

GROOT DRAKENSTEIN SEWER

DRAFT CONSTRUCTION ENVIRONMENTAL MANAGEMENT PROGRAMME

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Cape Town Office
14 Kloof Street, Cape Town, 8001

GROOT DRAKENSTEIN SEWER

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GLOSSARY OF TERMS, DEFINITIONS AND ABBREVIATIONS

Contractor	Contractor appointed to construct a given project as per the design and specifications prepared by a Consultant.
Contractors Camp / Construction Camp	The area allocated for the establishment of equipment, repair area, ablution facilities, lay down and rest areas, etc. It also serves as the central point for the storage of fuel and construction material.
Contaminated water	Water contaminated by the Contractor's activities, e.g. concrete water and runoff from plant / personnel wash areas.
Environment	The surroundings within which humans exist and that are made up of: <ul style="list-style-type: none"> a) The land, water and atmosphere of the earth; b) Micro-organisms, plant and animal life; c) Any part or combination of (a) and (b) and the interrelationships among and between them; and d) The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being
Environmental Control Officer (ECO)	Person responsible for monitoring compliance with the Environmental Management Plan (EMP) during the construction phase and advising the construction team on environmental matters relating to construction. In the case of this project the Resident Engineer takes on the role of ECO, as well as his other duties.
Environmental Impact Assessment (EIA)	A systematic process of identifying, assessing and reporting environmental impacts associated with an activity. EIA provides for the assessment of the nature, character and significance of these impacts and the identification of options for mitigating the adverse impacts and / or enhancing the positive impacts. There are two types of EIA – Basic Assessment for activities which are deemed to have a lower environmental impact and full EIA and Scoping for activities which are deemed to have a higher environmental impact.
Environmental Management Programme (EMP)	A document that sets out instructions that will be included in Contract documentation for the construction of a project. The EMP is designed to ensure the construction activities are conducted and managed in an environmentally sound and responsible manner. The EMP also details the organisational authority and structure required to ensure the effective implementation of the EMP and measures to monitor and improve the application of the EMP.
Environmental Specifications	Instructions and guidance for specific construction activities designed to help prevent, reduce and / or control the potential environmental implications of these construction activities.
Interested and Affected Parties (I&APs)	All persons who may be affected by the project either directly or indirectly, or who have an interest or stake in the area to be affected by the project.

Method Statement	<p>A written submission by the Contractor to the Resident Engineer in response to the Specification or a request by the Resident Engineer, setting out the plant, materials, labour, timing and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Resident Engineer when requesting the Method Statement, in such detail that the Resident Engineer and ECO is enabled to assess whether the Contractor's proposal is in accordance with the Specification and / or will produce results in accordance with the Specifications.</p> <p>The Method Statement shall cover applicable details with regard to:</p> <ul style="list-style-type: none"> • Construction procedures; • Materials and equipment to be used; • Transporting equipment to and from site; • How the equipment / material will be moved while on site; • How and where material will be stored; • The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or solid material that may occur; • Timing and location of activities; • Compliance / non-compliance with the Specifications; and • Any other information deemed necessary by the Resident Engineer.
Potentially Hazardous Substance	A substance which, in reasonable opinion of the Resident Engineer, can have a deleterious effect on the environment.
Rehabilitation	The return of a disturbed area, feature or structure to a state which approximates the state (where possible) which it was before disruption, or to an improved state.
Resident Engineer (RE)	An engineer appointed by the Design Consultant to oversee construction both in terms of the engineering and environmental context (i.e. acts as the Environmental Control Officer as well).
Solid Waste	All solid waste, including construction debris, chemical waste, excess cement / concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).
Spoil	Uncontaminated soil removed during excavations for civil works such as culverts and roads etc.
Subsoil	Soil horizons between the topsoil horizon and the underlying parent rock. Subsoil typically has more clay-like material than the topsoil and less organic content. Subsoil is of less value to plants, in terms of nutrient and oxygen supply than topsoil. When subsoil is exposed it tends to erode fairly easily.
Topsoil	The A (surface) horizon of the soil profile. Topsoil is the upper layer of soil from which plants obtain their nutrients for growth. It is often

	<p>darker in colour due to its organic content.</p> <p>Topsoil is deemed for the purposes of this specification as the layer of soil from the surface to the depth agreed upon on site between the Resident Engineer and Contractor.</p>
Water Body / Water Resource	Any open body of water including streams, dams, rivers, estuaries lakes and the sea.
Wetland vegetation	Vegetation that is indicative of a wetland environment, for example, sedges, rushes, reeds, hydrophilic grasses and ground covers.
Wetland	Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is periodically covered with shallow water and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

1 INTRODUCTION

1.1 Introduction

This document represents the draft Construction Environmental Management Programme (EMP) for the Groot Drakenstein Sewer project.

The proposal is for the construction of a new 5.79 km gravity sewer to transport sewerage from the existing housing community on Erf 1006/1 (Meerlust) and various neighbouring farms northwards to the Pearl Valley Wastewater Treatment Works. The proposed sewer will begin on the southern portion of the Meerlust site and continue in a north easterly direction.

The sewer will then pass across the Berg River to a pump station located adjacent to the Berg River on Erf 913. From there, wastewater will be pumped through a rising main of approximately 600 m into an existing manhole on Erf 826/11 where it will join an existing sewer which will transport the wastewater via gravity to the Pearl Valley wastewater treatment works.

The sewer pipeline will therefore comprise the following:

- 1 640 m of 200 mm diameter Class 34 (Heavy Duty) uPVC gravity sewer main;
- 1 700 m of 250 mm diameter Class 34 (Heavy Duty) uPVC gravity sewer main;
- 1 850 m of 300 mm diameter Class 34 (Heavy Duty) uPVC gravity sewer main;
- 600 m of 110 mm diameter Class 12 rising main (Design flow = 12l/s); and
- One sewage pump station with two submersible pumps (duty, stand-by) capable of delivering 12l/s each. The footprint of the pump station will be approximately 36 m².

The sewer will have a peak throughput of 6 litres per second.

The trench associated with the sewer will be a maximum of 0.9 m wide by 3.6 m deep. A 5m wide servitude will be required for the sewer.

The route falls within the jurisdiction of the Stellenbosch Local Municipality and Drakenstein Local Municipality.

This document is in draft form as the Environmental Authorisation for the project is yet to be granted by the competent authority, namely the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP). Should the environmental authorisation be granted, this document will be updated accordingly to reflect the conditions set therein. Before construction is to commence, the final EMP must first be approved by the DEA&DP.

1.2 Details of the Applicant and Project Team

The Applicant is the Cape Winelands District Municipality (CWDM). The CWDM appointed Aurecon (Pty) Ltd as the consulting engineers for the project and Arcus GIBB (Pty) Ltd (GIBB) as the independent Environmental Assessment Practitioner (EAP) to conduct the Environmental Impact Assessment (EIA) for the project. Given the nature of the proposed development it was confirmed with the DEA&DP that in line with the 2010 EIA Regulations, the EIA would take the form of a Basic Assessment. In light of the sensitivity of the existing environment (refer to Section X below), GIBB appointed a heritage specialist (Bridget O'Donoghue), botanical specialist (Robin Jangle) and aquatic ecology specialist (Earl Herdien) to assist with the investigation of the impacts of the proposed pipeline on the environment.

1.3 Purpose of the Environmental Management Programme (EMP)

The purpose of the EMP will be to minimise or prevent the potential negative environmental impacts associated with the construction phase of the project, and / or to enhance any positive environmental impacts. The effective implementation of the EMP will ensure that the construction activities are undertaken and managed in an environmentally sound and responsible manner.

This document describes mitigation measures and is partly prescriptive, identifying specific people to undertake specific tasks. The EMP will be used by the Applicant, along with the Contractor (and its Sub-contractors), to ensure that a minimum scope of activities to manage the potential environmental impacts associated with the construction of the Groot Drakenstein Sewer is applied and maintained by appointed parties.

In general terms, it is expected that the EMP will be used to:

- Ensure that the Contractor clearly understands the level of environmental responsibility required during the execution of his construction phase Contract;
- Mitigate the predicted adverse impacts of the development proposals and measures that enhances the beneficial effects of the proposed activities; and
- Enable the Environmental Control Officer (ECO) to measure compliance with the environmental management requirements.

The EMP will be incorporated into the Contract for the Contractors working on the project, as guidance on the expected content, focus and minimum scope of coverage of instructions for construction activities. It is expected that the Contractor will review the 'Library of Environmental Specifications' listed in this EMP and will abide by these.

2 PROJECT DESCRIPTION

2.1 Development Concept

The sewerage generated by the existing community on Erf 1006/1 is currently stored in a septic tank and collected on a weekly basis by the CWDM. The sewerage is collected by truck and transported to an existing WWTW for disposal. This method of sewerage collection is expensive and also has the added risk of overflowing of the tank should a collection be missed. Sewage from the surrounding farms is currently dealt with on-site.

The local municipalities are responsible for Basic Service Delivery and have identified the need for the improvement of the sanitation services to the above community. To do this, the CWDM are proposing the construction of a gravity line sewer from the Meerlust property to the Pearl Valley Wastewater Treatment Works.

2.2 Proposed Activities

The construction phase of the Groot Drakenstein Sewer is expected to take approximately 6 months to complete.

The proposed construction activities will include:

- **Site establishment** which will include the establishment of the Contractor's Camp including the establishment of fuel storage tanks, site offices, workshop, site materials storage hut, portable ablution facilities etc, determination of stockpile and laydown areas, transportation of plant to the site (excavator, TLB, portable concrete mixer, trench compactors, water bowser, angle grinders, generators, cutting torch and oxyacetylene tanks), transportation of materials to site (cement, river sand, concrete stone, reinforcing steel), ensure that plant, equipment and materials are safe, establishment of site security (night and day), erection of signage, notice to community regarding commencement of construction activities, mobilisation of labour, establishment of waste management system, establishment of emergency response system etc;
- **Site clearing** within the pipeline corridor. A corridor of 10m will be cleared for the construction of the pipeline. Site clearing will include the transportation of excavators / TLBs onto that particular area of site. The vegetation will be systematically removed, topsoil to the required depth collected and stockpiled;
- **Trench excavation.** The trench will be 2m in depth. Trench excavation will include: transportation and laying of the pipe sections alongside the trench, trench excavation using an excavator, controlled blasting of rock (where required), stockpiling of excavated sub-soil alongside the trench, placement of safety barricades alongside the trench;
- **Pipe laying** which will include the preparation of the bottom of trench (partial backfilling of trench bottom with free-draining granular material, levelling and compaction using a trench compactor), picking up of pipes using an excavator or TLB, lowering of pipes into the open trench using an excavator or TLB, connection of adjacent pipes, air testing of pipes using a compressor to pump air into the pipeline and air pressure measurement;
- **Trench backfilling and compaction** including wetting of stockpiled materials using a water bowser to ensure the correct moisture content, moving of wetted material back into the trench using a TLB in layers of 300mm, compaction of layers to the required densities using a trench compactor;
- **Construction of manholes** including concrete mixing, cutting and fixing of steel, securing of shutters, pouring of concrete, curing of concrete, touching up of concrete works where required,

water testing of manhole by filling with treated effluent and observing for leaks, marking of manholes, securing manholes with heavy concrete/ metal lid;

- **Testing of the sewer line** including pumping of raw sewerage into the line and monitoring of selected manholes for flow;
- **Site rehabilitation** including dismantling and removal of all signage, plant, equipment, unused materials and waste, collection and spreading of stockpiled topsoil within all disturbed areas and rehabilitation / re-vegetation of the disturbed areas; and
- **Site closure and handover** including completion of all paper work and formal handover to the system operator.

2.3 Description of the Existing Environment

The proposed route of the Groot Drakenstein Sewer is shown in Appendix A. The proposed sewer begins at the centre of the Meerlust property before running in a northerly directly along property's western boundary. After crossing the south western corner of Riversmead farm, the sewer enters the Bien Donne property before turning north westwards and entering the Langerust property followed by Niewe Sion, Watervliet 2, Watervliet 3 and Berg River Farms. On Berg River farms, the sewer crosses the Berg River and enters a pump station from where the sewerage will be pumped via a rising main to join with the existing sewer on Kliprug which will take the sewerage to the Pearl Valley Wastewater Treatment Works.

The proposed route is located in the Berg River Valley near Pniel and Franschoek. The Berg River Valley is created by a ring of surrounding mountains including Simonsberg (approximately 5km south west), the Groot Drakenstein Mountains (approximately 6km south), the Klein Drakenstein Mountains (approximately 6km east) and the Paarl Mountain (approximately 13km north). The valley is characterised by neatly ordered farmlands with areas of forestry located on the mountain slopes between the agricultural lands and mountain fynbos.

The area through which the sewer passes is generally made up of naturally vegetated land and farmlands mainly comprising vineyards, orchards and pastures.

The farms which the sewer crosses are listed below:

- **Meerlust (Erf 1006/1):** The majority of the property is vacant comprising natural vegetation. A development of 32 dwellings is located towards the centre of the property. The proposed sewer will begin in the vicinity of these properties and run across the middle of the site to the western boundary of the property. From there the sewer will run in a northerly direction along the property's western boundary which borders Werda Farms (Erf 982). The sewer passes through the natural vegetation; with the northern part of the property having been identified for protection as a Critical Biodiversity Area by Cape Nature.
- **Riversmead (905):** The pipeline passes for a short distance along the property's south western boundary before turning in a northerly direction to run along an existing dirt road.
- **Bien Donne (904):** For the majority of its length on this property, the proposed sewer follows an existing dirt road from the southern boundary of the property to the western boundary of the property. Approximately 400m before the western boundary the property, the sewer leaves the road and passes through pastureland.
- **Langerust (946/5):** The proposed sewer runs across the centre of the property from the south eastern to north western boundaries. It passes along the edge of a vineyard.

- **Niewe Sion (1223):** The sewer runs along an existing farm road in the western part of the property, from the southern to northern property boundaries.
- **Watervliet 3 (1224/3):** The sewer is located in the northern eastern part of the property from the southern to northern site boundaries. For the majority of its length the sewer runs along an existing farm road and farm track, passing through a small section of vineyard near the southern boundary.
- **Watervliet 2 (1224/2):** The sewer runs along an existing farm track between two vineyards in the north eastern part of the property from the southern to northern boundaries.
- **Berg River Farms (913):** The sewer enters the south eastern corner of the property passing through disturbed naturally vegetated land to cross the Berg River. On the eastern bank of the Berg River the sewer passes through natural riverine vegetation before entering the pump station which will be constructed on Erf 913. A rising main then continues in a north easterly direction through a vineyard to the northern eastern boundary of the property.
- **Kliprug (826/11):** The rising main enters the south western corner of the property and passes through naturally vegetated ground before entering the existing manhole to an existing gravity sewer which will take the sewerage to the Pearl Valley Wastewater Treatment Works.

The site is located in the Western Cape which has a Mediterranean climate experiencing winter rainfall and dry hot summers. The mean annual precipitation for the study site ranges between 750 mm to 1000 mm¹.

The gradient of the proposed route is less than 1:10 (the gradients vary from 0.84% to 0.65% to 0.50% along its route). The mountains of the Berg River Valley comprise the Peninsula Formation of the Table Mountain Group. The Peninsula Formation is made up of a very homogeneous ortho-quartzite, which is very hard and resistant to erosion. The proposed route is anticipated to be located on Quaternary alluvial deposits, which are derived weathering and erosion products from the Table Mountain Group. A study undertaken on the Meerlust property in 20071 indicates that, based on regionally available groundwater data sets, although the groundwater is of good quality, the hydraulic conductivity of the area is low and thus the groundwater yield is low, occurring mainly within a fractured aquifer setting.

The proposed route is located near the centre of a Grade One Heritage Site.

The northern part of the Meerlust Site has also been identified for protection as a Critical Biodiversity Area by Cape Nature.

Various farmsteads and farm dwellings are located in proximity to the route, some within 100m of the route. The sewer begins at the 32 dwellings occupied by ex-SAFCOL employees on Erf 1006/1.

In consideration of the above, the following key sensitive receptors have been identified for consideration in this EMP:

- The Grade One Heritage Site;
- The Critical Biodiversity Area on the Meerlust site;
- Residents of the nearby farmhouses and dwellings on Meerlust; and
- The Berg River.

Further detail is provided below.

2.3.1 Heritage

The study identified little significant impacts to historic structures, tree roots or tree trunks during construction phase. The little possible damage can be mitigated by adherence to the mitigation measures during construction. There are no significant impacts during operation with similar low impacts should any

¹ Conrad J (2007). Geohydrological Assessment – Proposed Mining Area, Meerlust, Western Cape: GEOSS Report No: G2007/08-02. Stellenbosch.

maintenance activities take place.

2.3.2 Botanical Assessment

It was found that, with the exception of Meerlust 1006/1, the preferred (proposed) pipeline route traverses entirely transformed environment and no significant impacts are associated with the construction and operation thereof.

Meerlust 1006/1 however, is for the most part good to excellent condition Swartland Alluvium Fynbos and considered irreplaceable. The preferred (proposed) pipeline route will have significant residual impacts if positioned through this remnant.

2.3.3 Aquatic Environment

The proposed development site investigated was in a predominantly good water quality state; with moderately to highly transformed habitat integrity however with poor condition riparian vegetation. In terms of the sampling site's ecological importance and sensitivity it was assessed as being high and classed as a D-class in respect to its overall ecostatus ecological management category.

The report notes that water quality impairment, flow modification and bed modification are the likely impacts to occur with the proposed construction and during the maintenance period of the proposed development. The potential impacts identified can be mitigated with the sound implementation of management measures and an environmental management programme

2.3.4 Archeology

The study identified no significant impacts to pre-colonial archaeological material and thus no mitigation measures are recommended. The affected environment is not a sensitive or threatened archaeological landscape.

3 POTENTIAL IMPACTS AND MITIGATION MEASURES

This section outlines the potential impacts and recommended mitigation measures that were identified during the Basic Assessment.

3.1 Potential Impacts

3.1.1 Heritage

3.1.1.1 Construction Phase

Impact 1: Damage to Tree trunks and roots

The potential hazards to existing trees are equipment, soil and machinery damaging branches, trunk and root system in addition to water and debris depositing around trunk.

Most of the trees on the various farms are a safe distance from construction activities. The areas of concern include the avenue of trees adjacent to the proposed pipeline route situated within the informal farm 5m wide roadway on Bien Donne, the mature trees situated adjacent to a section of the proposed pipeline near the cottage on Langerust, and the single immature Oak tree adjacent to the pipeline route on Watervliet 2.

The impacts at Bien Donne can be avoided by aligning the pipeline route in the centre of the roadway and construction team adherence to the Method Statement for the protection of trees in the Construction Environmental Management Programme. The impacts on trees at Langerust can be mitigated by aligning the pipeline closer to the garden shrubbery when adjacent to the cottage, aligning the pipeline route in the centre of the roadway when in-between vineyards, as well as adherence to the Method Statement for the protection of trees and vineyards. The impacts to the immature Oak at Watervliet 2 can be mitigated by adhering to the Method Statement: Protection of trees and vineyards.

Impact 2: Damage to Historic Structures

Generally, there is little expected damage to historical structures as they are mostly a safe distance from the proposed pipeline trench construction.

There are two main structures of concern:

- Bien Donne Agricultural complex: residential boundary walls of the residences;
- Langerust: residential building over 60 years (not graded in terms of cultural significance);

Mitigation of impacts at Bien Donne can be accomplished by aligning the pipeline in the centre of the roadway and by demanding adherence to the Method Statement for the protection of historic structures in the Construction Environmental Management Programme. Impacts at Langerust can be mitigated by aligning the pipeline route closer to the orchard/vineyard when adjacent to water tank and by adhering to the Method Statement for the protection of historical structures.

3.1.1.2 Operational Phase Impact

There are few significant impacts during the operational phase, but would be the same as those during construction phase should maintenance activities include excavation.

3.1.2 Botanical

3.1.2.1 Construction Phase

Impact 1: Loss of Swartland Alluvium Fynbos (Critically Endangered)

Deep soil disturbance in fynbos vegetation is not irreversible to the extent that it will revert to vegetation of the same structure and floristic diversity prior to the disturbance incident²

Swartland Alluvium Fynbos is listed as Critically Endangered as per Anon, 2008³. The Biodiversity Act (Act 10 of 2004) provides for listing of threatened or protected ecosystems in one of four categories with **Critically Endangered** being the rank assigned to ecosystems with the highest risk of being entirely irreversibly transformed. According to the 2009 NSBAP assessments, 75% of the original extent of Swartland Alluvium Fynbos is transformed, therefore the extent of remaining natural habitat in the ecosystem is less than its biodiversity target (30%).

The intensity of this impact is rated as “High” due to all untransformed remnants being viewed as “irreplaceable” (*i.e.* essential for meeting National targets).

Impact 2: Loss of species of conservation concern

The proposed preferred pipeline route traverses through populations of *Lachenalia pustulata* (NT), *Babiaba villosula* (EN), *Monsonia speciosa* (EN) and *Arctotis angustifolia* (CR). Of these four taxa *M. speciosa* and *A. angustifolia* will be significantly negatively impacted if the pipeline follows the preferred route – the populations occur within the road reserve and nowhere else on the site. The habitat in the road reserve is sand over cobbles – unlike the rest of the site which is a typical alluvium substrate (*i.e.* cobbles).

Arctotis angustifolia is of particular concern as this sub-population is one of only two that constitute the known extant population of approximately 250 individuals.⁴

The route also traverses to within 25m of a population *Serruria gracilis* (CR). Helme *et al*⁵ state that subsurface drainage (hydrology) is a key determinant of community structure in alluvium fynbos. It is also a key determinant of species composition, given that taxa have a range of tolerance to environmental parameters (which includes soil moisture regime). Excavation and backfilling of the trench as well as placing a physical obstruction in the soil (the actual pipe) could affect the subsurface flow and therefore the moisture retention and ultimately lead to the demise of this taxon at the site.

This impact has been rated “Medium to High with mitigation” as *Lachenalia pustulata* and *Babiaba villosula* can be translocated to elsewhere on the site. However in the interests of best practice this impact is best avoided rather than attempt to mitigate it partially.

3.1.2.2 Operational Phase

Impact 1: Loss of Swartland Alluvium Fynbos (Critically Endangered)

According to the 2009 NSBAP assessments, 75% of the original extent of Swartland Alluvium Fynbos is transformed, therefore the extent of remaining natural habitat in the ecosystem is less than its biodiversity target (30%).

This impact must be avoided as there is no mitigation for the loss of irreplaceable remnants.

² De Villiers *et al* (2005)

³ Anon (2008)

⁴ Helme, N.A. *et al* (2009)

⁵ in De Villiers, C.C., *et al* (2005)

Impact 2: Loss of exiting indigenous plant communities

The pipeline must be constructed of high quality materials with a long life expectancy to negate the possibility of leakage due to material and/or joint failure. Furthermore all *Acacia mearnsii* (black wattle) must be removed where they are within seven metres of the pipeline.

3.1.3 Aquatic

3.1.3.1 Construction Phase

Impact 1: Water Quality Impairment

In a direct sense, water quality impacts by construction equipment, vehicles and material will be a likely water quality impairment point source. From an indirect and non-point source, runoff of building materials (e.g. cement) into the river during construction of the pipeline/bridge is also possible.

The water quality impacts during the construction phase in particular should be addressed through the compliance of an Environmental Management Plan/Programme, implementation of which is monitored by an on-site Environmental Officer. Runoff from the construction site should be prevented from directly entering the Berg River as far as possible by implementing features such as the use of silt/sand traps and other measures. Construction should also preferably take place during the drier months when runoff is low.

A buffer refers to a riparian area adjacent to the water body that comprises of natural or near-natural vegetation, designed to protect aquatic and riparian areas from the impacts associated with various human activities. Buffers serve to reduce the levels of sediment and pollutants from directly entering the rivers and wetlands. A buffer zone should therefore be adopted to protect aquatic habitats from the impacts associated with any development.

Impact 2: Flow Modification

Infilling and compacting of soil layers covering the pipeline is likely to alter the sub-surface flow from the terrestrial surroundings to the river as well as the flow through the channel banks. This may cause the river flow to increase or be impeded. Nevertheless, the erosion potential of the river will be compromised and is likely to cause erosion at the point of infilling or downstream of such point. However, this is seen as a small surface area impact as well as only short term.

Due to the small section of the river being impacted by flow modification, some channel straightening should be undertaken in the section, so as to not cause any erosion potential at the development points within the banks or channel bed. If significant straightening of the channel is considered, the past flow velocity, volume and variability data would have to be assessed so as to mimic and maintain as natural a flow regime post construction.

Impact 3: Loss of riparian habitat and bed / bank modification

The loss of instream and riparian habitat and modification to the bed or banks of the stream, at the proposed site and immediately downstream is highly likely.

During the construction phase of the project, the impact on the riparian zone of the river system should be kept to a minimum, particularly in the channel margins and wetbanks. Impacted areas should be re-vegetated as soon as incurred. No significant soil embankments must become exposed for long periods as a result of run-of-river erosion potential and potential freshets.

Any impacted areas within the riparian zone should be rehabilitated, specifically to re-vegetate the area with suitable vegetation. It is desirable to maintain and re-establish a buffer strip of at least 30m to

protect the river from the impacts to the site. However, this should be addressed in consultation with farming rights and farm management (as cultivation takes place in the upper riparian zones).

Cumulative impacts

The cumulative impact is associated with upstream disturbances impacting on the proposed site development and includes the regulated “new Berg River dam” as well as associated surrounding agricultural and township land-uses. With effective implementation of the EMP and the recommended mitigation measures, the condition of the stream will be maintained at an acceptable level. In the context of the proposed development’s potential impacts cumulatively becoming realise, the effect would remain localised but will require rehabilitation as soon as occurred.

3.1.3.2 Operational Phase

Impact 1: Water Quality Impairment

Due to the nature of the development (sewer), the potential for leaks and damage to the pipeline is largely unlikely, but will provide a high water quality impact should any sewer water leak into the river directly or indirectly during the operations phase of the development.

Cumulative Impacts

The significance of cumulative impacts are not relevant to the operations phase.

3.1.4 Archeology

The study identified no significant impacts

3.2 Recommended Mitigation Measures

3.2.1 Heritage

3.2.1.1 Construction Phase

Mitigation 1: Damage to Tree Trunks and Roots

The impacts at Bien Donne can be avoided by aligning the pipeline route in the centre of the roadway and construction team adherence to the Method Statement for the protection of trees in the Construction Environmental Management Programme. The impacts on trees at Langerust can be mitigated by aligning the pipeline closer to the garden shrubbery when adjacent to the cottage, aligning the pipeline route in the centre of the roadway when in-between vineyards, as well as adherence to the proposed mitigation measures for the protection of trees and vineyards. The impacts to the immature Oak at Watervliet 2 can be mitigated by adhering to the Method Statement: Protection of trees and vineyards.

Mitigation 2: Damage to Historic Structures

Mitigation of impacts at Bien Donne can be accomplished by aligning the pipeline in the centre of the roadway and by demanding adherence to the Method Statement for the protection of historic structures in the Construction Environmental Management Programme. Impacts at Langerust can be mitigated by aligning the pipeline route closer to the orchard/vineyard when adjacent to water tank and by adhering to the proposed mitigation measures for the protection of historical structures.

3.2.1.2 Operation Phase

There are few significant impacts during the operational phase, but would be the same as those during construction phase should maintenance activities include excavation.

The mitigation measures would thus, also be the same as those presented for the construction phase.

3.2.2 Botanical

3.2.2.1 Construction Phase

Mitigation 1: Loss of Swartland Alluvium Fynbos (Critically Endangered)

According to the 2009 NSBA assessments, 75% of the original extent of Swartland Alluvium Fynbos is transformed, therefore the extent of remaining natural habitat in the ecosystem is less than its biodiversity target (30%).

This impact must be Avoided as there is no mitigation for the loss of irreplaceable remnants.

Mitigation 2: Loss of species of Conservation Concern

Geophytes such as *Lachenalia pustulata* and *Babiana villosula* can be translocated to elsewhere on the site. This is however somewhat idealistic. This would entail a site assessment to locate all individuals. These would then be marked and the site would need to be visited throughout the growing season to harvest the seed capsules. Once the plants are entering dormancy they can be exhumed. This is however not a straightforward task in rocky alluvium soils. A similar habitat would need to be identified where the plants will be translocated to and the task of excavating suitable planting holes would then be undertaken.

Whilst this may be feasible for these two taxa, it is not necessarily so for the other species of conservation concern. *Monsonia speciosa* produces extensive rhizomatous roots that are difficult to harvest and *Arctotis angustifolia* is unknown from a horticultural perspective.

This impact is best Avoided. The precautionary principle is being applied as we cannot guarantee the survival of the taxa after translocating. Personal experience of re-introductions and translocations has been negative – the survival rate is low and on occasions 100% mortality has been observed.

3.2.2.2 Operational Phase

Impact 1: Loss of Swartland Alluvium Fynbos (Critically Endangered)

According to the 2009 NSBAP assessments, 75% of the original extent of Swartland Alluvium Fynbos is transformed, therefore the extent of remaining natural habitat in the ecosystem is less than its biodiversity target (30%).

This impact must be avoided as there is no mitigation for the loss of irreplaceable remnants.

Impact 2: Loss of exiting indigenous plant communities

The pipeline must be constructed of high quality materials with a long life expectancy to negate the possibility of leakage due to material and/or joint failure. Furthermore all *Acacia mearnsii* (black wattle) must be removed where they are within seven metres of the pipeline.

As a result to avoid the degradation of a critical biodiversity area in Meerlust 1006/1 the Botanical study recommends a preferred ecological alternative route for the pipeline.

3.2.3 Aquatic

3.2.3.1 Construction Phase

The following measures are recommended to mitigate likely impacts of the pipeline construction:

- No construction vehicles should be allowed within 15m of the berg river water edge, except for those authorised to undertake activities applied for under section 21 c & i of the National Water Act (Act 36 of 1998) and/or within the context of an endorsed Water-Use License. Limited disturbance should be allowed within this buffer zone and as far as possible the disturbed areas should be rehabilitated with vegetation characteristic of the area's biodiversity.
- Where the pipeline route crosses the drainage lines, there should be minimal use of machinery and disturbance within these areas should be kept to a minimum.
- The rehabilitation and re-vegetation of disturbed areas must take place during or immediately after construction is complete. Only appropriate indigenous riparian vegetation may be used for rehabilitation and re-vegetation within the disturbed area.
- Clearing or felling of all alien invasive trees should take place along the pipeline route.
- Colonisation by alien invasive vegetation must be removed as soon as noted.
- Clearing of debris and hard rubble associated with the construction activities should be undertaken on completion of the pipeline construction activity.
- Stormwater associated with the construction activities must be prevented from entering the river as far as possible.
- Other activities that may lead to elevated levels of turbidity must be minimised. If possible construction activities should take place during the low rainfall months when run off volumes will also be low.
- Pipeline installation must not significantly obstruct the natural movement of water through the surrounding landscapes' soil profile (can result in localised damming and formation of wet areas or ponds).
- Manholes, if possible, should be located as far as possible away from water features and pipelines should be regularly monitored for spillages.

3.2.3.2 Operational Phase

Mitigation 1: Water Quality Impairment

Routing maintenance checks on the pipeline must be performed to check for leaks as part of the proposed development adopted Environmental Management Programme. Any such leaks must be repaired immediately and be handled as a disaster management priority.

As part of EMP general maintenance work, any pollutants or rubble should be removed from the river during the dry season so as to reduce the likelihood of pollution within the river. The restoration of a good riparian buffer on areas where vegetation has been cleared will also restore the ability of the river to restore water quality levels where impacted.

The following design features of the pipeline will further mitigate the risks of the sewer pipeline bursting or leaking:

- The pipe will be made of High Density Polyethylene (HDPE) with butt welded joints.
- The pipe will be pressure tested upon completion of the installation to confirm the integrity of the pipe's strength/durability/leakage.
- All other quality assurance criteria as specified by SANS 1200 will be adhered to.

3.2.4 Archaeology

The study identified no significant impacts and therefore recommends no mitigation measures and

concludes that the project is viable.

3.2.5 Cumulative Mitigation Measures for Construction and Operation Phase

- The rehabilitation and re-vegetation of disturbed areas must take place during or immediately after construction is complete. Only appropriate indigenous vegetation may be used for rehabilitation and re-vegetation within the disturbed area.
- Clearing or felling of all alien invasive trees should take place along the pipeline route.
- Clearing of debris and hard rubble associated with the construction activities should be undertaken on completion of the pipeline construction activity.
- A suitably qualified Environmental Control Officer must be appointed to monitor construction activities until completion of the construction phase.

4 LEGISLATIVE CONTEXT

4.1 National, Local and Regional Legislation

All legislation applicable to the development must be strictly enforced during the construction phase. The contractor must be acquainted with the relevant environmental legislation, including provincial and local government regulations, which are in place to ensure the protection of the environment. The environmental legislation applicable to the project include, but are not limited to, the following:

- The Constitution of the Republic of South Africa, 1996;
 - National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA);
 - NEMA: Air Quality Management Act (Act No 39 of 2004);
 - National Water Act (Act No 36 of 1998);
 - Hazardous Substances Act, 1973 (Act No 15 of 1973);
 - Fire Brigade Services Act, 1987 (Act No 99 of 1987);
 - National Heritage Resources Act, 1999 (Act No 25 of 1999);
 - Conservation of Agricultural Resources Act, 1977 (Act No 103 of 1977);
 - Occupational Health and Safety Act, 1993 (Act No 85 of 1993); and
 - The White paper on integrated pollution and waste management of South Africa.
-

4.2 Water Use (Licence / Registration under General Authorisation)

In accordance with Section 21(c) of the National Water Act (Act no 36 of 1998), due to the proposed sewer crossing the Berg River, a Water Use Licence has been applied from the Department of Water Affairs (DWA) for the *'impeding or diverting the flow of water in a watercourse'*.

It should also be noted that Section 21(a) requires that a Water Use Licence / Registration Certificate is required for *'taking water from a water resource'*.

Subject to the requirements of the General Authorisation published in Government Notice No. 399 of 26 March 2004 and extended by Government Notices No. 313 of 20 March 2009 and 837 of 23 September 2010, a water use must be registered with the DEA prior to the commencement of:

*"taking more than 50 cubic metres from surface water or 10 cubic metres from groundwater on any given day; or
a combined storage of more than 10 000 cubic metres of water per property."*

Should the volumes be greater than a Water Use Licence will be required.

Therefore, should the Contractor require that water is abstracted from the Berg River or other water resource, the necessary registration certificate or water use licence must have been obtained from the DWA prior to the commencement of the construction works and associated abstraction.

Should water be abstracted prior to the registration certificate / water use license being issued by DWA, this would constitute an offence in terms of the NWA, and would be punishable by a fine or imprisonment.

5 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PROGRAMME

5.1 Roles and responsibilities

The following section details the roles and responsibilities of the various parties involved in the project. In order to ensure sound development and effective implementation of the Construction EMP, it is necessary to identify and define the responsibilities and authority of the various persons and organisations that will be involved in the project.

During construction, all instructions and official communications regarding environmental matters shall follow the generic organogram shown in **Figure 2**. It is noted that the structure may require revision as the project unfolds.

The CWDM will appoint a Consultant / Engineer / Project Manager (hereafter referred to as the 'PM') to administer the Contract for the proposed development. The Engineer will in turn appoint a Resident Engineer (RE) on site to co-ordinate and monitor the Contractor during the construction of the works.

An Environmental Control Officer (ECO) will be appointed to oversee the implementation of the EMP on site. It will be the responsibility of the ECO to consult with the RE regarding instructions pertaining to contravention, corrective actions, penalties or working methods. Except in an emergency situation, where instructions may be given directly to the Contractor, all instructions given by the ECO shall go through the RE / PM, who will then convey these to the Contractor. The Contractor will be responsible for appointing an Environmental Officer (EO) who will act as the public liaison officer. All complains / comments received from the public must be logged in a Complaints Register by the EO. Any comments requiring input from the ECO must be forwarded to the ECO by the RE for addressing.

The EMP will be an item on the agenda at the monthly site meetings, and the ECO shall attend these meetings in order to provide input with respect to compliance with the EMP. Copies of the minutes will be sent to the CWDM.

The roles and responsibilities of these parties are expanded upon in the following sections.

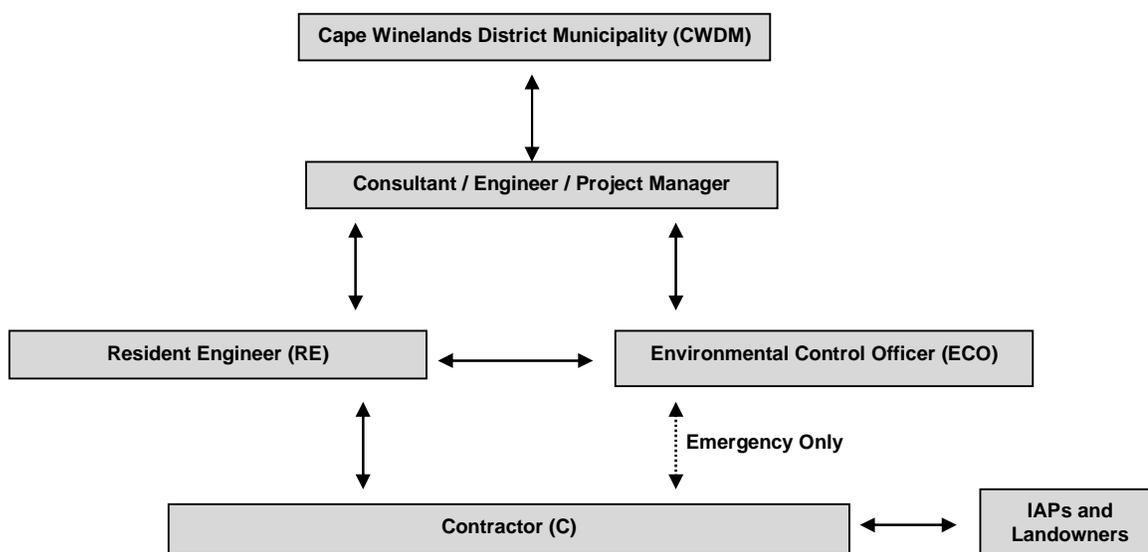


Figure 2: Organisational / Reporting Structure for implementation of the EMP

5.2 The Department of Environmental Affairs and Development Planning

The Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) is the designated authority responsible for authorising the Basic Assessment and EMP. The DEA&DP has overall responsibility for ensuring that the Applicant complies with the conditions of its Environmental Authorisation as well as this EMP.

5.3 Consultant / Engineer / Project Manager

The Consultant / Engineer / Project Manager (hereafter referred to as the 'PM') will be responsible for the overall management of the project and the implementation, administration and enforcement of the EMP. Responsibilities shall include:

- Ensuring that the EMP specifications are included in all tender documents issued for the development works and activities on site, and shall ensure that the prospective Tenderers / Contractors abide by the provisions thereof;
 - Appointing an ECO to monitor implementation of and compliance with the EMP for the duration of the works. The RE may be required to fulfil this function when the ECO is not available;
 - Support the RE in enforcing the environmental specifications of the EMP;
 - Being liable/accountable, to the relevant authority, DEA&DP, for any contravention/non-compliance by any Contractor under their supervision; and
 - Through the RE, issuing fines or stop works orders for contravention of the EMP and giving instruction regarding corrective action.
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5.4 Resident Engineer (RE)

The RE will be responsible for overseeing the site works, liaison with the Contractor, PM, and ECO. The RE will be responsible for monitoring, reviewing and verifying compliance with the EMP by the Contractor when the ECO is not available. The RE's duties will include:

- Compliance with the contents of this EMP specifications to ensure that the requirements of the EMP are met;
- Monitoring and verifying that the EMP is adhered to at all times and take action if the specifications are not followed;
- Monitoring and verifying that environmental impacts are kept to a minimum;
- Reviewing of Construction Method Statements in conjunction with the ECO;
- Assisting the Contractor in finding environmentally responsible solutions to problems with input from the ECO;
- Keeping records of all activities/incidents concerning the environment in the site diary;
- Inspecting the site and surrounding areas regularly with regard to compliance with the EMP;
- Attending regular Contractor meetings and monthly site meetings with the project management team;and
- Ordering the removal of, or issuing spot fines for, person(s) and/or equipment not complying with the specifications of the EMP.

5.5 Environmental Control Officer (ECO)

The ECO will be responsible for ensuring that the EMP is implemented by the Contractor by undertaking compliance monitoring, review and verification audits. In particular, the ECO shall:

- Be appointed by the PM to monitor all activities on site;
- Visit/inspect the site on a monthly basis, to ascertain the level of compliance of the works with the EMP, as well as attend Contractor's meetings when necessary and monthly site meetings with the project management team and report back on the environmental issues;
- Maintain inspection audit reports on file;
- Assist the PM in ensuring that necessary environmental authorisations and permits have been obtained;
- Monitor and verify that the EMP is adhered to at all times and take action if the specifications are not followed;
- Monitor and verify that environmental impacts are kept to a minimum;
- Review and approve construction Method Statements together with the RE;
- Assist the Contractor in finding environmentally responsible solutions to problems;
- Respond to any public comments / complaints forwarded by the Contractor;
- Provide environmental awareness training for all new personnel coming onto site;
- Advise on the removal of person(s) and/or equipment not complying with the specifications;
- Recommend the issuing of fines for transgressions of site rules and penalties for contravention;
- Maintain a photographic record of the site before, during and after construction; and
- Ensure that activities on site comply with legislation of relevance to the environment.

5.6 The Contractor

The Contractor will be responsible for the implementation and compliance with recommendations and conditions of the EMP. The Contractor shall:

- Ensure that a copy of the EMP and any revisions is kept on site at all times;
- Ensure that the environmental specifications of the EMP (including any revisions, additions or amendments) are effectively implemented. This includes the on-site implementation of steps to mitigate environmental impacts;
- Ensure all site staff received environmental awareness training from the ECO;
- Ensure that all employees and sub-contractors employed comply with the requirements and provisions of the EMP;
- Prepare Method Statements for submission to the ECO;
- Monitor environmental performance and conformance with the specifications contained in this document during regular site inspections and report back to the RE;
- Discuss implementation of and compliance with this document with staff at routine site meetings;
- Be responsible for sub-contractors;
- Report progress towards implementation of and non-conformances with this document at site meetings with the ECO;
- Keep copies of the monthly environmental audit reports from the ECO;
- Notify the RE and ECO of the anticipated programme of works and fully disclose all details of activities involved;
- Ensure that suitable records are kept and that the appropriate documentation is available to the ECO;
- Appoint an Environmental Officer (EO) as the community liaison officer;
- Keep a record of all major incidents (spills, impacts, complaints, legal transgressions etc) as well as corrective and preventative actions taken;
- Record of all complaints / comments received from the public must be logged in a Complaints Register kept at the site and notify the RE of these complaints;

- All accidents and incidents resulting in injury or death must be reported;
- Notify the ECO of all incidents, accidents and transgressions on site with respect to environmental management as well as requirements of the EMP and corrective actions/remedial action taken;
- Bear costs for incidents and accidents and their corrective action / remediation; and
- Inform the ECO of problems arising when implementing the EMP and recommend ways of improving it.

5.7 Community Relations

When specified, the Contractor shall erect an information board containing background information of the construction activity and listing the relevant contact details of responsible persons, in particular the Contractor's EO. The number, location and type of information boards will be specified in the Contract documents.

The public shall assist in the general environmental management and monitoring of the area by providing comments and reports on the works as necessary.

The Contractor's EO will be responsible for receiving these comments, recording the comments in the Complaints Register and liaising with the public. The RE will forward any comments relating to the environment to the ECO for addressing.

It must be ensured that the construction process and the contractor's employees do not affect access to homesteads, gardens and private plots. No access to private property will be permitted without the express written permission of the resident or his / her representative. Any complaints received will be addressed and if necessary the relevant persons will be suspended from the project.

5.8 Non-compliance and Penalties

The RE, in consultation or on the advice of the ECO, shall issue spot fines if the Contractor infringes the environmental specifications set out in this EMP. The Contractor shall be advised in writing of the nature of the infringement and the amount of the spot fine. The Contractor shall be liable for the fine and it is his responsibility to recover the fine from the relevant employee. The Contractor shall also take the necessary steps (e.g. training) to prevent a recurrence of the infringement.

The Contractor is also advised that the imposition of spot fines does not replace any legal proceedings the authorities, landowners and/or members of the public may institute against the Contractor. Spot fines should be determined depending upon the severity of the infringement. The decision on how much to impose will be made by the ECO / RE and will be final.

In addition to the spot fine, the Contractor shall be required to compensate for any damage caused as a result of the infringement at his own expense.

A preliminary list of infringements for which spot fines will be imposed is as follows:

- Using areas outside the working areas without permission/accessing "no-go areas";
- Clearing and/or levelling areas outside of the working areas;
- Spillage onto the ground or water bodies of oil, diesel, etc;
- Picking / damaging plant material;
- Damaging / killing wild animals / birds;
- Littering of the site and surrounds;
- Burying waste on site and surrounds;
- Making fires on site;

- Discharging effluent and / or stormwater onto the ground or into surface water;
- Repeated contravention of the specifications or failure to comply with instructions;
- Damage to heritage sites;
- Driving anywhere outside the demarcated construction area whether to reverse or turn the machine or for any other reason whatsoever;
- Damaging any tree outside of the construction area or any tree marked for protection within the construction footprint;
- Damaging any rock outside of the construction area or any rock marked for protection within the construction footprint; and
- Additional fines as determined by the ECO and added to this list.

The RE shall:

- Retain records of the fines issued. Monies for the spot fines will be deducted from the Contractors monthly certificate.
 - The RE, on recommendation from the ECO, may also order the Contractor to suspend part or all the works if the Contractor repeatedly causes damage to the environment by not adhering to the EMP (i.e. more than 3 cases of infringements). The suspension will be enforced until such time as the offending actions, procedure or equipment is corrected. No extension of time will be granted for such delays and all costs will be borne by the Contractor.
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6 ENVIRONMENTAL SPECIFICATIONS

The following comprises a library of the minimum range of constraints, controls, procedures and standards required for the construction of the project.

It should be noted that the EMP forms part of the Main Contract and is subject to the Conditions of the main construction works Contract. In all cases, where there is conflict between the EMP and the Contract, the Contract shall take precedence.

The general environmental principles for the construction works are as follows:

1. The environment is considered to be composed of both biophysical and social components.
2. Construction is a potentially disruptive and destructive activity and due consideration must be given to the environment, including the social environment during the execution of a project to minimise the impact on affected parties. All work must be undertaken in an environmentally sensitive manner.
3. Minimisation of areas disturbed by construction activities (i.e. the 'footprint' of the construction area) should minimise many of the construction-related potential environmental impacts of the project and reduce rehabilitation requirements and costs.
4. All relevant standards relating to international, national, regional and local legislation, as applicable, should be adhered to. This includes requirements relating to waste emissions, waste disposal practices, noise regulations, road traffic ordinances, etc.
5. All relevant permits and permissions shall be obtained from the relevant authorities to undertake construction activities as necessary.
6. Every effort should be made to minimise, reclaim and / or recycle waste.
7. The Contractor will be required to prepare an Environmental Policy Statement that will state his commitment to achieving the basic principles for environmental protection and control for the duration of his Contract. This statement will be displayed at the site as part of the Environmental Information Poster display.

6.1.1 Construction Method Statements

Method statements indicate how compliance with the Environmental Specification will be achieved.

The Contractor shall submit written Method Statements to the ECO for approval, covering those activities identified in this document and / or by the ECO as being potentially harmful to the environment. The Method Statements shall state clearly:

- Timing and location of activities;
- Materials, equipment and staffing requirements;
- Transporting the materials and / or equipment to, from and within the site;
- Transportation of workers / staff to and from site;
- The storage provisions for the materials and / or equipment;
- Emergency procedures;

- The proposed construction procedure designed to implement the relevant Environmental Specifications; and
- Other information deemed necessary by the ECO.

Method Statements shall be submitted at least ten working days prior to the proposed commencement of work on an activity to allow the ECO time to study and approve the method statement. The Contractor shall not commence work on that activity until such time as the ECO has approved the Method Statement in writing. The ECO shall approve the Method Statements within the response time stipulated in the appointment contract. The Contractor shall carry out the activities in accordance with the approved Method Statement.

Due to changing circumstances, it may be necessary to modify an approved Method Statement. In such cases the proposed changes must be agreed upon in writing between the Contractor, the RE and the ECO and appropriate records retained by the ECO, RE and Contractor.

Approved Method Statements shall be readily available on the site and shall be communicated to all relevant personnel.

It should be noted that the approval of the Method Statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the Contract.

The following are typical Method Statements, which will be called for by the ECO. Additional Method Statements may be required by the ECO during the course of works, depending on the nature of the construction works and its location:

- Location, layout and preparation of the construction camp;
- Location, layout and preparation of cement / concrete batching facilities including the methods employed for the mixing of concrete and the management of runoff water from such areas;
- Contaminated water management plan, including the containment of runoff and polluted water;
- Emergency construction Method Statements (including details of methods for fuel spills and clean up operations);
- Logistics for the environmental awareness course for all the Contractors employees and management staff;
- Construction of the sewer of the Berg River;
- Construction of the sewer within the Critical Biodiversity Area;
- Rehabilitation of disturbed areas and revegetation after construction is complete; and
- Solid waste control and removal of waste from site.

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
(A) Legislation and Compliance			
Compliance with Environmental Legislation			
The Contractor shall ensure that all pertinent legislation concerning the protection of the natural environmental and prevention of pollution is strictly enforced. This includes all applicable national, regional and local legislation.	Contractor	Continuous	
The Contractor shall maintain a database of all legislation, regulations and guidance pertinent to the environmental management of the project for the duration of the Contract.	Contractor	Continuous	
Permits and Permissions			
The Contractor shall ensure that all pertinent permits, certificates and permissions have been obtained prior to any activities commencing on site and are strictly enforced / adhered to.	Contractor	Prior to any new activities	
The Contractor shall maintain a database of all pertinent permits, certificates and permissions required for the Contract as a whole and for pertinent activities for the duration of the Contract.	Contractor	Continuous	
Management objectives		Measurable targets	
<ul style="list-style-type: none"> Legal compliance 		<ul style="list-style-type: none"> No contraventions of legal or permit requirements 	
(B) Record Keeping			
Site Monitoring, Auditing and Reporting			
Environmental records and documentation must be kept on site. The documentation shall be signed by all parties to ensure that such documents are legal. The following documentation shall be kept on site: <ol style="list-style-type: none"> Physical access plan Complaints register Environmental Incident Log Site daily diary Records of all remediation / rehabilitation activities ECO inspection audit reports The Environmental Authorisation (EA) issued for the project. 	Contractor / ECO	Continuous	
All records relating to monitoring and auditing must be made available for inspection to any relevant authority in respect of the project. It should be noted that the DEA&DP reserves the right to monitor and audit the development throughout its full life cycle to ensure compliance with the EA as well as mitigation measures in the final environmental impact report and the this EMP.	Contractor / ECO	As necessary	
Management objectives		Measurable targets	
<ul style="list-style-type: none"> Maintain records on site 		<ul style="list-style-type: none"> No delays due to unavailable information for audits 	

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
(C) Community Relations			
Negotiation for Land Access and Compensation			
Negotiations for access to land and payment of compensation for permanent loss of property where required shall be undertaken by CWDM.	CWDM	Prior to construction commencing	
The Contractor will be required to negotiate with the appropriate landowners to use and access areas outside the designated construction site, and in particular provide appropriate compensation for the temporary loss of land.	Contractor	Prior to any new activities	
Community Relations Complaints Register and Environmental Incidents Log			
The Contractor must appoint a Community Liaison Officer who will be responsible for liaison with the public. The Contractor must establish a formal grievance mechanism through which affected people can lodge a grievance and to help ensure a speedy satisfactory resolution of any disputes.	Contractor	Prior to construction commencing	
The Contractor shall erect and maintain information boards in the position, quantity, design and dimensions required by the RE. The Information boards should contain background information for the construction activity and list the relevant contact details of responsible persons. Such boards shall also include contact details for complaints by members of the public.			
A Community Relations Complaints Register and Environmental Incidents Log must be maintained by the Community Liaison Officer. The following information must be recorded in the incidents register: <ul style="list-style-type: none"> • Time, date and nature of the complaint. • Type of communication (telephone, letter etc). • Name, contact address and telephone number of the complainant. • Response and investigation undertaken. • Actions taken and by whom. Any complaints received by the project team from the public must be recorded in this log. All complaints must be brought to the attention of the RE.	Contractor	As necessary	√
The RE must forward any environmentally related complaints to the ECO for addressing.	RE	As necessary	
Where grievances occur, the Contractor will be required to assist in the process to investigate and resolve the grievance as effectively and quickly as reasonable. All grievances must be investigated and responded to within 10 working days.	Contractor / RE / ECO	As necessary	
No access to homesteads, gardens and private plots will be permitted without the express written permission of the resident or his / her representative.	Contractor	Continuous	
Management objectives	Measurable targets		

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
<ul style="list-style-type: none"> Maintain records of occurrences on site 	<ul style="list-style-type: none"> No delays due to unavailable information for audits No delays in the project due to Landowner interference 		
(D) Environmental Training and Awareness			
<p>The Contractor and sub-contractors shall be aware of the environmental requirements and constraints on construction activities contained in the provisions of the EMP.</p>	Contractor	Continuous	
<p>The Contractor will be required to provide for the appropriate Environmental Training and Awareness as described in this Specification in their costs and programming. The Contractor (with the help of the ECO as necessary) shall arrange and undertake Environmental Awareness Training for all site staff, including sub-contractor's staff. The emphasis of the environmental awareness training should be on any (potential) environmental impacts relating to the construction activities to be undertaken on site and the related environmental precautions which need to be taken to avoid or mitigate these impacts. The training should include reference, but not be restricted, to the following:</p> <ul style="list-style-type: none"> Basic awareness and understanding of the key environmental features of the work site and environs; Understanding the importance of and reasons why the environment must be protected; Ways to minimise environmental impacts; Prevention and handling of fire and other hazards; Health risks pertinent to the site, including prevention of diseases including HIV / AIDS; and Risk of injury from land mines and other unexploded ordinance and the measures to minimise such risks. 	Contractor / ECO	When new staff are contracted	√
<p>Registers of attendance of the Environmental Awareness Training shall be maintained by the Contractor.</p>	Contractor	When training is held	
<p>The Contractor shall erect and maintain Environmental Information Posters for his employees. These posters shall depict actions to be taken to ensure compliance with aspects of the Environmental Specifications. The Environmental Information Posters shall be erected at the suitable locations at the site.</p>	Contractor	Prior to the commencement of construction	

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
Management objectives	Measurable targets		
<ul style="list-style-type: none"> Conduct environmental induction training Erect appropriate environmental awareness signage 	<ul style="list-style-type: none"> All staff on site have undergone induction training No incidents related to lack of awareness of environmental sensitivity of the site 		
(E) Existing Services and Infrastructure			
Utilities and other service providers shall be advised of the construction activities. The Contractor will be responsible for any damage to these services / utilities.	Contractor	Prior to commencement of construction activities	
The Contractor shall ensure that any existing services (e.g. roads, pipelines, powerlines and telephone services) are not damaged or disrupted unless required by the Contract and with the permission of the RE. The Contractor shall be responsible for the repair and reinstatement of any existing infrastructure that is damaged or services which are interrupted. Such repair or reinstatement will be to the Contractor's cost and shall receive top priority over all other activities. A time limit for the repairs may be stipulated by the RE in consultation with the Contractor.	Contractor	Continuous	
It is the Contractor's responsibility to familiarise themselves with the position of existing services and infrastructure that may get damaged due to construction activities.	Contractor	Continuous	
The Contractor shall inform members of all nearby communities of potential disruptions to services and the expected timeframe for resumption of the disrupted services	Contractor	As necessary	
(F) Local Labour			
Wherever possible, the Contractor should endeavour to use local labour. The Contractor will be required to submit monthly labour sheets to the Resident Engineer.	Contractor	Continuous	
(G) Construction Campsite			
A precautionary approach must be adopted with any works deviating from specifications being approved by both the RE and ECO.	Contractor	Continuous	
A number of activities (including cement mixing, filling of trucks, servicing and cleaning of construction equipment etc.) that take place in the Contractor's camps could adversely affect the surrounding environment if preventative measures are not taken. For this reason, camps must be located at a reasonable distance away from any drainage courses and outside the 1:50 year floodlines (as agreed with DEA&DP). Furthermore, earth berms or drainage ditches must be constructed round all camps in which constructional plant is garaged, cleaned etc, and in all fuel depots and workshops. Runoff from these camps must be channelled into retention ponds or conservancy tanks.	Contractor	Prior to construction	√
Campsite establishment including proposed layout and location must be checked and approved by the ECO prior to commencement of construction. A method statement must be supplied by the Contractor for	Contractor	Prior to construction	√

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
campsite establishment and must be approved by the ECO. The campsite shall not be located with the area marked for protection as a Critical Biodiversity Area on the Meerlust site.			
The footprint of the campsite and access roads must be kept to a minimum to ensure the least environmental impacts.	Contractor / ECO	Continuous	√
All materials, equipment, plant and vehicles must be stored within the construction camp in a dedicated area.	RE / Contractor	Continuous	√
The operation of heavy machinery and construction equipment known to produce high noise levels must be limited. Silent compressors must be used. Noise generated by employees shouting or whistling must also be limited.	Contractor	Continuous	
Appropriate safety and precaution signs must be erected prior to the start of construction.	Contractor	Prior to construction	
A dedicated area must be made available for construction staff to change and store their personal belongings.	Contractor	Prior to construction	√
Storm water control berms (trench and/or earth barriers) must be constructed to divert rainwater around the campsite and to contain any dirty water running from the campsite.	Contractor	Prior to and construction and as necessary	√
Artificial lighting with a short wave length emission attracts insects and results in their large scale destruction. In view of this, external lighting must be in the yellow/orange range (600 -650 nrm) (e.g. yellow fluorescent tubes or high pressure sodium lamps).	Contractor	As necessary	√
The construction campsite shall be securely fenced with a 1.8m bonnox fence or similar and working areas secured before construction can proceed.	Contractor	Prior to construction	√
All land outside of the working areas must be considered as "No-go" areas. Personnel and equipment shall not be permitted within "No-go" areas.	Contractor / ECO	Continuous	√
Removal of any protected and unprotected vegetation shall be avoided until such time as soil stripping is required. Exposed surfaces must be re-vegetated or stabilised as soon as is practically possible.	Contractor / ECO	Continuous	√
All earthworks and excavations must be undertaken in such a manner so as to minimise the extent of any impacts caused by such activities.	Contractor	Continuous	√
The disturbance of vegetation must be limited to areas of construction.	Contractor	Continuous	√
The removal or picking of any protected or unprotected plants shall not be permitted and no horticultural specimens (even within the demarcated working area) shall be removed, damaged or tampered with unless agreed by the ECO.	Contractor / CECO / ECO	Continuous	
The topsoil (i.e. the top 30-50 cm of soil) must be stockpiled in a suitable place in order to be replaced on top of the exposed subsoil during rehabilitation. Soil stockpiles should not exceed 2 m in height. Erosion damage to soil stockpiles should be prevented with soil conservation works such as deflection berms etc. Topsoil stockpiles older than 6 months should be upgraded/enriched before use to ensure the effectiveness of the topsoil.	Contractor / CECO	As necessary	√

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
Amenities such as ablution facilities with chemical toilets must be installed in the construction camp prior to construction commencing. The number of toilets shall be based on a minimum ratio of 15 people per toilet.	Contractor	Prior to construction	√
A wastewater management system that will comply with legal requirements must be provided. The ECO must approve this. Sewerage and wastewater from the campsite must be removed to an approved sewerage treatment works.	Contractor / ECO	Prior to construction	√
Ablutions anywhere other than in the toilets shall not be permitted.	Contractor	Continuous	
Toilets must be secured to prevent them from blowing over.	Contractor	Continuous	
A service provider shall be appointed and shall empty toilets regularly.	Contractor	Prior to construction	
Chemical and waste from toilet cleaning operations should not be spilled on the ground at any time.	Contractor	Continuous	
Management objectives	Measurable targets		
<ul style="list-style-type: none"> • Campsite erected and managed appropriately • Campsite areas appropriately cleared prior to erection • Campsite area rehabilitated to its previous state post construction 	<ul style="list-style-type: none"> • No environmental damage due to incorrect placements and management of campsite • No environmental damage due to improper ablutions • No total loss off vegetation and topsoil of campsite area • Successful rehabilitation post construction 		
(H) Access, traffic and transportation			
The construction infrastructure and equipment shall be off-limits to the public.	Contractor	Continuous	
All construction vehicles using public roads shall be in a roadworthy condition.	Contractor	Continuous	
Vehicle speeds shall not exceed 40km/h along untarred roads or when transversing unconsolidated and un-vegetated areas. Where required, speed limits must be indicated on the roads.	Contractor	Continuous	
If access is across running water, the Contractor shall take precautions not to impede the natural flow of water. If instructed, the Contractor is to stone pitch the crossing point. There shall be no pollution of water. Access across running water and the method of crossing shall be at the approval of the RE.	Contractor	As necessary	√
Existing land contours shall not be crossed by vehicles and equipment unless agreed upon, in writing, by the RE.	Contractor / ECO / RE	As necessary	
Existing drainage systems shall not be blocked or altered in any way.	Contractor / ECO	Continuous	
No painting or marking of rocks or vegetation to identify locality or other information shall be allowed as it will disfigure the natural setting. Marking shall be done by steel stakes with tags, if required.	Contractor / ECO	As necessary	
The cutting down of bushes and trees to gain line of sight must be minimised as it will damage the visual character of the particular site.	Contractor / ECO	As necessary	

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
Any dangerous crossings shall be marked as such and where necessary, speed limits shall be enforced.	Contractor	Prior to construction	
Access to existing roads, schools, buildings, shops and residential properties shall not be impeded during construction.	Contractor	Continuous	√
Management objectives	Measurable targets		
<ul style="list-style-type: none"> • Access to the construction site is limited • Construction traffic is appropriately managed throughout construction resulting in no irreparable environmental damage • Access to surrounding properties is maintained throughout construction 	<ul style="list-style-type: none"> • No public member on the construction site • No complaints from adjacent landowners and the general public on traffic issues • No damage to the environment from construction traffic 		
(I) Waste Management			
Develop and implement an on-site waste management plan to prevent the spread of refuse. The minimisation, reuse and recycling of waste must be maximised.	Contractor / RE / ECO	Once-off	√
Sufficient bins / skips must be provided with secure lids for waste disposal purposes. The bins should be clearly marked for the segregation of waste types. All bins must be emptied regularly.	Contractor	Continuous	
Waste that cannot be recycled or reused must be disposed of off-site at an appropriate permitted landfill site.	Contractor	Continuous	
Signage must be erected that contains information on how waste must be managed on site.	Contractor	Continuous	
A maintenance cleaning crew must be established to manage cleanups and general waste management	Contractor	Continuous	
Littering by the employees of the Contractor shall not be allowed.	Contractor	Continuous	
The Contractor shall collect all litter and dispose thereof in terms of the approved waste management plan. A litter patrol around the construction camp and work areas along the route are to take place every day to collect any litter.	Contractor	Continuous	
No waste shall be buried or burned on site.	Contractor	Continuous	
The site office and materials storage area must be kept neat and tidy and free of litter.	Contractor	Continuous	
Material that may harm humans or animals must not be left on site.	Contractor	Continuous	
The piling of any material that could rot and release unpleasant smells into the air will not be permitted.	Contractor	Continuous	
Surplus concrete may not be dumped indiscriminately on site, but must be disposed of at a licensed landfill site.	Contractor	Continuous	
Concrete trucks shall not be washed on site after depositing concrete into foundations. Any spilled concrete shall be cleaned up immediately.	Contractor	Continuous	
Management objectives	Measurable targets		

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
<ul style="list-style-type: none"> • Neat workplace and site • Disposal of refuse in a sustainable manner • Minimise litigation • Minimise complaints 			<ul style="list-style-type: none"> • No rubble or refuse lying around on site • Waste segregation • Evidence of waste reuse and recycling • No visible concrete spillage • No incidents of litigation • No complaints
(J) Materials Use, Handling, Storage and Transport (Cement, Fuel [Petrol and Diesel] and Oils)			
Procedures for material handling shall be discussed with and approved by the ECO. An emergency procedure to deal with accidents and incidents (e.g. spills) arising from hazardous substances shall be compiled and implemented.	Contractor / ECO	Once-off	√
Relevant national, regional and local legislation regarding the transport, use and disposal of hazardous waste must be adhered to at all times.	Contractor	Continuous	
All mechanical equipment used in construction activities shall be clean and free of oil, petrol, and diesel leaks	Contractor	Continuous	
<p>A method statement is required from the Contractor that details the procedure to be followed in dealing with leaks or spills:</p> <ul style="list-style-type: none"> • Spills of hazardous substances shall be reported to the ECO immediately. • A register for spills and incidents involving hazardous materials must be maintained. • Soil which has been contaminated must be removed to an approved waste disposal site. Alternatively, contaminated soil can be treated on site through bioremediation. Should a person experienced in bioremediation not be available on site, a specialist contractor shall be used. • Spills must be cleaned and remediated to the satisfaction of the ECO. • A complete emergency spill kit shall be available on site at all times. • Ensure that relevant staff members are trained to use the emergency spill kit and on the manner in which to deal with spills of hazardous substances (oils, diesel or petrol). 	Contractor / ECO	As necessary	√
<p>A concrete platform with a bund wall must be constructed to accommodate hazardous substances (fuel, oil paint, bitumen, herbicide and insecticides) to guard against infiltration of hazardous substances into the soil:</p> <ul style="list-style-type: none"> • Fuel tanks must be bunded to hold 110% of the contents of the tank. House the tanks in a roofed area so that no water will collect within the bund wall. • All empty and externally dirty tanks shall be sealed and stored on an area where the ground has been protected. • All necessary approvals with respect to fuel storage and dispensing shall be obtained from the appropriate authorities. • Areas of fuels storage and other flammable materials shall comply with standard fire safety regulations and will require the approval of the RE and the Municipal Fire Prevention Officer. 	Contractor / ECO	Once-off and as necessary	√

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
No smoking shall be allowed in the vicinity of the stores and adequate fire-fighting equipment shall be accessible at fuel storage area and areas in the vicinity of the storage area. "NO smoking" and "Danger" signs must be erected at hazardous substance storage areas.	Contractor	Continuous	
Any concrete batching activity must be located in an area of low environmental sensitivity, in consultation with the ECO. The location must be indicated on the site layout plan. The Contractor shall be responsible for the proper management of the batching plant.	Contractor / ECO	Once-off	√
Concrete shall not be mixed directly on the ground.	Contractor / ECO	Continuous	
All wastewater resulting from batching of concrete shall be disposed of via the wastewater management system.	Contractor	Continuous	
Bags of cement shall be stored in an area protected from the weather.	Contractor	Continuous	
The necessary permit from the Department of Water affairs shall be obtained prior to using local water for concrete batching.	Contractor / PM / ECO	Prior to batching	
Rehabilitate the ground of the batching plant area and clean the site to the satisfaction of the RE and ECO once construction is complete.	Contractor	Upon completion	√
All vehicles shall be serviced off site.	Contractor	Continuous	
Only emergency repairs shall be allowed on site and a drip tray shall be used to prevent oil spills. Any oil spills must be cleaned up and the following shall apply: <ul style="list-style-type: none"> • All contaminated soil shall be removed and be placed in containers. • Contaminated soil can be taken to one central point at the Contractors campsite where bio-remediation can be done. • A specialist contractor shall be used for the bio-remediation of contaminated soil. • Smaller spills can be treated on site. • The area around the fuel storage drum at the Contractor's campsite shall also be remediated upon completion of the contract. • All oil spills must be reported to the ECO and RE. 	Contractor	As necessary	
Management objective	Measurable targets		
<ul style="list-style-type: none"> • Prevention of pollution of the environment • Minimise chances of transgression of the legislation controlling pollution 	<ul style="list-style-type: none"> • No pollution of the environment • No litigation due to transgression of pollution control acts • No complaints 		
(K) Health and safety			
The site and all operations shall comply with all National Health and Safety Standards and other relevant national, regional and local regulations. CWDM shall appoint a Health and Safety Officer. The Contract documentation for the specifications of the H&S Officer that will be present on site for the duration of the works.	Contractor	Continuous	

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
Designated eating areas shall be allocated.	Contractor	Continuous	
Potable water and washing facilities shall be made available for all personnel.	Contractor	Continuous	
Safety measures, such as detour signs, must be implemented during construction to ensure the safety of workers, pedestrians and drivers/passengers in vehicles in the vicinity of construction work.	Contractor	Prior to construction	
Prevent public access to the construction site at all times.	Contractor	Continuous	
Staff shall wear the necessary personal protective equipment.	Contractor	Continuous	
All the necessary precautions must be taken against the spreading of disease, especially where animals are present.	Contractor	Continuous	
A record of any medicinal drugs administered and the dates when this was done must be kept, which can then be used as evidence in court should any claims be instituted against CWDM or the Contractor.	Contractor	Continuous	
Management objective	Measurable target		
<ul style="list-style-type: none"> Prevent personnel and public safety issues Prevent litigation 	<ul style="list-style-type: none"> Appointment of a Health and Safety Officer No incidences of personnel or public safety issues No litigation 		
(L) Air Quality and Dust Control			
The production of dust from areas cleared of vegetation and soil stockpiles must be avoided: <ul style="list-style-type: none"> Dust-suppression measures must be used on stockpiles and exposed areas (e.g. regular wetting, possibly by means of a water bowser or by means of a soil binding compound). Stockpiles must be located in areas where they are exposed to the minimum erosive effects of wind. Excavation, handling and transport of erodible materials must be avoided under high wind conditions 	Contractor	As necessary	
All machinery and equipment to be used on site shall be properly serviced and in good working order to avoid excessive smoke and exhaust fumes.	Contractor	Continuous	
Management objectives	Measurable targets		
<ul style="list-style-type: none"> Prevent air quality impacts Implement dust control measures effectively 	<ul style="list-style-type: none"> No complaints regarding inadequate dust control 		
(M) Noise			
Restrict noise generating activities to between 07h00 and 17h00 Monday to Friday, unless otherwise agreed to and approved by the environmental officer and adjacent landowners.	Contractor	Continuous	
All equipment, vehicles and machinery must be in good working condition and be equipped with sound mufflers if necessary.	Contractor	Continuous	
Construction staff must be trained and made aware of not creating unnecessary noise such as hooting and shouting.	Contractor	Continuous	
Management objectives	Measurable targets		
<ul style="list-style-type: none"> Prevent noise pollution 	<ul style="list-style-type: none"> No complaints regarding unnecessary noise 		

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
(N) Vegetation Management and Protection			
Construction personnel must be restricted to the construction zone only.	Contractor	Continuous	
Construction of the sewer through marshes, streams and rivers must be carefully designed to ensure that soil and moisture regimes are not altered.	RE / Contractor/ ECO	As necessary	√
The ECO must traverse the route with the RE to check the surveyed construction path to draw attention to the sensitive areas. The RE must understand the sensitivity of specially protected areas of conservation significance (e.g. the area identified for protection as a Critical Biodiversity Area) along the route before machinery moves on site.	ECO / RE	Prior to construction	
Penalties shall be imposed on the drivers and staff of the construction company and its subcontractors, for the following transgressions: <ul style="list-style-type: none"> Driving anywhere outside the demarcated construction area whether to reverse or turn the machine or for any other reason whatsoever. Damaging any tree outside of the construction area or any tree marked for protection within the construction footprint. 	Contractor / RE / ECO	Prior to and during construction	
Plant, firewood or kindling collecting shall not be permitted. Any staff member found in possession of plant material must be ordered off site permanently).	Contractor / ECO	Continuous	
Effective rehabilitation of the construction area must be undertaken. The specifications must be explicit and detailed and included in the contract documentation (Environmental Management Programme) so that the tasks can be costed and monitored for compliance and result.	PM / Contractor	On completion of construction	√
Vegetation must only be cleared that is in the path of actual construction. Rehabilitation must commence as soon as each section of the pipeline has been completed.	Contractor / RE / ECO	As necessary	√
All earthmoving and stockpiling must be carefully contained within the construction footprint.	Contractor	As necessary	√
The special conditions of contract must include the stripping and stockpiling of topsoil from the construction areas for later re-use. Topsoil is considered to be at least the top 300 mm of the natural soil surface and includes grass, roots and organic matter.	Contractor / ECO	Continuous	
All vegetation that has been removed from large areas must be replaced with indigenous vegetation on completion of construction. No vegetation must be removed outside of the construction footprint without approval from the ECO. <ul style="list-style-type: none"> Vegetation with specific conservation concern must be translocated elsewhere on site. A similar habitat would need to be identified where the plants will be translocated to and the task of excavating suitable planting holes would then be undertaken. Areas where removal has occurred must be marked and the site would need to be visited throughout the growing season to harvest the seed capsules. 	Contractor / ECO	As necessary	√
On completion of construction, the site must be cleared of all excavated material (rocks, excess soil etc.) and construction rubble, waste, litter etc.	Contractor / ECO	On completion of construction	

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
All areas beyond the works area must also be rehabilitated. This includes areas such as construction campsites, lay down areas, etc.	Contractor	On completion of construction	√
The re-vegetation programme should be monitored and managed to ensure that problems (e.g. erosion, die back and lack of grass cover) are identified early so that corrective measures can be taken.	ECO	Continuous	
Management objectives	Measurable targets		
<ul style="list-style-type: none"> • Minimise damage to vegetation • Minimise possibility of erosion due to removal of vegetation • Minimise removal of plant material on river and stream embankments • Eradication of alien invader species • Minimise scarring of the soil surface and land features • Minimise disturbance and loss of topsoil • Rehabilitate all disturbed areas along the servitude 	<ul style="list-style-type: none"> • No de-stumping of vegetation on river and stream embankments • All alien invaders removed along the pipeline servitude • No visible herbicide damage to the vegetation along the servitude one year after completion of the contract due to incorrect herbicide use • No litigation due to unauthorised removal of vegetation • No visible erosion scars once construction is completed • No claims regarding damage leading to litigation • All damaged areas successfully rehabilitated one year after completion 		
(O) Effluent and Storm Water Management			
No ponding of surface water shall occur adjacent to the construction works both during and after construction.	Contractor / ECO	Continuous	
No mechanical plant or equipment shall be washed on site, unless in an area equipped for such a purpose.	Contractor / ECO	Continuous	
Pollutants such as cement, concrete, lime, chemicals and fuels shall not be discharged into any water source.	Contractor / ECO	Continuous	
Water from ablution facilities and dirty water from the construction camp site shall be removed from the site for depositing into an approved wastewater treatment works.	Contractor / ECO	Continuous	
All structures constructed for river access purposes shall be properly designed and drawings of such structures shall be available for record purposes.	Contractor / ECO	Continuous	√
Management objectives	Measurable targets		
<ul style="list-style-type: none"> • Minimise damage to river and stream embankments • Minimise pollution of water resources 	<ul style="list-style-type: none"> • No discharging of wastewater into rivers and streams 		

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
(P) Wetland, river and stream protection			
All river and wetland areas must be treated as sensitive and important areas. Construction within or adjacent to river and significant wetlands must be minimised as far as possible.	RE / Contractor / ECO	Continuous	
Appropriate measures must be put in place to minimise erosion and the amount of sediment entering rivers and wetlands. Risks of erosion / sediment runoff will become more problematic during the rainfall season.	Contractor / ECO	Continuous	√
It is important that the vegetated buffer areas surrounding aquatic systems are maintained. These areas will help to absorb surface stormwater runoff thus allowing sediments to settle prior to reaching aquatic systems as well as provide additional filtering for other pollutants.	Contractor / ECO	Continuous	√
No dumping of excavated material and no storage of equipment and materials must be allowed within, and in proximity to river and wetland areas.	Contractor / ECO	Continuous	
Construction camps, equipment storage sites and ablution facilities serving the construction phase should be sited at reasonable distance away from any drainage courses and outside the 1:50 year floodlines (as agreed with DEA&DP).	Contractor / ECO	Prior to construction	√
Where aquatic ecosystems are impacted by construction activities, necessary action must be taken to fully rehabilitate the sites.	Contractor / ECO	Immediately after impact	√
During construction of bridge structures, there must be no obstruction of the water flow of rivers and streams.	RE / Contractor / ECO	Continuous	
Excavated material must not be stockpiled on or near riverbanks, in order to prevent sedimentation occurring.	Contractor / ECO	Continuous	
No impediments to natural surface water flow, other than approved erosion control measures, must occur.	Contractor / ECO	Continuous	
Management objectives		Measurable targets	
<ul style="list-style-type: none"> • Protect wetlands, rivers and streams • Minimise damage to river and stream embankments • Minimise pollution of water resources 		<ul style="list-style-type: none"> • Construction activities within or adjacent to rivers and wetlands are minimised • Construction facilities are located at the distance agreed with DEA&DP from drainage courses and outside the 1:50 year floodlines • No stockpiling or dumping of materials within or near to rivers and wetlands 	
(Q) Water Abstraction Points and Wet Areas			
The relevant permits / authorisations / agreements in accordance with the National Water Act 1998 (Act No. 36 of 1998) must be obtained for any abstraction of water.	Contractor / ECO	Prior to water abstraction	√

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
Any work or access near or in a permanent drainage system may have implications in terms of the National Water Act 1998 (Act No. 36 of 1998), and therefore may well require the application of a Water Use License / registration in terms of a General Authorisation. Therefore, the contractor must in consultation with the ECO, assess all areas along the alignment well in advance in order to ensure the relevant Water Use License / Registration is obtained where required.	Contractor / ECO	As necessary	
Pumps must be placed a safe distance from the drainage courses to minimise any pollution threat. Pumps must be placed on metal trays (which must be cleaned regularly) to prevent grease, oil etc from polluting the ground. Petrol/diesel for the pumps must also be placed a safe distance from the drainage courses. Pump attendants must be equipped with operative fire extinguishers and must be in radio contact with the site agent/camp in case of a fire or spill.	Contractor / ECO	Continuous	
Any unused water must be returned to the drainage courses in a dispersed fashion to prevent erosion of the banks.	Contractor / ECO	As necessary	
Where necessary, alternative methods of construction shall be used to avoid damage to wet areas.	Contractor	Continuous	√
Management objectives	Measurable targets		
<ul style="list-style-type: none"> Water abstraction to be undertaken with no environmental impact Avoid the requirement for additional environmental authorisations as a result of working in wet areas 	<ul style="list-style-type: none"> No damage to the Berg river banks or pollution of the river due to abstraction activities No damage to wet areas No complaints or litigation 		
(R) Fauna Protection			
It is illegal to interfere with any wildlife or other fauna including avi-fauna. All fauna occurring on-site shall be protected. Staff must not chase, catch or kill animals prior to, during and after construction.	Contractor / ECO	Continuous	
Any animals that stray into the designated the construction area must be carefully removed to a safe place outside of the construction area.	Contractor / ECO	Prior to construction	
Management objectives	Measurable targets		
<ul style="list-style-type: none"> Protection of Fauna 	<ul style="list-style-type: none"> No complaints No records of animal incidents 		
(S) Archaeology / Heritage			
The footprint of the construction works should be kept to a minimum to limit the possibility of encountering chance heritage finds outside the areas assessed during this study.	Contractor / RE	As necessary	
The construction team should be informed about the value of the cultural heritage resources in general so as to ensure that they do not destroy the chance archaeological sites they may encounter during working on the road upgrade alignment.	Contractor / ECO	Continuous	

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
If any heritage/archaeological sites/objects are discovered during the construction works, the relevant part on site should note the location of the find, ensure that it is not disturbed or destroyed and notify the ECO immediately. The ECO should immediately contact Heritage Western Cape.	Contractor / ECO	As necessary	
The collection of heritage/archaeological objects/artefacts shall not be allowed.	Contractor / ECO	Continuous	
Ablutions must only occur at the ablation facilities provided by the Contractor.	Contractor	Continuous	
Management objectives	Measurable targets		
<ul style="list-style-type: none"> • Protection of archaeological sites and land considered to be of cultural value • The preservation and appropriate management of new archaeological finds, should these be discovered during construction 	<ul style="list-style-type: none"> • No destruction of or damage to the Grade 1 Heritage Site • Management of existing heritage sites and new discoveries in accordance with the recommendations of the Archaeologist 		
(T) Fire Prevention			
Open fires shall not be allowed on site under any circumstance (The Forest Act, No 122 of 1984).	Contractor	Continuous	
The use of open fires for cooking of food etc. by construction and maintenance personnel should be strictly prohibited. Temporary enclosed areas (windshield) for food preparation should be provided.	Contractor	Continuous	
Accidental fires should be prevented through proper sensitisation of the contractors and their workers towards the associated risks, dangers and damage of property.	Contractor / ECO	Continuous	
The Contractor shall have fire-fighting equipment, for each construction team readily available on site. The firefighting equipment shall be regularly checked and shall be approved by the Health and Safety Officer on site.	Contractor	Continuous	
An emergency preparedness plan should be in place in order to fight accidental fires should they occur. The adjacent land owners/users/managers should also be informed and/or involved.	Contractor / ECO	Continuous	√
The use of branches of trees and shrubs for fire making purposes must be strictly prohibited. Penalties for the unnecessary removal and/or destruction of any plant for any reason (firewood, medicinal use, collectors value etc) should be agreed upon beforehand and be included in the contract.	Contractor / ECO	Prior to construction	
The Contractor is liable for any expenses incurred by any organisations called to assist with fighting fires and any cost relating to the rehabilitation of burnt areas/and/or properties and persons should the fire be the cause of the Contractor's activities on site.	Contractor	As necessary	
Management objectives	Measurable targets		

Environmental Specification	Responsible Individual	Frequency	Method Statement Required
<ul style="list-style-type: none"> Minimise the risk of fires 	<ul style="list-style-type: none"> No fires started by the Contractor's work force No claims from surrounding landowner for damages due to fires No litigation 		
(U) Emergency Procedures			
Emergency procedures shall be set up prior to the commencement of works. They must include but not be limited to fires, spills, and contamination of ground and surface water, accidents to employees and damage to services.	Contractor / ECO	Prior to the commencement of construction	
Key staff shall be trained in emergency response and all staff made aware of the emergency procedures.	Contractor	As necessary	
Emergency numbers should be on display at convenient locations on the site	Contractor	Continuous	
A register of all incidents, accidents, etc. must be maintained, which includes the action taken after the event has occurred. The ECO must be informed of the event.	Contractor / ECO	Continuous	
All equipment shall be user safe and vehicles shall be roadworthy.	Contractor	Continuous	
Vehicles transporting materials such as sand, rock and pipes shall be covered to prevent their contents falling/ blowing off, causing traffic hazards.	Contractor	As necessary	
Only qualified/ trained personnel shall operate equipment and construction vehicles.	Contractor	Continuous	
Management objectives		Measurable targets	
<ul style="list-style-type: none"> Emergency preparedness 	<ul style="list-style-type: none"> Records of emergency response training of key staff Emergency procedures in place Record of incidents No litigation 		

6.1.2 Completion of Contract and Decommissioning of the Site

The following key actions apply at the completion of the contract:

1. Prior to completion of the Contract, the Contractor must timeously notify the RE of 'Practical Completion' meetings and 'snagging lists' to provide an opportunity to identify work outstanding or incomplete.
2. The RE must timeously inform the ECO of Contract Completion so that a final audit can be arranged.
3. On completion of the Contract, the Contractor shall decommission the works. This shall include the following:
 - Removal of all remaining structures, services, facilities, unless sold or given to the landowner;
 - Removal of all remaining construction rubble and waste, to be disposed of in accordance with the Waste Management Plan; and
 - Reinstatement and rehabilitation of all remaining disturbed areas in line with the Environmental Specifications above.

APPENDICES

Appendix A: Detailed location plan and technical maps, designs, drawings; and site photographs

Appendix B: Example of a Method Statement

Appendix C: Project Start-up and Site Inspection Sheet

Appendix D: Routine Site Inspection Sheet

Appendix E: Site Decommissioning Inspection Sheet

Appendix F: Site Inspection Report Structure

Appendix G: Material Safety Data Sheet

APPENDIX A

DETAILED LOCATION PLAN AND TECHNICAL MAPS, DESIGNS AND DRAWINGS

APPENDIX B
EXAMPLE OF A METHOD STATEMENT

ENVIRONMENTAL METHOD STATEMENT

CONTRACT: _____ **DATE:** _____

PROPOSED ACTIVITY

WHAT WORK IS TO BE UNDERTAKEN

WHERE ARE THE WORKS TO BE UNDERTAKEN

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

DECLARATIONS

1) ECO

The mitigation described in this method statement is accepted based on current information. It could however be improved in future as site conditions become more clear, or additional information is known.

Signature Name

Dated: _____

2) CONTRACTOR ENVIRONMENTAL REPRESENTATIVE

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 Engineer's SHE Coordinator and Engineer will audit my compliance with the contents of this Method Statement

Signature Name

Dated: _____

3) RESIDENT ENGINEER

I hereby accept the method statement based on current information.

Signature Name

Dated: _____

APPENDIX C
PROJECT START-UP SITE INSPECTION SHEET

PROJECT START UP INSPECTION SHEET

Project: _____
 Contract No.: _____
 Contractor: _____

Date: _____
 Completed by: _____

ES	ENVIRONMENTAL ASPECT	YES NO N/A	COMMENTS	ACTION
PLANNING				
ESTABLISHMENT				
CLEARANCE				

APPENDIX D
ROUTINE SITE INSPECTION SHEET

ROUTINE SITE INSPECTION SHEET

Project: _____
Contract No.: _____
Contractor: _____

Date: _____
Completed by: _____

ES	ENVIRONMENTAL ASPECT	YES/ O N/A	COMMENTS	ACTION
HOUSEKEEPING				
CONSTRUCTION ACTIVITIES				
REINSTATEMENT AND REHABILITATION				

APPENDIX E

CONSTRUCTION CAMP DECOMMISSIONING INSPECTION SHEET

APPENDIX F
SITE INSPECTION REPORT STRUCTURE

Purpose of the Site Inspection Report

The purpose of the Site Inspection Report is to describe the results of the site inspections undertaken by the ECO or delegated responsible person so that the level of compliance with the EMP can be monitored throughout the Contract.

In particular, it will be expected to summarise the following:

- The key results;
- Trends observed;
- Key issues observed;
- Problems encountered;
- Actions required and response taken or to be taken; and
- Recommendations.

The Site Inspection Report should conclude with a comment on the overall performance of the Contractor in terms of meeting the requirements of individual / groups of Environmental Specifications and / or the EMP as a whole.

Preparation of the Site Inspection Reports

Site Inspection Reports are expected to be prepared regularly throughout a given construction Contract, including (but not be limited to) the following:

- Prior to the handover of the site to the Contractor;
 - At regular stages throughout the construction works, and particularly with the commencement of particularly significant activities; and
 - At the decommissioning of the site and prior to the handover of the site to the Employer / Operator.
-

Recommended Structure for the Site Inspection Reports

The following report structure is suggested for the Site Inspection Report:

Introduction

By way of setting the context for the Site Inspection Report, this section should outline the following:

- The need for the Site Inspections, and reporting.
- Purpose of the Site Inspection Report.

	<ul style="list-style-type: none"> • The scope of coverage of the Site Inspection Report.
Environmental Management Requirements	This section should summarise the environmental requirements for the Contract and for the construction works, and against which environmental performance is assessed.
Methodology	<p>This should describe the activities undertaken during the particular site inspection, such as:</p> <ul style="list-style-type: none"> • A site walkabout with the RE. • A review of documents and records, such as complaints records and / or incidents reports maintained by the Contractor and / or ECO. • Consultations with pertinent parties on site.
Findings of the Site Inspection	<p>This should contain reference to the following:</p> <ul style="list-style-type: none"> • A commentary on the level of compliance with key aspects of the Environmental Specifications, as listed in the checklist(s). • Details of issues, infringements, problems and non-compliances encountered. • Recommendations on actions to be undertaken to address any issues, infringements and / or non-compliances.
Conclusions	This should include an overall statement on the level of compliance observed during the site inspection.
Annexures	<p>Annexures should be used to store supporting information to the main document, such as:</p> <ul style="list-style-type: none"> • Photographs. • A quick reference, summary table of issues of concern and the necessary corrective measures required to address these issues.

APPENDIX G
EXAMPLE OF A MATERIAL SAFETY DATA SHEET

EXAMPLE OF A MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT

General Product Name: **Biodiesel (B100)**
Synonyms: Methyl Soyate, Rapeseed Methyl Ester (RME)
Product Description: Methyl esters from lipid sources
CAS Number: Methyl Soyate: 67784-80-9; RME: 73891-99-3.

2. COMPOSITION / INFORMATION ON INGREDIENTS

This product contains no hazardous materials.

3. HAZARDS IDENTIFICATION

Potential Health Effects:

INHALATION:

Negligible unless heated to produce vapors. Vapors or finely misted materials may irritate the mucous membranes and cause irritation, dizziness, and nausea. Remove to fresh air.

EYE CONTACT:

May cause irritation. Irrigate eye with water for at least 15 to 20 minutes. Seek medical attention if symptoms persist.

SKIN CONTACT:

Prolonged or repeated contact is not likely to cause significant skin irritation. Material is sometimes encountered at elevated temperatures. Thermal burns are possible.

INGESTION:

No hazards anticipated from ingestion incidental to industrial exposure.

4. FIRST AID MEASURES

EYES:

Irrigate eyes with a heavy stream of water for at least 15 to 20 minutes.

SKIN:

Wash exposed areas of the body with soap and water.

INHALATION:

Remove from area of exposure; seek medical attention if symptoms persist.

INGESTION:

Give one or two glasses of water to drink. If gastro-intestinal symptoms develop, consult medical personnel. (Never give anything by mouth to an unconscious person.)

5. FIRE FIGHTING MEASURES

Flash Point (Method Used): 130.0 C or 266.0 F min (ASTM 93)

Flammability Limits: None known

EXTINGUISHING MEDIA:

Dry chemical, foam, halon (may not be permissible in some countries), CO₂, water spray (fog).

Water stream may splash the burning liquid and spread fire.

SPECIAL FIRE FIGHTING PROCEDURES:

Use water spray to cool drums exposed to fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Biodiesel soaked rags or spill absorbents (i.e. oil dry, polypropylene socks, sand, etc.) can cause spontaneous combustion if stored near combustibles and not handled properly. Store biodiesel soaked rags or spill absorbents in approved safety containers and dispose of properly. Oil soaked rags may be washed with soap and water and allowed to dry in well ventilated area. Firefighters should use self-contained breathing apparatus to avoid exposure to smoke and vapor.

6. ACCIDENTAL RELEASE MEASURES SPILL CLEAN-UP PROCEDURES

Remove sources of ignition, contain spill to smallest area possible. Stop leak if possible. Pick up small spills with absorbent materials and dispose of properly to avoid spontaneous combustion (see unusual fire and explosion hazards above). Recover large spills for salvage or disposal. Wash hard surfaces with safety solvent or detergent to remove remaining oil film. Greasy nature will result in a slippery surface.

7. HANDLING AND STORAGE

Store in closed containers between 50°F and 120°F.
Keep away from oxidizing agents, excessive heat, and ignition sources.
Store and use in well ventilated areas.
Do not store or use near heat, spark, or flame, store out of sun.
Do not puncture, drag, or slide this container.
Drum is not a pressure vessel; never use pressure to empty.

8. EXPOSURE CONTROL / PERSONAL PROTECTION

RESPIRATORY PROTECTION:

If vapors or mists are generated, wear a NIOSH approved organic vapor / mist respirator.

PROTECTIVE CLOTHING:

Safety glasses, goggles, or face shield recommended to protect eyes from mists or splashing.
PVC coated gloves recommended to prevent skin contact.

OTHER PROTECTIVE MEASURES:

Employees must practice good personal hygiene, washing exposed areas of skin several times daily and laundering contaminated clothing before re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point, 760 mm Hg:>200°C Volatiles, % by Volume: <2
Specific Gravity (H₂O=1): 0.88 Solubility in H₂O, % by Volume: insoluble
Vapor Pressure, mm Hg: <2 Evaporation Rate, Butyl Acetate=1: <1
Vapor Density, Air=1:>1
Appearance and Odor: pale yellow liquid, mild odor

10. STABILITY AND REACTIVITY

GENERAL:

This product is stable and hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Strong oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS:

Combustion produces carbon monoxide, carbon dioxide along with thick smoke.

11. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL:

Waste may be disposed of by a licensed waste disposal company. Contaminated absorbent material may be disposed of in an approved landfill. Follow local, state and federal disposal regulations.

12. TRANSPORT INFORMATION

UN HAZARD CLASS: N / A

NMFC (National Motor Freight Classification):

PROPER SHIPPING NAME: Fatty acid ester

IDENTIFICATION NUMBER: 144920

SHIPPING CLASSIFICATION: 65

13. REGULATORY INFORMATION

14. OTHER INFORMATION

This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any other process. Such information is to the best of the company's knowledge and believed accurate and reliable as of the date indicated. However, no representation, warranty or guarantee of any kind, express or implied, is made as to its accuracy, reliability or completeness and we assume no responsibility for any loss, damage or expense, direct or consequential, arising out of use. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use.

DOCUMENT CONTROL
IP180_B



CLIENT : Cape Winelands District Municipality
PROJECT NAME : Groot Drakenstein Sewer **PROJECT No.** : J31020
TITLE OF DOCUMENT : Groot Drakenstein Sewer: Draft Construction Environmental Management Programme
ELECTRONIC LOCATION : P:\J31020 (Groot Drakenstein Pipeline)\G_Outgoing Docs (Reports)

Approved By **Reviewed By** **Prepared By**

ORIGINAL	NAME Tanya Faber	NAME Tanya Faber	NAME David Hadlow
DATE 18 June 2012	SIGNATURE 	SIGNATURE 	SIGNATURE 

Approved By **Reviewed By** **Prepared By**

REVISION	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

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Arcus GIBB (Pty) Ltd Website : www.arcusgibb.co.za
 Postal Address : P.O. Box 3965 Physical Address : 14 Kloof Street
 Cape Town, 8000 Cape Town, 8001
 Contact Person : Tanya Faber Email Address : tfaber@gibb.co.za
 Telephone No. : +27 21 469 9229 Fax No. : + 27 21 424 5571