

**THE PROPOSED PERIODIC MAINTENANCE OF TRUNK ROAD 16 SECTION 8 (16/8)  
AND TRUNK ROAD 16 SECTION 9 (16/9) BETWEEN THE NORTHERN CAPE BORDER  
AND MURRAYSBURG, WESTERN CAPE**

**FINAL ENVIRONMENTAL MANAGEMENT PROGRAMME**

DEA&DP Ref: 16/3/3/6/7/1/C3/13/0049/23

**(INCLUDING THE WASTE, WATER USE AND ELECTRICITY CONSUMPTION MINIMIZATION AND  
MANAGEMENT PLAN)**

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## ABBREVIATIONS

|             |                                                              |
|-------------|--------------------------------------------------------------|
| DEA&DP..... | Department of Environmental Affairs and Development Planning |
| DFFE.....   | Department of Forestry, Fisheries and the Environment        |
| DWS.....    | Department of Water and Sanitation                           |
| EA.....     | Environmental Authorisation                                  |
| EAP.....    | Environmental Assessment Practitioner                        |
| ECO .....   | Environmental Control Officer                                |
| EIA.....    | Environmental Impact Assessment                              |
| EMPr .....  | Environmental Management Programme                           |
| EO .....    | Environmental Officer                                        |
| ER.....     | Employer's Representative                                    |
| ESO .....   | Environmental Site Officer                                   |
| GNEC.....   | Guillaume Nel Environmental Consulting                       |
| I&AP.....   | Interested and Affected Parties                              |

## DEFINITIONS

***Alien species*** - Plants and animals which do not arrive naturally in an area - they are brought in by humans. Alien plants often force indigenous species out of the area. Rooikrans is a good example of alien species in the Cape.

***Alternative*** - A possible course of action, in place of another, that would meet the same purpose and need defined by the development proposal. Alternatives considered in the EIA process can include location and/or routing alternatives, layout alternatives, process and/or design alternatives, scheduling alternatives or input alternatives.

***Aspect*** – Element of an organisation's activities, products or services that can interact with the environment.

***Auditing*** - A systematic, documented, periodic and objective evaluation of how well the environmental management programme is performing with the aim of helping to safeguard the environment by facilitating management control which would include meeting regulatory requirements. Results of the audit help the organisation to improve its environmental policies and management systems.

***Biodiversity*** - The rich variety of plants and animals that live in their own environment. Fynbos is a good example of rich biodiversity in the Cape.

***Built environment*** - Physical surroundings created by human activity, e.g. buildings, houses, roads, bridges and harbours.

***Conservation*** - Protecting, using and saving resources wisely, especially the biodiversity found in an area.

***Contamination*** - Polluting or making something impure.

***Corrective (or remedial) action*** - Response required to address an environmental problem that is in conflict with the requirements of the EMPr. The need for corrective action may be determined through monitoring, audits or management review.

***Degradation*** - The lowering of the quality of the environment through human activities, e.g. river degradation, soil degradation.

***Ecology*** - The scientific study of the relationship between living things (animals, plants and humans) and their environment.

***Ecosystem*** - The relationship and interaction between plants, animals and the non-living environment.

**Environment** - Our surroundings, including living and non-living elements, e.g. land, soil, plants, animals, air, water and humans. The environment also refers to our social and economic surroundings, and our effect on our surroundings.

**Environmental Impact Assessment (EIA)** - An Environmental Impact Assessment (EIA) refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of a proposed development. The EIA includes an evaluation of alternatives; recommendations for appropriate management actions for minimising or avoiding negative impacts and for enhancing positive impacts; as well as proposed monitoring measures.

**Environmental Management System (EMS)** - Environmental Management Systems (EMS) provide guidance on how to manage the environmental impacts of activities, products and services. They detail the organisational structure, responsibilities, practices, procedures, processes and resources for environmental management. The ISO14001 EMS standard has been developed by the International Standards Organisation.

**Environmental policy** - Statement of intent and principles in relation to overall environmental performance, providing a framework for the setting of objectives and targets.

**Fynbos** - Low-growing and evergreen vegetation found only in the south of the Western Cape. Fynbos is known for its rich biodiversity.

**Habitat** - The physical environment that is home to plants and animals in an area, and where they live, feed and reproduce.

**Hazardous waste** - Waste, even in small amounts, that can cause damage to plants, animals, their habitat and the well-being of human beings, e.g. waste from factories, detergents, pesticides, hydrocarbons, etc.

**Impact** - A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

**Indigenous species** - Plants and animals that are naturally found in an area.

**Infrastructure** - The network of facilities and services that are needed for economic activities, e.g. roads, electricity, water, sewerage.

**Integrated** - Mixing or combining all useful information and factors into a joint or unified whole. See Integrated Environmental Management.

**Integrated Environmental Management (IEM)** - A way of managing the environment by including environmental factors in all stages of development. This includes thinking about physical, social, cultural and economic factors and consulting with all the people affected by the proposed developments. Also called "IEM".

**Land use** - The use of land for human activities, e.g. residential, commercial, industrial use.

**Mitigation** - Measures designed to avoid, reduce or remedy adverse impacts.

**Natural environment** - Our physical surroundings, including plants and animals, when they are unspoiled by human activities.

**Over-utilisation** - Over-using resources - this affects their future use and the environment.

**Policy** - A set of aims, guidelines and procedures to help you make decisions and manage an organisation or structure. Policies are based on people's values and goals. See Integrated Metropolitan Environmental Policy.

**Process** - Development usually happens through a process - a number of planned steps or stages.

**Proponent** – Developer. Entity which applies for environmental approval and is ultimately accountable for compliance to conditions stipulated in the Environmental authorisation (EA) and requirements of the EMPr.

**Recycling** - Collecting, cleaning and re-using materials.

**Resources** - Parts of our natural environment that we use and protect, e.g. land, forests, water, wildlife, and minerals.

**Scoping Report** - A report presenting the findings of the scoping phase of the EIA. This report is primarily aimed at reaching closure on the issues and alternatives to be addressed in the EIA (in the case of a full EIA process).

**Stakeholders** - A subgroup of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term includes the proponent, authorities and all interested and affected parties.

**Storm water management** – Strategies implemented to control the surface flow of storm water such that erosion, sedimentation and pollution of surface and ground water resources in the immediate and surrounding environments are mitigated. This is specifically important during the construction and decommissioning phases of a project.

**Sustainable development** - Development that is planned to meet the needs of present and future generations, e.g. the need for basic environmental, social and economic services. Sustainable development includes using and maintaining resources responsibly.

**Sustainability** - Being able to meet the needs of present and future resources.

**Waste Management** – Classifying, recycling, treatment and disposal of waste generated during construction and decommissioning activities.

**Wetlands** - An area of land with water mostly at or near the surface, resulting in a waterlogged habitat containing characteristic vegetation species and soil types e.g. vleis, swamps.

**Zoning** - The control of land use by only allowing specific type development in fixed areas or zones.

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National Environmental Management Act 107 of 1998 (NEMA).

## SECTION 1 - INTRODUCTION AND BACKGROUND

### 1.1 INTRODUCTION AND BACKGROUND

The Western Cape Government: Department of Infrastructure, as proponent of the proposed maintenance will use this Planning, Construction and Operational Phase Environmental Management Programme (EMPr) as a tool in managing the impacts of the proposed periodic maintenance of the mentioned roads, after environmental approval from the Department of Environmental Affairs and Development Planning (DEA&DP) in terms of the Environmental Impact Assessment Regulations (GN R. No. 983, GN R. No. 984 and GN R. No. 985 [4 December 2014, as amended 07 April 2017]) under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), is obtained.

This document is based on the EMPr Guideline provided by DEA&DP which was compiled in accordance with the Integrated Environmental Management (IEM) philosophy which aims to achieve a desirable balance between conservation and development (DEAT, 1992). IEM is a key instrument of the National Environmental Management Act [NEMA] (Act No. 107 of 1998). NEMA promotes the integrated environmental management of activities that will have a significant effect on the environment, while IEM prescribes a methodology for ensuring that environmental management principles are fully integrated into all stages of the development process. It advocates the use of several environmental and management tools that are appropriate for the various levels of decision-making. One such tool is an Environmental Management Programme (EMPr).

The IEM guidelines intend encouraging a pro-active approach to sourcing, collating and presenting information in a manner that can be interpreted at all levels. The basic principles underpinning IEM are that there be:

- informed decision-making;
- accountability for information on which decisions are taken;
- accountability for decisions taken;
- a broad meaning given to the term environment (i.e. one that includes physical, biological, social, economic, cultural, historical and political components);
- an open, participatory approach in the planning of proposals;
- consultation with interested and affected parties;
- due consideration of alternative options;
- an attempt to mitigate negative impacts and enhance positive aspects of proposals;
- an attempt to ensure that the 'social costs' of development proposals (those borne by society, rather than the developers) be outweighed by the 'social benefits' (benefits to society as a results of the actions of the developers);
- democratic regards for individual rights and obligations;

- compliance with these principles during all stages of the planning, implementation and decommissioning of the proposals (i.e. from ‘cradle to grave’), and
- The opportunity for public and specialist input in the decision-making process.

These principles are in line with National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), and is focussed primarily on co-operative governance, public participation and sustainable development. The Environmental Impact Assessment Regulations GN No. R. 982, R. 983, R. 984, and R. 985 (as amended), are to regulate the procedures and criteria for the submission, processing, consideration and decision on applications for environmental authorisation of listed activities.

## 1.2 SCOPE AND TERMS OF REFERENCE

The general principles contained within this document apply to all **PRE-CONSTRUCTION, CONSTRUCTION AND OPERATIONAL** activities.

Principles of this EMPr

This EMPr is compiled using the following concepts and implementation requirements so that the higher principles of sustainable development are realised:

- ***Continuous improvement.*** The project proponent (or implementing organisation) must be committed to review and to continually improve environmental management, with the objective of improving overall environmental performance.
- ***Broad level of commitment.*** A broad level of commitment will be required from all levels of management as well as the workforce in order for the development and implementation of this EMPr to be successful and effective.
- ***Flexible and responsive.*** The implementation of the EMPr must be responsive to new and changing circumstances, i.e. rapid short-term responses to problems or incidents. The EMPr is a dynamic “living” document and thus regular planned review and revision of the EMPr must be carried out.
- ***Integration across operations.*** This EMPr is integrated across existing line functions and operational units such as health, safety and environmental departments in a company/project. This is done to change the redundant mindset of seeing environmental management as a single domain unit.
- ***Legislation.*** It is understood that any development project during its construction phase is a dynamic activity within a dynamic environment. The Developer, Engineer, Contractor and sub-contractor must therefore be aware that certain activities conducted during construction will require further licensing or environmental approval, e.g. river or stream diversions, bulk fuel storage, waste disposal, etc. The Contractor must consult the ER, EO and ECO on a regular basis in this regard.

## SECTION 2 – SITE SPECIFIC INFORMATION

### 2.1 PROPOSED ACTIVITY AND LOCAL CONTEXT

#### INTRODUCTION AND BACKGROUND

The proposed periodic maintenance of Trunk Road 16 Section 8 (TR16/8) and Trunk Road 16 Section 9 (TR16/9) is located between Murraysburg and Victoria West in the Northern Cape area and is maintained by the Central Karoo District Municipality. Murraysburg is situated approximately 93 kilometres South of Victoria West. TR16/8 (R63) is approximately 4.64km in length and starts at the border of the Northern Cape at km 43.48 and ends at the TR16/8 / N1 intersection at km 48.12. The TR16/9 starts at the N1 intersection and continues straight through the relatively flat Karoo landscape up to the town of Murraysburg, where it ends at the junction with Church Street in the heart of the town at km 41.42.

The N1 National Road is approximately 46.69 kilometres Northwest of Murraysburg. The dominate land-use in the area of the proposed periodic maintenance along the TR16/8 and TR16/9 road is livestock farming and agricultural activities.

EFG Engineers (Pty) Ltd., on behalf of the Western Cape Government: Department of Infrastructure (previously Transport and Public Works), appointed Guillaume Nel Environmental Consultants (GNEC) in order to facilitate a Basic Assessment Process for the proposed periodic maintenance of Trunk Road 16/8 and Trunk Road 16/9.

The proposed maintenance will include:

- erosion control;
- sediment removal;
- vegetation removal;
- repairing of culvert structures;
- while minor maintenance repairs will also be done to most of the major culverts and bridges along the route.

#### PROJECT PROPOSAL

The proposed development will take place within the existing proclaimed road reserve of the following roads:

- Trunk Road 16 Section 8 from km 43.48 to km 48.12
- Trunk Road 16 Section 9 from km 0.00 to km 41.42

The total length of the road being repaired is approximately 46 kilometres.

The mentioned roads are located within the Central Karoo District Municipality area. The local Municipality is the Beaufort West Municipality.

TR16/8 and TR16/9 (the indicated sections) are existing surfaced roads with stormwater infrastructure being present at different locations along the road to ensure the throughflow of water underneath the road. The majority of the structures along the two roads require minor maintenance, but a number of

the structures require larger maintenance/minor upgrade works to ensure the functionality of the structures.

The proposed maintenance period will approximately take 12 months to complete.

There are various minor and major concrete culverts passing under the roads. Generally, all the culvert inlets and outlets need to be cleaned and most culvert barrels need to be cleaned out as they are blocked. The culverts will therefore be cleaned and repaired. Erosion protection measures are needed where erosion has taken place over the years. Concrete head walls, wingwalls and aprons are needed to replace the existing masonry structures, which are mainly in poor condition.

**The listed activities in terms of the National Environmental Management Act (NEMA) EIA Regulations, 2014 (as amended) for the proposed construction/maintenance work are triggered by the construction activities taking place within the watercourses along the two roads. It is important to note that the works on the road surface itself is not triggered (activities including repair of edge break, surfacing and base repair, filling of ruts, texture slurring and resurfacing of the road). The maintenance works on the road surface itself is allowed to commence without issuing the environmental authorisation.** The proposed maintenance / minor upgrades at structures situated within watercourses triggers listed activities. These structures include:

**TR16/8:**

**1 Bridge and 5 Culvert Structures**

**Bridge B4611: TR16/8 at Km 46.11 (Gabriel Stream)**

The existing bridge is a 7 span simply supported in-situ concrete structure. The bridge consists of precast beams and an in-fill composite deck with closed wall type abutments with wing walls and wall-type piers. The bridge is founded on spread footings – dolerite rock.

The following maintenance activities are proposed at **Bridge B4611**:

- Reseal deck and seal exposed concrete shoulder;
- Install asphaltic plug joints at piers;
- Reconstruct approach with BMS (10m) on both sides to full bridge width;
- Roll-over joints with glass grid at abutments;
- Clean and apply a protective cementitious coating to all pier and abutment walls;
- Concrete repairs to balustrades and apply cementitious protective coating;
- Replace bridge handrails with precast concrete handrails;
- Concrete repairs to the deck;
- Concrete repairs at piers where required and backfilling of piers;
- Sediment removal where required;

- Erosion protection works at piers / embankments;
- Vegetation clearance where applicable.

Temporary access required as seen in Figure 1 below:



Figure 1: Proposed bridge access at B4611.

The following general maintenance activities for the **culverts** situated in a watercourse consist of:

- The construction of new concrete headwalls at culverts on inlet and outlets where no headwalls are present or where headwalls require reconstruction;
- The construction of new concrete wingwalls at culverts on inlet and outlet where no wingwalls are present or where wingwalls require reconstruction;
- The construction of new concrete apron slabs and cut off walls at culverts on inlet and outlet where no apron slabs are present or where apron slabs or cut off walls require reconstruction;
- The construction of new concrete culvert floor where no culvert floor is present, but required, or reconstruction of existing culvert floors;
- Installation of erosion protection works at culverts on inlet and outlet where required which include concrete, rip-rap, reno-mattresses, gabions and stone pitching;
- Shaping of existing embankments where erosion has occurred to reinstate prior to erosion;
- Sediment removal to ensure hydraulic functioning of culverts;

- Vegetation removal at culverts where culverts are overgrown; and
- Daylighting of culverts were required; daylighting might extend beyond fence line/road reserve. Daylighting is required to prevent stagnant water within the culvert and next to the road.

The list of **culverts** along the route of TR16/8 can be found in the list below:

- o **Culvert** at Km 43.92 (Approximately 180m Northwest of the Western Cape boundary)
- o **Culvert** at Km 44.49
- o **Culvert** at Km 46.66
- o **Culvert** at Km 46.75
- o **Culvert** at Km 47.75

#### **TR16/9:**

4 **Bridges** and approximately 60 **culvert** structures

**Bridge B4612:** TR16/9 at Km 17.45 (Brakvallei River)

The existing bridge is a 6 span simply supported concrete structure. The bridge is in fair structural condition and consists of pre-cast beam and an in-fill composite deck. The bridge can be described to have closed wall type abutments with wing walls and wall type piers. The bridge is founded on spread footings on calcrete.

The following maintenance activities are proposed at **Bridge B4612:**

- Reseal deck and seal exposed concrete shoulder;
- Install asphaltic plug joints at piers;
- Reconstruct approach with BMS (10m) on both sides to full bridge width;
- Roll-over joints with glass grid at abutments;
- Clean and apply a protective cementitious coating to all pier and abutment walls;
- Concrete repairs to balustrades and apply cementitious protective coating;
- Replace bridge handrails with precast concrete handrails;
- Concrete repairs to the deck;
- Concrete repairs at piers where required and backfilling of piers;
- Sediment removal where required;
- Erosion protection works at piers / embankments;
- Vegetation clearance where applicable;
- Sloping of embankments.

Temporary access required as seen in Figure 2 below:

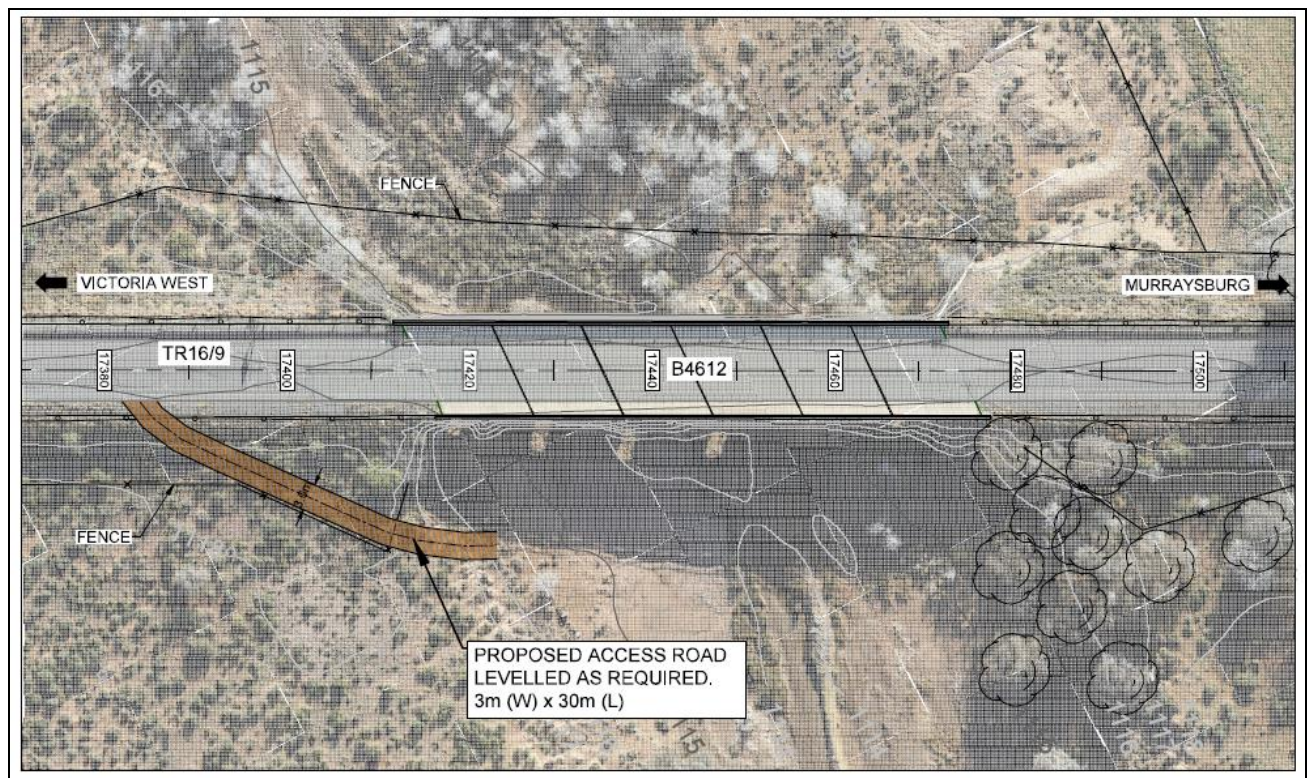


Figure 2: Proposed access at Bridge B4612.

#### **Bridge B4613: TR16/9 at Km 18.92 (Tributary of the Brakvallei River)**

The existing bridge is a 3 span simply supported concrete structure. The bridge consists of a precast beam and infill composite deck with closed wall type abutments with wingwalls and wall-type piers. The bridge is founded on spread footings on calcrete.

The following maintenance activities are proposed at **Bridge B4613**:

- Reseal deck and seal exposed concrete shoulder;
- Install asphaltic plug joints at piers;
- Reconstruct approach with BMS (10m) on both sides to full bridge width;
- Roll-over joints with glass grid at abutments;
- Clean and apply a protective cementitious coating to all pier and abutment walls;
- Re-instate gap in balustrade joints;
- Concrete repairs to balustrades and apply cementitious protective coating;
- Concrete repairs to the deck;
- Concrete repairs at piers where required and backfilling of piers;
- Sediment removal where required;
- Erosion protection works at piers / embankments;
- Vegetation clearance where applicable;

- Sloping of embankments.

Temporary access required as seen in Figure 3 below:

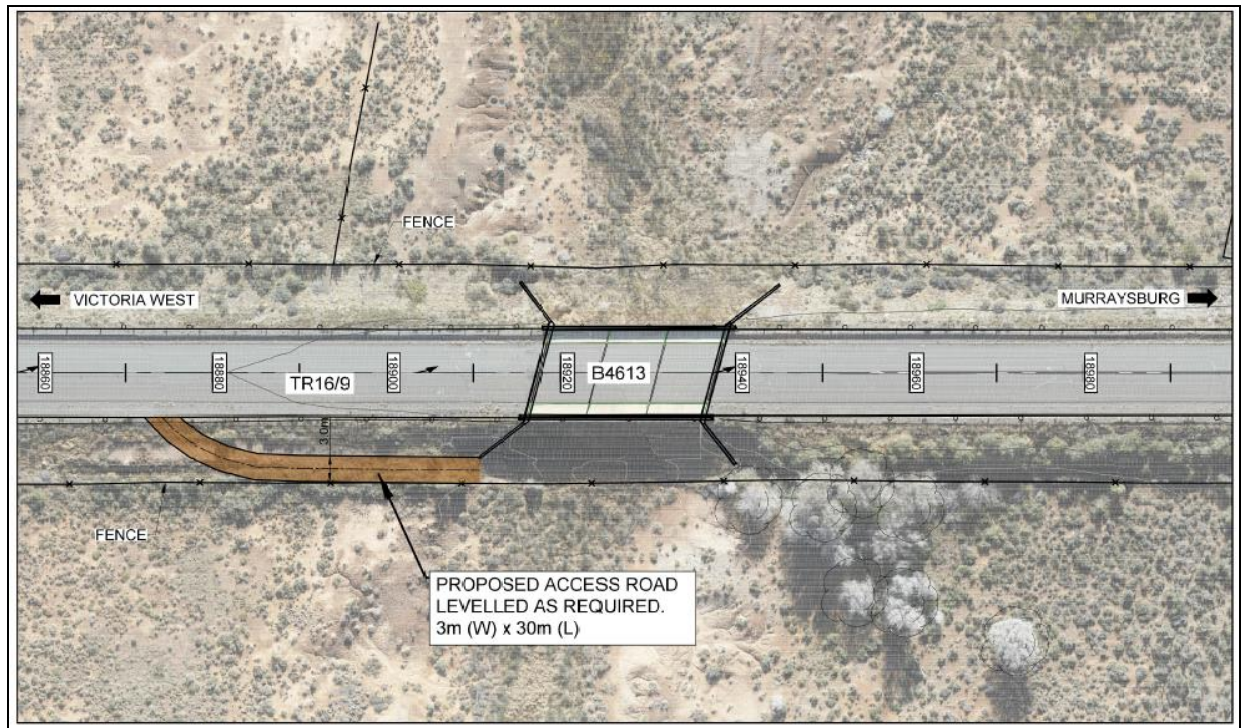


Figure 3: Proposed access to Bridge B4613.

#### **Bridge B4614: TR16/9 at Km 26.94 (Buffalo River)**

The existing bridge is a 3 span simply supported concrete structure. The bridge consists of cast-in-situ beams and a slab deck. Closed abutments with return walls on caissons are present as well as wall-type piers on shale.

The following maintenance activities are proposed at **Bridge B4614**:

- Reseal deck and seal exposed concrete shoulder;
- Install asphaltic plug joints at piers and abutments;
- Reconstruct approach with BMS (10m) on both sides to full bridge width;
- Roll-over joints with glass grid at abutments ends / approach slab;
- Clean and apply a protective cementitious coating to all pier and abutment walls;
- Concrete repairs to balustrades and apply cementitious protective coating;
- Replace bridge handrails with precast concrete handrails;
- Repair gabion embankment protection works and bush clearing;
- Erosion protection works at piers / embankments;
- Vegetation clearance where applicable;

- Concrete repairs at piers where required and backfilling of piers;
- Sediment removal where required.

Temporary access required as seen in Figure 4 below:

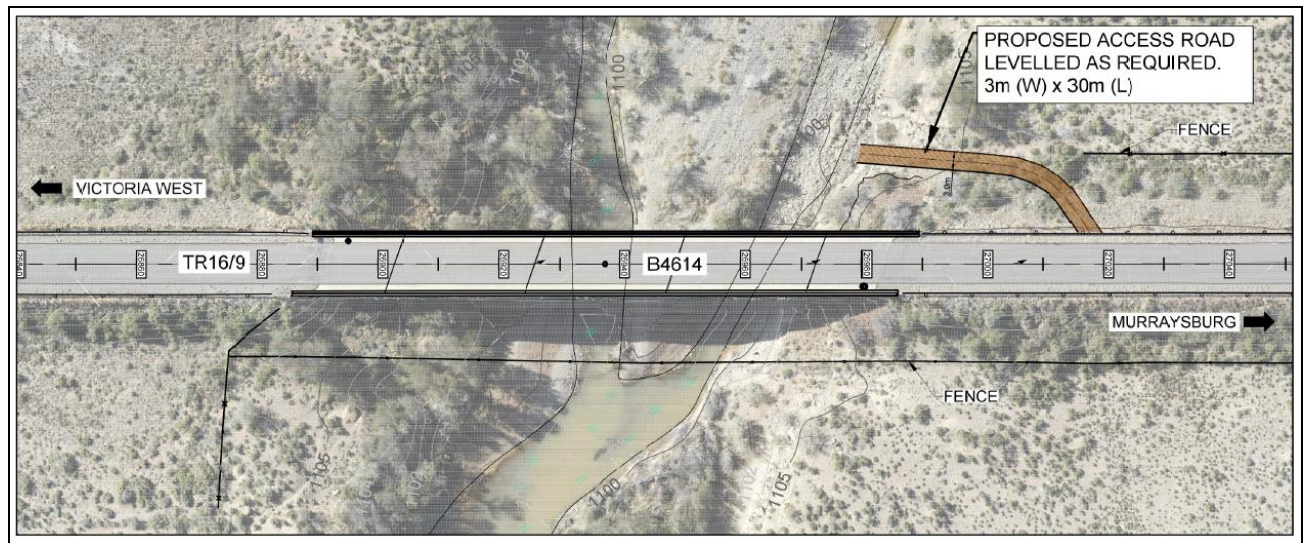


Figure 4: Proposed access to Bridge B4614.

#### **Bypass TR16/9 at Km 26.94 (Buffalo River)**

As part of the maintenance works proposed to the Buffalo River bridge the bearings of the bridge is proposed to be replaced. In order for the bearings to be replaced the entire deck of the bridge is required to be jacked to allow access to the bearings. During this operation the bridge will not be able to allow traffic over the bridge, therefore a temporary bypass on the north-eastern side of the bridge is proposed to temporary divert traffic.

The bypass will utilize two existing farm roads to provide access to the Buffalo River. The proposal is to place 4x 600mm pipe culverts within the watercourse with gravel material placed over the pipes to allow access across the watercourse. The temporary bypass is proposed to be constructed next to an existing old causeway, which is in a very bad condition and not safe to be utilized for access over the watercourse. After the jacking of the bridge has been completed the temporary bypass structure will be removed from the watercourse and traffic will use the bridge again. The proposed bypass road is situated on the north-eastern side of the TR16/9 is approximately 990m in length and 6m wide on the western side of the watercourse, minimal widening of the existing access road on the eastern side of the watercourse is required up to the bypass structure proposed in the watercourse. The widening of the existing gravel road is proposed approximately 4m and a small section of new gravel road is proposed to allow fluent alignment. The new section required is approximately 100m in length and 6m wide (600m<sup>2</sup>).

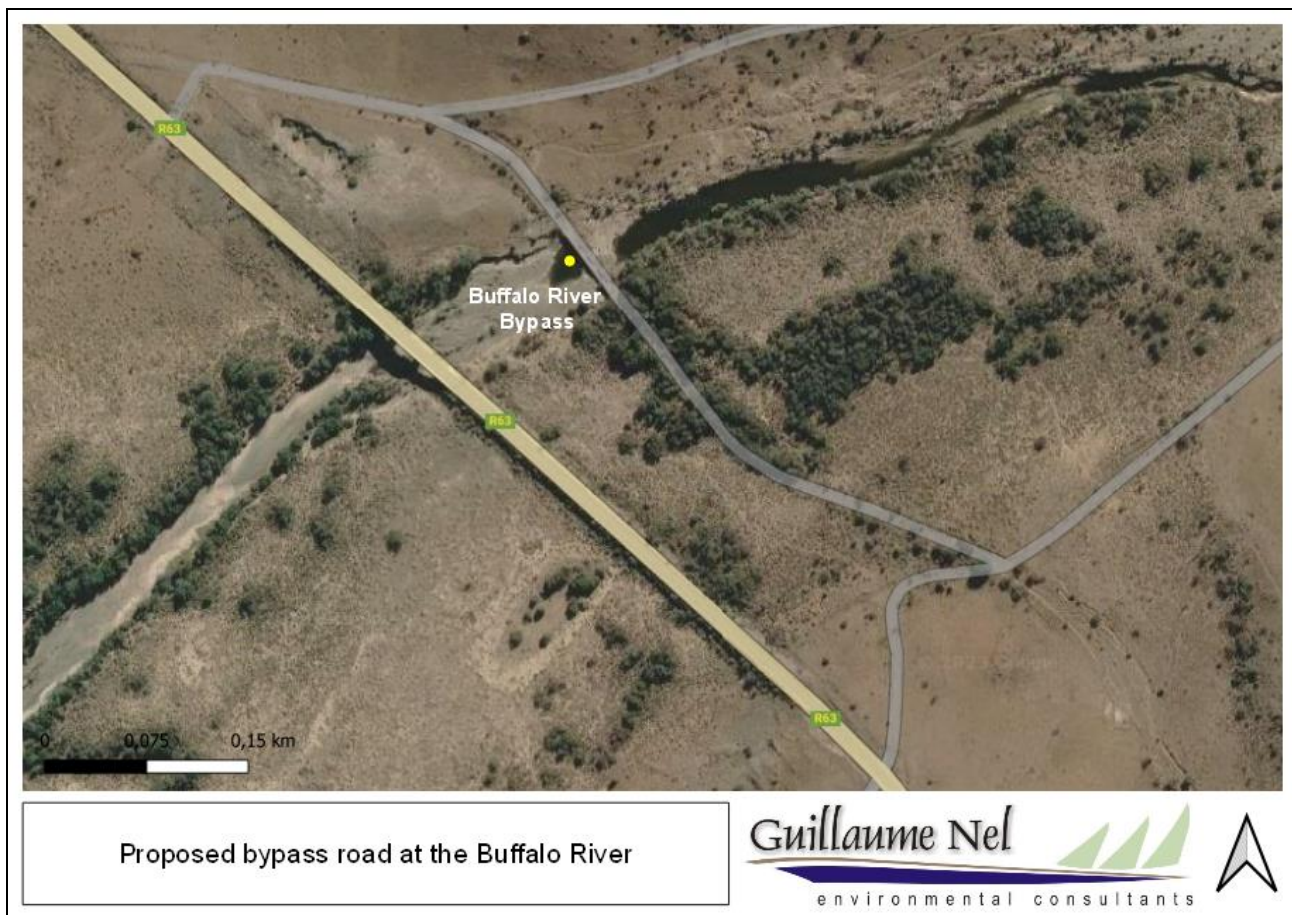


Figure 5: Proposed bypass location at Buffels River.

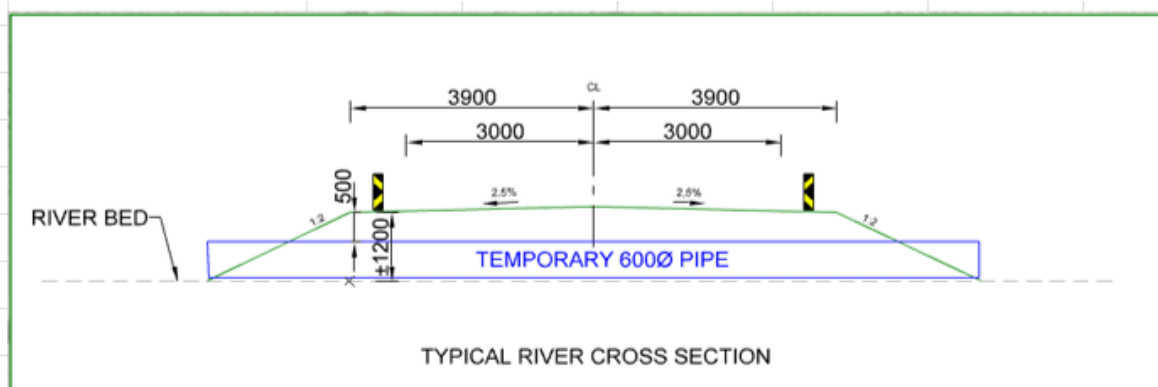
The proposed bypass road is situated on the north-eastern side of the TR16/9 is approx. 990m in length and 6m wide on the western side of the watercourse, minimal widening of the existing access road on the eastern side of the watercourse is required up to the bypass structure proposed in the watercourse. The widening of the existing gravel road is proposed approx. 4m and along a length of approx. 220m. A small section of new gravel road is proposed to allow fluent alignment. The new section required is approx. 100m in length and 6m wide (600m<sup>2</sup>). Please refer to bypass layout in die addendums.

Vegetation clearance of 4m wide x approx. 220m in length (required for widening) + 6m wide x 100m in length (required for new section) = approx. 1 480m<sup>2</sup>.

The total footprint area for culvert upgrades situated in watercourses will be approx. 220m<sup>2</sup>.

The total length of the proposed bypass structure from bank to bank is approx. 65m and the road over the 4x 600mm pipe culverts 7.8m wide calculating to 820m<sup>2</sup> of temporary bypass within the watercourse.

The total fill required within the watercourse is approx. 800m<sup>3</sup> and will be removed once the bridge is operational again.



Total length = 65 m

Road width = 7,8 m

Fill hight = 1,2 m

Fill slopes = 1: 2

Fill footprint = 819 m<sup>2</sup>

Total fill volume = 796 m<sup>3</sup>

Figure 6: Typical River Cross Section design.

#### Bridge 4615: TR16/9 at Km 39.50 (Uitkyk River)

The existing bridge is a 3 span simply supported concrete structure. The bridge consists of precast beam and in-fill Solid composite deck with closed wall type abutments with wing walls. The bridge has wall-type piers and is found on spread footings on rocks.

The following maintenance activities are proposed at **Bridge B4615**:

- Reseal deck and seal exposed concrete shoulders;
- Install asphaltic plug joints at piers;
- Reconstruct approach with BMS (10m) on both sides to full bridge width;
- Roll-over joints with glass grid at abutments;
- Clean and apply a protective cementitious coating to all pier and abutment walls;
- Concrete repairs in balustrades and apply protective coating;
- Concrete repairs at piers where required and backfilling of piers;
- Sediment removal where required;
- Erosion protection works at piers / embankments;
- Vegetation clearance where applicable;
- Sloping of embankments.

Temporary access required as seen in **Figure 7** below:

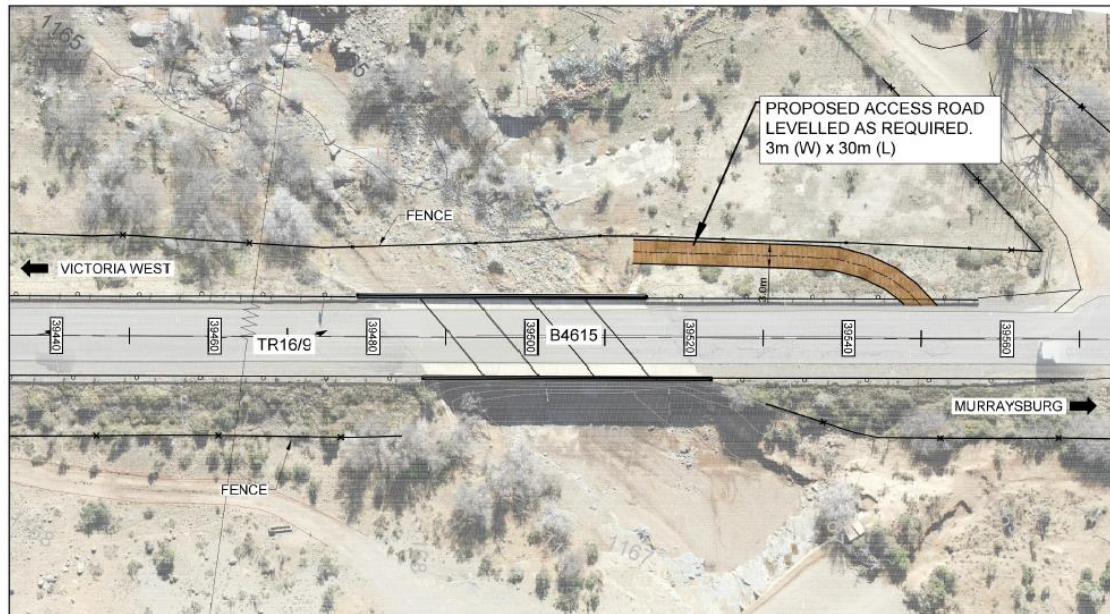


Figure 7: Proposed access to Bridge B4615.

The following general maintenance activities for the culverts situated in a watercourse consist of:

- The construction of new concrete headwalls at culverts on inlet and outlets where no headwalls are present or where headwalls require reconstruction;
- The construction of new concrete wingwalls at culverts on inlet and outlet where no wingwalls are present or where wingwalls require reconstruction;
- The construction of new concrete apron slabs and cut off walls at culverts on inlet and outlet where no apron slabs are present or where apron slabs or cut off walls require reconstruction;
- The construction of new concrete culvert floor where no culvert floor is present, but required, or reconstruction of existing culvert floors;
- Installation of erosion protection works at culverts on inlet and outlet where required which include concrete, rip-rap, reno-mattresses, gabions and stone pitching;
- Shaping of existing embankments where erosion has occurred to reinstate prior to erosion;
- Sediment removal to ensure hydraulic functioning of culverts;
- Vegetation removal at culverts where culverts are overgrown; and
- Daylighting of culverts were required; daylighting might extend beyond fence line/road reserve. Daylighting is required to prevent stagnant water within the culvert and next to the road.

The list of culverts along the route of TR16/9 for which the above maintenance is required can be found in the list below:

- **Culvert** at Km 0.21

- **Culvert** at Km 0.34
- **Culvert** at Km 0.43
- **Culvert** at Km 0.55
- **Culvert** at Km 1.26
- **Culvert** at Km 3.58
- **Culvert** at Km 7.24
- **Culvert** at Km 7.39
- **Culvert** at Km 7.70
- **Culvert** at Km 7.79
- **Culvert** at Km 7.88
- **Culvert** at Km 7.97
- **Culvert** at Km 8.64
- **Culvert** at Km 8.85
- **Culvert** at Km 9.75
- **Culvert** at Km 13.03
- **Culvert** at Km 13.09
- **Culvert** at Km 13.22
- **Culvert** at Km 13.34
- **Culvert** at Km 13.44
- **Culvert** at Km 13.58
- **Culvert** at Km 13.70
- **Culvert** at Km 13.98
- **Culvert** at Km 14.22
- **Culvert** at Km 14.96
- **Culvert** at Km 15.26
- **Culvert** at Km 24.23
- **Culvert** at Km 24.39
- **Culvert** at Km 24.63
- **Culvert** at Km 25.05
- **Culvert** at Km 25.56

- **Culvert** at Km 25.73
- **Culvert** at Km 27.16
- **Culvert** at Km 27.28
- **Culvert** at Km 28.29
- **Culvert** at Km 29.68
- **Culvert** at Km 30.14
- **Culvert** at Km 30.28
- **Culvert** at Km 30.36
- **Culvert** at Km 30.95
- **Culvert** at Km 31.00
- **Culvert** at Km 31.88
- **Culvert** at Km 32.27
- **Culvert** at Km 33.03
- **Culvert** at Km 33.13
- **Culvert** at Km 33.52
- **Culvert** at Km 34.33
- **Culvert** at Km 34.54
- **Culvert** at Km 35.91
- **Culvert** at Km 36.18
- **Culvert** at Km 36.41
- **Culvert** at Km 36.64
- **Culvert** at Km 37.16
- **Culvert** at Km 38.20
- **Culvert** at Km 39.02
- **Culvert** at Km 39.79
- **Culvert** at Km 40.69
- **Culvert** at Km 40.79
- **Culvert** at Km 40.9
- **Culvert** at Km 41.01

## FRESHWATER

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd. was appointed by Guillaume Nel Environmental Consultants (GNEC) to conduct a specialist freshwater ecological assessment as part of the Environmental Authorisation (EA) and Water Use Authorisation processes for the proposed periodic maintenance of TR16/8 and TR16/9 which is a section of the R63 road corridor, immediately north-west of the town of Murraysburg, and south of the town of Victoria West, Western Cape.

According to FEN Consulting (2023), two primary drainage systems are traversed by the assessed section TR16/8 and TR16/9, specifically the Brak River and Buffels River, and their associated tributaries which include two channelled valley bottom wetlands which drain into the Brak River. These watercourses are in a largely natural to moderately modified ecological state, and of high ecological importance and sensitivity.

Based on the findings of the freshwater assessment, the proposed periodic maintenance of Trunk Road 16/8 and Trunk Road 16/9 predominantly pose a low risk to the various watercourses, since activities do not require extensive work or time within the active channels of the watercourses.

### *Temporary Bypass at B4614 KM 26.94*

In addition to the above, as part of the maintenance works proposed to the Buffels River bridge, the bearings of the bridge are proposed to be replaced. In order for the bearings to be replaced, the entire deck of the bridge is required to be jacked to allow access to the bearings. During this operation the bridge will not be able to allow traffic over the bridge, therefore a temporary bypass on the northeastern side of the bridge is proposed to temporarily divert traffic.

The bypass will utilize two existing farm roads to provide access to the Buffels River. The proposal is to place 4 x 600mm pipe culverts within the watercourse with gravel material placed over the pipes to allow access across the watercourse. The temporary bypass is proposed to be constructed next to an existing old causeway, which is in a very bad condition and not safe to be utilized for access over the watercourse. After the jacking of the bridge has been completed, the temporary bypass structure will be removed from the watercourse and traffic will use the bridge again. The existing gravel road on the north-eastern side of TR16/9 is approximately 1km in length and 6m wide.

The total fill required within the watercourse is approximately 800m<sup>3</sup> and will be removed once the bridge is operational again. The total length of the proposed bypass structure from bank to bank is approximately 65m and the road over the 4 x 600mm pipe culverts 7.8m wide calculating to 820m<sup>2</sup> of temporary bypass within the watercourse.

According to FEN Consulting (2023), the bypass will have the following impacts to the watercourse:

- Exposure of soil, leading to increased runoff and erosion, and thus increased likelihood for further sedimentation of the river;
- Loss of freshwater habitat and ecological structure with the section of the river that will be traversed, resulting in impacts to biota;
- Increased sedimentation of the river, leading to smothering of vegetation in the downstream reaches;
- Proliferation of alien and/or invasive vegetation as a result of disturbances; and
- Potential changes to the ecoservices provision of the river.

In addition to the above, the proposed temporary bypass diversion over the Buffels River to allow for more extensive maintenance of the bridge over the river potentially poses a medium significance risk due to the occurrence of the activities within the active channel of the river, albeit temporary and short duration. Whilst a 'low' risk significance may be achieved through ensuring that the diversion is constructed and operated for a maximum of six weeks during the dry late autumn to winter period.

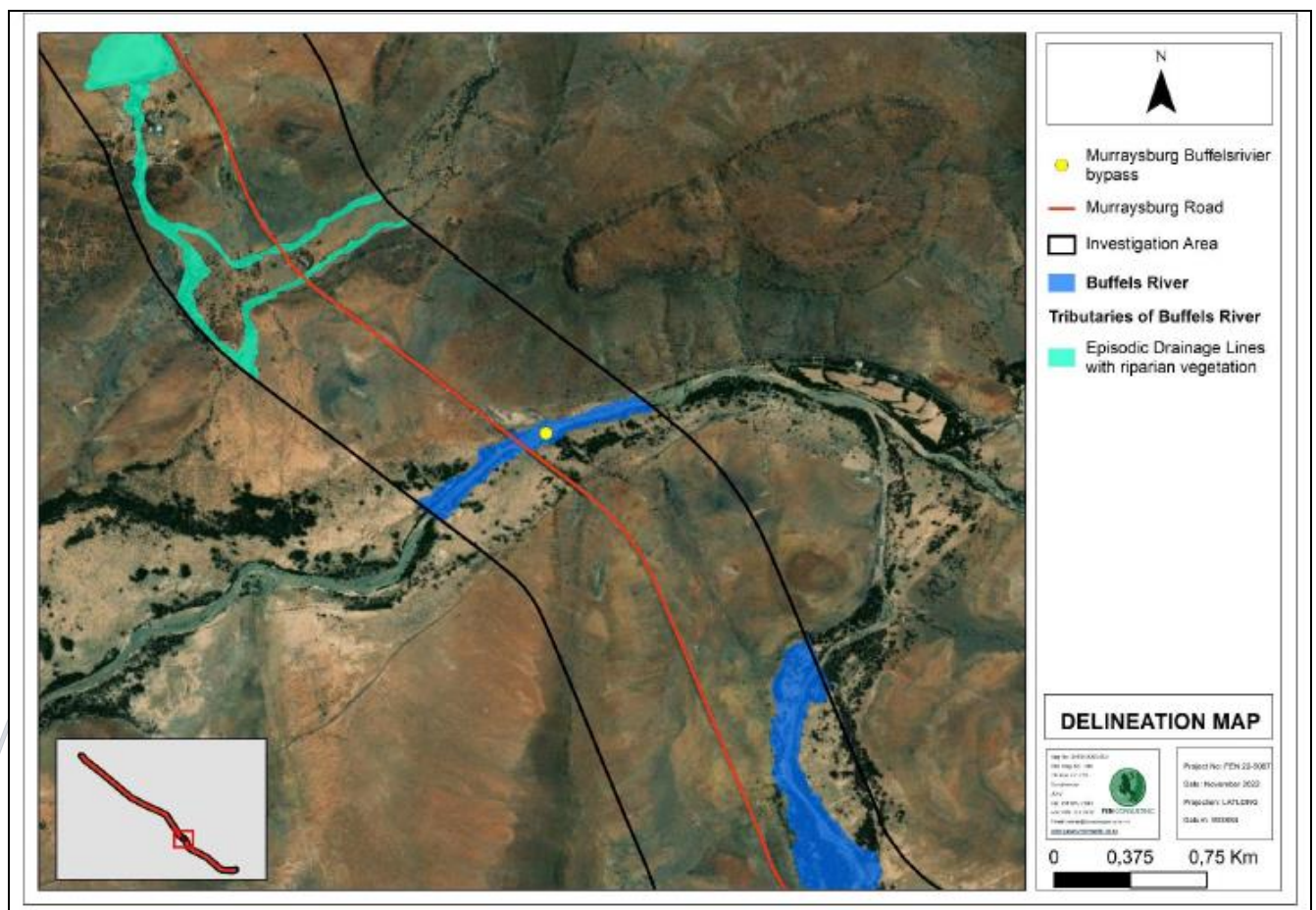


Figure 8: Delineation of the Buffels River in relation to the proposed temporary bypass over the river (FEN, 2023).

## VEGETATION

The site area is situated in the Central Karoo which is an arid area. The vegetation varies from sour grass and fynbos in the mountains to Karoooveld in the biggest part of the district. Thorn trees and other scrubs are found along the watercourses.

It should be noted that the road sections are surfaced with stormwater infrastructure present. No large areas of vegetation will be removed, but vegetation removal is required at certain structures. Therefore, although the site would have historically supported the vegetation types, the site was historically altered from its natural state due to previous road construction activities as well as continues mowing and maintenance activities.

The vegetation types found in the area is classified below:

- Upper Karoo Hardeveld – Nama Karoo Vegetation Type (NKu2) - LC Least Concern
- Southern Karoo Riviere – Inland Saline Vegetation Type (AZi6) - LC Least Concern
- Eastern Upper Karoo – Upper Karoo Bioregion Vegetation Type (NKu4) - LC Least Concern

The following is the total proposed vegetation clearance required as part of the application:

### **Bypass**

Vegetation clearance of 4m wide x approx. 220m in length (required for widening) + 6m wide x 100m in length (required for new section) = approx. 1 480m<sup>2</sup>. It is important to note this is linear activity.

### **Culverts**

The clearance required at the culverts is approx. 1 000m<sup>2</sup>.

### **Temporary accesses at the bridges**

Approximately 450m<sup>2</sup> of clearance is proposed for the temporary accesses. It is important to note this is linear activity.

### **Possible site camp/stockpile areas**

Total clearance required for possible site camp/stockpile areas = 4 300m<sup>2</sup>

Grand total of clearance proposed is approx. 7 230m<sup>2</sup> for which approx. 1 930m<sup>2</sup> is for linear activities.

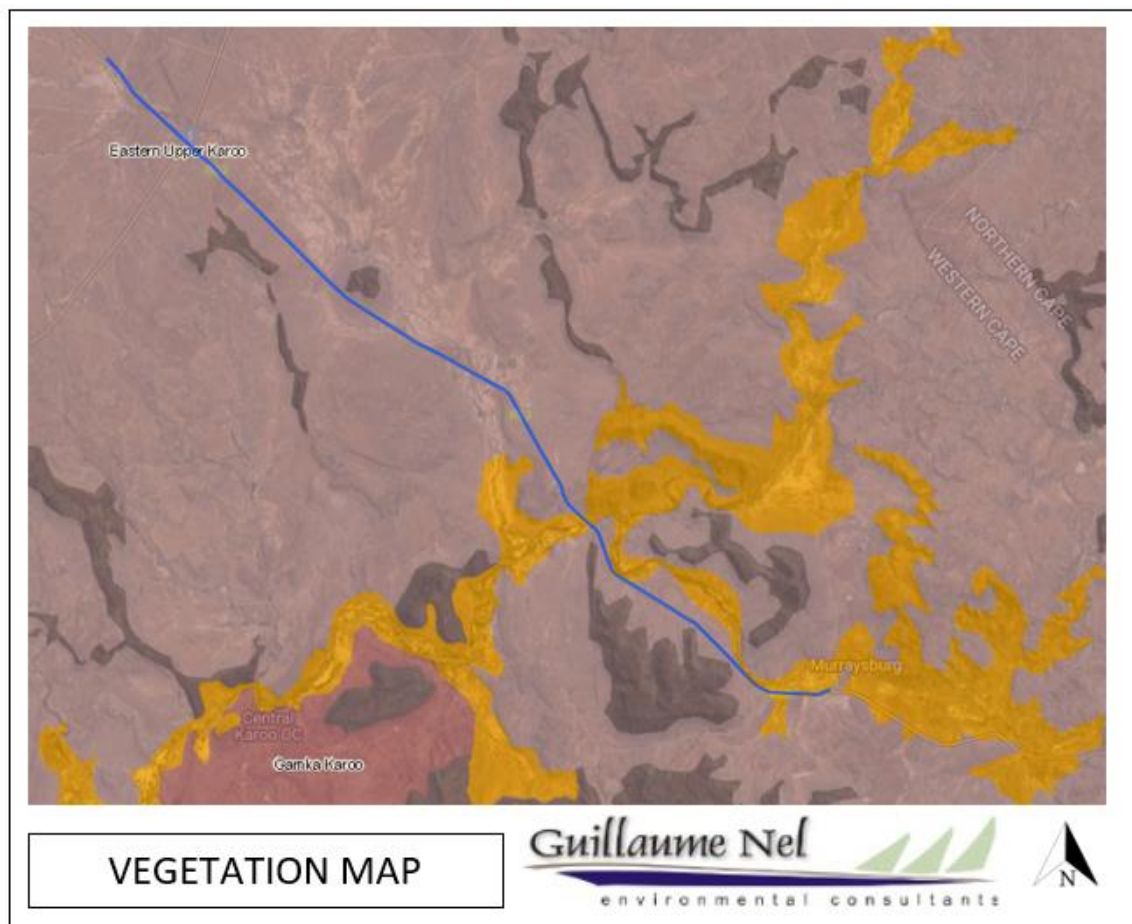


Figure 8: Vegetation Map of the area.

## GEOLOGY

The area along the TR16/9 route predominately consists of Middleton Formations, intermitted occasionally by Karoo Dolerite and Alluvium, Colluvium, Eluvium, grave, scree, sand, soils and debris.

## RIVERINE RABBIT OPINION

Scientific Terrestrial Services (STS, 2023) was appointed by Guillaume Nel Environmental Consultants to prepare an opinion letter pertaining to the *Bunolagus monticularis* (Riverine Rabbit, Critically Endangered (CR)) which are associated with the R63 road and subsequently impacted upon as a result of the proposed road and culvert maintenance activities.

The proposed R63 road maintenance activities that will be undertaken are unlikely to pose a significant threat to the Riverine Rabbit, as the associated repairs will be restricted to the road surface itself. Furthermore, the maintenance teams and equipment will likely make use of the road reserves for parking, however, the road reserves are not considered important for the Riverine Rabbit.

The Riverine Rabbit is endemic to the semi-arid central Karoo region of South Africa. Two distribution ranges (that are fragmented from one another) have been identified where this species occur. According to STS (2023), there are an estimated 12 subpopulations which are largely being isolated from each other by jackal-proof fencing and sever land transformation through agricultural practices. No

subpopulations are believed to carry more than 50 mature individuals from investigations undertaken between 2009 and 2013. Concerns regarding fragmentation are more notable, specifically through the conversion of fertile alluvial floodplains and riparian habitat for cultivation. The Riverine Rabbit, for the most part, inhabits dense riparian growth along seasonal rivers in the central Karoo, where it shows the greatest preference for riverine vegetation on alluvial soils adjacent to ephemeral rivers. The majority of the Riverine Rabbit occupancy lies in the Upper Karoo Bioregion, in which the Murraysburg road maintenance project is located.

Maintenance activities (vegetation clearing) relating to the culvert systems, notably where these structures are associated with riparian vegetation may however impact on habitat availability for this species. It is however important to note that riparian habitat adjacent / closely associated with the culverts are unlikely to be readily utilised by this species, notably when contemplating permanent habitation. It is noted however, that culverts may serve as a movement corridor for this species, allowing access to habitat on either side of the road network. As such, the riparian habitat associated with the freshwater systems adjacent to the culverts will provide important cover for this species when moving between areas. Accordingly, excessive removal of vegetation may inadvertently expose individuals to increased threats of predation.

#### **GENERAL AUTHORISATION**

A General Authorisation registration process in terms of the National Water Act, 1998 (Act No. 36 of 1998) is currently underway.

#### **HERITAGE**

No impacts are expected on any heritage or visual resources on site. The site is zoned Transport and has been previously disturbed due to activities such as previous road construction and ongoing road maintenance. No heritage resources were identified on site. A Notice of Intent to Develop (NID) application has been submitted to Heritage Western Cape in terms of Section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999). HWC's responded that *"since there is no reason to believe that the proposed periodic maintenance of Trunk Road 16/8 from km 0.00 to km 43.05 – N1 National Road to Murraysburg and Trunk Road 16/9 from km 43.48 to km 48.12 – Northern Cape boundary to N1 National Road, Beaufort West, Central Karoo District, will not negatively impact on heritage resources, no further action under Section 38(8) of the National Heritage Resources Act (Act 25 of 1999) is required"*.

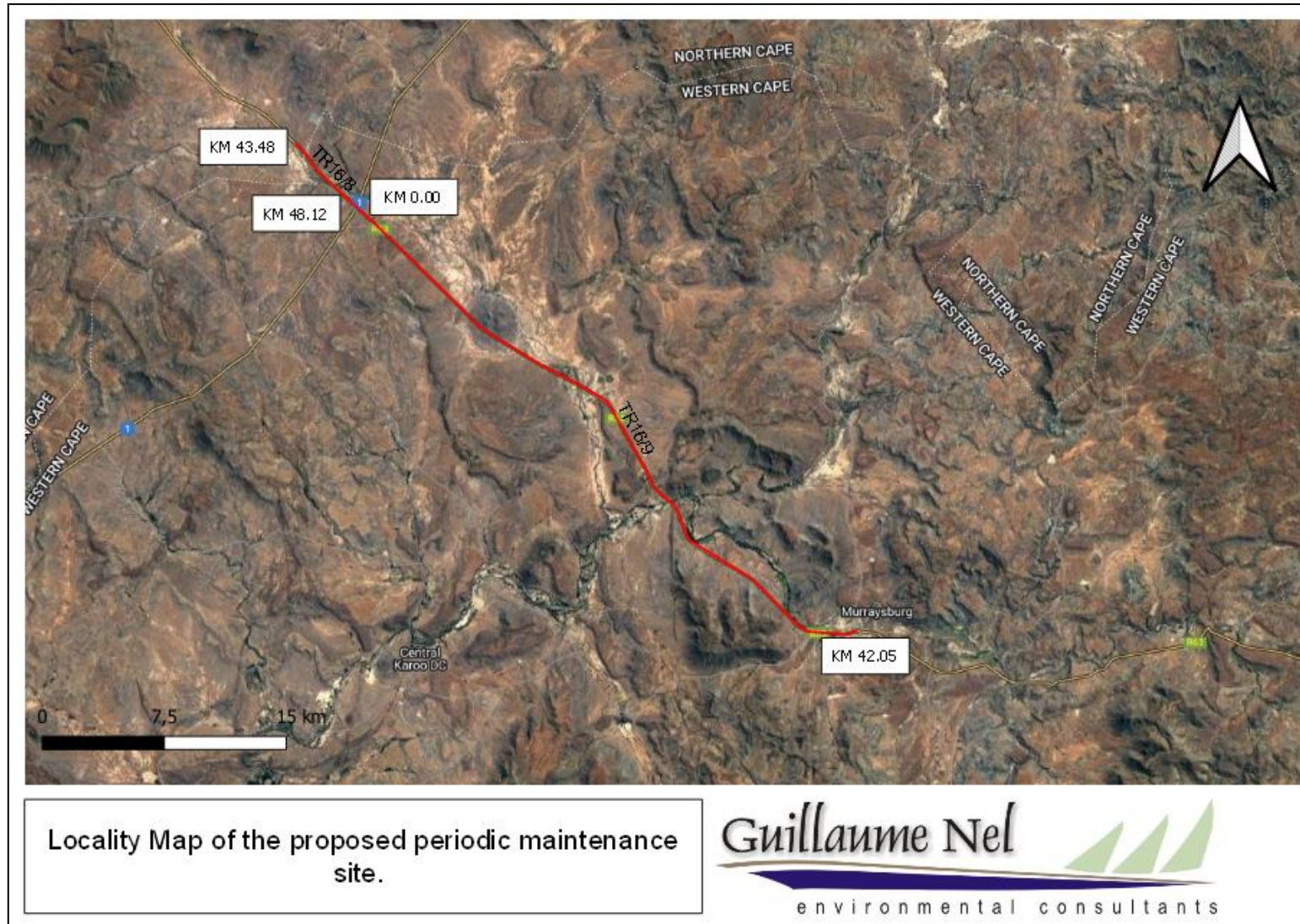


Figure 9: Locality Map of the mentioned roads between the Northern Cape boundary and Murraysburg, Western Cape.

### **2.1.1 SUMMARY OF IMPACTS ASSOCIATED WITH THE PROPOSED ACTIVITY**

#### Freshwater Resources:

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd. was appointed by Guillaume Nel Environmental Consultants (GNEC) to conduct a specialist freshwater ecological assessment as part of the Environmental Authorisation (EA) and Water Use Authorisation (WULA) processes for the proposed periodic maintenance of a section of the R63 road corridor, immediately north-west of the town of Murraysburg, and south of the town of Victoria West, Western Cape.

According to FEN Consulting (2023), two primary drainage systems are traversed by the assessed section of the R63 road, specifically the Brak River and Buffels River, and their associated tributaries which include two channelled valley bottom wetlands which drain into the Brak River. These watercourses are in a largely natural to moderately modified ecological state, and of high ecological importance and sensitivity.

Based on the findings of the freshwater assessment, the proposed periodic maintenance of Trunk Road 16/8 and Trunk Road 16/9 predominantly pose a low risk to the various watercourses, since activities do not require extensive work or time within the active channels of the watercourses.

#### Impact on fauna:

The loss of habitat associated with the proposed development is not expected to be of great significance. The identified roads and the associated habitat within the road reserve are fragmented by man-made barriers such as fencing, agricultural areas and the roads themselves, which limits faunal movement within the area. Culverts must be maintained and kept clear, as may smaller faunal species utilise the structures as movement corridors between habitats fragmented by the road structure.

#### Heritage impact:

No impacts are expected on any heritage or visual resources on site. The site is zoned Transport and has been previously disturbed due to activities such as previous road construction and ongoing road maintenance. No heritage resources were identified on site. A Notice of Intent to Develop (NID) application has been submitted to Heritage Western Cape in terms of Section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999). A positive RoD has been received from Heritage Western Cape.

#### Visual impact:

Minimal and temporary visual impacts are expected to occur during the construction phase on the proposed maintenance site. The future visual effects of the proposed maintenance site have been given due consideration.

It must be noted that the proposed project entails the maintenance of existing roads, therefore the infrastructure is already built and in place. Therefore, the proposed maintenance of the mentioned roads would have a very low visual impact on the surrounding environment as no high buildings will be constructed and hence the views of the surrounding landscape will not be impacted on.

### Noise pollution:

Some noise impacts can be expected as a result of the proposed construction activities. However, these impacts are not expected to be significant, given the temporary nature of the construction activities. No significant impact related to noise is expected during the operation phase of the project proposal.

No odour impacts are expected during the construction or operational phases.

### Socio-Economic:

Social impact refers to economic changes, i.e., what impact would the proposed maintenance of the specific roads have on the existing community as well as what associated economic improvement would occur. The maintenance of the existing roads will however have a positive socio-economic impact.

The land uses of the properties surrounding the proposed maintenance roads include residential and agricultural practices. The proposed maintenance of the mentioned roads will ensure the creation of employment opportunities during the construction phase of the proposed site. The proposed maintenance of the roads will therefore significantly contribute towards the socio-economic value of the area. Access to a maintained road is a basic right and the creation of more job opportunities in the area is of high importance, especially in a rural environment and community. This project will have a positive effect on the economic state for the specific area.

## **2.1.2 Proposed maintenance's environmental management policy and commitments**

The proponent understands the importance of conserving the environment and will endeavour to apply all necessary mitigation measures to conserve and maintain sensitive areas and prevent environmental degradation.

## **2.1.3 Interpretations**

The implementation of the EMPr is not an additional or "add on" requirement. The EMPr is legally binding through NEMA and the relevant EA. This EMPr is to be used during the planning, construction and operational phases of the proposed project. The Environmental Control Office, appointed by the developer after environmental approval, must use this EMPr during the ECO audits to determine the developer's compliance to it.

Further on, the proponent is to ensure that through the project tender process the EMPr forms part of the Project Construction Contract Document to be incorporated in line with:

- General project specifications; and
- SANS 1200 A or SANS 1200 AA, as applicable.

The proponent is also to ensure that through any tender or appointment process, the operational EMPr forms part of the management contract with all service providers and contractors, for a period of time as stipulated by the DEA&DP during which the development will be audited for compliance to the operational EMPr. This EMPr is compiled in line with relevant legislation and general construction project specifications.

However, to ensure sound environmental practice, the measures as described in the operational EMPr must be implemented for the full operational life of the development.

#### 2.1.4 Project phase

The first part of this EMPr is specifically compiled for the ***period of time prior to commencement of and activities associated with construction of the above-mentioned activity***, and for the ***operational phase*** of the proposed development.

If and when applicable, where specific activities of the proposed development fall outside of the general principles contained herein, the Department will attach further 'activity – specific' EMPr's as appendices to this document.

#### 2.1.5 Role players and responsibility matrix

In order for the EMPr to be successfully implemented, all the role players involved in the project need to co-operate. For this to happen, role players must have a clear understanding of their roles and responsibilities in the project, must be professional, form respectful and transparent relationships, and maintain open lines of communication. The EMPr therefore clearly defines the role players involved and indicates their role in the implementation of the generic EMPr.

Typically, these role players or the project team will include the Authorities (A), Other Authority (OA), Developer/Proponent (D), Consulting Engineers (CE), Employer's Representative (ER), Environmental Officers (EO), Environmental Site Officer (ESO), Environmental Control Officer (ECO), Project Manager (PM), Contractors (C), and Environmental Assessment Practitioner (EAP). Further, landowners, interested and affected parties and the relevant environmental and project specialists are also important role players.

**Figure 3** below indicates the proposed reporting channels and highlights the relationships that need to be established between these role players to ensure that the EMPr is effectively implemented.

### SECTION 3 – ENFORCEMENT, MONITORING AND AUDITING

#### 3.1 PRE-CONSTRUCTION AND CONSTRUCTION PHASE

The applicant must appoint, at his own cost, an **ECO** and full time EO (as part of the construction team) who will oversee the implementation of the EMPr.

DEA&DP must be informed of the appointment of the ECO prior to construction activities. Please note that the responsibility of the particular ECO may end at the end of the construction period. In the event that an ECO is appointed during the operational phase, it must be noted that this ECO might be different from the original ECO and DEA&DP must be notified of this appointment again.

**The independent ECO is responsible for fortnightly audits (site inspections)** on compliance with relevant environmental legislation, conditions of the EA, and the EMPr for the project.

Fortnightly site visits are to be undertaken, with an Informal Audit Report in the middle of each month and a Formal Audit Report at the end of each month.

Evidence of the following as **key performance indicators**, must be included in the audit reports:

- Complaints received from landowners and actions taken.
- Environmental incidents, such as oil spills, concrete spills, etc. and actions taken.
- Incidents leading to litigation and legal contraventions.
- Environmental damage that needs rehabilitation measures to be taken.

A copy of all ESO and EO monitoring reports, contractor method statements must be held by the ESO and/or the EO on site and be made available to the Competent Authority and or the ECO upon request.

#### Independent External Audit

The Holder must, for the period during which the environmental authorisation; and EMPr remain valid ensure that compliance with the conditions of the environmental authorisation and the EMPr, is audited by an independent external auditor. It is important to note that the independent auditor may not be the ECO or EAP who facilitated the EIA process and must be independent.

An independent external audit must be undertaken 6 months after commencement and the final independent external audit within 3 months after completion of the construction phase. Only 2 external audits will be done, 1 during construction and 1 after completion as described above.

The independent external audit must be undertaken in terms of Regulation 34 of the EIA Regulations, 2014 (as amended). The external audit must be submitted to the Competent Authority and registered I&AP's.

The Holder must, within 7 calendar days of the submission of the audit report to the Competent Authority, notify all registered I&APs of the submission and make the report available to anyone upon request.

#### Method Statements

A written submission by the Contractor to the Employer's Representative and ECO in response to the contract specification or a request by the Employer's Representative, setting out the, materials, labour method of works etc.

Method statements are required on for the following activities:

- Emergency spills procedures for the contamination of soils from spills
- Handling & storage of oils and chemicals
- Cement and concrete batching, which includes the location, storage, washing, & disposal of cement spills and rubble, packaging, tools, and plant
- Diesel tanks and refuelling procedures
- Construction lay down areas
- Workshop maintenance and cleaning of plant

- Topsoil management and handling (method of removal, location of stockpile areas, method of preserving)
- Toilet placement and manner of securing toilets
- Rubble management (including the location of stockpiling)
- Litter management
- Locations of spoil areas (if applicable)
- Dust management
- Bitumen handling

### **3.2 OPERATIONAL PHASE**

A suitably qualified independent person shall conduct, at a frequency as determined by the DEA&DP and stipulated in the relevant EA for the project, conduct ECO audits. The audits are to verify the developments compliance with the operational EMPr (if applicable) and operational conditions of the EA (if applicable).

The only operational activities for the sections of road are ongoing maintenance to the road surface and structures along the road. A Maintenance Management Plan (MMP) forms part of the environmental authorisation process to be adopted by the Competent Authority for future maintenance.

### 3.3 FORMAL ENVIRONMENTAL COMMUNICATION CHANNELS

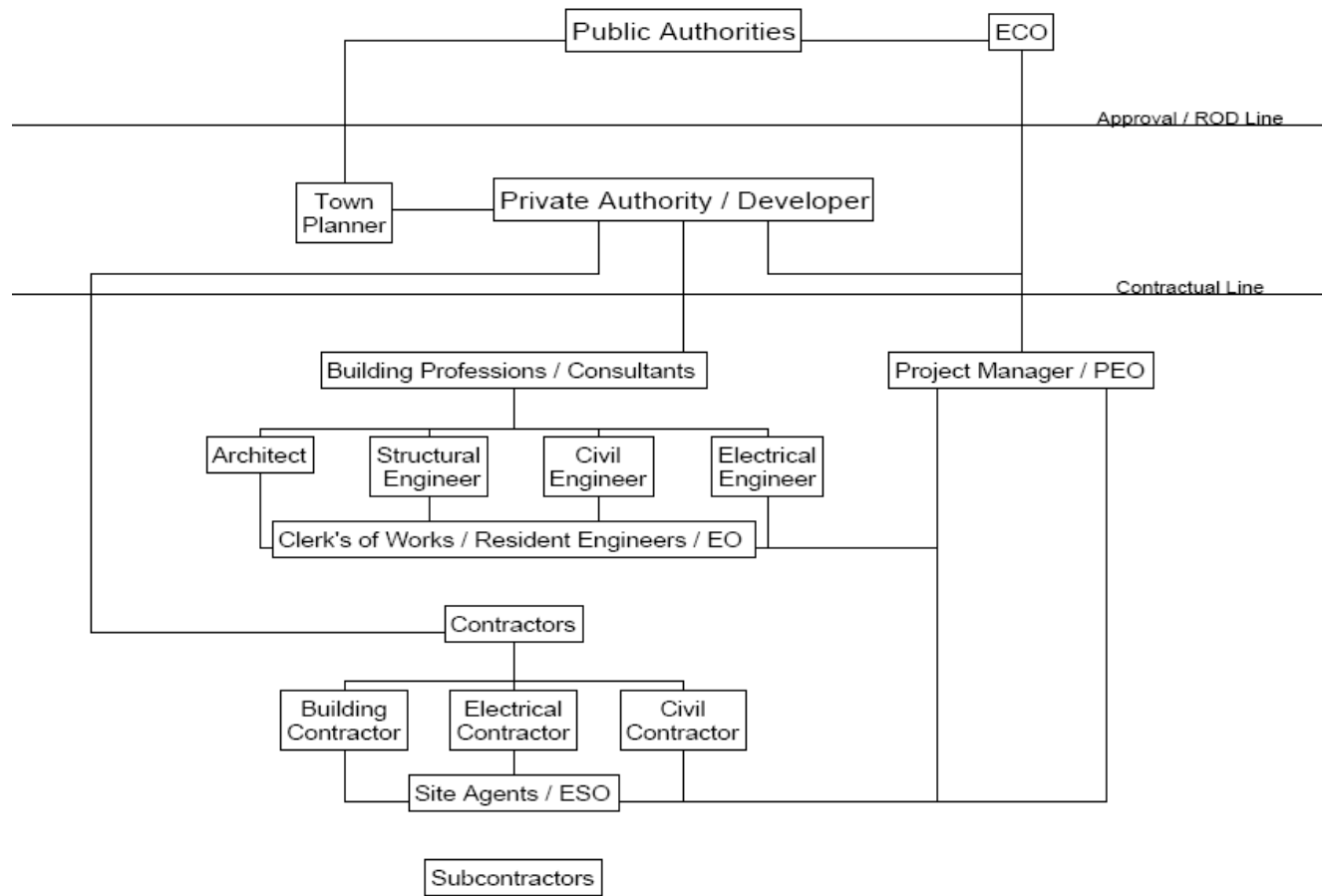


Figure 10: Reporting structure and role players involved in the periodic maintenance of the mentioned roads.

Please note that due to the timeline of the development as well as the coming and leaving of consultants and contractors, as well as the many crossed channels of communication in the DEAD&DP EMPr Guideline, it was decided by the project team to use the GACP-channels of communication whereby the Project Manager remains the central pivot between all the disciplines. All instructions and reports shall flow through the Project Manager (PM). In the environmental matters the PM becomes the Project Environmental Officer (PEO).

### 3.4 MEASUREMENT AND PAYMENT

It is understood that environmental requirements included in this EMPr will entail costs over and above those of the civil requirements. These include provision for: mitigation and enhancement actions; training and environmental awareness requirements; monitoring; auditing; and corrective actions. The proponent shall recognise this and make provision for it in the tender. Costing for management action must be done with inputs and advice from appropriate technical members of the project team and relevant EAP who have knowledge of the management actions being recommended as well as practical experience in implementing similar measures and techniques.

A lump sum must be allocated for the management of Environmental Specifications where it is not possible to cost requirements of the EMPr.

### 3.6 GENERAL GUIDELINES

Guidelines as per standardised construction documentation must be used.

### 3.7 AWARENESS (INDUCTION) TRAINING

#### 3.7.1 Construction Phase

The EO or ESO, are responsible in ensuring everyone on site is given an environmental awareness induction session which not only clearly defines what the environment is and specifics detailing the local environment but outlines the requirements of the EMPr as a management tool to protect the environment. The ECO can be consulted to assist with the awareness induction.

Refresher courses must be conducted as and when required. The EO or ESO must ensure daily toolbox talks include alerting the workforce to particular environmental concerns associated with the tasks for that day or the area/habitat in which they are working. Awareness posters and/or a handout must be produced to create awareness throughout the site.

#### 3.7.2 Operational Phase

The ECO is responsible in ensuring everyone involved in the operation of the development at ground level receives an environmental awareness induction which not only clearly defines what the environment is and specifics detailing the local environment but outlines the requirements of the EMPr as a management tool to protect the environment.

### 3.8 SITE DOCUMENTATION

#### 3.8.1 Construction Phase

The following is a list of documentation that must be held on site and must be made available to the ECO and/or DEA&DP on request.

- Site daily diary /instruction book
- Records of all remediation / rehabilitation activities
- Copies of EA, EMPr, method statements and ECO reports
- Complaints register.

#### 3.8.2 Operational Phase

The following is a list of documentation which must be held on sight and must be made available to the ECO and/or DEA&DP on request.

- Environmental monitoring reports (if required)
- Records of all remediation / rehabilitation activities (if required)
- Environmental Management Programme (EMPr)
- Complaints register.

### 3.9 TOLERANCES AND NON-COMPLIANCE

**The independent ECO is responsible for fortnightly audits** on compliance to relevant environmental legislation, conditions of the Environmental Authorisation (EA), and the EMPr for the project.

Fortnightly site visits are to be undertaken, with an Informal Audit Report in the middle of each month and a Formal Audit Report at the end of each month.

If the contractor shows repeated non-compliance in terms of the audits, a range of fines will be issued to the contractor. These fines are included as part of the Construction EMPr (Table 6).

The Engineer, in conjunction with the ECO, shall be the judge as to what constitutes a transgression in terms of this clause, subject to the General Conditions of Contract.

## SECTION 4 - GENERIC CONSTRUCTION PHASE EMPR - IMPLEMENTATION

### 4.1 PREAMBLE

The EMPr is to empower a pro-active rather than re-active approach to environmental performance by addressing potential problems before they occur. This will limit corrective measures needed during the construction phase of the project. Therefore, the purpose of this EMPr is to provide management measures that must be implemented by the Western Cape Government: Department of Transport and Public Works and all contractors and sub-contractors alike to ensure that the potential impacts of the proposed development of the proposed maintenance project of the mentioned roads are minimised. It must also be ensured that the EMPr is maintained and upheld as a dynamic document in order for the project team to add or improve on issues that might be considered left out or not relevant to the project. In such instances the DEA&DP will authorise the ECO to make such changes.

The following tables form the core mitigation measures appropriate to the pre-construction and construction phase. The tables present, the objectives to be achieved and the management actions that needs to be implemented in order to mitigate the negative impacts and enhance the benefits of the project. Associated responsibilities, criteria/targets and timeframes are clearly specified.

The ‘**pre-construction**’ section of this generic EMPr, refers to the period of time leading up to and prior to commencement of construction activities, and is included to ensure pro-active environmental management measures with the goal of identifying avoidable environmental damage at the outset and sustain optimal environmental performance throughout the construction phase. Most impacts will occur during the construction phase and must be mitigated through the contingency plans identified in the pre-construction phase.

The bulk of environmental impacts will have immediate effect during the ‘construction’ phase (e.g. noise, dust, and water pollution). If the site is monitored on a continual basis during the construction phase, it is possible to identify these impacts as they occur. These impacts will then be mitigated through the measures outlined in this section, together with a commitment to sound environmental management from the project team.

The “construction” section refers to all construction and its operation-related activities that will occur within the approved area and access roads, until the project is completed. This “construction” section is divided into three functional areas, namely “materials”; “plant”; and “construction”. Each of these functional areas within the EMPr contains specific generic mitigation requirements and requested contractor method statements stipulated where required.

Many potential environmental impacts will have immediate or long-term effects during the ‘operational’ phase (e.g. noise, waste management, and water pollution). If the development is monitored on a continual basis during operations, it is possible to identify these impacts as they occur. These impacts will then be mitigated through the measures outlined in this section, together with a commitment to sound environmental management from the proponent and management team.

It must be noted that the responsible party for the majority of the mitigation measures is that of the Management body, unless otherwise stipulated. The names of the responsible parties must be made available to DEA&DP for record purposes.

The management body must ensure that a maintenance team is employed with the correct equipment and skill to maintain boardwalks, pathways, fences etc. The following tables will refer to the responsible party as “Management body: ‘to be announced’ and “maintenance crew”.

## 4.2 STRUCTURE AND CONTENTS OF THE TABLES

The table consists of seven parts as follows:

“Phase of development” - This row will identify either pre-construction (planning) or actual construction phase.

“Impact / issue” - This row will identify the issue being addressed, e.g. Materials, site demarcation, heritage, etc.

Mitigation Measure - This column will include all the necessary mitigation measures for each impact/issue’.

Management objectives - This column will indicate what the management objectives to be achieved for each mitigation measure are.

Measurable targets - This column will indicate what evidence is to be used as an indication to whether or not the ‘Management objectives’ have been implemented and hence achieved.

Responsible party - This column will provide information as to which role player, e.g. ECO, ER, etc. is responsible for the implementation and or management of each mitigation measure.

Frequency of action - These columns provide time guidelines for the ‘Responsible party’ by which he/she is to action or manage the required mitigation.

### 4.2.1 SPECIALIST RECOMMENDATIONS

#### 4.2.1.1 Pre-Construction and Construction Phases

The last part of the table provides space for the EAP to add specialist recommendations that need to be addressed during the pre-construction and construction phases.

#### 4.2.1.2 Operational Phase

Additional requirements will need to be added to the table pending conditions required in the Environmental Authorisation (EA). The last part of the table provides space for such conditions, which must be added before the “declaration of understanding” is signed by the proponent and ECO.

Table 1: PROPOSED PERIODIC MAINTENANCE OF TR16/8 AND TR16/9, PRE-CONSTRUCTION (PLANNING) PHASE EMPr

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | PRE-CONSTRUCTION (PLANNING)                                                                                                                                                                                                                                  |                                                                                                                  |                                       |                       |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------|--|
| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | GENERAL                                                                                                                                                                                                                                                      |                                                                                                                  |                                       |                       |  |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | MANAGEMENT OBJECTIVES                                                                                                                                                                                                                                        | MEASURABLE TARGETS                                                                                               | RESPONSIBLE PARTY                     | FREQUENCY OF ACTION   |  |
| <p><b>Project contract and programme</b></p> <p>The EMPr must be included as part of the tender documentation thereby making it part of the enquiry document to make the recommendations and constraints, as set out in this document, enforceable under the general conditions of contract.</p> <p>A copy of this EMPr must be available on site. The Contractor shall ensure that all the personnel on site, sub-contractors, suppliers, etc. are familiar with and understand the specifications contained in the EMPr.</p> <p>It is imperative that all construction activities to be conducted with the watercourse be undertaken during the drier months to limit surface water contamination and the need for any surface water diversion during the construction works.</p> | <ul style="list-style-type: none"> <li>Contingencies for minimising negative impacts anticipated to occur during the construction phase.</li> <li>Ensure environmental awareness and formalise environmental responsibilities and implementation.</li> </ul> | <ul style="list-style-type: none"> <li>Contract records.</li> <li>Signed declaration pro forma's.</li> </ul>     | Project team.                         | -                     |  |
| <p><b>Site demarcation and development</b></p> <p>The construction footprint as approved in the Environmental Authorisation (EA) must be clearly understood and set out before the contractors set up their site camps or start with construction. No disturbance is allowed outside the boundaries of the approved construction footprint.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Contingencies for minimising negative impacts anticipated to occur during the construction phase.</li> </ul>                                                                                                          | <ul style="list-style-type: none"> <li>Demarcated areas.</li> <li>Filled in section of this document.</li> </ul> | EAP specialist, Engineer, contractor. | As and when required. |  |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | PRE-CONSTRUCTION<br>(PLANNING)                                                                                                                      |                                                                      |                       |                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------|--------------------------------------------------------|
| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | GENERAL                                                                                                                                             |                                                                      |                       |                                                        |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | MANAGEMENT OBJECTIVES                                                                                                                               | MEASURABLE TARGETS                                                   | RESPONSIBLE PARTY     | FREQUENCY OF ACTION                                    |
| <p><b>Method Statements</b></p> <p>A written submission by the Contractor to the Employer's Representative and ECO in response to the contract specification or a request by the Employer's Representative, setting out the materials, labour method of works etc.</p> <p>Method statements are required on for the following activities:</p> <ul style="list-style-type: none"> <li>Emergency spills procedures for the contamination of soils from spills</li> <li>Handling &amp; storage of oils and chemicals</li> <li>Cement and concrete batching, which includes the location, storage, washing, &amp; disposal of cement spills and rubble, packaging, tools, and plant</li> <li>Diesel tanks and refuelling procedures</li> <li>Construction lay down areas</li> <li>Workshop maintenance and cleaning of plant</li> <li>Topsoil management and handling (method of removal, location of stockpile areas, method of preserving)</li> <li>Toilet placement and manner of securing toilets</li> <li>Rubble management (including the location of stockpiling)</li> </ul> | <ul style="list-style-type: none"> <li>Contingencies for minimising negative impacts anticipated to occur during the construction phase.</li> </ul> | <ul style="list-style-type: none"> <li>Method statements.</li> </ul> | Contractor, Engineer. | <p>Prior to commencement and as and when required.</p> |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | PRE-CONSTRUCTION<br>(PLANNING)                                                      |                                                                                         |                   |                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------|---------------------|
| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | GENERAL                                                                             |                                                                                         |                   |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | MANAGEMENT OBJECTIVES                                                               | MEASURABLE TARGETS                                                                      | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| <ul style="list-style-type: none"> <li>Litter management</li> <li>Locations of spoil areas (if applicable)</li> <li>Dust management</li> <li>Bitumen handling</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                     |                                                                                         |                   |                     |
| <p><b>Stockpiles and Site Camps</b></p> <p>All stockpiled material must be easily accessible on site without any environmental damage of the surrounding properties.</p> <p>All temporarily stockpiled material must be stockpiled in such a way that the spread of materials is minimised.</p> <p>In the case of strong wind and/or rain all stockpile material must be covered with a tarpaulin in order to prevent erosion.</p> <p>The stockpiles will only be placed within the demarcated areas, the location of which must be approved by the ER, the ECO must be consulted to scan areas prior to any clearance or usage of the area.</p> <p>Stockpiles may not exceed 2 metres in height and their footprint must be kept to a minimum. Stockpiling of removed materials will only be temporary and must be</p> | <ul style="list-style-type: none"> <li>Prevent environmental degradation</li> </ul> | <ul style="list-style-type: none"> <li>Monitor stockpile and site camp areas</li> </ul> | Contractor        | Daily               |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                   | PRE-CONSTRUCTION<br>(PLANNING) |                       |                      |                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------|----------------------|------------------------|
| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                         | GENERAL                        |                       |                      |                        |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                     | MANAGEMENT<br>OBJECTIVES       | MEASURABLE<br>TARGETS | RESPONSIBLE<br>PARTY | FREQUENCY OF<br>ACTION |
| <p>disposed of at a registered waste disposal facility.</p> <p>All exposed soils must be protected for the duration of the construction phase with a suitable geotextile (e.g. Geojute or hessian sheeting), if deemed required by the Engineer, in order to prevent erosion and sedimentation of the watercourses in close proximity to these stockpiles.</p> <p>Stockpiles are to be stabilised if signs of erosion are visible.</p> |                                |                       |                      |                        |

Table 2: ADDITIONAL CONDITIONS FOR THE PROPOSED PERIODIC MAINTENANCE OF TR16/8 AND TR16/9, EMPr.

| Phase of development | PLANNING      | EA reference number   | 16/3/3/6/7/1/C3/13/0049/23 |                   |                     |
|----------------------|---------------|-----------------------|----------------------------|-------------------|---------------------|
| Impact / issue       | EA Conditions |                       |                            |                   |                     |
| MITIGATION MEASURE   |               | MANAGEMENT OBJECTIVES | MEASURABLE TARGETS         | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
|                      |               |                       |                            |                   |                     |
|                      |               |                       |                            |                   |                     |

Table 3: PROPOSED PERIODIC MAINTENANCE OF TR16/8 AND 16/9, CONSTRUCTION PHASE EMPr (Materials)

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CONSTRUCTION                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                 |                   |                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|
| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Materials                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                 |                   |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | MANAGEMENT OBJECTIVES                                                                                                                                                                                                                                                | MEASURABLE TARGETS                                                                                                                                                                                                                                                                              | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| <b>Handling</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                 |                   |                     |
| <p><b>Stockpiles and Site Camps</b></p> <p>All stockpiled material must be easily accessible on site without any environmental damage of the surrounding properties.</p> <p>All temporarily stockpiled material must be stockpiled in such a way that the spread of materials is minimised.</p> <p>In the case of strong wind and/or rain all stockpile material must be covered with a tarpaulin in order to prevent erosion.</p> <p>The stockpiles will only be placed within the demarcated areas, the location of which must be approved by the ER, the ECO must be consulted to scan areas prior to any clearance or usage of the area.</p> <p>Stockpiles may not exceed 2 metres in height and their footprint must be kept to a minimum. Stockpiling of removed materials will only be temporary and must be disposed of at a registered waste disposal facility.</p> | <ul style="list-style-type: none"> <li>• Minimise scarring of the soil surface and land features.</li> <li>• Minimise disturbance and loss of soil.</li> <li>• Minimise construction footprint.</li> <li>• Minimise contamination of storm water run-off.</li> </ul> | <ul style="list-style-type: none"> <li>• No visible erosion scars once construction is completed.</li> <li>• The footprint has not exceeded the agreed site in terms of EA etc.</li> <li>• Minimal invasive weed and grass growth.</li> <li>• No signs of sedimentation and erosion.</li> </ul> | Contractor        | Daily               |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CONSTRUCTION                                                                                                                                                                              |                                                                         |                   |                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------|---------------------|
| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Materials                                                                                                                                                                                 |                                                                         |                   |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MANAGEMENT OBJECTIVES                                                                                                                                                                     | MEASURABLE TARGETS                                                      | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| <p>All exposed soils must be protected for the duration of the construction phase with a suitable geotextile (e.g. Geojute or hessian sheeting), if deemed required by the Engineer, in order to prevent erosion and sedimentation of the watercourses in close proximity to these stockpiles.</p> <p>Stockpiles are to be stabilised if signs of erosion are visible.</p>                                                                                                                                  |                                                                                                                                                                                           |                                                                         |                   |                     |
| <p><b>Topsoil Management</b></p> <p>Stockpiled topsoil must be regarded as no-go areas.</p> <p>Stockpiled topsoil must be monitored for invasive exotic vegetation growth. Contractors must remediate as and when required in consultation with the ER and ECO.</p> <p>No plant, workforce or any construction related activities will be allowed onto the stockpile topsoil.</p> <p>All topsoil must be replaced during the rehabilitation phase to ensure the re-establishment of natural vegetation.</p> | <ul style="list-style-type: none"> <li>• Maintain the integrity of topsoil for rehabilitation.</li> <li>• Containment of invasive plant growth by means of topsoil monitoring.</li> </ul> | <ul style="list-style-type: none"> <li>• No loss of topsoil.</li> </ul> | Contractor        | Daily               |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | CONSTRUCTION                                                                                                                                                                    |                                                                                                                                                               |                   |                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|
| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Materials                                                                                                                                                                       |                                                                                                                                                               |                   |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | MANAGEMENT OBJECTIVES                                                                                                                                                           | MEASURABLE TARGETS                                                                                                                                            | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| <p>Handling of the topsoil must be minimised and must therefore only be handled before construction (to be stockpiled) and after construction (topsoil to be replaced).</p> <p>Topsoil stockpiles may not be higher than 2m.</p> <p>The windrow of topsoil is preferred where no damage would be caused to the topsoil. This is to prevent carting topsoil to different areas on the site. Where windrow of topsoil is not possible (due to limited space or where topsoil might be damaged by construction works), the topsoil should be stockpiled in dedicated areas. It is important to note that record must be kept where topsoil was stripped and stockpiled to ensure the correct topsoil returns to where it was stripped.</p> |                                                                                                                                                                                 |                                                                                                                                                               |                   |                     |
| <p><b>Oil and chemicals</b></p> <p>The contractor <b>must provide method statements</b> for the “handling &amp; storage of oils and chemicals”, “fire”, and “emergency spills procedures”.</p> <p>These substances must be confined to specific and</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>• Prevention of pollution of the environment.</li> <li>• Minimise chances of transgression of the acts controlling pollution.</li> </ul> | <ul style="list-style-type: none"> <li>• No pollution of the environment.</li> <li>• No litigation due to transgression of pollution control acts.</li> </ul> | Contractor.       | Daily.              |

| <b>Phase of development</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>CONSTRUCTION</b>          |                                                                                                                    |                          |                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------------|
| <b>Impact / issue</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Materials</b>             |                                                                                                                    |                          |                            |
| <b>MITIGATION MEASURE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>MANAGEMENT OBJECTIVES</b> | <b>MEASURABLE TARGETS</b>                                                                                          | <b>RESPONSIBLE PARTY</b> | <b>FREQUENCY OF ACTION</b> |
| <p>secured areas within the contractor's camp, and in a way that does not pose a danger of pollution even during times of high rainfall.</p> <p>Drip trays (minimum of 10cm deep) must be placed under all machinery and vehicles.</p> <p>The surface area of the drip trays will be dependent on the vehicle and must be large enough to catch any hydrocarbons that may leak from the vehicle while standing.</p> <p>Any spills larger than 100ℓ must be reported to all local authorities.</p> <p>Spill kits must be available on site and in all vehicles that transport hydrocarbons for dispensing to other vehicles on the construction site.</p> <p>Spill kits must be made up of material/product that is in line with environmental best practice (sunsorb is a recommended product that is environmentally friendly).</p> <p>All spilled hazardous substances must be contained in impermeable containers for removal to a General &amp;</p> |                              | <ul style="list-style-type: none"> <li>• No complaints from I &amp; AP's.</li> <li>• Method statements.</li> </ul> |                          |                            |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CONSTRUCTION                                                                                                                                                                                                     |                                                                                                                                                                                               |                   |                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|
| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Materials                                                                                                                                                                                                        |                                                                                                                                                                                               |                   |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | MANAGEMENT OBJECTIVES                                                                                                                                                                                            | MEASURABLE TARGETS                                                                                                                                                                            | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| Hazardous Waste Landfill site, (this includes contaminated soils, and drenched spill kit material).<br><br>Vehicles to be serviced at the contractor laydown area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                  |                                                                                                                                                                                               |                   |                     |
| <p><b>Concrete</b></p> <p><b>It is suggested that ready-mix concrete be used as far as possible to minimize the possible impact on the surrounding environment.</b></p> <p>Cement batching areas must be located in consultation with the ER, ECO to ensure residues are contained and that the proposed location does not fall within sensitive areas such as drainage lines, storm water channels, etc. The contractors <b>must provide and maintain a method statement</b> for “cement and concrete batching” which includes the storage, washing &amp; disposal of cement, packaging, tools and plant.</p> <p>The mixing of concrete shall only be done at selected sites on mortar boards or similar structures to contain run-off into natural vegetation, soils and streams.</p> <p>Cleaning of cement mixing, and handling equipment</p> | <ul style="list-style-type: none"> <li>Minimise the possibility of cement residue entering into the surrounding environment.</li> <li>Minimise pollution of soil, surface and ground water resources.</li> </ul> | <ul style="list-style-type: none"> <li>No evidence of contaminated soil on the construction site.</li> <li>No evidence of contaminated water resources.</li> <li>Method statement.</li> </ul> | Contractor.       | Monitored daily.    |

| <b>Phase of development</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>CONSTRUCTION</b>          |                           |                          |                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------|--------------------------|----------------------------|
| <b>Impact / issue</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Materials</b>             |                           |                          |                            |
| <b>MITIGATION MEASURE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>MANAGEMENT OBJECTIVES</b> | <b>MEASURABLE TARGETS</b> | <b>RESPONSIBLE PARTY</b> | <b>FREQUENCY OF ACTION</b> |
| <p>shall be done using proper cleaning trays.</p> <p>All empty containers must be stored in a dedicated area and later removed from the site for appropriate disposal at a Licensed Landfill site. All empty cement bags are to be picked up immediately to ensure that cement dust is not blown away.</p> <p>Empty cement bags are to be stored in a weather and scavenger proof bin, in order to prevent leaching and groundwater contamination.</p> <p>Cement dust is poisonous and will be detrimental to the environment.</p> <p>Any spillage that may occur must be investigated and immediate remedial action shall be taken.</p> <p>The visible remains of concrete, either solid, or from washings, shall be physically removed immediately and disposed of as waste to a Licensed Landfill site.</p> <p>Washing of the remains into the ground is unacceptable.</p> <p>Should any cement silos be employed on site; they are</p> |                              |                           |                          |                            |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | CONSTRUCTION                                                                                                                                                                                                                                           |                                                                                                                                                             |                   |                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|
| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Materials                                                                                                                                                                                                                                              |                                                                                                                                                             |                   |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | MANAGEMENT OBJECTIVES                                                                                                                                                                                                                                  | MEASURABLE TARGETS                                                                                                                                          | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| <p>to be fitted with appropriate air pollution control equipment to control dust during fill-up operations.</p> <p>No mixed concrete will be deposited outside of the designated construction footprint.</p> <p>A batter / dagga board mixing trays must be provided, onto which any mixing can be done</p>                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                        |                                                                                                                                                             |                   |                     |
| <p><b>DANGEROUS AND TOXIC MATERIALS</b></p> <p><b>Provision of storage facilities</b></p> <p>Materials such as fuel, oil, paint, herbicide and insecticides must be sealed and stored in beamed areas or under lock and key, as appropriate, in well-ventilated areas.</p> <p>Storage facilities must be bunded, roofed, secure, rain, wind and tamper proof.</p> <p>Storage areas shall display the required safety signs depicting “no smoking”, “No Naked lights” and “Danger” containers shall be clearly marked to indicate contents as well as safety requirements.</p> | <ul style="list-style-type: none"> <li>• Prevention of pollution of soil, surface and ground water resources in the immediate and surrounding environments.</li> <li>• Minimise chances of transgression of the acts controlling pollution.</li> </ul> | <ul style="list-style-type: none"> <li>• No visible signs of pollution.</li> <li>• No litigation due to transgression of pollution control acts.</li> </ul> | Contractor.       | Monitor daily.      |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CONSTRUCTION                                                                                                                               |                                                                                                                                                   |                   |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------|
| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Materials                                                                                                                                  |                                                                                                                                                   |                   |                        |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | MANAGEMENT OBJECTIVES                                                                                                                      | MEASURABLE TARGETS                                                                                                                                | RESPONSIBLE PARTY | FREQUENCY OF ACTION    |
| <p>Sufficient care must be taken when handling these materials to prevent pollution. Training on the handling of dangerous and toxic materials must be conducted for all staff prior to the commencement of construction.</p> <p>In the case of pollution of any surface or groundwater, the Regional Representative of the <b>Department of Water and Sanitation (DWS)</b> must be informed immediately.</p> <p>Empty containers shall be removed to a General &amp; Hazardous Waste Landfill site.</p> <p><b>Material Safety Data Sheets (MSDS)</b> must be prepared for all hazardous substances on site and supplied by the supplier where relevant. MSDS's must be updated as required.</p> |                                                                                                                                            |                                                                                                                                                   |                   |                        |
| <p><b>Bulk storage of fuels and oils</b></p> <p>The contractors must <b>provide and maintain a method statement</b> for "Diesel tanks and refuelling procedures".</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>Prevention of pollution of soil, surface and ground water resources in the immediate and</li> </ul> | <ul style="list-style-type: none"> <li>No visible signs of pollution.</li> <li>No litigation due to transgression of pollution control</li> </ul> | Contractor.       | Once off, as required. |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | CONSTRUCTION                                                                                                                                            |                                                                                  |                   |                     |
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| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Materials                                                                                                                                               |                                                                                  |                   |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | MANAGEMENT OBJECTIVES                                                                                                                                   | MEASURABLE TARGETS                                                               | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| <p>Bulk fuel storage tanks on the site shall be on an impervious surface that is bunded and able to contain at least 110% of the volume of the tanks.</p> <p>A Flammable Liquid License must be obtained for diesel volumes greater than 200 litres.</p> <p>As no application was lodged for this activity, it must be noted that Environmental Authorisation is required for the storage of Diesel and/or Petrol with volumes greater than 30 000 litres.</p> <p>Bulk fuel storage tanks shall be located in a portion of the construction camp where they do not pose a high risk in terms of water pollution.</p> <p>Bulk fuel storage tanks shall be placed so that they are out of the way of traffic, so that the risk of the tanks being ruptured or damaged by vehicles is minimised.</p> <p>Bulk fuel storage must be covered during the rainy season (if practical).</p> | <p>surrounding environments.</p> <ul style="list-style-type: none"> <li>Minimise chances of transgression of the acts controlling pollution.</li> </ul> | <p>acts.</p> <ul style="list-style-type: none"> <li>Method statement.</li> </ul> |                   |                     |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CONSTRUCTION                                                                                                                                                                                                                                           |                                                                                                                                                               |                   |                     |
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| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Materials                                                                                                                                                                                                                                              |                                                                                                                                                               |                   |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | MANAGEMENT OBJECTIVES                                                                                                                                                                                                                                  | MEASURABLE TARGETS                                                                                                                                            | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| <p><b>Use of dangerous and toxic materials.</b></p> <p>The contractor shall keep the necessary materials and equipment on site to deal with spills/ fire of the materials present should they occur.</p> <p>The contractor shall set up a procedure for dealing with spills/ fire, which will include notifying the ECO and the relevant authorities prior to commencing with construction. These procedures must be developed in consultation and approval by the appointed EO.</p> <p>All staff must receive some form of fire training. Fire buckets and hoses shall be in good working order and easily accessible on site.</p> <p>A record must be kept of all spills and the corrective action taken.</p> | <ul style="list-style-type: none"> <li>• Prevention of pollution of soil, surface and ground water resources in the immediate and surrounding environments.</li> <li>• Minimise chances of transgression of the acts controlling pollution.</li> </ul> | <ul style="list-style-type: none"> <li>• No pollution of the environment.</li> <li>• No litigation due to transgression of pollution control acts.</li> </ul> | Contractor.       | As required.        |

Table 4: PROPOSED PERIODIC MAINTENANCE OF TR16/8 AND TR16/9, CONSTRUCTION PHASE EMPr (Plant)

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | CONSTRUCTION                                                                                                                                                                                                                          |                                                                                                                                     |                   |                          |
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| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | GENERAL                                                                                                                                                                                                                               |                                                                                                                                     |                   |                          |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | MANAGEMENT OBJECTIVES                                                                                                                                                                                                                 | MEASURABLE TARGETS                                                                                                                  | RESPONSIBLE PARTY | FREQUENCY OF ACTION      |
| <p><b>Eating areas and camp followers</b></p> <p>The contractors must <b>provide and maintain a method statement</b> for “Crew camps and construction lay down areas”.</p> <p>The Contractor shall, in conjunction with the EO, designate the restricted eating area for eating during normal working hours. Two refuse bins with lids must be provided and cleaned on a daily basis. The bins are to be secure, wind, weather and scavenger proof.</p> <p>Designated areas for smoking must be provided.</p> <p>No fires are to be lit outside of a facility designed to contain fires. The adequacy and positioning of these structures must be determined in consultation with the EO and ECO.</p> <p>No animals, domestic or otherwise are allowed on the premises. The feeding, or leaving of food, for stray or other animals in the area is strictly prohibited.</p> <p>Camp followers/informal traders must not be allowed to congregate on pavements or outside the construction site. However, at the contractor’s discretion facilities can be made</p> | <ul style="list-style-type: none"> <li>• Control potential influx of vermin and flies.</li> <li>• Neat workplace and hygienic environment.</li> <li>• Minimise negative social impacts to local businesses and residences.</li> </ul> | <ul style="list-style-type: none"> <li>• No visual sign of vermin and flies.</li> <li>• No complaints from I &amp; AP’s.</li> </ul> | Contractor, EO.   | Once off, monitor daily. |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | CONSTRUCTION                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                           |                       |                       |
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| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | GENERAL                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                           |                       |                       |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | MANAGEMENT OBJECTIVES                                                                                                                                                                                                                                                                                                             | MEASURABLE TARGETS                                                                                                                                                                                                                                                                        | RESPONSIBLE PARTY     | FREQUENCY OF ACTION   |
| <p>available within the designated eating area.</p> <p>Litter (even if originating outside the camp) and concrete bags etc. must be picked up and put into suitably closed bins.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                           |                       |                       |
| <p><b>Toilets and ablution facilities</b></p> <p>The contractor will be responsible for providing all sanitary arrangements for his and the sub-contractors team. It is proposed that that <b>one toilet for 15</b> people will be established on site.</p> <p>Sanitary arrangements shall be to the satisfaction of the ECO and the local authority. The contractor shall keep the toilets in a clean, neat and hygienic condition. The <b>contractor shall supply toilet paper at all toilets at all times</b>. Toilet paper dispensers shall be provided in all toilets.</p> <p>Toilets provided by the contractor must be easily accessible and a maximum of 150m from the works area to ensure they are utilised. All toilets will be located within the contractor's camp. Should toilets be needed elsewhere, their location must first be approved by the ER, ECO.</p> <p>The contractor (who must use reputable toilet-servicing company) shall be responsible for the cleaning, maintenance and servicing of</p> | <ul style="list-style-type: none"> <li>• Ensure proper sanitation is achieved which will encourage the workforce to utilise toilets provided and not the surrounding habitat.</li> <li>• Minimise potential of diseases on site.</li> <li>• Minimise potential to pollute soils, water resources and natural habitats.</li> </ul> | <ul style="list-style-type: none"> <li>• Workforce use toilets provided.</li> <li>• No complaints received from I &amp; AP's as well as members of the workforce.</li> <li>• No visible or measurable signs of pollution of the environment (soils, ground and surface water).</li> </ul> | Contractor, ER or EO. | As and when required. |

| Phase of development                                                                                                                                                                                                                                                                                          | CONSTRUCTION          |                    |                   |                     |
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| Impact / issue                                                                                                                                                                                                                                                                                                | GENERAL               |                    |                   |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                            | MANAGEMENT OBJECTIVES | MEASURABLE TARGETS | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| <p>the toilets. The contractor (using reputable toilet-servicing company) shall ensure that all toilets are cleaned and emptied before the builders' or other public holidays.</p> <p>Toilets out on site must be secured to the ground and have a sufficient locking mechanism operational at all times.</p> |                       |                    |                   |                     |

| Phase of development                                                                      | CONSTRUCTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |                     |
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| Impact / issue                                                                            | GENERAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |                     |
| MITIGATION MEASURE                                                                        | MANAGEMENT OBJECTIVES                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MEASURABLE TARGETS                                                                                                                                                                                                                                                                                                                                                                                                          | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| <b>Waste management</b><br>Please refer to the waste minimization plan herewith attached. | <ul style="list-style-type: none"> <li>• Sustainable management of waste by recycling.</li> <li>• To keep the site neat and tidy.</li> <li>• Minimise litigation and complaints by I&amp;AP's.</li> <li>• Reduce visual impact.</li> <li>• Control potential influx of vermin and flies thereby minimising the potential of diseases on site and the surrounding environment.</li> <li>• Minimise potential to pollute soils, water resources and natural habitats.</li> </ul> | <ul style="list-style-type: none"> <li>• Disposal of rubble and refuse in an appropriate manner with no rubble and refuse lying on site.</li> <li>• Site is neat and tidy.</li> <li>• No complaints from surrounding industries and businesses.</li> <li>• Sufficient containers available on site.</li> <li>• No visible or measurable signs of pollution of the environment (soils, ground and surface water).</li> </ul> | Contractor, EO    | Daily               |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | CONSTRUCTION                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                             |                       |                                  |
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| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | GENERAL                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                             |                       |                                  |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | MANAGEMENT OBJECTIVES                                                                                                                                          | MEASURABLE TARGETS                                                                                                                                                                                                                                                                                                                                                                          | RESPONSIBLE PARTY     | FREQUENCY OF ACTION              |
| <p><b>Dust</b></p> <p>It is imperative that method statements regarding dust control be supplied to the ECO by the contractor prior to the commencement of any construction activities. Dust management and dust suppression during the construction phase is deemed very important. The method statement must provide information on the proposed source of water to be utilised and the details of the licenses acquired for such usage.</p> <p><b>Potable water will not be used as a means of dust suppression,</b> alternative measures must be sourced. The use of 'grey' water must be investigated as an alternative. The contractor will be responsible to source this water and obtain the required approvals.</p> <p>Dust mitigation measures to include the use of chemical dust suppressants, such as Lignosulphonates; and the use of soil stabilisers such as straw for large open ground areas.</p> <p>The construction camp shall be treated with dust suppression during dry and windy conditions to control dust fallout.</p> <p>Dust production must be controlled by regular dust suppression of roads and works area, should the need arise. (<b>NB:</b> Concrete dust is toxic and damages soil properties. Therefore, dust suppression to prevent dust spread must not be done where concrete dust has fallen, or it will infiltrate into the soil. Concrete bags must not be allowed to blow around the site and spread cement dust.)</p> | <ul style="list-style-type: none"> <li>• Reduce dust fall out.</li> <li>• Reduce visual impact.</li> <li>• Minimise loss of valuable soil material.</li> </ul> | <ul style="list-style-type: none"> <li>• No visible signs of dust.</li> <li>• No complaints from Interested and Affected parties.</li> <li>• No incidences reported to ECO.</li> <li>• No visible evidence of dust contamination on the surrounding environment.</li> <li>• Method statement.</li> <li>• Baseline targets not exceeded during regular monitoring of dust counts.</li> </ul> | ER,<br>Contractor, EO | <p>Monitored daily</p> <p>57</p> |

| Phase of development                                                                                                                                                                                                                                                                                                            | CONSTRUCTION          |                    |                   |                     |
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| Impact / issue                                                                                                                                                                                                                                                                                                                  | GENERAL               |                    |                   |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                              | MANAGEMENT OBJECTIVES | MEASURABLE TARGETS | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| <p>At the end of construction, the site camp must be fully rehabilitated by removing the temporary surface, ripping the area to loosen the soil.</p> <p>All vehicles transporting material that can be blown off (e.g. soil, rubble etc.) must be covered with a tarpaulin, and speed limits of 20 km/h must be adhered to.</p> |                       |                    |                   |                     |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | CONSTRUCTION                                                                                                                                                                                                                                                           |                                                                                                                                                                                            |                     |                     |
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| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | GENERAL                                                                                                                                                                                                                                                                |                                                                                                                                                                                            |                     |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | MANAGEMENT OBJECTIVES                                                                                                                                                                                                                                                  | MEASURABLE TARGETS                                                                                                                                                                         | RESPONSIBLE PARTY   | FREQUENCY OF ACTION |
| <p><b>Workshop equipment, maintenance and storage</b></p> <p>The contractors <b>must provide and maintain a method statement</b> for “workshop maintenance and cleaning of plant”.</p> <p>All maintenance and washing of vehicles and equipment shall be done off-site as far as possible. During servicing of vehicles or equipment, a suitable drip tray shall be used to prevent spills onto the soil. Leaking equipment shall be repaired immediately or be removed from site to facilitate repair.</p> <p>Workshop areas shall be monitored for oil and fuel spills and such spills shall be cleaned and remediate to the satisfaction of the EO or ER. Cleaning and remediation must be done with products or similar approved products that are in line with best environmental practice i.e. Sunorb, or similarly approved.</p> <p>The Contractor shall be in possession of an emergency spill kit that must be complete and available at all times on site. The Contractor must ensure that senior and the other relevant members of the workforce are trained in dealing with spills by using emergency spill kits.</p> <p>All spills of hazardous substances must be reported to the ESO, EO, ER or ECO.</p> | <ul style="list-style-type: none"> <li>• Prevent pollution of the environment.</li> <li>• Minimise chance of transgression of the acts controlling pollution.</li> <li>• Disposal of hazardous substances to a General &amp; Hazardous Waste Landfill site.</li> </ul> | <ul style="list-style-type: none"> <li>• No pollution of the environment.</li> <li>• No litigation due to transgression of pollution control acts.</li> <li>• Method statement.</li> </ul> | ER, Contractor, EO. | Monitor daily.      |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | CONSTRUCTION                                                                                                                                                                                           |                                                                                                             |                   |                       |
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| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | GENERAL                                                                                                                                                                                                |                                                                                                             |                   |                       |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | MANAGEMENT OBJECTIVES                                                                                                                                                                                  | MEASURABLE TARGETS                                                                                          | RESPONSIBLE PARTY | FREQUENCY OF ACTION   |
| <p><b>Noise</b></p> <p>Noise reduction is essential, and Contractors shall endeavour to limit unnecessary noise, especially loud talking, shouting or whistling, radios, sirens or hooters, motor revving, etc. The use of silent compressors is a specific requirement. All machinery to be muffled where possible.</p> <p>Noisy activities shall take place only during working hours. The EO must inform the residents of houses and businesses adjacent to the development in writing 24 hours prior to any planned activities that will be unusually noisy or any other activities that could reasonably have an impact on the adjacent sites. These activities could include, but are not limited to use of pneumatic jack-hammers and compressors etc. No noise louder than 70dB from the ambient noise level.</p> <p>Machinery and equipment on site must be maintained so as to avoid any unnecessary noises.</p> | <ul style="list-style-type: none"> <li>• Maintain noise levels below “disturbing” as defined in the National Noise Regulations.</li> <li>• Minimise the nuisance factor of the development.</li> </ul> | <ul style="list-style-type: none"> <li>• No complaints from surrounding landowners or I&amp;APs.</li> </ul> | Contractor, EO.   | As and when required. |

Table 5: PROPOSED PERIODIC MAINTENANCE OF TR16/8 AND TR16/9, CONSTRUCTION PHASE EMPr (Construction)

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | CONSTRUCTION                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                  |                      |                     |
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| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | CONSTRUCTION                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                  |                      |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | MANAGEMENT OBJECTIVES                                                                                                                                                                                                                                                                                                  | MEASURABLE TARGETS                                                                                                                                                                                                               | RESPONSIBLE PARTY    | FREQUENCY OF ACTION |
| <p><b>Crew camps</b></p> <p>Accommodation for members of the workforce will not be permitted on site unless authorisation has been given in terms of the Environmental Authorisation issued for the site. If accommodation is to be provided for workers, details need to be provided as to the location and facilities to be provided for the workers.</p> <p>The contractor's camp shall be monitored for dust fallout and dust suppression applied as required. This will include the laying of gravel; the use of grey water can be considered as an option if the required permits have been acquired.</p> <p>The contractor's camp, offices and storage facilities shall be located within the site boundaries. If this is not feasible an alternative must be designated in consultation with the ECO.</p> <p>The contractor shall provide labourers to clean up the contractor's camp and construction site on a daily basis. These areas shall then be inspected by the contractor or his/her ESO to ensure compliance with this requirement.</p> <p>Crew camps must be established outside of the delineated watercourse.</p> | <ul style="list-style-type: none"> <li>• Minimise water pollution.</li> <li>• Minimise dust fallout.</li> <li>• Minimise unwarranted environmental damage outside the footprint.</li> <li>• Maintain a clean and healthy working environment.</li> <li>• Minimise visual impact to surrounding environment.</li> </ul> | <ul style="list-style-type: none"> <li>• No signs of water or soil pollution.</li> <li>• No complaints from surrounding landowners or I&amp;APs.</li> <li>• No visible signs of litter.</li> <li>• Method statements.</li> </ul> | Contractor, EO, ESO. | Monitor daily.      |

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| <p>The contractor shall be responsible for cleaning the contractor's camp and construction site of all structures, equipment, residual litter and building materials at the end of the construction period and, the topsoil restored in areas where landscaping is to take place.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                   |                                                                                                                                                                                                             |                             |                       |
| <p><b>Visual Impact</b></p> <p>The site must be kept tidy at all times.</p> <p>Building material stockpiles must be protected from dispersion into the surrounding area by wind or water.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• Minimise visual impact.</li> </ul>                                                                                                       | <ul style="list-style-type: none"> <li>• No unacceptable visual impacts.</li> </ul>                                                                                                                         | <p>Contractor, EO, ESO.</p> | <p>Monitor, daily</p> |
| <p><b>Fires</b></p> <p>The contractors <b>must provide and maintain a method statement</b> for "fires", clearly indicating where and for what fires will be utilised plus details on the fuel to be utilised in creating the fire. Fire training and equipment to be nearby to put fires out. No wood is to be collected from private or public property. Fires must be within designated areas and must be in small scale.</p> <p>Absolutely no burning of waste is permitted.</p> <p>Fires will only be allowed in facilities especially constructed for this purpose within fenced Contractor's camps. Wood and/or charcoal are the only fuels permitted to be used for fires. The contractor must provide sufficient wood (fuel) for this purpose.</p> <p>Fires in the designated areas must be small in scale so as to prevent excessive smoke being released into the atmosphere.</p> <p>Heavy smoke will not be released into the air.</p> <p>No felling of trees or wood collection is allowed from private or public</p> | <ul style="list-style-type: none"> <li>• Minimise risk of veldt fires.</li> <li>• Minimise destruction of natural fauna and flora.</li> <li>• Maintain safety on site.</li> </ul> | <ul style="list-style-type: none"> <li>• No veldt fires started by the contractor's workforce.</li> <li>• No claims from landowners for damages due to veldt fires.</li> <li>• Method statement.</li> </ul> | <p>Contractor, EO, ESO.</p> | <p>Monitor daily.</p> |

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| property.<br><b>The Contractor shall ensure that there is appropriate fire-fighting equipment available on site at all times.</b>                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                      |                          |                       |
| <b>Erosion and sedimentation</b><br><br>To reduce the loss of material by erosion, the contractor shall ensure that disturbance on site is kept to a minimum. The disturbance especially includes the movement of heavy vehicles.<br><br>In the case of strong wind and/or rain all stockpile material must be covered with a tarpaulin in order to prevent erosion. | <ul style="list-style-type: none"> <li>• Minimise erosion damage.</li> <li>• Minimise scarring of the soil surface and land features.</li> <li>• Minimise disturbance and loss of topsoil.</li> <li>• Re-growth of disturbed areas.</li> </ul> | <ul style="list-style-type: none"> <li>• No erosion scars.</li> <li>• No loss of topsoil.</li> <li>• No interference with the natural flow of water.</li> <li>• No visible erosion scars once construction is completed.</li> <li>• The footprint has not exceeded the agreed boundaries.</li> </ul> | Contractor, EO, ESO.     | As and when required. |
| <b>Fauna &amp; Flora</b><br><br><ul style="list-style-type: none"> <li>• Appropriate sanitary facilities must be provided during the maintenance and must be removed to an appropriate waste disposal site.</li> <li>• No dumping of litter, rubble or cleared vegetation on site must be allowed. Infrastructure and rubble removed because of the</li> </ul>       | <ul style="list-style-type: none"> <li>• Minimise disturbance to animals.</li> <li>• Minimise destruction of habitat.</li> </ul>                                                                                                               | <ul style="list-style-type: none"> <li>• No complaints from Nature Conservation.</li> <li>• No litigation concerning applicable animal protection acts.</li> </ul>                                                                                                                                   | ER, Contractor, EO, ESO. | Monitor daily.        |

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| <p>construction activities must be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must be carefully collected and disposed of at a separate waste facility;</p> <ul style="list-style-type: none"> <li>• If any spills occur, they must be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits must be kept on-site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage must be practised, preventing the ingress of hydrocarbons into the topsoil; and</li> <li>• Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area.</li> <li>• Edge effects arising from the proposed maintenance, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEMBA Alien species lists, 2022), in line with the NEMBA Alien and Invasive Species Regulations (2014); and</li> <li>• Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility that complies</li> </ul> |  | <ul style="list-style-type: none"> <li>• No measurable or visible signs of habitat destruction.</li> </ul> |  |  |
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| <p>with legal standards.</p> <ul style="list-style-type: none"> <li>• The relocation success of floral SCC (if found) must be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful;</li> <li>• No collection of floral SCC or medicinal floral species must be allowed by construction personnel;</li> <li>• Edge effect control needs to be implemented to prevent further degradation and potential loss of floral and faunal SCC outside of the proposed development footprint area;</li> <li>• No trapping or hunting of fauna whatsoever must be allowed.</li> <li>• Should the presence of any faunal SCC be noted, or their breeding sites be located within the development footprint, a suitably qualified specialist must be consulted on the best way to proceed.</li> </ul> <p><u>All activities on site must comply with:</u></p> <p>The regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962); and Marine Living Resources Act, 1998 (Act No. 18 of 1998).</p> <p>All construction workers must be informed that the intentional killing of any animal is not permitted as faunal species are a benefit to society. Poaching is illegal and it must be a condition of employment that any employee caught poaching will be dismissed. Employees must be trained on how to deal with fauna species as intentional killing will not be tolerated. In the case of a problem animal e.g. a large snake a specialist must be called in to safely relocate the animal if the EO or ECO is not able to.</p> |  |  |  |  |
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| <p><b>Heritage</b></p> <p>In terms of the National Heritage Act, 1999 (Act No. 25 of 1999), should any archaeological artefacts be exposed during construction activities, work on the area where the artefacts were found shall cease immediately and the ECO as well as the Local Council shall be notified within 24 hours. Finds of human remains must be treated as a crime scene.</p> <p>Upon receipt of such notification, the ECO will arrange for the excavation to be examined by an Archaeologist.</p>                                                                                | <ul style="list-style-type: none"> <li>• Limit the destruction of the country's heritage resources.</li> <li>• The preservation and appropriate management of new archaeological finds should these be discovered during construction.</li> </ul> | <ul style="list-style-type: none"> <li>• No destruction of or damage to known archaeological sites.</li> </ul>   | <p>Contractor, EO, ER, ESO.</p> | <p>Monitor Daily.</p>              |
| <p><b>No-go / sensitive areas</b></p> <p>Stockpiled topsoil must be demarcated and seen as no-go areas.</p> <p>All construction activities must remain within the boundaries of the development area, as demarcated at the start of the construction phase. The construction footprint must be kept to a minimum by constructing boundaries and demarcation around areas not to be disturbed.</p> <p>These No-go areas must be <b>demarcated</b> and signs before any construction activities commence. The EO must be on site in order to make sure the correct areas are fully demarcated.</p> | <ul style="list-style-type: none"> <li>• Minimise the potential for the spread of the construction footprint.</li> </ul>                                                                                                                          | <ul style="list-style-type: none"> <li>• Containment of footprint.</li> </ul>                                    | <p>ER, Contractor, ESO, EO.</p> | <p>Monitor daily.</p>              |
| <p><b>Access route/haul roads</b></p> <p>Any authorised clearing for access roads must be done under the supervision of the ER and/or ECO.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>• Minimise loss of topsoil and enhancement of erosion.</li> </ul>                                                                                                                                          | <ul style="list-style-type: none"> <li>• No erosion on access roads after completion of construction.</li> </ul> | <p>Contractor, ER or EO.</p>    | <p>As required, monitor daily.</p> |

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| <p>Access roads for earthmoving-equipment must be clearly designated and be positioned as close as possible to the proposed development site. No driving off from the marked roads is permitted and designated parking areas must be identified and demarcated with applicable signage.</p> <p>Neither the site nor its access roads must be allowed to be utilised for recreational activities, this includes but is not limited to quad bikes, 4x4's and dirt bikes. Security personnel ensure that this is enforced. No unauthorised access is permitted.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• Minimise fauna displacement by destruction of natural habitats.</li> </ul>                                                                                                                 | <ul style="list-style-type: none"> <li>• No loss of topsoil due to runoff water on access roads.</li> </ul> |                                 |                       |
| <p><b>Crime, safety and security</b></p> <p>No site staff, other than security personnel and skeleton staff shall be housed on site unless otherwise stipulated in the environmental authorisation. Security personnel and skeleton staff shall be supplied with adequate protective clothing, ablution facilities, water and refuse collection facilities. A boundary fence will serve to prevent public access to the site office, for public safety and security reasons. The access to the site must be controlled so as to restrict unauthorised personnel from entering the site. The workers on site must retain some means of identification. The ESO and the contractor are responsible for ensuring that only authorised personnel are on site at all times.</p> <p>Site specific conditions and regulations as set forth by the health and safety agent must also be adhered to.</p> <p>The contractor shall ensure that all emergency procedures are in place prior to commencing work. Emergency procedures shall include (but not be limited to) fire, spills, contamination of the ground, accidents to employees,</p> | <ul style="list-style-type: none"> <li>• Reduce the risk of potential incidences.</li> <li>• Minimise the potential impact on the environment.</li> <li>• Reduce the risk of possibly fatal incidents occurring on site.</li> </ul> | <ul style="list-style-type: none"> <li>• No incidences reported.</li> </ul>                                 | <p>ER, Contractor, ESO, EO.</p> | <p>Monitor daily.</p> |

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| <p>use of hazardous substances and materials, etc.</p> <p>The contractor shall ensure that lists of all emergency telephone numbers / contact persons are kept up to date and that all numbers and names are posted at relevant locations throughout the construction site.</p> <p>The nearest emergency service provider must be identified during all phases of the project as well as its capacity and the magnitude of accidents it will be able to handle. The contact details of this emergency centre, as well as the police and ambulance services must be available at prominent locations around the construction site and the construction crew camps.</p> |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                          |                                               |                                             |
| <p><b>Visual impact</b></p> <p>Rubble and litter must be removed every two weeks or more often as the need arises and be disposed of at a registered landfill site as designated by the Beaufort West Local Municipality's solid waste removal department.</p>                                                                                                                                                                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>Minimise visual impact.</li> </ul>                                                                                                                                                                          | <ul style="list-style-type: none"> <li>No complaints from I &amp; AP's.</li> </ul>                                                                                                                                                       | <p>Contractor, landscape contractor, ESO.</p> | <p>Monitor daily.</p>                       |
| <p><b>Freshwater Ecology</b></p> <p><u>The following mitigation measures were identified by FEN Ecological Consulting (FEN) (2023):</u></p> <ol style="list-style-type: none"> <li>Contractor laydown areas (if applicable) are to be established outside of the delineated watercourses, and only for a short duration, in consultation with the appropriate authority.</li> <li>All maintenance footprint areas to remain as small as possible (preferably no more than 2-3 m in any direction from the maintenance site) and vegetation clearing to be limited to what is essential and may not extend beyond the road reserve.</li> </ol>                         | <ul style="list-style-type: none"> <li>Minimise pollution of soil, surface and ground water resources in the immediate and surrounding environments.</li> <li>Minimise impeding the natural flow of water.</li> <li>Minimise the impact</li> </ul> | <ul style="list-style-type: none"> <li>No visible signs of pollution.</li> <li>No signs of siltation of water courses.</li> <li>No visible erosion scarring once construction is completed.</li> <li>Minimum loss of topsoil.</li> </ul> | <p>ER, Contractor, EO.</p>                    | <p>As and when required, monitor daily.</p> |

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| <ol style="list-style-type: none"> <li>3. It is considered imperative that the proposed maintenance activities occur during the drier periods, to minimise any impact on the hydrological functioning of the watercourses.</li> <li>4. The watercourses must be demarcated and marked as a 'no-go' area where no construction activities are planned.</li> <li>5. Areas where bank failure is observed must be immediately repaired.</li> <li>6. All alien invasive vegetation species, debris and litter removed from the crossings must be removed from site and properly disposed of (no stockpiling allowed).</li> <li>7. Any sediment or silt removed from the watercourse will be temporarily stockpiled in the road reserve but outside the watercourse, for the duration of the day's work. These stockpiles will not exceed 2m in height, and their footprint must be kept to a minimum.</li> <li>8. Stockpiling of removed materials will only be temporary (may only be stockpiled during the period of clearing at a certain crossing point) and must be disposed of at a registered waste disposal facility.</li> <li>9. The clearing activities must be limited to only what is necessary.</li> <li>10. Only authorised maintenance personnel will be permitted to enter the watercourse as part of the clearing activities to prevent excessive compaction of the soil within the watercourse.</li> <li>11. It is preferred that no machinery be used as part of the clearing activities.</li> </ol> | <p>on natural water flow dynamics.</p> <ul style="list-style-type: none"> <li>• Minimise scarring of the soil surface and land features.</li> </ul> |  |  |  |
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| <p>Contractor laydown areas and equipment storage are to remain outside of the 32 m NEMA ZoR associated with the watercourses.</p> <p>In the event of pollution caused as a result of construction activities, the contractor, according to section 20 of the National Water Act, 1998 (Act No. 36 of 1998) shall be responsible for all costs incurred by organisations called to assist in pollution control and/or to clean up polluted areas and water courses.</p> <p>The contractor shall ensure that excessive quantities of sand, silt and silt-laden water do not enter the storm water system.</p> <p>All wastes are to be removed from the site and disposed of at a registered facility.</p> |  |  |  |  |
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| <p><b>Soil</b></p> <p>Topsoil must be stripped from all areas that are to be utilized during the construction period and where permanent structures and access is required. These areas will include comprising the permanent works, pipeline trenches, stockpiles, access roads, construction camps and lay down areas.</p> <p>Topsoil must be deemed to be the top layer of soil containing organic material, nutrients and plant grass seed. For this reason it is an extremely valuable resource for the rehabilitation and vegetation of disturbed areas.</p> <p>At the beginning of the construction phase, topsoil removed for vegetation clearance must be stripped to a minimum depth of 300 mm and windrowed.</p> <p>However, the use of topsoil for rehabilitation contaminated by the seed of alien vegetation must not be permitted unless a programme to germinate the seed and eradicate the seedlings is drawn up and approved, or some other mitigatory feature is found. This must be approved by the ECO.</p> <p>Single handling is recommended. Stockpiles must not be higher than 2m to avoid compaction.</p> <p>The soils surrounding the wingwalls and concrete aprons must be suitable loosened on completion of construction activities.</p> <p>Dust suppression is necessary for stockpiles older than a month – with either water or a biodegradable chemical binding agent.</p> <p>Backfill will require contouring to ensure that it blends in with the surrounding environment.</p> | <ul style="list-style-type: none"> <li>• Minimise scaring of the soil surface and land features.</li> <li>• Minimise disturbance and loss of soil.</li> <li>• Minimise construction footprint.</li> <li>• Maintain the integrity of topsoil's for future rehabilitation.</li> <li>• Containment of invasive plant growth.</li> </ul> | <ul style="list-style-type: none"> <li>• No visible erosion scars once construction is completed.</li> <li>• The footprint has not exceeded the agreed site in terms of EA etc.</li> <li>• Minimal invasive weed growth.</li> <li>• No signs of sedimentation and erosion.</li> <li>• Method statement.</li> </ul> | <p>Contractor.</p> | <p>Daily.</p> |
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| Phase of development | CONSTRUCTION |                   |                     |
| Impact / issue       | TOLERANCES   |                   |                     |
| MITIGATION MEASURE   |              | RESPONSIBLE PARTY | FREQUENCY OF ACTION |

| Fines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Engineer | Monitor Daily |
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| <p>Environmental management is concerned not only with the final results of the Contractor's operations, but also to the standard of the day-to-day operations required to complete the works.</p> <p>Penalties may be instituted for non-compliance. The penalty is over and above the cost of rectifying the problem and / or damage. Penalties will vary on a sliding scale from <b><u>R 1 000 to R 5 000</u></b> for non-serious issues as determined by the Engineer / RE / ECO. For each subsequent similar offence, the fine shall be doubled in value to a maximum value of <b><u>R 20 000</u></b>.</p> <p>The Engineer together with the ECO will decide how the penalties, if any, are to be spent on measures improving the environment. Such fines will be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental specifications. The Engineer will inform the Contractor of the contravention and the amount of the fine, the amount will be deducted from the monies due in payment certificates issued under the Contract.</p> <p>Maximum fines for the following contraventions by either the Contractor and / or his subcontractors may be imposed by the Engineer / ECO, as follows:</p> <ul style="list-style-type: none"> <li>a) Any persons, vehicles, plant, or material related to the Contractors operation within the designated boundaries of a "no-go" area. <b><u>R 5 000</u></b></li> <li>b) Persistent failure to demarcate "no-go" areas. <b><u>R 2 000</u></b></li> <li>c) Damage to trees not specified to be removed. <b><u>R 3 000</u></b></li> <li>d) Persistent and unrepaired oil leaks from machinery / not using a drip tray to collect waste oil and other lubricants / not using specified absorbent material to encapsulate hydrocarbon spillage / using inappropriate methods of refuelling. <b><u>R 3 000</u></b></li> <li>e) Litter on site associated with construction activities. <b><u>R 2 000</u></b></li> <li>f) Deliberate lighting of illegal fires on site. <b><u>R 1 000</u></b></li> <li>g) Burning of waste without a permit. <b><u>R 2 000</u></b></li> <li>h) Any employee eating meals on site, outside of defined eating area. <b><u>R 500</u></b></li> <li>i) Employees not making use of the site ablution facilities. <b><u>R 2 000</u></b></li> <li>j) Failure to implement specified noise controls. <b><u>R 1 000</u></b></li> </ul> |          |               |

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| <p>k) Failure to empty waste bins/skips/litter structures on a regular basis. <b><u>R 2 000</u></b></p> <p>l) Inadequate dust control or failure to apply dust suppression. <b><u>R 2 000</u></b></p> <p>m) Any water abstraction activities from a watercourse without approval. <b><u>R 5 000</u></b></p> <p>n) Inadequate handling of bitumen. <b><u>R 3 000</u></b></p> <p>o) Inadequate handling of concrete. <b><u>R 2 000</u></b></p> <p>Any activity, that in the reasonable opinion of the Engineer, RE and ECO, constitutes a deliberate contravention of the requirements of the specifications relating to environmental matters. <b><u>R 4 000</u></b></p> | Engineer | Monitor daily |
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Table 6: PROPOSED PERIODIC MAINTENANCE OF TR16/8 AND TR16/9, OPERATIONAL PHASE EMPr (General)

| Phase of development                                                                      | OPERATIONAL                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                             |                   |                     |
|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|
| Impact / issue                                                                            | General                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                             |                   |                     |
| MITIGATION MEASURE                                                                        | MANAGEMENT OBJECTIVES                                                                                                                                                                                                                                                                                                                                                      | MEASURABLE TARGETS                                                                                                                                                                                                                                                                                          | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| <b>Waste management</b><br>Please refer to the waste Minimization Plan Herewith attached. | <ul style="list-style-type: none"> <li>• Sustainable management of waste by recycling.</li> <li>• To keep the development neat and tidy.</li> <li>• Minimise litigation and complaints by I&amp;AP's.</li> <li>• Reduce visual impact.</li> <li>• Control potential influx of vermin and flies thereby minimising the potential of diseases at the site and the</li> </ul> | <ul style="list-style-type: none"> <li>• Disposal of refuse in an appropriate manner with no refuse polluting the development.</li> <li>• Development is neat and tidy.</li> <li>• No complaints from surrounding industries and businesses.</li> <li>• Sufficient containers available on site.</li> </ul> | ECO.              | 6 Monthly.          |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | OPERATIONAL                                                                                                                                                                                                                                            |                                                                                                                                                                                                              |                   |                                                  |  |
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| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | General                                                                                                                                                                                                                                                |                                                                                                                                                                                                              |                   |                                                  |  |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | MANAGEMENT OBJECTIVES                                                                                                                                                                                                                                  | MEASURABLE TARGETS                                                                                                                                                                                           | RESPONSIBLE PARTY | FREQUENCY OF ACTION                              |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | surrounding environment.                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>No visible or measurable signs of pollution of the environment (soils, ground and surface water).</li> </ul>                                                          |                   |                                                  |  |
| <p><b>Stormwater Management</b></p> <p>Stormwater, wherever possible, must be allowed to soak into the land in the area on which the water has been discharged.</p> <p>The storm water system and the discharge points must be inspected, and damaged areas must be repaired if required. Discharge points must further be inspected for blockages of any kind; these must be removed timeously to ensure the efficient operation of the storm water management system.</p> <p>No waste or refuse must be allowed to access the stormwater infrastructure.</p> <p>In the event that silt runoff occurs off the development site, the</p> | <ul style="list-style-type: none"> <li>Minimise pollution of soil, surface and ground water resources.</li> <li>Minimise the potential loss of topsoil.</li> <li>Minimise the potential of flooding of the development, or its neighbouring</li> </ul> | <ul style="list-style-type: none"> <li>No evidence of pollution at the discharge points.</li> <li>No evidence of silt build-up at the discharge points.</li> <li>No complaints from I &amp; AP's.</li> </ul> | ECO.              | As and when required.<br><br>Monitor seasonally. |  |

| Phase of development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | OPERATIONAL                                                                                                                                               |                                                                                                                                                                                                                                 |                   |                     |
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| Impact / issue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | General                                                                                                                                                   |                                                                                                                                                                                                                                 |                   |                     |
| MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | MANAGEMENT OBJECTIVES                                                                                                                                     | MEASURABLE TARGETS                                                                                                                                                                                                              | RESPONSIBLE PARTY | FREQUENCY OF ACTION |
| <p>cause of this must be investigated and suitable mitigation measures employed. This will include the vegetation of bare areas, installing flow diversion channels in consultation with an engineer, installing velocity reducing structures etc.</p> <p>For all maintenance undertaken reference must be made to recommendations in the engineer's reports.</p> <p>All maintenance activities must be monitored to ensure that no environmental damage occurs. All damage must be mitigated immediately.</p> | properties.                                                                                                                                               |                                                                                                                                                                                                                                 |                   |                     |
| <p><b>Atmospheric pollution</b></p> <p><b>Air pollution</b></p> <p>All forms of dust/air pollution must be managed in terms of the Air Quality Act No. 39 of 2004 and Dust Regulations of 2013, this includes the control of noxious and offensive gases, smoke, dust and vehicular emissions.</p> <p>Under no circumstances will heavy smoke be released into the air.</p>                                                                                                                                    | <ul style="list-style-type: none"> <li>• Reduce visual impact.</li> <li>• Minimise chances of transgression of the acts controlling pollution.</li> </ul> | <ul style="list-style-type: none"> <li>• No visible signs of pollution.</li> <li>• No litigation due to transgression of pollution control acts.</li> <li>• No complaints from surrounding residents and businesses.</li> </ul> | ECO.              | Monitor daily.      |

| Phase of development                                                                                                                                                                                                              | OPERATIONAL                                                                                                                                             |                                                                                                                                                                                  |                   |                        |
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| Impact / issue                                                                                                                                                                                                                    | General                                                                                                                                                 |                                                                                                                                                                                  |                   |                        |
| MITIGATION MEASURE                                                                                                                                                                                                                | MANAGEMENT OBJECTIVES                                                                                                                                   | MEASURABLE TARGETS                                                                                                                                                               | RESPONSIBLE PARTY | FREQUENCY OF ACTION    |
| <b>Noise pollution</b><br><br>Noise levels shall be kept within acceptable limits, these are determined in terms of the relevant local by laws. Operation activities will remain within normal working hours (07:00am – 18:00pm). |                                                                                                                                                         |                                                                                                                                                                                  |                   |                        |
| <b>Traffic management</b><br><br>All traffic management must be done in accordance with the <b>National Road Traffic Act No. 93 of 1996.</b>                                                                                      | <ul style="list-style-type: none"> <li>Minimise chances of transgression of the acts controlling traffic.</li> <li>Minimise traffic backlog.</li> </ul> | <ul style="list-style-type: none"> <li>No litigation due to transgression of traffic control acts.</li> <li>No complaints from surrounding industries and businesses.</li> </ul> | ECO.              | Monitored continually. |

Table 7: PROPOSED PERIODIC MAINTENANCE OF TR16/8 AND TR16/9, OPERATIONAL PHASE EMPr (EA conditions)

| Phase of development | OPERATIONAL           | GNEC-Guillaume Nel |                   |                     |  |
|----------------------|-----------------------|--------------------|-------------------|---------------------|--|
| Impact / issue       | EA Conditions         |                    | .....             |                     |  |
| MITIGATION MEASURE   | MANAGEMENT OBJECTIVES | MEASURABLE TARGETS | RESPONSIBLE PARTY | FREQUENCY OF ACTION |  |
|                      | •                     | •                  |                   |                     |  |

**THE PROPOSED PERIODIC MAINTENANCE OF TRUNK ROAD 16 SECTION 8 (16/8) AND  
TRUNK ROAD 16 SECTION 9 (16/9) BETWEEN THE NORTHERN CAPE BORDER AND  
MURRAYSBURG, WESTERN CAPE**

**DEA&DP Ref: 16/3/3/6/7/1/C3/13/0049/23**

**(INCLUDING THE WASTE, WATER USE AND ELECTRICITY CONSUMPTION MINIMIZATION  
AND MANAGEMENT PLAN)**

**Prepared for:**

Western Cape Government: Department of Infrastructure

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## REFERENCES

DEA&DP, 2003. A Waste Minimization Guideline Document for Environmental Impact Assessments (2003) by Common Ground in association with deVilliers Brownlie Associates.

National Environmental Management Act 107 of 1998 (NEMA)

National Environmental Management: Waste Act 59 of 2008 (NEM:WA)

National Environmental Management Laws Amendment Act 25 of 2014

National Environmental Management: Waste Amendment Act 26 of 2014

## SUB SECTION 1 - INTRODUCTION

### 1.1 INTRODUCTION

The Western Cape Government: Department of Infrastructure, proponent of the proposed maintenance, will use this WASTE, WATER USE AND ELECTRICITY CONSUMPTION MINIMIZATION AND MANAGEMENT PLAN to minimize and manage waste and wastage, electricity consumption and water use in the design, construction and operational phase of the proposed development as a tool in managing the impacts of the proposed development after environmental approval from the Department of Environmental Affairs and Development Planning (DEA&DP) in terms of the Environmental Impact Assessment Regulations (GN R. No. 983, GN R. No. 984 and GN R. No. 985 [4 December 2014], as amended 07 April 2017) under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), is obtained.

This document is based on the Waste Minimization Guideline Document on the DEA&DP website (by Common Ground in association with deVilliers Brownlie Associates) and the Stellendale Village DRAFT Green Building Guidelines by Steadfast Greening.

The regulation of activities that have a significant impact on the environment as well as the protection of the environment itself, have improved significantly in the last decade and a half with the promulgation of the Constitution, and general environmental legislation, such as the National Environmental Management Act (NEMA) and the National Water Act. One of the main impacts of human activities on the environment is that of waste disposal (Common Ground & deVilliers Brownlie Associates, 2003).

Waste may be in solid, liquid or gaseous form. It may be benign, toxic, or hazardous. The management of hazardous waste, with associated negative impacts on the environment, is generally covered by legislation. The longer term, cumulative impacts of relatively benign waste disposal is poorly addressed by our laws (DEA&DP Waste Minimization Guideline, 2003).

“Waste” in this document is primarily interpreted as solid waste. Waste minimization per se is not specifically legislated in South Africa at present. Similarly, there are no legal instruments that can be used to enforce reduction in wastage of electricity and water although the National Water Act No 36 of 1998 prohibits wastage of water without specifying what wastage means and how this section will be enforced. However, there are a number of laws and overarching policies that are aimed at sustainable development and sound environmental management, and which are relevant to waste and wastage minimisation.

Wastage is defined in the Oxford Dictionary as “expend or employ to no purpose or for inadequate result, use extravagantly or ineffectually, squander”. Part of the obligation to protect

the environment would be to limit wastage of resources. Thus, limiting wastage of water would fall within this obligation. So too would be limiting the wastage of electricity that results in pollution at the site of electricity generation (Common Ground & deVilliers Brownlie Associates, 2003).

## SUB SECTION 2 - WASTE REDUCTION

### 2.1 BACKGROUND TO WASTE REDUCTION

A key element of environmentally friendly buildings is to promote awareness and change behaviour around all aspects of waste management.

Waste minimisation can therefore be assessed as a component of waste management that aims to reduce the amount of waste, which has to be disposed of. In this regard waste minimisation is aimed at tackling the causes and sources of waste rather than just trying to address and mitigate the symptoms (e.g. through treatment). Waste management can be depicted as a hierarchy, as shown in Figure 4 below. In the hierarchy, source reduction options are considered as a priority, followed by re-use and recycling options. Treatment options are considered only when acceptable waste minimisation techniques have been investigated. As a “last resort” disposal must be considered.

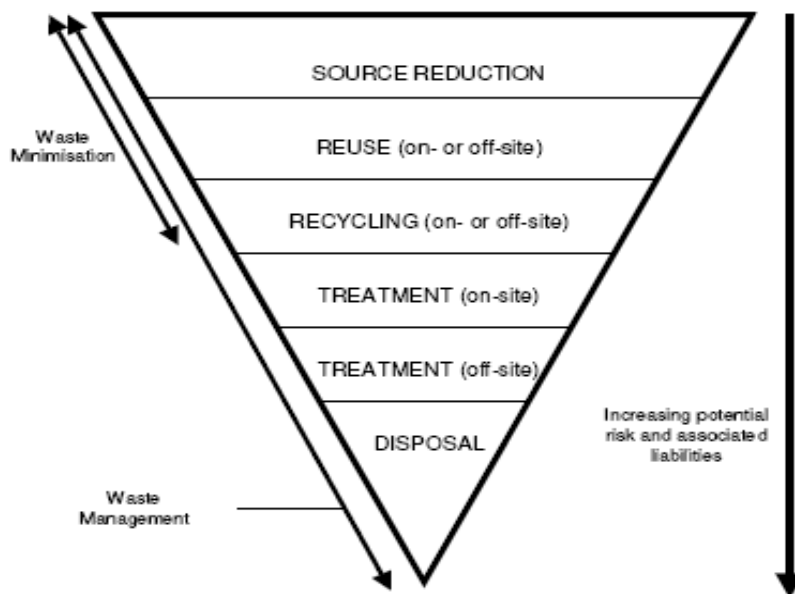


Figure 11: Waste Management Hierarchy (Common Ground & deVilliers Brownlie Associates, 2003).

Waste Management, therefore, involves interventions to minimize waste generation in the planning, operation, management and maintenance of the built environment, and includes waste prevention, waste reduction, waste re-use, and recycling.

A further aspect is minimizing the environmental and health impacts by reducing toxicity and ensuring environmentally sound treatment and disposal of remaining waste. The ultimate is

however to promote a zero-waste concept where all the related materials can be used again over the longer term with life-cycle assessments, cradle to cradle.

Zero Waste is a goal, a process, a way of thinking that is different to the way we think about products and processes. Not only is Zero Waste about recycling and avoiding waste going to landfill, it also changes production and distribution systems to prevent waste from being manufactured in the first place. It is a way of changing how materials flow through society in such a way that, as in nature, they flow in a closed loop – resulting in efficient use of material and other resources, such as energy and water (Steadfast Greening, 2008).

**Zero Waste therefore aims to:**

- Prevent rather than manage waste.
- Turn resource that would normally be thrown away into economic value instead of loss.
- Support sustainable development.
- Follows natural processes where everything is recycled.
- Promote the efficient flow of energy and materials.

It is thus essential to ensure that waste avoidance is built into the process at a design phase, referring to the construction and maintenance of the building. This will be done through selection of the appropriate building materials and managing the construction process in a responsible manner.

Opportunities for the separation of waste at source must also be built into the design of the building to encourage people to recycle their waste.

## **2.2 BENEFITS OF WASTE REDUCTION**

The benefits of waste reduction as described in the DEA&DP Waste Minimization Guideline (Common Ground & deVilliers Brownlie Associates, 2003) include the following benefits.

### **2.2.1 Financial benefits**

- Reduced transportation costs for waste materials (less transportation because of less material wasted). This includes transportation to and from the site and disposal.
- Reduced disposal costs of waste materials (disposal costs are likely to rise significantly in the near future)
- Reduced purchase quantity and price of raw materials by waste minimisation.

- Reduced purchase price of new materials when considering reuse and recycling (depending on materials).
- Increased returns can be achieved by selling waste materials to be reused.

### **2.2.2 Environmental benefits**

Some of the environmental benefits are:

- Reduced quantity of waste generated.
- Efficient use of waste generated.
- Minimised amounts of waste disposed of at landfills, which therefore extend the lifespan of landfills.
- Reduced environmental effects as a result of disposal, e.g. noise, pollution.
- Reduced transportation of waste to be disposed of (hence less noise, vehicle emission pollution, and energy used).

### **2.2.3 Social benefits**

- Increased site safety.
- Increased work efficiency.
- Enhanced company image.
- Job creation through recycling initiatives.

## **2.3 GENERATED WASTE**

### **2.3.1 Examples of waste generated during construction:**

- Waste wood from cutting structural elements, broken structural elements and damaged elements from incorrect storage
- Damaged or off-cut steel components
- Off-cut electrical wiring and cabling
- Broken or off-cut tiles
- Packaging
- Off-cut and broken bricks
- Surplus material from cut and fill activities
- Spoil from cut and fill activities

- Off-cut, or broken conduit and plumbing
- Off-cut or damaged insulation elements
- Surplus paint and paint containers
- Broken or redundant plant and equipment
- Surplus concrete, cement and grouting
- General waste

## SUB SECTION 3 - WASTE MINIMIZATION PLAN

### 3.1 WASTE MINIMIZATION DURING CONSTRUCTION

| Issue                         | Minimization Plan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| General Considerations        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Standardization of dimensions | <p>The developer will for as far as it is economically feasible design the buildings to maximise the use of standard dimensions in order to minimize the amount of cutting waste during construction. They include but are not limited to:</p> <ul style="list-style-type: none"> <li>• The size of rooms and roofs to ensure minimal cutting of tiles;</li> <li>• The size of roofs to make use of standard roof trusses.</li> </ul>                                                                                                                             |
| Material Selection            | <p>The developer will, for as far as it is economically feasible select:</p> <ul style="list-style-type: none"> <li>• materials for least waste generation during preparation and use during construction,</li> <li>• materials used in the construction which are durable in order to minimise maintenance or replacement,</li> <li>• standard materials to increase re-use/ recycling potential,</li> <li>• materials which are sourced locally.</li> </ul>                                                                                                     |
| Pre-Fabrication               | <p>The developer will, for as far as it is economically feasible make use of prefabricated components in order to minimise waste on site and permit re-use by the manufacturers of any waste generated during construction of the units.</p>                                                                                                                                                                                                                                                                                                                      |
| Hazardous Substances          | <p>The developer will, for as far as it is economically feasible make use of non-hazardous substances to replace hazardous substances such as replacing asbestos with fibre glass etc.</p>                                                                                                                                                                                                                                                                                                                                                                        |
| Maintenance                   | <p>The developer will, for as far as it is economically feasible design the structure of buildings in such a way that it minimizes but facilitates maintenance, in order to prolong the life-span of the structure and reduce the amount of waste resulting from demolition.</p> <p>The developer will, for as far as it is economically feasible design the structure of buildings in such a way that maintenance does not require the use of hazardous or toxic substances. This will ensure that minimal waste will be un-recyclable due to contamination.</p> |
| Ordering                      | <p>The developer will strive to order materials “just-in-time” to avoid</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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|                                 | deterioration/ breakage during storage The developer will strive to (as far as reasonably possible) order materials only from suppliers which will take back any unused/ off-spec or broken materials favoured. The developer will strive to (as far as reasonably and economically possible) order materials in bulk to reduce packaging but without over-ordering resulting in waste generation. Suppliers which take back the packaging will be favoured by the developer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Load and unloading of materials | The construction site staff will be trained to load and unload materials correctly to avoid breakage and wastage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Storing of materials            | Care will be taken to ensure that materials are stored appropriately according to supplier specifications to reduce the risk of damage or deterioration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| The use of temporary structures | The developer will attempt to keep temporary structures on site to a minimum.<br>Where unavoidable the temporary structures used on this site, will be re-used on other sites.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| General                         | <p>The <b>contractors must provide and maintain a method statement</b> for “solid waste management”. The method statement must provide information on the proposed licensed facility to be utilised and details of proposed record keeping for auditing purposes. For the disposal of clean building rubble, a General &amp; Hazardous Waste Landfill sites can be utilized.</p> <ul style="list-style-type: none"> <li>• Waste shall be separated into recyclable and non-recyclable waste, and shall be separated as follows: Hazardous waste: including (but not limited to) old oil, paint,etc,</li> <li>• General waste: including (but not limited to) construction rubble,</li> <li>• Reusable construction material.</li> </ul> <p>Recyclable waste shall preferably be deposited in separate bins. The contractor is advised that “Collect-a-Can” collect tins, including paint tins, chemical tins, etc. and “Consol” collect glass for recycling.<br/>Any illegal dumping of waste will not be tolerated.<br/>Proof of legal dumping must be able to be produced on request.<br/>Bins must be clearly marked for ease of management.<br/>All refuse bins must have a lid secured so that animals cannot gain</p> |

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|  | <p>access.</p> <p>Under no circumstances will any waste be burnt.</p> <p>All waste must be managed in accordance with the Minimum Requirements for waste disposal by landfill 2nd ed 1998.</p> <p>The minimum requirements for easy access by waste disposal service trucks will be met in order for vehicles to effectively access the waste.</p> <p>All waste must be disposed of at a registered site. It is the management bodies' responsibility to ensure that the contracted party responsible for waste disposal disposes of the waste at the correct facility. This facility refers to a General &amp; Hazardous Waste Landfill site as referred to by the Beaufort West Municipality Solid Waste Management Department. These landfill sites are permitted by Department Water and Forestry with operating numbers in place.</p> |
|  | <p>The use of building materials which result in least amount of waste generated (e.g. pre-fabrication as opposed to on-site construction/fabrication) will be favoured by the developer as far as economically feasible.</p> <p>Materials will be re-used on site wherever possible.</p> <p>Off-cuts and equipment will be re-used on other jobs wherever possible.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

### 3.2 WASTE MINIMIZATION DURING OPERATION

| Issue                  | Minimization Plan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| General Considerations |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| General                | <p>Owners of properties will be encouraged to separate waste into recyclable and non-recyclable waste, and shall be separated as follows:</p> <ul style="list-style-type: none"> <li>• Hazardous waste: including (but not limited to) old oil, paint, etc,</li> <li>• General waste: including (but not limited to) domestic refuse, non- recyclable waste;</li> <li>• Recyclable waste shall preferably be deposited in separate bins. The owners will be advised that "Collect-a-Can" collect tins, including paint tins, chemical tins, etc. and "Consol" collect glass for recycling.</li> </ul> <p>Bins must be clearly marked for ease of management.</p> |

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|  | <p>All refuse bins must have a lid secured so that animals cannot gain access. Sufficient closed containers must be strategically located around the development to handle the amount of litter, wastes, rubbish, debris generated by the development.</p> <p>Under no circumstances must any waste be burnt.</p> <p>All waste must be managed in accordance with the Minimum Requirements for waste disposal by landfill 2nd ed 1998.</p> <p>The minimum requirements for easy access by waste disposal services must also be met in order for vehicles to effectively access the waste.</p> <p>All waste must be disposed of at a registered site. It is the management bodies' responsibility to ensure that the contracted party responsible for waste disposal disposes of the waste at the correct facility. This facility refers to a General &amp; Hazardous Waste Landfill site as referred to by the Beaufort West Municipality Solid Waste Management Department. These landfill sites are permitted by Department Water and Sanitation with operating numbers in place.</p> |
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## SUB SECTION 4 – WATER USE AND MANAGEMENT PLAN

### 4.1- WATER USE MINIMIZATION AND MANAGEMENT DURING CONSTRUCTION AND OPERATION

| CONSTRUCTION PHASE              |                                                                                                                                                                                                                                                                                                                                                                            |
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| Issue                           | Management Plan                                                                                                                                                                                                                                                                                                                                                            |
| General Considerations          |                                                                                                                                                                                                                                                                                                                                                                            |
| DUST SUPPRESSION                | Potable water cannot (as far as possible) be used as a means of dust suppression, alternative measures must be sourced. The use of 'grey' water must be investigated as an alternative. The contractor will be responsible to source this water and obtain the required approvals.                                                                                         |
| ABLUTIONS                       | The developer will reuse as much of the water from wash basins on site as possible.                                                                                                                                                                                                                                                                                        |
| CONCRETE AND CEMENT PREPARATION | The developer/contractor will order concrete and cement from supplier for as far as possible.<br>The mixing area must contain any liquids to prevent contamination of soil and storm water                                                                                                                                                                                 |
| GENERAL CLEANSING OPERATIONS    | All hoses will be fitted with trigger gun spray nozzles to limit wastage.<br>Dry sweeping will be used (for as far as possible) in preference to washing of areas and equipment.<br><b>Wherever possible</b> biodegradable and non-toxic detergents, soaps and degreasers will be used.<br>Regular Maintenance of equipment will be conducted in order to prevent wastage. |

| OPERATIONAL PHASE      |                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WATER WISE LANDSCAPING | The developer will focus on the use of indigenous water wise planting and irrigation methods (if necessary), such as drip irrigation, which can drastically reduce garden water consumption.<br>If biodegradable, non-toxic soaps, shampoos and detergents are used exclusively in the structure, these wastewater streams can be directed to catch ponds for re-use as irrigation. |
| WATER SOURCES          | The capture and use of rainwater from gutters and roofs will be promoted amongst owners of the new erven                                                                                                                                                                                                                                                                            |

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| ABLUTIONS | <p>Washbasin taps must be fitted with flow reduction devices or aerators.</p> <p>Toilets will be fitted with dual flush systems.</p> |
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## SUB SECTION 5 – ELECTRICITY MANAGEMENT PLAN

### 5.1 ELECTRICITY CONSUMPTION REDUCTION OPERATION

Using energy efficient electrical installations is one of the cheapest and easiest ways to reduce energy costs and thus improve the economic and environmental performance of existing developments. Newer equipment is often more energy efficient than old equipment.

Choosing appliances such as energy efficient Geysers, stoves, Zero CFC based refrigerators; will initially be more expensive, although in the longer term it would reduce electrical costs and thus has a positive effect on the environment.

| OPERATIONAL PHASE      |                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General Considerations |                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| AIRCONDITIONING        | <p>The buildings will as far as possible be positioned or orientated to optimise use of ambient weather and climate conditions for heating and cooling.</p> <p>Solar glazing or energy efficient windows to reduce need for air-conditioning will be promoted.</p> <p>Insulation to reduce the need for air-conditioning will be promoted.</p> <p>Natural air flow must be used in preference to air-conditioning wherever possible.</p> |
| LIGHTING               | <p>Natural light will be used wherever possible during the day in preference to artificial light (trade-off between using large windows for use of sunlight but this may require additional air-conditioning)</p> <p>Low voltage or compact fluorescent and/or High-Pressure Sodium lights will be used in place of incandescent globes.</p>                                                                                             |
| REFRIGERATION          | <p><b>Should it be used</b> on the premises, consideration must be given to fit cold rooms and freezers with counter-weight doors to ensure that they cannot be left open unnecessarily.</p>                                                                                                                                                                                                                                             |
| HEATING                | <p>The use of solar heating will be investigated and utilized as far as economically feasible.</p>                                                                                                                                                                                                                                                                                                                                       |

## ANNEXURE 1 INCIDENT AND ENVIRONMENTAL LOG

| ENVIRONMENTAL INCIDENT LOG |                |                                                                                                                                                               |                                                                                              |                  |
|----------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|------------------|
| Date                       | Env. Condition | Comments<br><i>(Include any possible explanations for current condition and possible responsible parties. Include photographs, records etc. if available)</i> | Corrective Action Taken<br><i>(Give details and attach documentation as far as possible)</i> | <u>Signature</u> |
|                            |                |                                                                                                                                                               |                                                                                              |                  |
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