.
Soil should not be made too wet because that will cause safety problems and soil may be washed away.

Do not make loud noises around the site, especially near schools and homes.
Report or repair noisy vehicles.

Why? Loud noises are irritating to workers and people living around the site. Loud noise can also be harmful to people (especially children) and affect their hearing.
By keeping vehicles in good condition, loud noise can be prevented.

Use the toilets provided.
Report full or leaking toilets.

Why? Sewage attracts flies and other irritating pests. If the site is near a river or stream, sewage makes the water smell and people who swim in it or use it to wash their clothes will get sick. It also causes plants to grow too much which blocks the river, which may cause flooding of houses and property.
Regular emptying of toilets is hygienic and will also prevent overflows.

Make sure that you eat where there is a rubbish bin nearby.
Never eat near a river or stream.
Put packaging & leftover food into rubbish bins.

Why? Eating areas generate a lot of rubbish and litter (e.g. bottles and packets) which will pollute the site and surrounding areas. Therefore, eating must be done near bins which are placed in the eating.
Rubbish in a stream looks ugly and can be harmful to people's health. It may also kill the plants and animals living in the stream. Rubbish and food left lying around will attract pests (such as rats) which are

dangerous to people and cause a health hazard. Also, rubbish left lying around is ugly and unpleasant to look at.

Do not litter–put all rubbish (especially cement bags) into the bins provided.
Ask your supervisor for a bin if there is none. Bins must be provided.
Report full bins to your supervisor.
The responsible person should empty bins regularly.

Why? Litter is ugly. It is also dangerous and unhealthy to adults, children and animals walking around the area.
Not putting the lid back on the bin will cause rubbish to be blown away.
Regularly emptying bins will prevent litter and rubbish flying around the site.

Always keep to the speed limit.

Drivers - check & report leaks.

Ensure loads are secure & do not spill.

Why? Speeding is dangerous to people who live in the area, especially children. Speed kills!
Faulty vehicles are dangerous to the driver, pedestrians and other motorists. Leaks can also pollute the ground and water and smoke from vehicles can cause health problems.
This is a potential danger to other motorists. Also, do not overload vehicles.

Know all the emergency phone numbers.

Why? Prompt reaction to an accident, fire or spill will reduce the risk of serious damage to the environment and to workers.

<u>If rules are broken:</u>
- Spot fines
- Removal from site.
- Construction may be stopped.

Why? Failure to adhere to the EMP may result in spot fines being issued to the company. It is then the Site Agent's responsibility to collect these fines from guilty individuals and he may even deduct fines off your wages.
The fines are meant to act as an incentive for workers to take the EMP seriously.
A person may be removed from site if they continually disregard the specifications in the EMP.
If the EMP is not adhered to, the local Environmental Authority may stop construction.

Report any breaks, floods, fires, leaks and injuries to your supervisor.

Ask questions!

Thank you for your attention.

APPENDIX 4: BASIC RULES OF CONDUCT

BASIC RULES OF CONDUCT

The following list represents the basic Do's and Don'ts towards environmental awareness, which all participants in this project must consider whilst carrying out their tasks. These are not exhaustive and serve as a quick reference aid.

NOTE: **ALL new site personnel must** attend an environmental awareness presentation. Please inform your foreman or manager if you have not attended such a presentation or contact the ESO.

DO:

- Use the toilet facilities provided – report dirty or full facilities
- Clear your work areas of litter and building rubbish at the end of each day – use the waste bins provided and ensure that litter will not blow away.
- Report all fuel or oil spills immediately & stop the spill continuing.
- Dispose of cigarettes and matches carefully. (Littering is an offence.)
- Confine work and storage of equipment to within the immediate work area.
- Use all safety equipment and comply with all safety procedures.
- Prevent contamination or pollution of streams and water channels.
- Ensure a working fire extinguisher is immediately at hand if any "hot work" is undertaken e.g. welding, grinding, gas cutting etc.
- Report any injury of an animal.
- Drive on designated routes only.
- Prevent excessive dust and noise.

Do not:

- Remove or damage vegetation without direct instruction.
- Make any fires.
- Injure, trap, feed or harm any animals – this includes birds, frogs, snakes, lizards etc.
- Enter any fenced off or marked area.
- Allow cement or cement bags to blow around.
- Speed or drive recklessly
- Allow waste, litter, oils or foreign materials into the stream
- Swim in the dam.
- Litter or leave food laying around

Notes:

If any animals such as tortoises, chameleons or snakes be encountered then do not harm them. The ECO or Site Supervisor must be contacted to remove these safely. The harming of any animal will result in disciplinary action.

Construction and heavy machine operators must be particularly sensitive to staying within access routes and prevention of unnecessary damage. Dust and noise is also of particular concern. Ensure that vehicles and machinery do not leak fuel or oils. Refuelling or maintenance must be done within the maintenance camp area only.

Alien plant clearing and control work teams must be closely supervised.

BASIESE GEDRAGSKODES

Die volgende lys verteenwoordig die moets en moenies vir omgewingsbewustheid wat alle deelnemers aan hierdie projek in ag moet neem tydens die uitvoer van hul take. Hierdie lys is nie volledig nie en dien slegs as 'n vinnige verwysing.

Nota: **alle nuwe terreinpersoneel moet** 'n aanbieding ten opsigte van omgewingsbewustheid bywoon. Indien u nog nie so 'n aanbieding bygewoon het nie, lig asseblief u voorman of bestuurder in of kontak die omgewings terreinbeampte.

Moets:

- Gebruik die beskikbare toilet-geriewe – rapporteer vuil of vol geriewe.
- Maak u werkplek skoon van rommel of bourommel aan die einde van elke dag – gebruik beskikbare vullisdromme en verseker dat rommel nie rondwaai nie.
- Rapporteer alle brandstof- en olie stortings onmiddellik – stop verdere storting.
- Wees versigtig met die wegdoen van sigarette en vuurhoutjies. (rommelstrooi is 'n oortreding.)
- Beperk werkaktiwiteite en die stoor van toerusting tot die onmiddellike werkarea.
- Gebruik veiligheidstoerusting en voldoen aan alle veiligheids-maatreëls.
- Voorkom besoedeling van strome en waterbane
- Verseker dat 'n brandblusser in werkende toestand byderhand is wanneer "warm" werk verrig word bv. Sweis, wegslyp, gasny, ens.
- Rapporteer beseerde diere.
- Ry slegs op aangewese roetes.
- Voorkom oormatige stof en geraas.

Moenie:

- Plantegroei verwyder of beskadig sonder direkte instruksie nie.
- Enige vure maak nie.
- Enige diere dood, beseer, vang of voer nie, insluitende voëls, paddas, slange, akkedisse, ens.
- Enige omheinde of afgesperde areas binnetree nie.
- Sement of sementsakke laat rondwaai nie.
- Vinnig of roekeloos bestuur nie.
- Enige rommel, afval, olie or enige vreemde materiaal in strome laat beland nie.
- In die dam swem nie.
- Rommelstrooi of kos laat rondlê nie.

Notas:

Indien enige diere soos skilpaaie, verkleurmannetjies of slange teëgekom word, moet hulle nie beseer of dood nie. Kontak die otb of ri om hulle veilig te verwyder. Die besering van diere sal lei tot dissiplinêre optrede.

Operateurs van konstruksie- en swaar masjiene moet veral versigtig wees om binne toegangsroetes te bly en om enige onnodige skade te voorkom. Verseker dat voertuie en masjiene nie olie of brandstof lek nie. Brandstofaanvulling en voertuigonderhoud mag slegs binne die onderhoudsarea gedoen word.

Streng toesig moet gehou word oor indringerplantbeheerspanne.

EZIPPHAMBILI EKUNYANZELEKILEYO UKUBA ZENZIWE

Zonke ezi zinto zilandelayo zizinto ekufuneka zenziwe nekufuneka zingenziwanga.

Wonke umntu ofikayo kufuncka afundiswe ngemigaqo kupala. Needa yazisa iforman yakho ikuba awukhange uye kufundiswa.

Izinto emazenziwe

- Sebenzisa izindlu zangasese, yazisa xa kukho umonakalo.
- Zama ukucoca apho ubusebenza khona.
- Sebenzisa imigqomo yenkukuma ungayeki iphaphtieke.
- Yazisa xa ubona ioil echithskalayo okanye ipetrol.
- Cima lozoli cigarette xa ugqibibile ukutshaya
- Zonke izixhobo usebenza zibuyisele apho zihlaka khona xa ucgibile apho zihlala khona xa ugqibile ukuzisebenzisa.
- Zisebenzise izikhuselixa uzinkiwe.
- Sukugalela izinto emlanjeni.
- Masibekho isicima mlilo xausebenza ngomlilo.
- Yazisa msinyane xa ubone isilwanyana ezonzakeleyo.
- Xauqhuba isithuthi hamba endleleni qha ungafathulinje.
- Naphina zamaungenzi thuli okanye ingxolo xa usebenza.

Emazingenziwa

- Sukususa nesiphina isityalo ungakhange uxelelwe
- Sukwenza mlilo nokuba sekubanda
- Amagqara ukubulala izilwanyana nokuzifida akuvumelekanga
- Sukungena xa kuvaliwe ngaphandle kwe mvume
- Ingxowa zesamente mazincedwe zingalahlwa nje
- Sukuqhuba ngesantya esiphakamileyo
- Sukugalele nayiphi into phaya emlanjeni
- Sukuqubha edameni q oqosha yonk inkukuma

APPENDIX 5: PENALTIES FOR NON-COMPLIANCE

PENALTIES FOR NON-COMPLIANCE

The contractors / sub-contractors must contact the ECO at any stage if unsure about any matter, or if a pollution incident occurs, or vegetation or animals are damaged.

ECO = Environmental Control Officer ESO= Environmental Site Officer

PHASE	**Penalty for Non-compliance**	
PRE-CONSTRUCTION PHASE	**Bottom range**	**Top Range***
Construction area to be marked off before construction starts.		5000
The demarcated area must be maintained throughout the construction phase	500	1000
Site area for stock piling of building material must be demarcated	500	5000
Site area for storing of waste material must be demarcated	500	5000
Fencing off the construction site with mesh fencing of 1.8m, where necessary or other suitable material as agreed on by ECO	500	1000
Sitting of access road/s to be approved by ECO & demarcated with stakes before any construction starts (if applicable)		5000
Temporary route used for construction must be determined on site with ECO (if applicable)	1000	5000
Telecommunications & AC power routes must be determined with the ECO (if applicable)	1000	5000
Sensitive features that may be harmed must be clearly marked or demarcated.	500	2000
Vegetation that may not be removed must be clearly marked or demarcated.	500	5000
Contractor must make the Construction team and all sub-contractors aware of all environmental aspects that could lead to imposition of penalties	100	5000
Contractor to sign Declaration of understanding (DOU) before construction starts		5000
Contractor to assure that all subcontractors be informed and signed DOU	1000	5000
Method statements must be provided on request by the ECO. No work may commence until the Method Statement is accepted by the ECO and Engineer	1000	5000
CONSTRUCTION PHASE		
Information		
A copy of the EMP & Record of Decision with all the conditions of approval, and the relevant Method Statements must be at site at all times.	200	5000
Construction crew behaviour		

Construction crews may not overnight on site.	200	5000
No amplified music allowed on site	100	200
Construction crew must stay within the demarcated construction area. (Applicable in sensitive sites)	50	500
Eating of meals only allowed in demarcated area	50	500
No pets permitted on site		100
Driving, Parking & Storing of machinery and vehicles are only allowed inside demarcated areas and existing roads	1000	5000
Machinery may only be used on the road and may not disturb the vegetation on the sides of the road except if cleared by ECO. Machinery used must be carefully considered to limit environmental damage	500	5000
No vegetation other than that agreed on may be damaged - i.e. no access to areas outside construction area.	500	2000
No individual may cause unnecessary damage to flora and fauna on, around or near the site	20	2000
No littering allowed (incl. cigarette butts)	50	500
Excavations		
No topsoil may be removed or altered outside the demarcated area and/or which was not specified.		2000
Commercial sources of sand, rock and gravel to be cleared with ECO	200	5000
All surplus material to be taken off-site and be disposed of at approved site	500	5000
Toilets		
Sufficient ablution facilities must be provided		3000
Toilets to be secured to prevent them from falling or blowing over.	100	1000
They must be serviced regularly, (according to the manufacturer's instructions) and kept clean.	100	1000
Everybody on site must make use of ablution facilities	50	1000
Fire Prevention		
All mandatory firefighting equipment (as specified at start-up) must be on site at all times	500	4000
Firefighting equipment to be in good working order and serviced.	500	2000
No fires, including cooking fires, allowed on site	1000	5000
Cement		

Concrete may only be mixed within the boundaries of the demarcated area and/or where was agreed on by the ECO.	500	5000
All excess cement & concrete mixes to be contained on construction site prior to disposal off site	200	5000
Any cement / concrete spillage to be cleaned up immediately.	500	5000
Ready-mix delivery trucks must not carry out the wash down of their trucks on or around the site unless arranged with ECO.	1000	3000
Dust pollution control		
Ensure that loose building material is covered to prevent dust pollution	100	1000
Water run-off		
Contamination of water bodies, rivers, dams or wetlands must be prevented at all cost	500	5000
Rainwater from construction & building site/s must be channelled, contained & allowed to dry out, so as not to transport any pollutants into the surrounding area. Temporary trenches, straw stabilising, brush cutting can be used	500	5000
Waste control		
Sufficient refuse bins must be placed on site	500	2000
Refuse bins must be cleaned on a regular basis	100	1000
General litter / building refuse must be cleaned up on a regular basis from the site	500	3000
Cement-contaminated water; paint; oil; cement slurries etc. must be stored in watertight containers or as agreed with ECO	500	5000
Store all refuse & waste material in wind & animal proof containers	100	1000
Waste must be disposed of at an official waste deposit site on a regular basis.	500	5000
The absence of or inadequate drip trays or bunding facilities	500	5000
Failure to address oil/fuel leaks from on-site machinery	200	5000
Herbicides		
No herbicides or pesticides whatsoever may be used.	200	2000
Construction road		
Road must be upgraded to prevent degradation and erosion of the road and surrounds.	500	5000
Power and Telecommunications supply		
Demarcate power supply route	500	5000

No vehicles to drive through vegetation unless authorised by ECO	500	5000
Storage of equipment may only take place at an area demarcated by the ECO.	500	5000
Working must be done in phases to prevent trampling of vegetation	N/A	
Use of generators and fuel powered equipment		
A watertight cover must be place under the power generator equipment to prevent accidental spillage of fuel & oil seeping into the soil.	500	5000
Drip tray must be able to take 120% of fuel on site	500	5000
All waste material generated from the use of this equipment must be contained and removed from the site	500	5000
Mobile fuel powered equipment must be well maintained and must not have any fuel or oil leaks.	200	5000
Soil Stabilisation		
Ensure that soil material for filling and stabilisation comes from a source that does not contain seeds alien to the area. The source must be cleared with the ECO.	100	2000
Rehabilitation		
Remove rocks and stones and stock pile in area recommended by ECO	500	5000
Remove all plants that can be used for rehabilitation and store on- or off-site in appropriate manner as agreed with ECO	200	5000
Removal of all old concrete and alien materials from site	500	5000
Site must be cleared of all waste and building material	500	5000

*(Large scale / repeated offence)

APPENDIX 6: INFO ON METHOD STATEMENTS

INFORMATION ON METHOD STATEMENT

Method Statements are to be completed by the person undertaking the work (i.e. the Contractor). The Method Statement will enable the potential negative environmental impacts associated with the proposed activity to be assessed.

The Method Statement can only be implemented once approved by the ECO

The Contractor (and, where relevant, any sub-contractors) must also sign the Method Statement, thereby indicating that the works will be carried out according to the methodology contained in the approved Method Statement.

The ECO will use the Method Statement to audit compliance by the Contractor with the requirements of the approved Method Statement.

Changes to the way the works are to be carried out must be reflected by amendments to the original approved Method Statement; amendments require the signature of the ECO denoting that the changed methodology or works are necessary for the successful completion of the works, and are environmentally acceptable. The Contractor will also be required to sign the amended Method Statement thereby committing him/herself to the amended Method Statement.

This Method Statement MUST contain sufficient information and detail to enable the ECO to apply their minds to the potential impacts of the works on the environment. The Contractor will also need to thoroughly understand what is required of him/her in order to undertake the works.

THE TIME TAKEN TO PROVIDE A THOROUGH, DETAILED METHOD STATEMENT IS TIME WELL SPENT. INSUFFICIENT DETAIL WILL RESULT IN DELAYS TO THE WORKS WHILE THE METHOD STATEMENT IS REWRITTEN TO THE ER'S AND ESO'S SATISFACTION.

The page overleaf provides a *pro forma* method statement sheet, which needs to be completed for each activity requiring a method statement in terms of the EMP.

APPENDIX 7: EXAMPLE OF METHOD STATEMENT

PRO-FORMA METHOD STATEMENT

CONTRACT:…….. **DATE:**……..

PROPOSED ACTIVITY (give title of method statement and reference number):

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

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

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

Start Date:	End Date:

HOW ARE THE WORKS TO BE UNDERTAKEN (provide as much detail as possible, including annotated maps and plans where possible):

Note: please attach extra pages if more space is required

DECLARATIONS

1) ENVIRONMENTAL CONSULTANT AND/OR ENVIRONMENTAL CONTROL OFFICER

The work described in this Method Statement, if carried out according to the methodology described, is satisfactorily mitigated to prevent avoidable environmental harm:

_____ _____

(Signed) (Print name)

_____ _____

(Signed) (Print name)

Dated: _____

2) PERSON UNDERTAKING THE WORKS

I understand the contents of this Method Statement and the scope of the works required of me. I further understand that this Method Statement may be amended on application to other signatories and that the ESO will audit my compliance with the contents of this Method Statement

_____ _____

(Signed) (Print name)

Dated: _____

3) THE APPLICANT

The works described in this Method Statement are approved.

_____ _____ _____

(Signed) (Print name) (Designation)

Dated: _____

APPENDIX 8: CONTRACTOR ENVIRONMENTAL CHECKLIST

CONTRACTOR/S REPRESENTATIVE: ENVIRONMENTAL WEEKLY CHECKLIST

SITE: _____

PHASE OF WORK AND % OF COMPLETION: _____

ENVIRONMENTAL ASPECT	YES/ NO (✓ or X)	COMMENTS
How many workers are on site		
All new personnel on site are aware of the contents of the EMP and have been through the environmental awareness course.		
Contractor's camp is neat and tidy and the labourers' facilities are of an acceptable standard.		
Sufficient and appropriate firefighting equipment is visible and readily available.		
Waste control and removal system is being maintained.		
Refuse bins in place and maintained		
Toilets are in place and clean		
Demarcation and other fences are being maintained.		
What machinery are on site		
Drip trays are being utilised where there is a risk of incidental spillage		
Bunds/ drip trays are being emptied on a regular basis (especially after rain).		
No leakages (oil & fuel) are visible from construction vehicles		
No go areas, remaining natural features and trees have not been damaged.		
Dust control measures (if necessary) are in place and are effectively controlling dust.		
Noise Control measures (if necessary) is in place and is working effectively.		
Erosion control measures (if necessary) are in place and are effective in controlling erosion. (Access road, site areas etc.)		
Stockpiles are located within the boundary of the site, do not exceed 2 m in height and are protected from erosion.		

Completed by:…… Sign:…….. Date:……

To be submitted at the end of each week to the Environmental Site Officer (ESO)

Received by:

Environmental Site Officer: :…… Sign: Date:……

APPENDIX 9: ECO/ESO REPORT/CHECKLIST

ECO CONSTRUCTION SITE ENVIRONMENTAL INSPECTION REPORT

Project Name: _____ **Report no** _____

Main Contractor: _____ **Date** _____

ECO: _____ **EnviroAfrica Ref. no.** _____

ENVIRONMENTAL ASPECT	RATING	FINDINGS & RECOMMENDATIONS
RATING: 1 = EXTREMELY POOR 2 = POOR 3 = AVERAGE 4 = GOOD 5 = EXCELLENT		
1. **DEMARCATION** Boundaries of "no go" areas, construction sites, -offices, temporary storage areas as well as labourer's facilities must be demarcated (EMP and ECO requirements) and maintained for the length of the construction period.		
2. **NO-GO AREAS** Identified "No-Go Areas", must be demarcated for protection from construction damage (including secondary impact). • All areas outside of the demarcated construction site(s) and access road(s) to be regarded as NO-GO areas, including remaining natural veld identified trees. • Special attention to identified areas with significant vegetation.		
3. **SEARCH & RESCUE** All flora identified for search & rescue must be removed before any construction take place and re-used in pre-approved way.		
4. **VEGETATION & TOPSOIL REMOVAL** Before any construction or earthworks, topsoil must be stripped (>150mm) and stockpiled for rehabilitation/ landscaping. Stockpiles: • must be protected (erosion) and stored separately. • may not be moved further than 50m or mixed with any other soil. • must be convex and should not exceed 2m in height. In addition: • Cleared areas must be stabilized. • Burning or burying of cleared vegetation is prohibited (may be used for mulch or slope stabilisation on site).		
5. **CONSTRUCTION CAMP & SITE OFFICES** Must be demarcated, organised and free of day-to-day litter (good housekeeping standards).		

ENVIRONMENTAL ASPECT	RATING	FINDINGS & RECOMMENDATIONS
RATING: 1 = EXTREMELY POOR 2 = POOR 3 = AVERAGE 4 = GOOD 5 = EXCELLENT		
6. **LABOURER'S FACILITIES** Facilities must be of acceptable standards suitably demarcated, well maintained, neat and tidy and with adequate ablution facilities.		
7. **ENTRANCE AND HAUL ROADS** Only approved entrance and haul roads may be used. No new roads or parking areas may be developed without written approval from the ECO.		
8. **MANDATORY SITE EQUIPMENT** Mandatory site equipment must be in place, well maintained and in accordance with EMP and ECO requirements. • Sufficient refuse bins, well placed and cleaned regularly. • Sufficient fire extinguishers, readily available, maintained and functional. • Drip trays must be used at all fuel and oil storage and refuelling sites. • Toilets and sanitation facilities must be kept clean neat and hygienic.		
9. **FUEL STORAGE** Fuel storage areas must be situated within the demarcated construction camp site (or an area approved by the ECO). • Larger containers must be bunded (containment of accidental spillages). • Drip trays must be used during refuelling or under stationary refuelling vehicles. • Fuel and oil storage and refuelling sites must be maintained.		
10. **STOCKPILING & TEMPORARY STORAGE** May only be placed on pre-approved sites, demarcated, stabilised or organised and neat.		
11. **WASTE CONTROL** The contractor is expected to control all construction related waste material and general litter on actual construction sites and its immediate surroundings. • Waste management must be in accordance with the EMP, of acceptable standards, with regular removal of general waste, hazardous waste as well as construction waste (e.g. concrete waste and spoil).		
12. **CEMENT MIXING & BATCHING AREAS** Mixing areas must be approved by the ECO, suitably demarcated and may not result in pollution. • Polluted cement water may only be released into sedimentation ponds.		

ENVIRONMENTAL ASPECT	RATING	FINDINGS & RECOMMENDATIONS
RATING: 1 = EXTREMELY POOR 2 = POOR 3 = AVERAGE 4 = GOOD 5 = EXCELLENT		
• Sedimentation ponds must be maintained and cleaned regularly (and reinstated after use).		
13. **CONSTRUCTION VEHICLE MAINTENANCE** Construction vehicles must be in good working order and well maintained to prevent oil and fuel leakages and to reduce noise levels.		
14. **HEAVY EARTHMOVING EQUIPMENT** Construction vehicles and equipment may only operate within the demarcated site boundaries (and approved access roads), especially heavy earthmoving vehicles.		
15. **DUST CONTROL** Adequate control measures must be in place to prevent dust nuisance or pollution (entrance-, haul roads and exposed surfaces). • Areas of concern must be watered regularly during construction AND periods of strong winds, BUT must take water saving into account.		
16. **EROSION CONTROL** Erosion resulting from works must be controlled. • Temporary and permanent drainage areas must be maintained. • Erosion damage and damage in drainage courses must be reinstated.		
17. **NOISE CONTROL** Effective noise control measures must be in place and acceptable working hours must be kept (deviations must be approval by the ECO).		
18. **ARCHAEOLOGICAL & HERITAGE FINDS** Should any archaeological or heritage remains be exposed during excavations or any activity on site, these must immediately reported to The site agent/engineer, the ECO HWC or SAHRA.		
19. **METHOD STATEMENTS** Method statements must be submitted and approved before commencement of the works. **Possibly Required:** 1. Demarcation & No-Go Areas (Map) 2. Clearing of vegetation & topsoil conservation 3. Stockpiling & temporary storage 4. Construction camp & site offices 5. Labourer's facilities 6. Mandatory site equipment		

ENVIRONMENTAL ASPECT	RATING	FINDINGS & RECOMMENDATIONS
RATING: 1 = EXTREMELY POOR 2 = POOR 3 = AVERAGE 4 = GOOD 5 = EXCELLENT		
7. Fuel storage 8. Entrance & haul roads 9. Waste management 10. Cement/Concrete mixing 11. Dust control 12. Erosion control 13. Noise control 14. Rehabilitation **Additional Method Statements**		
20. **ENVIRONMENTAL CONDUCT** Environmental conduct of construction personnel must be acceptable (e.g. no burning or burying of refuse; no littering and no cement bags or other construction waste material lying around).		
21. **ENVIRONMENTAL CHECKLIST** The contractor must ensure that the weekly environmental checklist is completed at the end of each week and it must be available at the site offices.		
22. **REHABILITATION** On completion of the project or phase, all areas impacted by the construction activities must be reinstated and/or rehabilitated to the satisfaction of the ECO with emphasis on the following: • Site offices must be removed and the areas rehabilitated or reinstated to the satisfaction of the ECO. • Labourer's facilities must be removed and the areas rehabilitated or reinstated to the satisfaction of the ECO. • All construction site areas must be rehabilitated or reinstated to the satisfaction of the ECO. • All temporary fencing and demarcation must be removed and the areas reinstated to the satisfaction of the ECO. • Temporary storage areas must be rehabilitated or reinstated to the satisfaction of the ECO. • All remaining construction material must be removed and the areas rehabilitated or reinstated to the satisfaction of the ECO. • Any additional disturbed areas must be rehabilitated or reinstated to the satisfaction of the ECO.		
23. **SPOT FINES & PENALTIES**		

ENVIRONMENTAL ASPECT	RATING	FINDINGS & RECOMMENDATIONS
RATING: 1 = EXTREMELY POOR 2 = POOR 3 = AVERAGE 4 = GOOD 5 = EXCELLENT		
Spot fines and penalties must be recorded and documented by the ECO (in accordance with the EMP).		
24. **FIXED POINT PHOTOS** Photographs must be taken by the ECO, Site Engineer and or Site Manager, prior to, during and immediately after construction as visual reference. These photographs must be stored with other records relating to the EMP.		

ECO COMMENTS

End of report

ECO Signature

APPENDIX 10: Environmental incident report format

ENVIRONMENTAL INCIDENT REPORT

No. _____

PROJECT NAME			
PROJECT LOCATION			
SITE AGENT			
DATE OF INCIDENT		**TIME**	
BRIEF DESCRIPTION AND CAUSE OF INCIDENT:			
WHAT IMMEDIATE ACTIONS / CONTROL MEASURES WERE TAKEN:			
WHAT CORRECTIVE ACTIONS WERE TAKEN TO ENSURE NO REPEATS OF THE INCIDENT:			
ECO/ESO RESPONSE TO INCIDENT AND RECOMMENDATIONS:			
IS THIS INCIDENT A: ☐ **FIRST OFFENCE**	☐ **SECOND OFFENCE**	☐ **THIRD OFFENCE**	
SIGNATURE OF SITE AGENT: _____		**DATE** _____	
SIGNATURE OF ECO/ESO _____		**DATE** _____	
REMEMBER TO BE FACTUAL WHEN DESCRIBING THE INCIDENT			

APPENDIX 11: Environmental complaints register

COMPLAINTS REGISTER FORM

(To be completed by Site Agent/Supervisor)

NO.	DATE	NAME OF COMPLAINANT	CONTACT NO.	NATURE OF COMPLAINT	ACTION TAKEN TO RECTIFY COMPLAINT

APPENDIX 12: Method statement register

METHOD STATEMENT REGISTER		SITE AGENT:			PROJECT NAME:		
		CONTRACTOR:			PROJECT LOCATION:		
No.	METHOD STATEMENT ACTIVITY REFERENCE	DATE CREATED	DATE RECEIVED	CREATED BY	ACCEPTED / REJECTED	DATE APPROVED	APPROVED BY
1	Demarcation						
2	Clearing of vegetation and topsoil removal						
3	Stockpiling						
4	Temporary storage facilities						
5	Construction camp and site offices						
6	Fuel storage						
7	Labourer's facilities						
8	Entrance and haul roads						
9	Mandatory site equipment						
10	Waste management/control						
11	Cement mixing and batching areas						
12	Construction vehicle maintenance						
13	Dust control						
14	Erosion control						
15	Noise control						
16	Archaeological and heritage finds						
17	Rehabilitation						
18							

19	**Additional MS (Waste Licence requirements)**						
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

APPENDIX 13: Maps & Drawings

APPENDIX 14: Specialist studies

APPENDIX 15: Proof of compliance