# ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

## 1. INTRODUCTION

The purpose of this Environmental Management Programme (EMPr) is to ensure 'good environmental practice' by taking a holistic approach to the management of environmental impacts during the construction and operation for the proposed infilling of 200 cubic metres of bedding and blanket material into, and the excavation, removal and moving of soil and/or rock of 1 200 cubic metres from a watercourse in order to construct a 1 900 meter (450 mm diameter) and a 800 meter (300 mm diameter) Bulk Outfall Sewer Pipeline located on Portion 2 and Portion 28 of the farm Boschfontein 385-IR, Lesedi Local Municipality, Gauteng Province.

This EMPr therefore sets out the methods by which proper environmental controls are to be implemented by the applicant and his nominated contractor. However, where necessary, these methods have been expanded upon and additional issues addressed in order to ensure that all environmental aspects are appropriately considered and monitored.

It is important to note that this EMPr is focused primarily on the construction and operational phases of the project. Due to the projected lifespan, a detailed Site Closure and Decommissioning has not been included in this document as it is not intended for a project of this nature. Design specifications from an environmental point of view were taken into consideration, the Environmental Assessment Practitioner (EAP) have provided input with regard to possible mitigation measures for reducing environmental impacts.

This EMPr is also intended to ensure that the principles of sound Environmental Management and the general "Duty of Care" specified in the National Environmental Management Act are promoted on site during all phases of the development

This EMPr has been designed to suit the particular activities and needs of for proposed infilling of 200 cubic metres of bedding and blanket material into, and the excavation, removal and moving of soil and/or rock of 1 200 cubic metres from a watercourse in order to construct a 1 900 meter (450 mm diameter) and a 800 meter (300 mm diameter) Bulk Outfall Sewer Pipeline located on Portion 2 and Portion 28 of the farm Boschfontein 385-IR, Lesedi Local Municipality, Gauteng Province and incorporates specific project mitigation measures. This EMPr therefore identifies the following:

- Construction and operation activities that will impact on the environment;
- Specifications with which the contractor shall comply in order to protect the environment from the identified impacts; and
- Actions that shall be taken in the event of non-compliance.

It is important to note that the EMPr is a dynamic document subject to similar influences and changes as are brought by variations to the provisions of the project specification. Any substantial changes shall be submitted to the contractor, resident engineer and relevant environmental authorities in writing for approval.

A professional team consisting of the following experts have been assembled in order to ensure the success of the proposed development:

- The Civil Engineer
- A SAHRA Specialist.
- Botanical Specialist (Fauna and Flora habitat specialist)
- Wetland Specialist
- Registered Environmental Assessment Practitioner (EAP)

They were responsible for the following actions:

- The Civil Engineers were appointed to determine the capability of existing infrastructure to be linked to proposed development and readily available bulk services.
- A SAHRA Specialist has been appointed to determine the possible impact of the development on Archaeological and Cultural features.
- A Botanical specialist has been appointed to determine the impact of the proposed development on the Fauna and Flora of the area.
- A Wetland specialist has been appointed to determine the impact of the pipeline on the non-perennial stream.
- An Environmental Screening Process was conducted by the EAP to ensure that all the relevant Environmental Legislation is taken into consideration.
- Desktop studies were conducted and alternatives assessedThe EAP must assess all possible environmental issues that may affect the proposed project and ensure that all interested and affected parties are notified in order to assist him in identifying possible impacts. He must also give mitigation measures where applicable.
- It will be essential to plan for the appointment of an Environmental Control Officer (ECO) who will be responsible to ensure that all aspects regarding the environmental issues are implemented and monitored. The ECO will also be responsible for maintaining a database of all records pertaining to the environment for the study area.
- The surveyor ensured that the cadastral information is accurate, up to date and properly mapped. The contours of the area are accurately plotted.

## 2. Contents of the Environmental Management Programme

The contents of an EMPr, shown below, are contained in Appendix 4 of the NEMA EIA Regulations 982 of 2014 as amended and published in Appendix 4 of Government Notice No. R 326 of 2017.

1. (1) An EMPr must comply with section 24N of the Act and include-

(a) details of

(i) the EAP who prepared the EMPr; and
(ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;

(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;

(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;

(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-

(i) planning and design;
(ii) pre-construction activities;
(iii) construction activities;
(iv) rehabilitation of the environment after construction and where applicable post closure; and
(v) where relevant, operation activities;

(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes and outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to –

(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
(ii) comply with any prescribed environmental management standards or practices;
(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and
(iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;

(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);

(h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);

(i) an indication of the persons who will be responsible for the implementation of the impact management actions;

(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;

(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);

(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;

(m) an environmental awareness plan describing the manner in which-
(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and
(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and

(n) any specific information that may be required by the competent authority.

## 3. Details of Environmental Assessment Practitioner

| | | | |
|---|---|---|---|
| Environmental Assessment Practitioner (EAP):[1] | **Mr. JP de Villiers of AB Enviro Consult CC** | | |
| Contact person: | Mr JP de Villiers | | |
| Postal address: | 7 Louis Leipoldt Street | | |
| Postal code: | 2531 | Cell: | 083 5488 105 |
| Telephone: | 018 294 5005 | Fax: | 018 293 0671 |
| E-mail: | jp@abenviro.co.za | | |

## 4. Expertise of the Environmental Assessment Practitioner

AB Enviro Consult (CC) is a registered consultancy, owned and operated as an independent unit by the registered owner and consultant**: Prof. A.B. de Villiers**

- **Mr J.P. De Villiers** joined the consultancy during 2004
- **Mrs J.E. du Plooy** is a consultant since 2001

### EXPERIENCE OF THE CONSULTANCY

Over a period of 25 years (1996-2021) this consultancy has successfully applied for, and obtained positive ROD's and EA's for more than 380 projects. Environmental Control Officer's duties are also performed on various projects.

The company was involved (from 1992-1994) in evaluation of 114 applications for the subdivision of land, 23 applications for resort developments, and 54 applications for business rights for the Department of Agriculture, Conservation and the Environment - North West Province.

The consultancy is qualified to undertake professional studies in waste management and is still involved in the development of waste disposal- (solid and liquid effluent), and emission studies. These studies are

conducted both academically and practically. This work relates to mine waste, domestic waste and effluent as well as to the monitoring of waste disposal. Environmental audits in this respect are undertaken on a regular basis.

## PERSONAL PARTICULARS AND CAREER HISTORY OF PROF DE VILLIERS

### ACADEMIC AND PROFESSIONAL QUALIFICATIONS

Post–Matric Qualifications

| YEAR | Qualification | Institution | Field of Study |
|---|---|---|---|
| 1968 | B.Sc. | PU FOR CHE | Geography, Geology |
| 1970 | HONNS. B.Sc. | PU FOR CHE | Soil Science |
| 1974 | M.Sc. | PU FOR CHE | Geography |
| 1981 | Ph.D. | UOFS | Geography |

### PROFESSIONAL QUALIFICATIONS AND REGISTRATIONS

| YEAR | Qualification/ Registration | Institution | Field of Study |
|---|---|---|---|
| 1986 | Professional Natural Scientist | S.A. Council for Natural Scient | Environmental Science |
| 1994 | Quality Auditor | ESKOM | Auditing |
| 1998 | Personnel & Verifying Auditor | SAATCA | Environmental Auditing |
| 2006 | Environmental Assess Practitioner | Interim Certification Board EA | Environmental Science |

### MEMBERSHIP AND PARTICIPATION IN SOCIETIES, COUNCILS, ETC.

| **Name of professional societies** | **YEAR** | **Capacity** |
|---|---|---|
| S.A. Geographical Society. | 1967-1996 | Board Member |
| Society for Geography | 1968-2004 | Member |
| SAGS Western Transvaal | 1985-1989 1987-1989 | Chairman |
| Africa Geographical Association | 1993-1995 | Vice-President. |
| Society for the Vaal River Catchment | 1980-1999 | Member |
| S.A. Society for Photogrammetry, Remote Sensing Cartography | 1984-1996 | Member |
| Dendrological Society | 1986-2005 | Member |
| Birdlife South Africa | 2003-present | Member |
| British Geomorphological Research Group | 1985-1997 | Member |
| Int Com on Water Resource Systems | 1985-1997 | Member |
| Int Com on Continental Erosion | 1986-1990 | Member |
| Int Com on Remote Sensing and Data Transmission | 1986-1991 | Member |
| Society for S.A. Geographers | 1995-2005 | Member |
| SA Photogrammetrical and Geo. Info. | 1995-2003 | Member |
| S.A. Association of Geomorphologists | 1994-1999 | Board Member and member |
| SADC Mine Dump Study Group | 1996-2005 | Member |

## ACADEMIC AND PROFESSIONAL QUALIFICATIONS MR J.P. DE VILLIERS

| YEAR | Qualification | Institution | Field of Study |
|---|---|---|---|
| 1993 | BA | PU FOR CHE | Geography, Economics |
| 1994 | HED | PU FOR CHE | Geography Economics |

| | | | |
|---|---|---|---|
| 2006 | B.Sc.(Honns)<br>Cum Laude | North-West University | Environmental Management |
| 2007 | M.Sc. | North-West University | Geography |

## PROFESSIONAL QUALIFICATIONS AND REGISTRATIONS

| YEAR | Qualification/ Registration | Institution | Field of Study |
|---|---|---|---|
| 2008 | Basic Principles of Ecological Rehabilitation and Mine Closure | Centre for Environmental Management (North West University) | Ecological Rehabilitation |
| 2019 | Registered as Environmental assessment Practitioner | EAPASA<br>Registration number: 2019/808 | |

## ACADEMIC AND PROFESSIONAL QUALIFICATIONS MRS J.E. DU PLOOY

| YEAR | Qualification | Institution | Field of Study |
|---|---|---|---|
| 1999 | BA | PU FOR CHE | Geography, Tourism |
| 2000 | BA (Honns)<br>Cum Laude | PU FOR CHE | Geography |
| 2002 | Master's degree:<br>Environmental Management | PU FOR CHE | Environmental Management |
| 2001 | Aquabase Intro | AQUABASE | Hydrology |
| 2001 | Geomedia Professional | INTERTECH | GIS |
| 2001 | Map Info | SPATIAL TECHNOLOGY | GIS |

### PROFESSIONAL QUALIFICATIONS AND REGISTRATIONS

| YEAR | Qualification/ Registration | Institution |
|---|---|---|
| 2020 | Registered as Environmental assessment Practitioner | EAPASA<br>Registration number: 2019/1573 |

## 5. DESCRIPTION OF THE ACTIVITY

This proposed development entails the construction of a 1 900 meter (450 mm diameter) and a 800 meter (300 mm diameter) Bulk Outfall Sewer Pipeline located on Portion 2 and Portion 28 of the farm Boschfontein 385-IR, Lesedi Local Municipality, Gauteng Province. See Figure 1 below.

In order to construct the above mentioned sewer pipelines, five (5) areas that can be defined as water courses will have to be crossed. Crossing 1 will be for a section of 70 meters that crosses an artificial waterbody in order to construct the 1 900 meter (450 mm diameter) Bulk Outfall Sewer Pipeline. (See Figure 2 below). Crossing 2 is also on the 1 900 meter (450 mm diameter) Bulk Outfall Sewer Pipeline and will involve a section of 90 meters crossing a wetland seep. These two crossings are located on Portion 2 of the farm Boschfontein 385-IR See Figure 3 below.

Crossings 3, 4 and 5 are located on the 800 meter (300 mm diameter) Sewer Pump line and are 10 meters in length each and are located on Portion 28 of the farm Boschfontein 385-IR. See Figure 4 below.

The site is located within the Gauteng Provincial Environmental Management Framework (GPEMF) and is described as Zone 1: Urban development zone, however, this tool cannot be used for this application as:

*"(d) Conditions for exclusion:*

- *Ensure that there are **no wetlands and or rivers on the site** that will be affected;"*


**Figure 1: Proposed layout plan**

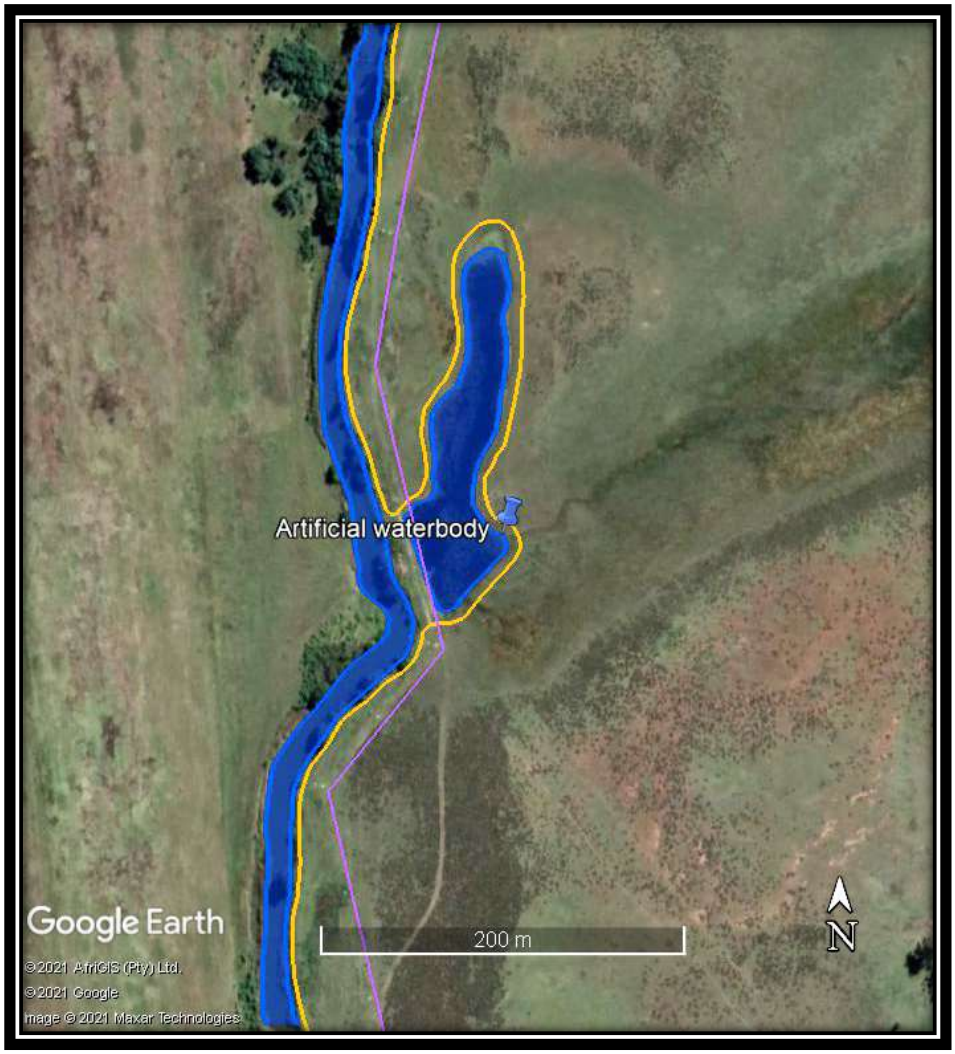



**Figure 2: Indication of perennial river (Blesbokspruit outside the site) and an artificial waterbody at stream crossing 1.**

| | | |
|---|---|---|
| | Purple outline | Part of the site (proposed pipeline) |
| | Orange outline | Outer edge of riparian zone |
| | Darker blue outline and shading | Active channels and artificial waterbody |


**Figure 3** Indication of perennial river (Blesbokspruit outside the site) and a wetland seep at the study area.

| | | |
|---|---|---|
| | Purple outline | Part of the site (proposed pipeline) |
| | Orange outline | Outer edge of riparian zone |
| | Darker blue outline and shading | Active channel |
| | Light blue outline and shading | Wetland at the site |

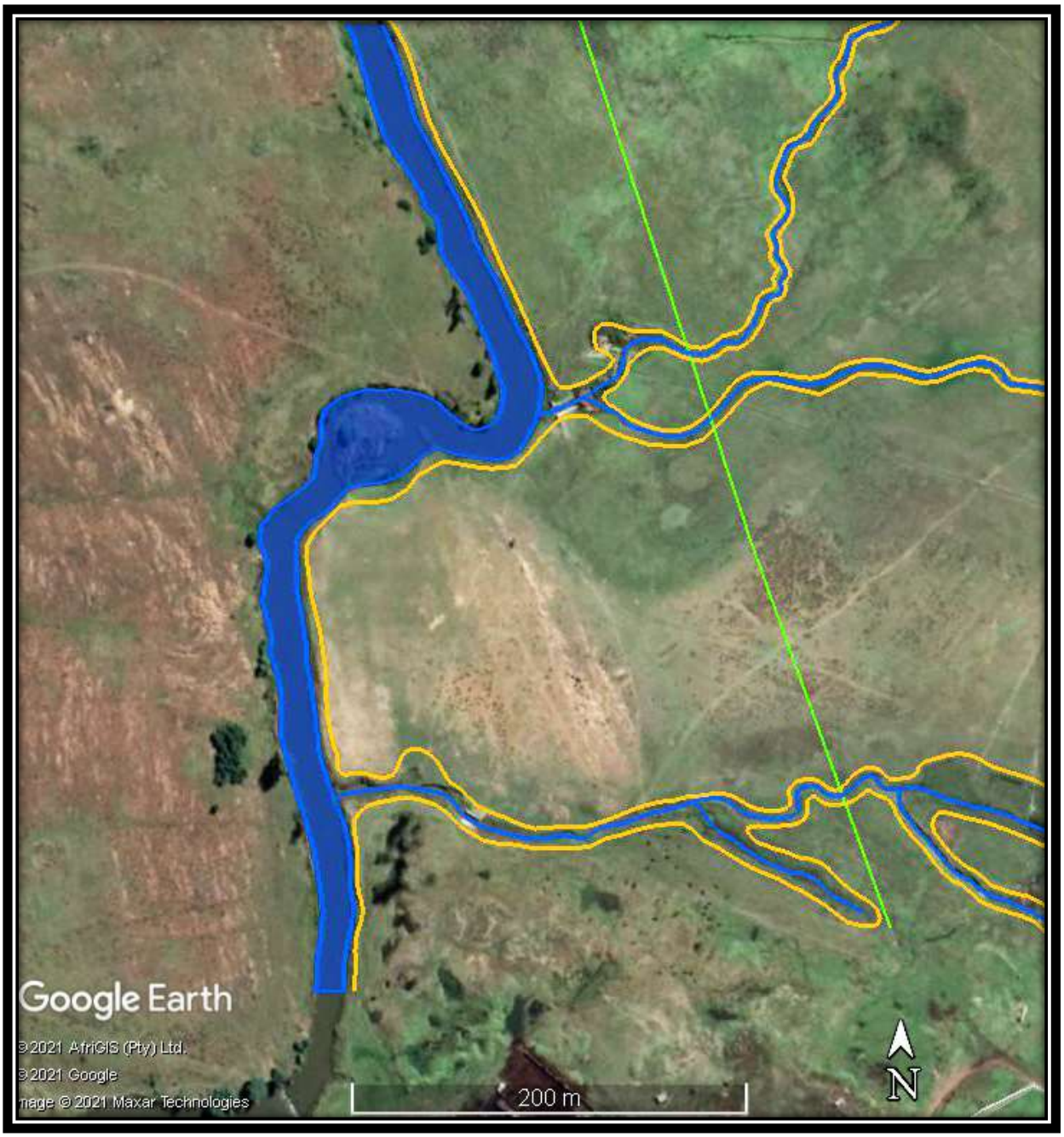



**Figure 4** Indication of perennial river (Blesbokspruit outside the site) and two small non-perennial tributaries at the southern parts of the site. The small tributaries were fed by outflow from a water treatment plant or sewage leakages at the time of the site visits.

| | |
|---|---|
| Green outline | Part of the site (proposed pipeline) |
| Orange outline | Outer edge of riparian zone |
| Darker blue outline and shading | Active channels |

## CONSTRUCTION OF NEW INTERNAL SEWAGE PIPELINES

The pipes will be encased in 200 mm mass concrete and the area on top of the concrete will be soilcrete that will be compacted in 150mm layers to natural ground level.

In the planning for the design phase of the pipelines, cognisance is taken of the following reference documents;

- Red Book – Guidelines for Human Settlement Planning and Design
- SABS 1200 – Standardized Specification for Civil Engineering Construction
- Local Municipal standards

When planning or designing the pipelines, a holistic approach that adheres to all the tenets of the reference or policy documents listed above will be adopted. The environmental sensitivity of wetland areas is acknowledged, and designs undertaken will take full cognisance of the proposed impact to these areas.

<u>The approach to design and construction will encompass the following;</u>

- Appropriate and adequate protection of the river/stream/wetland banks in the vicinity of the pipeline will be incorporated into the design.
- The existing river/stream bank structure will be maintained to reduce disturbance to the river/stream flow.
- Where crossing or running alongside river or stream courses, the existing river/stream bank structure will be maintained to reduce disturbance to the river flow.
- Where the pipeline crosses storm water channels these will be designed to have no impact on normal storm water flow in that all pipes and concrete casing will be buried at least 1.0m below natural channel level in the case of soft material, and level with the natural channel in the case of hard rock material.
- In the case of sewer pipelines, man holes will be provided at all changes in grade and direction and at intervals not exceeding 80m to facilitate maintenance during the lifetime of the pipelines.
- The pipe crossing has been designed to have no impact on normal river/stream flow
- Where pipes are laid through a flood plain (1:100-year flood line), a minimum cover level of 1.0m will be maintained.

<u>Construction Methodology</u>

- Conduct a competent site investigation to build up an informed picture of the task
- Conduct a topographical survey of the pipeline route
- Adequate design of all the stages of construction
- All environmental and Health and Safety requirements and good practice to be adhered to.
- Remove topsoil and stockpile for later use

- Excavate trench for pipeline to the design level
- If the material is firm, normal excavation techniques will apply. In soft material shoring of the trench sides may be required. In hard rock material trench excavation may require the use of pneumatic breakers or blasting
- Install temporary dewatering pumps to keep the excavation dry (if required due to ground water ingress)
- Construct stomwater diversion berms where required
- Place concrete to encasement if required. The top level will be determined by the stormwater channel level
- Place bedding, lay pipe, place and compact selected fill over the pipeline
- Construct manholes where required. Manholes will be constructed along the pipeline route at changes in grade and direction
- Backfill to specification of drawings.
- Dress backfill, topsoil and revegetate all exposed areas.

. See Figure 5 below.

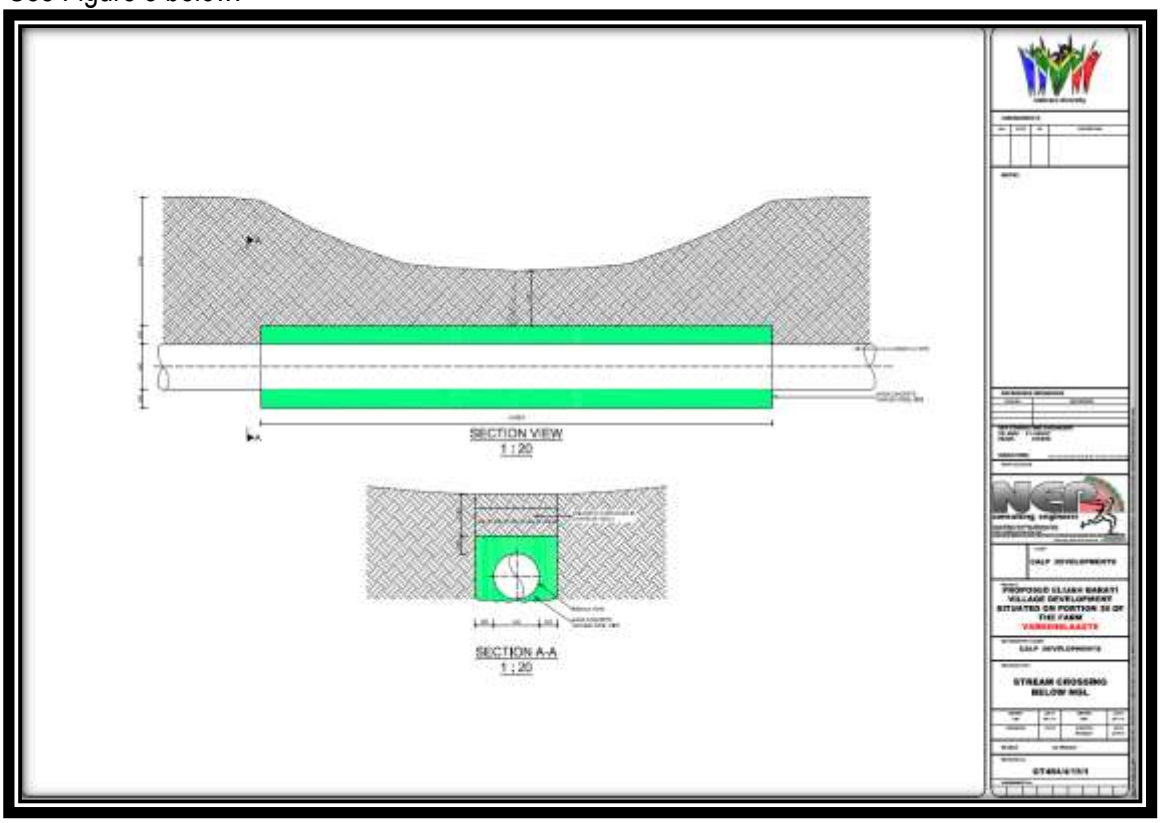



**FIGURE 5: PIPELINE INSTALLATION DESIGN**

## 6. DESCRIPTION OF THE PROPERTY

The site is located adjacent to the Blesbokspruit (See Photograph 1) on Portion 2 and Portion 28 of the farm Boschfontein 385-IR, Lesedi Local Municipality, Gauteng Province. See Figure 6 for a Locality Map.

The narrow footprint crosses five watercourses: 1) an artificial waterbody (See Photograph 2), 2) a wetland (a seep) (See Photograph 3) and 3, 4 and 5) three small tributaries of the Blesbokspruit at the southern part of the site. See Photograph 4. These water courses appear to be modified by excavations, cultivated fields, planting of alien invasive *Eucalyptus* tree species, possible overgrazing by cattle as well as impacts from the residential areas upstream. A perennial river, the Blesbokspruit, is present west of the site and is excluded from the proposed footprint.

Ecological disturbances include various excavations in the past, areas with conspicuous cover of alien invasive plant species, possible overgrazing by cattle, man-made ditches, impacts on the water regime from the residential areas upstream and sewage leaks. An old pipeline exists closer to the perennial stream west of the proposed footprint, the latter which is then further away from the perennial stream (Blesbokspruit).

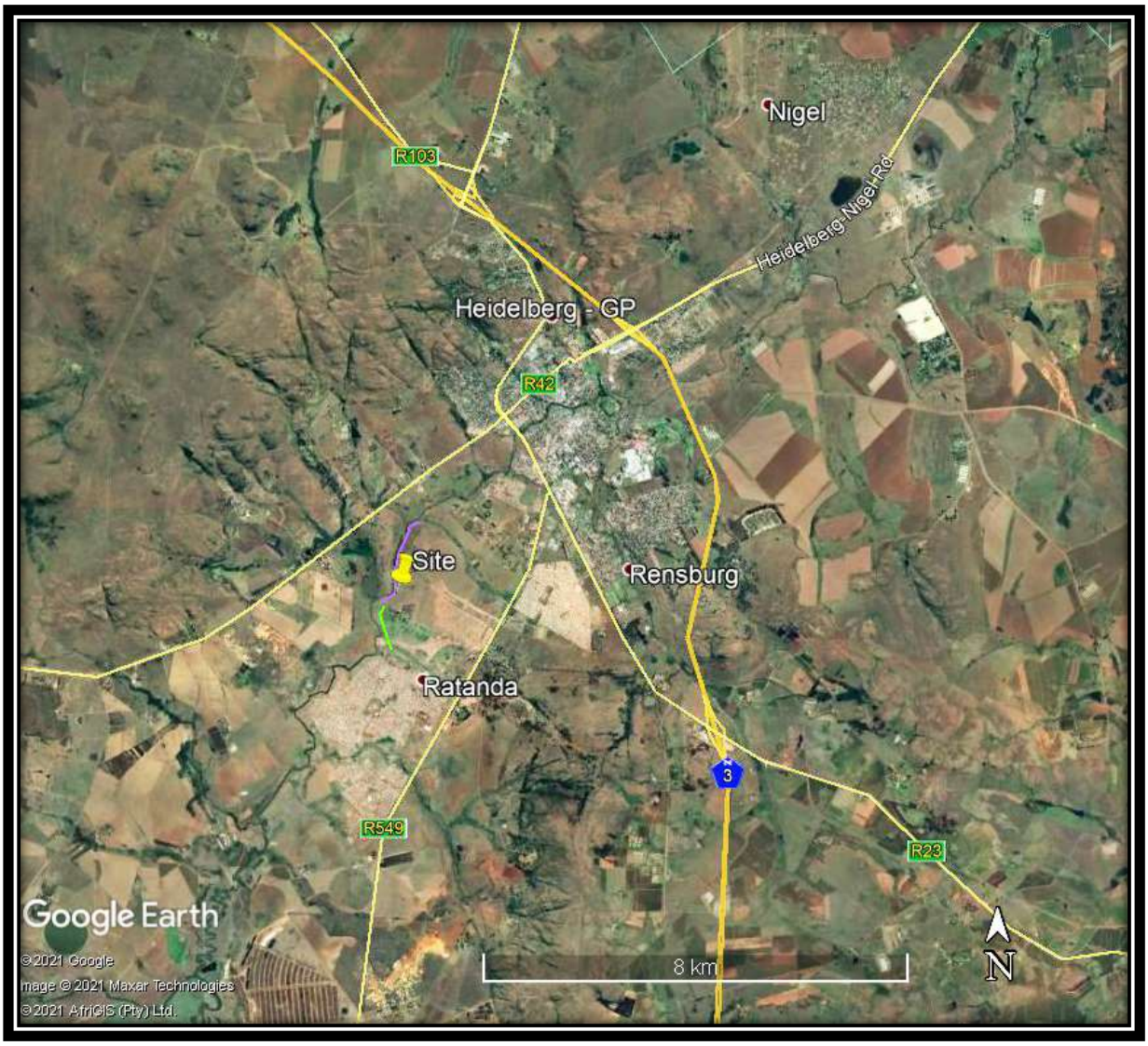



**FIGURE 6: LOCALITY MAP**

**Photograph 1: The Blesbokspruit on the right and the site on the left.**

**Photograph 2: Artificial waterbody at the site.**

**Photograph 3: Wetland seep at the site**

**Photograph 4: View of tributary that runs from the waterworks**

| | |
|---|---|
| Description of the property/properties where activity is proposed to be undertaken: | Portion 2 and Portion 28 of the farm Boschfontein 385-IR, Lesedi Local Municipality, Gauteng Province |
| Farm/ Erf name(s) & number(s) (including portion/ holding) of all proposed sites: | Portion 2 and Portion 28 of the farm Boschfontein 385-IR, Lesedi Local Municipality, Gauteng Province |
| Property size(s)(ha) of all proposed sites | 188,7496 ha |

| | | | |
|---|---|---|---|
| | | | |
| Property size(s) ($m^2$) of all proposed sites: | 1 887 496 $m^2$ | | |
| Development footprint size(s) in ha/$m^2$: | 380 $m^2$ | | |
| SG Digit code(s) of all proposed sites: | TOIR00000000038500002<br>TOIR00000000038500028 | | |
| Coordinates of site (Stream crossing 1): Latitude (S) | 26º | 31' | 55,92" |
| Longitude (E) | 28º | 19' | 42,45" |
| Coordinates of site (Stream crossing 2): Latitude (S) | 26º | 32' | 06,62" |
| Longitude (E) | 28º | 19' | 41,35" |
| Coordinates of site (Stream crossing 3): Latitude (S) | 26º | 32' | 32,24" |
| Longitude (E) | 28º | 19' | 34,82" |
| Coordinates of site (Stream crossing 4): Latitude (S) | 26º | 32' | 33,38" |
| Longitude (E) | 28º | 19' | 35,26" |
| Coordinates of site (Stream crossing 5): Latitude (S) | 26º | 32' | 39,50" |
| Longitude (E) | 28º | 19' | 37,61" |

**Note:** Coordinates must be provided in degrees, minutes and seconds using the Hartebeesthoek94 WGS84 co-ordinate system**.** Where numerous properties/sites are involved (e.g. linear activities), please attach a list of property descriptions separately.

| | |
|---|---|
| **Physical/Street address of proposed sites:** | Portion 2 and Portion 28 of the farm Boschfontein 385-IR, Lesedi Local Municipality, Gauteng Province |
| **Current Zoning of site(s)** | Residential |

## 7. DESCRIPTION OF THE ENVIRONMENT THAT MAY BE AFFECTED BY THE PROJECT

### 7.1 BIO-PHYSICAL ASPECTS

#### 7.1.1 GEOLOGY AND SOIL

Two geological patterns are represented, namely Lutaceous Arenite in the northern part and Quartzites in the southern two-thirds of the study area. Both the formations encountered in the study area belong to the Witwatersrand Supergroup and the Central Rand Group, which consists entirely of arenaceous and rudaceous rocks.

The geology of the northern part of the study area is placed within the Turffontein Subgroup, which has the Doornkop Quartzite Formation at its base, followed by the Kimberley Conglomerate Formation, the Elsburg Quartzite Formation and the Mondeor Conglomerate Formation at the top. A characteristic of the quartzite beds of this subgroup is their yellowish appearance and argillaceous nature, in contrast with the clean, white quartzites encountered in the Johannesburg subgroup.

The geology of the southern part of the study area is placed within the Johannesburg Subgroup, which consists of various quartzite and conglomerate formations, with the Booysens Shale Formation at the top.

No dolomite occurs in the area and no stability investigation is required.

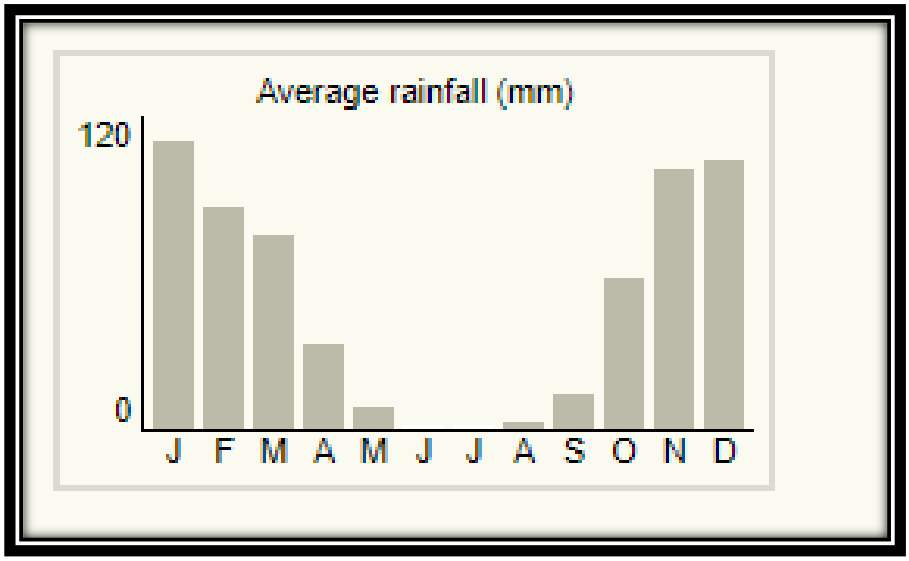
### 7.1.2 TOPOGRAPHY

The topography of the study area is on gentle to moderate slopes in a slightly undulating area. Levels has been determined by the Engineer and these has been used to determine the design of the pipelines.

### 7.1.3 CLIMATE

A summer maximum rainfall and a dry winter is the norm. Extreme climatic events may have an influence on the project during the construction and operation phase and will have to be considered.

The closest South African weather station to the site is located at Springs and is situated 28 km north of the proposed development site. Climatic statistics for this weather station has been used to describe the climate of the area.
Springs normally receives about 586mm of rain per year, with most rainfall occurring during summer. The chart below shows the average rainfall values for Springs per month. It receives the lowest rainfall (0mm) in June and the highest (111mm) in January. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Springs range from 16.9°C in June to 26°C in January. The region is the coldest during July when the mercury drops to 0°C on average during the night. Consult the chart below for an indication of the monthly variation of average minimum daily temperatures.




Extreme climatic events may have an influence on the project during the construction and operational phase and will have to be taken into consideration.

**Climate Change**

According to: WIREs Clim Change 2014, 5605-620. Doi:10.1002/wcc.295: "Climate change is a key concern within South Africa. Mean annual temperatures have increased by at least 1.5 times the observed global average of 0.65∘C over the past five decades and extreme rainfall events have increased in frequency. These changes are likely to continue. Climate change poses a significant threat to South Africa's water resources, food security, health, infrastructure, as well as its ecosystem services and biodiversity. Considering South Africa's high levels of poverty and inequality, these impacts pose critical challenges for national development. In relation to water, impact studies for the water resources sector have begun to look beyond changes in streamflow to changes in the timing of flows and the partitioning of streamflow into baseflows and stormflows, reservoir yields, and extreme hydrological events. Spatially the eastern seaboard and central interior of the country are likely to

experience increases in water runoff. Higher frequencies of flooding and drought events are projected for the future. Complexities of the hydrological cycle, influences of land use and management and the linkages to society, health, and the economy indicate far higher levels of complexity in the water resources sector than in other sectors. What has emerged is that land uses that currently have significant impacts on catchment water resources will place proportionally greater demands on the catchment's water resources if the climate were to become drier. The influence of climate change on water quality is an emerging research field in South Africa, with assessments limited to water temperature and non-point source nitrogen and phosphorus movement. A critical interaction that has not been explored is between changes in water quality and quantity and the combined impacts, such changes might have impact on various types of water use, e.g., irrigation, domestic consumption, or aquatic ecosystems support".

### 7.1.4 SURFACE DRAINAGE

The narrow, proposed footprint crosses four watercourses: 1) an artificial waterbody, 2) a wetland (a seep) and 3,4) two small tributaries of the Blesbokspruit at the southern part of the site. These water courses appear to be modified by excavations, cultivated fields, sewage leaks, possible overgrazing by cattle as well as impacts from the residential areas upstream. A perennial river, the Blesbokspruit, is present north of the site and is excluded from the proposed footprint.

Vegetation at the artificial waterbody contains wetland plant species such as the sedge *Cyperus fastigiatus*, herbacous *Persicaria* species and the grass species *Paspalum distichum*. This artificial waterbody is partly present owing to a dirt road elevation and could also have formed relatively recent owing to "extra" waterflow from residential areas up-slope. It it is difficult to trace the origins of the artificial waterbody. Soil at the artificial waterbody was foul-smelling and also had a greenish tinge at the time of the surveys (April 2021) and it appears that some unwanted pollutants could be present.

Present ecological status (PES) of the Artificial Waterbody at the site is CATEGORY E which means the watercourse is seriously modified. The losses of natural habitats and basic ecosystem functions are extensive. Ecological Importance and Sensitivity (EIS) of the Artificial Waterbody at the site is CATEGORY C which is Moderate and refers to watercourses that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.

A small Wetland Seep which could have formed recently owing to excess waterflow from residential areas up-slope is present at the site. Some diversity of indigenous wetland graminoids is found at the wetland seep. The wetland seep vegetation is visibly dominated by graminoids such as the sedges *Pycreus macranthus* and *Pycreus mundtii* and the grass species *Paspalum distichum*, whereas trees and megagraminoids are absent.

Present ecological status (PES) of the Wetland Seep at site is CATEGORY D which means the wetland is largely modified and a large loss of natural habitats and basic ecosystem functions has occurred. Ecological importance and sensitivity (EIS) of the Wetland Seep at the site is CATEGORY C which is Moderate and refers to watercourses that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.

The small tributary that runs from the waterworks at the western part of the site has a narrow active channel and narrow poorly defined riparian zone with a noticeable high cover of exotic weeds. The tributary could turn into a perennial stream if water feeds from the waterworks on a constant basis.

Present ecological status (PES) of the Non-perennial River that runs from the waterworks at the site is CATEGORY E which means the watercourse is seriously modified. The losses of natural habitats and basic ecosystem functions are extensive. The present ecological status is outside the general acceptable range. Ecological Importance and Sensitivity (EIS) at the site is CATEGORY C which is Moderate and refers to floodplains that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.

The small tributary that runs near and at the southern boundary the site has a narrow active channel and narrow poorly defined riparian zone with a noticeable high cover of exotic weeds. The tributary could turn into a perennial stream if water feeds from the sewage leak on a constant basis.

Present ecological status (PES) of the Non-perennial River at and near the southern boundary of the site is CATEGORY E which means the watercourse is seriously modified. The losses of natural habitats and basic ecosystem functions are extensive. The present ecological status is outside the general acceptable range. Ecological Importance and Sensitivity (EIS) at non-perennial river that runs at and near the southern boundary of the site is CATEGORY C which is Moderate and refers to floodplains that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.

Exotic plant species at both the conspicuously disturbed non-perennial rivers include the herbs *Rumex crispus* and *Trifolium repens* as well as the grass *Pennisetum clandestinum*. The indigenous herb *Berkheya radula* as well as the alien invasive herb *Cirsium vulgare* are found at the riparian zone and adjacent terrestrial zone.

Site is part of the Upper Vaal Water Management Area (WMA 8). The site is not part of a FEPA (Freshwater Ecosystem Priority Area) (Nel *et al.*, 2011a, 2011b).

The proposed pipeline development comprises a narrow open- and close exercise of the soil through highly disturbed watercourses of which most appear to have undergone extensive impacts, modifications or artificial increase in waterflow. Water from the up-slope residentials areas as well as sewage leaks appear to have considerably impacts on the watercourses at the site. The Present Ecological Status as well as Ecological Importance and Sensitvity of the wetland systems at the site is in general relatively poor and low.

There appears to be no threatened animal or plant species that use the site in particular as a habitat.

Impacts on the artificial waterbody, wetland seep, and two conspicuously disturbed non-perennial tributaries are of a low\ moderate risk. If the development is approved the <u>surface flow</u> and <u>erosion</u> at the wetlands are likely to be limited. There is no distinct indication that <u>interflow</u> play of the wetlands would be impacted significantly by the proposed developments. The <u>geomorphological setting</u> and <u>flow regime</u> likely to be similar post development, if the development is approved according to the mitigation measures stated. Loss of any <u>wetland animal or plant species</u> of particular conservation importance are not expected.

A key issue at the site that emerged from the risk and impact assessment is the implementation of efficient control of alien invasive plant species and rehabilitation. Following the mitigations which will be upheld and planned footprint for development all the impact risks listed above are moderate or low.

### 7.1.5 GROUND WATER

Possible infiltration into the groundwater must be taken into account. During the construction phase, no spills of lubricants or construction worker sewage should be allowed to pollute the ground water. During the operational phase, sewage systems must also not pollute groundwater.

### 7.1.6 FLORA

Terrestrial vegetation: Conspicuously disturbed grassland with few trees characterizes the terrestrial vegetation at the site. Pioneer grass species as well as *Seriphium plumosum* (Bankrupt Bush) are noticeable. Indigenous grass species such as *Aristida canescens, Eragrostis curvula*, *Eragrostis chloromelas, Aristida congesta, Cynodon dactylon*, *Eragrostis curvula, Sporobolus africanus*, *Elionurus muticus* and *Sporobolus africanus* are found at the site. Examples of indigenous shrublets and forbs at the site are *Conyza podocephala, Hilliardiella oligocephala, Helichrysum nudifolium*, *Helichrysum rugulosum*, *Gazania krebsiana* and *Felicia muricata.* The herbaceous shrub *Gomphocarpus fruticosus* is present at many parts of the stie. Conspicuous exotic weeds at the site are *Flaveria bidentis*, *Gomphrena celosioides*, *Guilleminea densa*, *Galinsoga parviflora*, *Schkuhria pinnata*, *Sonchus oleraceus*, *Chenopodium album*, *Tagetes minuta*, *Conyza bonariensis*, *Datura ferox, Datura stramonium*, *Xanthium spinosum*, *Malva parviflora*, *Plantago lanceolata, Verbena aristigera*, *Verbena bonariensis* and *Argemone ochroleuca*

Grassland Biome at the site is represented by Soweto Highveld Grassland (Gm 8) (Mucina & Rutherford 2006).

**Gm 8 Soweto Highveld Grassland**

Distribution: In South Africa the Soweto Highveld Grassland is found in Mpumalanga, Gauteng (and to a very small extent also in neighbouring Free State and North West) Provinces; In a broad band roughly delimited by the N17 road between Ermelo and Johannesburg in the north, Perdekop in the southeast and the Vaal River (border with the Free State) in the south. It extends further westwards along the southern edge of the Johannesburg Dome (including part of Soweto) as far as the vicinity of Randfontein. In southern Gauteng it includes the surrounds of Vanderbijlpark and Vereeniging as well as Sasolburg in the northern Free State. Altitude 1420 – 1760 m (Mucina & Rutherford 2006).

Vegetation and landscape features: Gently to moderately undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus*, *Eragrostis racemosa*, *Heteropogon contortus* and *Tristachya leucothrix*. In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover (Mucina & Rutherford 2006).

Geology and soils: Shale, sandstone or mudstone of the Madzaringwe Formation (Karoo Supergroup) or the intrusive Karoo Suite dolerites which feature prominently in the area. In the south, the Volksrust Formation (Karoo Supergroup) is found and in the west, the rocks of the older Transvaal, Ventersdorp and Witwatersrand Supergroups are most significant. Soils are deep, reddish on flat plains and are typically Ea, Ba and Bb land types (Mucina & Rutherford 2006).

Climate: Climate is characterized by summer-rainfall with mean annual precipitation of 662 mm. Frequent occurrence of frost and large thermic diurnal differences are recorded (Mucina & Rutherford 2006).

Important taxa of the Soweto Highveld Grassland listed by Mucina & Rutherford (2006): Graminoids: *Andropogon appendiculatus, Brachiaria serrata, Cymbopogon pospischilii, Cynodon dactylon, Elionurus muticus, Eragrostis capensis, Eragrostis chloromelas, Eragrostis curvula, Eragrostis plana, Eragrostis planiculmis, Eragrostis racemosa, Heteropogon contortus, Hyparrhenia hirta, Setaria nigrirostris, Setaria sphacelata, Themeda triandra, Tristachya leucothrix, Andropogon shirensis, Aristida adscensionis, Aristida bipartita, Aristida congesta, Aristida junciformis* susbp. *galpinii, Cymbopogon caesius, Digitaria diagonalis, Diheteropogon amplectens, Eragrostis micrantha, Eragrostis superba, Harpochloa falx, Microchloa caffra, Paspalum dilatatum*. Herbs: *Hermannia depressa, Acalypha angustata, Berkheya setifera, Dicoma anomala, Euryops gilfillanii, Geigeria aspera* var. *aspera, Graderia subintegra, Haplocarpha scaposa, Helichrysum miconiifolium, Helichrysum nudifolium* var. *nudifolium, Helichrysum rugulosum, Hibiscus pusillus, Justicia anagolloides, Lippia scaberrima, Rhyncosia effusa, Schistostephium crataegifolium, Selago densiflora, Senecio coronatus, Vernonia oligocephala, Wahlenbergia undulata*. Geophytic Herbs: *Haemanthus humilus* subsp. *hirsutus, Haemanthus montanus.* Herbaceous Climber: *Rhyncosia totta.* Low Shrubs: *Anthospermum hispidulum, Anthospermum rigidum* subsp. *pumilum, Berkheya annectans, Felicia muricata, Ziziphus zeyheriana*.

Note: The above is an outline of the vegetation type that serves as a larger ecological context within which the site occurs. Not all the plant species listed above for the vegetation type necessarily occur at the site.

### 7.1.7 FAUNA

**ASSESSMENT OF VERTEBRATE SPECIES OF CONSERVATION CONCERN**

**Mammals of particular high conservation priority**

**Threatened** mammal species of the Gauteng Province. Literature sources: Friedman & Daly, (2004), Skinner & Chimimba (2005), Wilson & Reeder (2005). Furthermore golden mole species that are rare and being reported from the adjacent Free State and Limpopo Provinces have also been included.

| Species | Red Listed Status | Recorded at site during survey | Likely to be found based on habitat assessment |
|---|---|---|---|
| ***Chrysospalax villosus*** Rough-haired golden mole | Vulnerable | No | No |
| ***Cloeotis percivali*** Short-eared Trident Bat | Vulnerable/ Near-threatened | No | No |
| ***Diceros bicornis*** Black rhinoceros | Critically Endangered | No | No |
| ***Lycaon pictus*** African wild dog | Endangered | No | No |
| ***Loxodonta africana*** African elephant | Vulnerable | No | No |

| | | | |
|---|---|---|---|
| ***Mystromys albicaudatus*** White-tailed mouse | Endangered | No | No |
| ***Neamblysomus julianae*** Juliana's Golden Mole | Critically Endangered | No | No |
| ***Panthera leo*** Lion | Vulnerable | No | No |
| ***Rhinolophus blasii*** Blasi's Horseshoe Bat | Vulnerable | No | No |
| ***Smutsia temminckii*** Ground Pangolin | Vulnerable | No | No |

Near threatened mammal species known to occur in the Gauteng Province, Free State Province and North-West Province. Literature sources: Skinner & Chimimba (2005).

| Species | Red Listed Status | Recorded at site during survey | Likely to be found based on habitat assessment |
|---|---|---|---|
| ***Ceratotherium simum*** White Rhinoceros | Near-threatened | No | No |

## Birds of particular high conservation priority

**Threatened** bird species of the Gauteng Province. Literature sources Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden (2007).

| Species | Common name | Red Listed Status | Recorded at site during survey | Likely to be found breeding on site based on being dependant on site |
|---|---|---|---|---|
| *Aegypius tracheliotos* | **Lappet-faced Vulture** | Vulnerable | No | No |
| *Anthropoides paradiseus* | **Blue Crane** | Vulnerable | No | No |
| *Aquila rapax* | **Tawny Eagle** | Vulnerable | No | No |
| *Ardeotis kori* | **Kori Bustard** | Vulnerable | No | No |
| *Botaurus stellaris* | **Eurasian Bittern** | Critically Endangered | No | No |
| *Buphagus africanus* | **Yellow-billed Oxpecker** | Vulnerable | No | No |
| *Circus ranivorus* | **African Marsh- Harrier** | Vulnerable | No | No |
| *Crex crex* | **Corn Crake** | Vulnerable | No | No |
| *Eupodotis senegalensis* | **White-bellied Korhaan** | Vulnerable | No | No |
| *Gorsachius leuconotus* | **White-backed Night-heron** | Vulnerable | No | No |
| *Gyps africanus* | **White-backed Vulture** | Vulnerable | No | No |
| *Gyps coprotheres* | **Cape Vulture** | Vulnerable | No | No |

| | | | | |
|---|---|---|---|---|
| *Neophron percnopterus* | **Egyptian Vulture** | Regionally almost extinct | No | No |
| *Neotis denhami* | **Denham's Bustard** | Vulnerable | No | No |
| *Pelecanus rufescens* | **Pink-backed Pelican** | Vulnerable | No | No |
| *Polemaetus bellicosus* | **Martial Eagle** | Vulnerable | No | No |
| *Rhynchops flavirostris* | **African Skimmer** | Endangered | No | No |
| *Sarothrura ayresi* | **White-winged Flufftail** | Critically Endangered | No | No |
| *Therathopius ecaudatus* | **Bateleur** | Vulnerable (in South Africa) | No | No |
| *Tyto capensis* | **African Grass-Owl** | Vulnerable | No | No |

**Near threatened** bird species of the Gauteng Province. Literature sources Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden (2007).

| Species | Common name | Red Listed Status | Recorded at site during survey | Likely to be found breeding on site based or being dependant on site |
|---|---|---|---|---|
| *Alcedo semitorquata* | **Half-collared Kingfisher** | Near threatened | No | No |
| *Anastomus lamelligerus* | **African Openbill** | Near threatened | No | No |
| *Aquila ayresii* | **Ayres's Hawk-Eagle** | Near threatened | No | No |
| *Buphagus erythrorynchus* | **Red-Billed Oxpecker** | Near threatened | No | No |
| *Charadrius pallidus* | **Chestnut-banded Plover** | Near threatened | No | No |
| *Ciconia nigra* | **Black Stork** | Near threatened | No | No |
| *Circus macrourus* | **Pallid Harrier** | Near threatened | No | No |
| *Falco biarmicus* | **Lanner Falcon** | Near threatened | No | No |
| *Falco peregrinus* | **Peregrine Falcon** | Near threatened | No | No |
| *Glareola nordmanni* | **Black-winged Pratincole** | Near threatened | No | No |
| *Leptoptilos crumeniferus* | **Marabou Stork** | Near threatened | No | No |
| *Mirafra cheniana* | **Melodious lark** | Near threatened | No | No |
| *Mycteria ibis* | **Yellow-billed Stork** | Near threatened | No | No |
| *Pelecanus onocrotalus* | **Great White Pelican** | Near threatened | No | No |
| *Phoenicopterus minor* | **Lesser Flamingo** | Near threatened | No | No |
| *Phoenicopterus ruber* | **Greater Flamingo** | Near threatened | No | No |

| | | | | |
|---|---|---|---|---|
| *Pterocles gutturalis* | **Yellow-throated Sandgrouse** | Near threatened | No | No |
| *Rostratula benghalensis* | **Greater Painted-snipe** | Near threatened | No | No |
| *Sagittarius serpentarius* | **Secretarybird** | Near threatened | No | No |
| *Sternia caspia* | **Caspian Tern** | Near threatened | No | No |

## Reptiles of particular high conservation priority

The following table lists possible presence or absence of reptile species of particular conservation concern at the site. This list to assess the possible presence or not of reptile species of conservation concern was compiled by using mainly the source Bates, Branch, Bauer, Burger, Marais, Alexander & De Villiers (2014), that is the Atlas and Red List of South Africa, Lesotho and Swaziland.

**Near Threatened** reptile species in Gauteng Province. Main source: Bates, Branch, Bauer, Burger, Marais, Alexander & De Villiers (2014). No = Reptile species is not a resident on the site; Yes = Reptile species is found to be resident on the site.

| Species | Red Listed Status | Resident at site | Recorded at site during survey | Likely to be found based on habitat assessment |
|---|---|---|---|---|
| *Chamaesaura aenea* **Coppery Grass Lizard** | Near Threatened | No | No | No |
| *Homoroselaps dorsalis* **Striped Harlequin Snake** | Near threatened | No | No | No |

## ASSESSMENT OF INVERTEBRATE SPECIES OF CONSERVATION CONCERN

## Butterflies of particular conservation priority

**Threatened (Endangered) butterfly** species of the Gauteng Province. Sources: Mecenero *et al.* (2013), Henning, Terblanche & Ball (2009).

| Species | Red List Status (Global status) | Recorded at site during survey | Residential status at the site: Confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely |
|---|---|---|---|
| ***Aloeides dentatis dentatis*** Roodepoort Copper | Endangered | No | Highly unlikely |
| ***Chrysoritis aureus*** Golden Opal/ Heidelberg Opal | Endangered | No | Highly unlikely |
| ***Lepidochrysops praeterita*** Highveld Blue | Endangered | No | Highly unlikely |
| ***Orachrysops mijburghi*** Mijburgh's Blue | Endangered | No | Highly unlikely |

**Rare butterfly species** of the Gauteng Province. Source: Mecenero *et al.* (2013).

| Species | Red List Status | Recorded at site during survey | Residential status at the site: Confirmed, Highly likely, Likely, Medium possibility, Unlikely, Highly unlikely |
|---|---|---|---|
| ***Colotis celimene amina*** Lilac Tip | Rare (Low density) | No | Highly unlikely |
| ***Lepidochrysops procera*** Grassland Blue | Rare (Habitat specialist) | No | Highly unlikely |
| ***Metisella meninx*** Marsh Sylph | Rare (Habitat specialist) | No | **Possibly** |
| ***Platylesches dolomitica*** (Hopper) | Rare (Low density) | No | Highly unlikely |

## Beetles of particular conservation priority

Fruit chafer species (Coleoptera: Scarabaeidae: Cetoninae) in the Gauteng Province and Gauteng Province which are of known high conservation priority.

| Species | Red Listed Status | Resident at site | Recorded at site during survey | Likely to be found based on habitat assessment |
|---|---|---|---|---|
| ***Ichnestoma stobbiai*** | Uncertain (Probably endangered) | No | No | No |
| ***Trichocephala brincki*** | Uncertain | No | No | No |

## Mygalomorph spiders of particular conservation priority

Baboon spiders species (Araneae: Teraphosidae) species that are of known high conservation priority in the Gauteng Province and Gauteng Province.

| Species | Red Listed Status | Resident at site | Recorded at site during survey | Likely to be found based on habitat assessment |
|---|---|---|---|---|
| ***Brachionopus pretoriae*** | Uncertain | No | No | No |

## Scorpions of particular conservation priority

Rock scorpion species (Scorpiones: Ischnuridae) species that are of known high conservation priority in the Gauteng Province and Gauteng Province.

| Species | Red Listed Status | Resident at site | Recorded at site during survey | Likely to be found based on habitat assessment |
|---|---|---|---|---|
| ***Hadogenes gracilis*** | Uncertain | No | No | No |
| ***Hadogenes gunningi*** | Uncertain | No | No | No |

### 7.1.8. AIR QUALITY

The only impact associated with air quality is that the project will however create a certain amount of dust during the construction phase. If proper dust suppression measures are implemented this variable will have very little impact (low in intensity and significance during the construction phase

### 7.1.9 NOISE

It is a fact that a certain amount of noise will be generated during the construction phase of the project. Noise levels should however rarely exceed the allowable limits. It is unlikely that the project will create any more noise during the operational phase than that already experienced on site.

## 7.2 SOCIOLOGICAL AND ECONOMIC ISSUES

### 7.2.1 SOCIAL AMENITIES

### 7.2.2 ARCHAEOLOGY AND CULTURAL SITES

A number of known cultural heritage sites (archaeological and/or historical) exist in the larger geographical area within which the study area falls. No sites, features or material of cultural heritage (archaeological and/or historical) origin or significance were identified in the study area during the physical assessment. If any sites did exist here in the past it would have been largely disturbed or destroyed by recent historical agricultural and urban development activities in the study and larger area around it.

### 7.2.3 AESTHETICS

Visual Intrusion is defined as the level of compatibility or congruence of the project with the particular qualities of the area, or its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape or townscape.

**High visual intrusion** – results in a noticeable change or is discordant with the surroundings;

**Moderate visual intrusion** – partially fits into the surroundings, but clearly noticeable;

**Low visual intrusion** – minimal change or blends in well with the surroundings.

The pipeline will have no visual impact once it has been constructed, as opposed to Alternative 2 which will imply a bridge with pipeline being visible.

During the construction and operational phases of the proposed development, jobs will be created and thus the unemployment rate of the area will be reduced

## 8. ENVIRONMENTAL MANAGEMENT OBJECTIVES AND TARGETS

The following table is a summary of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process.

| ENVIRONMENTAL ASPECTS | MANAGEMENT OBJECTIVES | MEASURABLE TARGETS |
|---|---|---|
| **DOCUMENTATION AND TRAINING** | | |
| The necessary documentation must be available in the site office | Ensure that all concerned is aware of the EMPr and related environmental aspects | Availability of documents<br>Trained and informed workforce. |
| **SITE ACCESS & TRAFFIC MANAGEMENT** | | |
| Access roads may increase the construction footprints | Construction vehicles, machinery and workers must be restricted to the designated access roads, and may not drive through undeveloped vegetation outside of the existing access route except where that vegetation falls within the authorised working area (development footprint) at the site. | Minimizing eradication of vegetation. |
| **VEGETATION CLEARING** | | |
| Vegetation will be cleared from within the footprint of the working area, before earthmoving and construction activities commence. | Vegetation clearing may only commence once the working area has been clearly demarcated to the ECO's satisfaction. | Land clearing must be restricted to the demarcated working area, and no vegetation may be cleared outside of the demarcated working area. |
| **TOPSOIL & SUBSOIL MANAGEMENT** | | |
| Topsoil (where present) will be removed from any area where physical disturbance of the surface will occur. | Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas on site | The topsoil must be adequately protected from being blown away or eroded by storm water.<br><br>Removed subsoil should be stockpiled separately from topsoil.<br><br>Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped on the site |
| **EXCAVATIONS & EARTHWORKS** | | |
| It will be necessary to employ heavy machinery (excavators, back-actors, bulldozers, dump trucks etc.) for the earthmoving required | Use of heavy machinery can substantially increase the likelihood, intensity and significance of potential negative environmental impacts, and it is thus essential that earthworks be performed under constant supervision, and that operators must be made aware of all the environmental obligations, as there is always the potential to inflict damage to sensitive areas. | Use of machinery should be restricted to only that which is strictly required, and the unnecessary or excessive movement/ use of such machinery must be kept to a minimum.<br><br>Excavations and earth-moving may only take place within the demarcated working area |
| **DANGEROUS AND TOXIC MATERIALS (CHEMICALS)** | | |
| Safe storage of chemicals<br>See also below for further aspects on this subject | Clean environment | No spills of chemicals |

| ENVIRONMENTAL ASPECTS | MANAGEMENT OBJECTIVES | MEASURABLE TARGETS |
|---|---|---|
| Availability of safety kits to prevent oils/toxic materials spreading in the environment<br><br>Proper storage must be provided for chemicals , paint and construction materials needed | Safe storage of materials | Proper storage provided |
| **STORAGE OF OIL AND FUEL** | | |
| Safe handling of fuel and oil and prevention of spills. | Clean environment | No spills of oil or fuel<br><br>No leakages of oil |
| **USE OF OIL AND CHEMICALS** | | |
| Drip trays must be provided for vehicles in storage yard<br><br>Wash bay and oil trap to be provided | No spills of oil<br><br>Cleaning area for vehicles | No oil spills from vehicles<br><br>No oil or fuel into environment due to cleaning of vehicles or equipment |
| **STORAGE OF CEMENT** | | |
| Safe handling of cement | Clean environment | No spills of cement |
| **STORAGE OF EQUIPMENT AND MATERIALS** | | |
| Safe and proper storage of equipment and material | Safe and proper storage of equipment and material | Neat, clean and ordered storage of material |
| **CONCRETE** | | |
| The contractors must provide information on proposed handling of concrete. | Minimise the possibility of concrete residue entering into the surrounding environment | No evidence of contaminated soil on the construction site |
| **TOILETS AND ABLUTION FACILITIES** | | |
| Clean sanitary environment | Clean and sanitary environment | Toilets for workers in accordance with the instructions in the EMP |
| **WASTE MANAGEMENT** | | |
| A clean and waste free environment | Clean environment with waste handled in accordance with the EMP | No waste in the environment |
| **WORKSHOP EQUIPMENT, MAINTENANCE AND STORAGE OF MATERIAL** | | |
| Clean and safe work area | Clean and safe work area | Safe and clean work and storage area |
| **FIRES** | | |
| No burning of waste and or fires originating from the construction area | No burning of waste and or fires originating from the construction area | No fire incidents |
| **OTHER ENVIRONMENTAL ASPECTS** | | |
| **Stockpiles**<br>All stockpiled material must be easily accessible without any environmental damage to adjacent grasslands/farmlands.<br>All temporarily stockpiled material must be stockpiled in such a way that the spread of materials are minimised.<br>The stockpiles may only be placed within the demarcated areas - the location of which must be approved by the ER or ECO.<br>Stockpiled material at batching plant must be contained to prevent the spread of gravel in the area.<br><br>**Erosion, sedimentation and storm water**<br>No erosion and or sedimentation | Properly constructed and well maintained stockpiles<br><br>• Minimise scarring of the soil | No erosion or spread of material from stockpiles<br><br>Gravel stockpiles must be properly managed<br><br>No erosion or sedimentation. |

| ENVIRONMENTAL ASPECTS | MANAGEMENT OBJECTIVES | MEASURABLE TARGETS |
|---|---|---|
| **Vegetation**<br>The contractor must avoid vegetated areas that will not be cleared. | surface and land features<br>• Minimise disturbance and loss of soil<br>• Minimise construction footprint<br>Minimise impacts on vegetation | Limit impact on vegetation |
| **Waste management**<br>Any illegal dumping of waste must not be tolerated. This aspect must be closely monitored and reported on; proof of legal dumping must be able to be produced on request. Bins must be clearly marked for ease of management. Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes, rubbish, debris, and builder's wastes generated on the site. | • Sustainable management of waste; to keep the site neat and tidy. This will control potential influx of vermin and flies thereby minimising the potential of diseases on site and the surrounding environment. It will also minimise the potential to pollute soils, water resources and natural habitats | • Disposal of rubble and refuse in an appropriate manner with no rubble and refuse lying on site<br>• Sufficient containers available on site |
| **Dust**<br>Dust production must be controlled by regular watering of roads and works area, should the need arise. | Reduce dust fall out | No visible signs of dust |
| **SAFETY** | Children's access to construction site controlled,<br>Access to construction camp controlled<br>Safety aspects considered | No children on construction site<br>Safety fence and controlled access available<br>Safety signs with necessary information displayed |

# 9. ENVIRONMENTAL IMPACT MANAGEMENT OUTCOMES

## 9.1 ASSESSMENT CRITERIA

Impacts were rated and are discussed in detail – see BAR for detailed impact assessment.

## 9.2 ENVIRONMENTAL IMPACT MANAGEMENT OUTCOMES

The following **Environmental Impact Management Outcomes** has been identified:

1. A full copy of the signed EA from GDARD in terms of NEMA, granting approval for the development must be available on site
2. A copy of the EMPr as well as any amendments thereof must be available on site
3. A suitably qualified ECO must be appointed.
4. Impacts on the environment must be minimised during site establishment and the development footprint must be kept to the approved development area.
5. Vegetation clearing may not commence until such time as the development footprint has been clearly defined.
6. No clearance of vegetation outside of the development footprint may occur.

7. At the end of the construction phase the site and its surrounding area must be free from any pollution that originated as a result of the construction activities.
8. No disturbance of topsoil & subsoil may commence until such time as the development footprint has been clearly defined.
9. No disturbance of topsoil & subsoil outside of the development footprint may occur.
10. At the end of the construction phase the site and its surrounding area must be free from any chemical, fuel, oil and cement spills that originated as a result of the construction activities.
11. At the end of the construction phase the site and its surrounding area must be free from any sewage that originated as a result of the construction activities.
12. At the end of the construction phase the site and its surrounding area must be free from any hazardous or general waste pollution that originated as a result of the construction activities.
13. Dust prevention measures must be applied to minimise the generation of dust.
14. Noise prevention measures must be applied to minimise the generation of unnecessary noise pollution as a result of construction activities on site.
15. Absolutely no burning of waste is permitted.
16. Fires will only be allowed in facilities especially constructed for this purpose.
17. No hunting of animals will be allowed.
18. No intentional destruction of any sites, features or material of cultural heritage (archaeological and/or historical) origin or significance may occur.
19. All Contractors and sub-contractors must abide to the rules and regulations of the Occupational Health and Safety Act, 85 of 1993.

## 10. MITIGATION MEASURES

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| **ENVIRONMENTAL DOCUMENTATION REPORTING AND COMPLIANCE** | A full copy of the signed EA from GDARD in terms of NEMA, granting approval for the development **must** be available on site | Obtain the Environmental Authorization and plan to have a copy of the signed EA on site. | Ensure that a signed copy of the EA is available in the site office | No action required | The Applicant, assisted by the EAP to be monitored by the ECO |
| | A copy of the EMPr as well as any amendments thereof **must** be available on site | Ensure that a site specific EMPr is compiled and approved and plan to have a copy of the approved document on site | Ensure that a copy of the approved EMPr is available in the site office | No action required | The Applicant, assisted by the EAP to be monitored by the ECO |
| | A suitably qualified ECO **must** be appointed. | Prior to the start of construction activities, an ECO must be appointed to ensure that an Environmental Control document is compiled. This | Ensure that the ECO document is available on site and that everyone on site is informed and trained regarding their Environmental obligations in terms of the EA and EMPr.<br><br>Records of training sessions must be kept on site. | No action required | The Applicant and the ECO |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | | document must explain the roles and responsibilities of everyone involved and must also contain an Environmental awareness training manual. | | | |
| | | | ECO's report must be an item on monthly site meeting agenda | No action required | The project manager. |
| | | The ECO must ensure that the contractor provides method statements for the various environmental aspects. | The method statements must be available in the site office | No action required | The Applicant and the contractor must ensure that the method statements are developed and approved by the ECO |
| **SITE ESTABLISHMENT** | Impacts on the environment **must** be minimised during site establishment and the development footprint must be kept to the | Ensure the development footprint is kept to a minimum to ensure that the flow of the river is not disturbed in the long run. | Construction vehicles, machinery and workers must be restricted to only operate within the approved development footprint. | No action required | The developer must ensure that the parameters of the development footprint is kept to a minimum and that all concerned |
| | | | The development footprint must be clearly demarcated and the extent of this area must be communicated to all contractors and sub-contractors. | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | approved development area. | | Existing access roads must be utilised to access the site camp(s) and working/ construction areas<br>Appropriate traffic management strategies must be implemented to ensure the safety of construction vehicles and other road-users.<br>If needed, signage to warn other road users of the presence of construction vehicles should be erected at appropriate locations, where the signage will be clearly visible to potentially affected road users. | | are trained in this regard. The ECO will monitor compliance. |
| **VEGETATION CLEARING** | Vegetation clearing **may not commence** until such time as the development footprint has been clearly defined.<br>No clearance of vegetation outside of the development footprint **may** occur. | The parameters of the development footprint must be clearly defined | Land clearing must be restricted to the demarcated working area, and no vegetation may be cleared outside of the demarcated working area. | No action required | The developer must ensure that the parameters of the development footprint are demarcated and that all concerned are trained in this regard. The ECO will monitor compliance. |
| **STORM AND WASTE WATER MANAGEMENT** | At the end of the construction phase the site and its surrounding area **must** be free from any pollution that | | Runoff from the cement/ concrete batching areas must be strictly controlled, and contaminated water must be collected, stored and either treated or disposed of off-site, at a location approved by the project manager | No action required | The ECO must monitor compliance. |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | originated as a result of the construction activities. | | All spillage of oil onto concrete surfaces must be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility. | | |
| | | | No wastewater may run freely into any naturally vegetated areas. Run-off containing high sediment loads must not be released into drainage channels | | |
| | | | Approval must be obtained from DW&S for any activities that require authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998. | | |
| | | | Surface water or storm water must not be allowed to concentrate, or to flow down cut or fill sloped routes without erosion protection measures being in place | | |
| | | | To reduce the loss of material by erosion, the contractor must ensure that disturbance on site is kept to a minimum. The contractor is responsible for rehabilitating all eroded areas in such a way that the erosion potential is minimised after construction has been completed | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| **TOPSOIL & SUBSOIL** | **No** disturbance of topsoil & subsoil may commence until such time as the development footprint has been clearly defined. | The parameters of the development footprint must be well defined. | Land clearing must be restricted to the demarcated working area, and no disturbance of topsoil & subsoil outside of the demarcated working area will be allowed.<br>Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas.<br>The topsoil must be adequately protected from being blown away or eroded by storm water. The topsoil storage area must be located on a level area outside of any surface drainage/ storm-water channels, and at a location where it can be protected from disturbance during construction and where it will not interfere with construction activities.<br>Removed subsoil should be stockpiled separately from topsoil.<br>Handling of topsoil should be minimized as much as possible, and the location of the topsoil berm should be chosen carefully to avoid needing to relocate the topsoil berm at a later date. Ideally, topsoil is to be handled twice only, once to strip and stockpile, and once to replace, level, shape and scarify. | No action required | The developer must ensure that the parameters of the development footprint is well defined and that all concerned are trained in this regard.<br><br>The Contractor will be responsible for the removal and correct stockpiling of the topsoil and subsoil.<br><br>The ECO will monitor compliance. |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | | | The topsoil berm may be a few meters wide but should ideally not be more than 0.5m high to allow sufficient light and air penetration. | | |
| | No disturbance of topsoil & subsoil outside of the development footprint **may** occur. | | Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped. | | |
| **DANGEROUS AND TOXIC MATERIALS** | At the end of the construction phase the site and its surrounding area **must** be free from any chemical, fuel, oil and cement spills that originated as a result of the construction activities. | **CHEMICALS** | | | The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.<br><br>The ECO will monitor compliance. |
| | | The Contractor must provide method statements for the storage and handling of chemicals on site. | All hazardous substances must be stored in suitable containers as defined in the Method Statement; | No Action required | |
| | | | Containers must be clearly marked to indicate contents, quantities and safety requirements | | |
| | | | All storage areas must be bunded. The bunded area must be of sufficient capacity to contain a spill / leak from the stored containers | | |
| | | | Bunded areas to be suitably lined with a SABS approved liner | | |
| | | | An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis | | |
| | | | All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS); | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | | | All employees working with HCS must be trained in the safe use of the substance and according to the safety data sheet | | |
| | | | Employees handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate personal protective equipment must be made available | | |
| | | **FUEL AND OIL** | | | The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.<br><br>The ECO will monitor compliance. |
| | | The Contractor must provide method statements for the storage and handling of fuel and oil on site. | The Contractor must ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers | No Action required | |
| | | | Fuel storage tanks must be located in a portion of the construction camp where they do not pose a high risk in terms of water pollution (i.e. they must be located away from water courses) | | |
| | | | The tanks/ bowsers must be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining must extend to the crest of the bund and the volume inside the bund must be 110% of the total capacity of all the storage tanks/ bowsers | | |
| | | | The floor of the bund must be sloped, draining to an oil separator | | |
| | | | Provision must be made for refuelling at the storage area by protecting the soil with an | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | | | impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained | | |
| | | | All empty externally dirty drums must be stored on a drip tray or within a bunded area | | |
| | | | Spill kits must be available on site and in all vehicles that transport hydrocarbons for dispensing to other vehicles on the construction site. 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) | | |
| | | | Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit must be used. Appropriate ground protection such as drip trays must be used | | |
| | | | The responsible operator must have the required training to make use of the spill kit in emergency situations | | |
| | | | In the event of a spill, contaminated soil must be collected in containers and stored in a central location and disposed of according to the National Environmental Management: Waste Act 59 of 2008. | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | | | During servicing of vehicles or equipment, a suitable drip tray must be used to prevent spills onto the soil. | | |
| | | | Leaking equipment must be repaired immediately or be removed from site to facilitate repair | | |
| | | | Construction area must be monitored for oil and fuel spills | | |
| | | | Drip trays (minimum of 10cm deep) must be placed under all vehicles that stand for more than 24 hours. Vehicles suspected of leaking must not be left unattended, drip trays must be utilised. 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. | | |
| | | **CONCRETE AND CEMENT** | | | |
| | | The contractors must provide and maintain a **method statement** for "cement and concrete batching". The method statement must provide information on proposed storage, | The mixing of concrete must only be done at specifically selected sites on mortar boards or similar structures to contain run-off into soils rocky outcrops, streams and natural vegetation | No Action required | The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard. |
| | | | Cleaning of cement mixing and handling equipment must be done using proper cleaning trays | | |
| | | | All empty containers must be stored in a dedicated area and later removed from the site for appropriate disposal at a licensed facility | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | | washing & disposal of cement, packaging, tools and plants | Any spillage that may occur must be investigated and immediate remedial action must be taken | | The ECO will monitor compliance. |
| | | | The visible remains either of concrete, solid, or from washings, must be physically removed immediately or disposed of as waste to a registered landfill site | | |
| | | | Cement batching areas must be located in an area where residues are contained and that the location does not fall within storm water channels | | |
| **TOILETS AND ABLUTION FACILITIES** | At the end of the construction phase the site and its surrounding area **must** be free from any sewage that originated as a result of the construction activities. | The contractor must provide method statement for the operation and maintenance of toilets and ablution facilities | The contractor is responsible for providing all sanitary arrangements for his and the sub-contractors team. A minimum of one chemical toilet must be provided per 30 persons and should include male and female toilets. | No Action required | The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.<br><br>The ECO will monitor compliance. |
| | | | Sanitary arrangements must be to the satisfaction of the ECO. The contractor must keep the toilets in a clean, neat and hygienic condition. The contractor must supply toilet paper to all toilets at all times. Toilet paper dispensers must be provided in all toilets | | |
| | | | The contractor must be responsible for the cleaning, maintenance and servicing of the toilets. The contractor must ensure that no | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | | | spillage occurs when the toilets are cleaned or emptied. | | |
| | | | The use of ablution facilities and or mobile toilets must be used at all times and no indiscriminate use of the veld for the purposes of ablutions must be permitted under any circumstances | | |
| | | | Toilets out on site must be secured to the ground and have a sufficient locking mechanism operational at all times | | |
| **WASTE MANAGEMENT** | At the end of the construction phase the site and its surrounding area **must** be free from any hazardous or general waste pollution that originated as a result of the construction activities. | The contractors must provide and maintain a method statement for "solid waste management". The method statement must provide information on the proposed licensed facility to be utilised and details must be kept of record keeping for auditing purposes | Waste must be separated into recyclable and non-recyclable waste, and must be separated as follows:<br>• **Hazardous waste**: including (but not limited to) old oil, paint, etc.<br>• **General waste**: including (but not limited to) paper, plastic, glass and construction rubble | No Action required | The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.<br><br>The ECO will monitor compliance. |
| | | | Any illegal dumping of waste must not be tolerated, this action will result in a fine and if required further legal action will be taken. This aspect must be closely monitored and reported on; proof of legal dumping must be able to be produced on request. | | |
| | | | Bins must be clearly marked for ease of management | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | | | All refuse bins must have a lid secured so that animals cannot gain access | | |
| | | | Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes, rubbish, debris, and builder's waste generated on the site | | |
| | | | Subcontractor(s) contracts must contain a clause to the effect that the disposal of all construction-generated refuse / waste to an officially approved dumping site is the responsibility of the subcontractor in question and that the subcontractors are bound to the management activities stipulated in this EMP. Proof of this undertaking must be issued to the ECO | | |
| | | | All solid and chemical wastes that are generated must be removed and disposed of at a licensed waste disposal site. The contractor is to provide proof of such to the ECO | | |
| | | | Chemical containers and packaging brought onto the site must be removed for disposal at a suitable site | | |
| | | | A suitably positioned and clearly demarcated waste collection site must be identified and provided The waste collection site must be maintained in a clean and orderly manner. A | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | | | covered container (Like a skip, with a cover), must be used to contain refuse from campsite bins, rubble and other construction material | | |
| **DUST** | Dust prevention measures **must** be applied to minimise the generation of dust. | The contractors must provide and maintain a method statement for "dust control". The method statement must provide information on the proposed source of water to be utilised. | All forms of dust pollution must be managed in terms of the National Environmental Management: Air quality Act, 2004 (Act No 39 of 2004)).<br>Acceptable dust fall rates for residential areas are:<br>**Dust fall rate (D) (mg/m$^2$/day, 30 days average:**<br>D<600<br>**Permitted frequency of exceeding dust fall rate:**<br>Two within a year, not sequential months | No Action required | The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.<br><br>The ECO will monitor compliance. |
| | | | Removal of vegetation must be avoided until such time as soil stripping is required and similarly exposed surfaces must be revegetated or stabilised as soon as is practically possible. | | |
| | | | Excavation, handling and transport of erodible materials must be avoided under high wind conditions or when a visible dust plume is present | | |
| | | | The construction camp must be watered during dry and windy conditions to control dust fallout. | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | | | Dust production must be controlled by regular watering of roads and work area, should the need arise | | |
| | | | During high wind conditions, the ECO must evaluate the situation and make recommendations as to whether dust damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level | | |
| | | | Where possible, soil stockpiles must be located in sheltered areas where they are not exposed to the erosive effects of the wind | | |
| | | | Where erosion of stockpiles becomes a problem, erosion control measures must be implemented at the discretion of the ECO | | |
| | | | Vehicle speeds must not exceed 40 km/h along dust roads or 20 km/h when traversing unconsolidated and non-vegetated areas | | |
| **NOISE** | Noise prevention measures **must** be applied to minimise the generation of unnecessary noise pollution as a result of construction activities on site. | The contractors must provide and maintain a method statement for noise. | All vehicles and machinery must be fitted with appropriate silencing technology and must be properly maintained. | No Action required | The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard. |
| | | | Develop a Code of Conduct for the construction phase in terms of behaviour of construction staff. Operating hours as determined by the environmental authorisation are adhered to during the development phase. Where not defined, it must be ensured that development | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | | | activities must still meet the impact management outcome related to noise Management.<br><br>It is proposed that normal working hours are between 08h00 and 17h00 (Mondays to Saturdays). No work will be allowed on Sundays or outside of the abovementioned hours. | | The ECO will monitor compliance. |
| | | | Any complaints received by the Contractor regarding noise must be recorded and communicated. Where possible or applicable, provide transport to and from the site on a daily basis for construction workers. | | |
| **FIRES** | Absolutely **no** burning of waste is permitted. | The contractors must provide and maintain a method statement for "fires", clearly indicating where and for what, fires will be utilised plus details on the fuel to be utilised | Absolutely no burning of waste is permitted. | No Action required | The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard. |
| | Fires will **only** be allowed in facilities especially constructed for this purpose. | | Fires will only be allowed in facilities especially constructed for this purpose within fenced Contractor's camps. Wood, charcoal or anthracite are the only fuels permitted to be used for fires. The contractor must provide sufficient wood (fuel) for this purpose. | | |
| | | | Fires within the designated areas must be small in scale so as to prevent excessive smoke being released into the air. | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | | | The contractor must designate a smoking area for the labour force so as to prevent unanticipated incidents of veldt fires. | | The ECO will monitor compliance. |
| | | | No wood is to be collected, chopped or felled for fires from private or public property as well as from no-go or sensitive areas within the site and any surrounding natural vegetation | | |
| **FAUNA** | **No** hunting of animals will be allowed. | Plan to ensure that all activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962) | 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. | No Action required | The Contractor will be responsible for providing method statements. He will also be responsible for training of staff in this regard.<br><br>The ECO will monitor compliance. |
| | | | Environmental induction training and awareness must include aspects dealing in safety with wild animals into and on site. Focus on animals such as snakes and other reptiles that often generate fear by telling workers how to move safely away and to whom to report the sighting. Workers should also be informed where snakes most often hide so that they can be vigilant when lifting stones, etc. | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| **HERITAGE** | **No** intentional destruction of any sites, features or material of cultural heritage (archaeological and/or historical) origin or significance may occur. | Conduct a Phase 1 HIA for the development to identify any sites, features or material of cultural heritage (archaeological and/or historical) origin or significance. | In terms of the National Heritage Act, 1999 (Act No. 25 of 1999), construction personnel must be alert and must inform the local heritage agency within 48 hours should they come across any signs of heritage resources. | No Action required | The developer and applicant.<br><br>Study to be conducted by a suitable qualified specialist.<br><br>Findings to be monitored by the ECO. |
| | | | Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance. | | |
| | | | Should any archaeological artefacts be exposed during site activities, work on the area where the artefacts were found must cease immediately and the ECO must be notified immediately. | | |
| | | | All work must cease immediately, if any human remains are uncovered. Such material, if exposed, must be reported to the South African Police Services, so that a systematic and professional investigation can be undertaken. Sufficient time must be allowed to remove/collect such material before development recommences | | |
| **CRIME, SAFETY AND SECURITY** | All Contractors and sub-contractors **must** abide to the rules and regulations of the Occupational Health | Plan to appoint a health and safety officer for the construction site. | The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and the National Building Regulations | No actions required | Health and safety officer. |
| | | Compile an Emergency | The contractor must ensure that all emergency procedures are in place prior to commencing | | |

| ENVIRONMENTAL ASPECT | ENVIRONMENTAL IMPACT MANAGEMENT OUTCOME | ENVIRONMENTAL IMPACT MANAGEMENT ACTIONS | | | RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | Pre-construction phase | Construction phase | Operational phase | |
| | and Safety Act, 85 of 1993. | Response Action Plan (ERAP) prior to the commencement of the project | work. Emergency procedures must include (but not be limited to) fire, spills, contamination of the ground, accidents to employees, use of hazardous substances and materials, etc. | | |
| | | | The contractor must 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. | | |
| | | | Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats e.g. large brush stockpiles, fuels etc | | |
| | | | All unattended open excavations must be adequately fenced or demarcated. | | |
| | | | Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged. | | |
| | | | Ensure that the workforce is sensitised to the effects of sexually transmitted diseases, especially HIV AIDS. The Contractor must ensure that information posters on AIDS are displayed in the Contractor Camp area | | |
| | | | Workers must be instructed not to trespass onto adjacent land. Trespassers will be prosecuted. | | |

# 11. ENVIRONMENTAL AWARENESS PLAN

## 11.1 INTRODUCTION

Training is essential for ensuring that the EMP provisions are implemented efficiently and effectively. It is vital that all personnel are adequately trained to perform their designated tasks to an acceptable standard.

The Construction Contractor should make allowance for all construction workers, including all subcontractors that will be working at the site, to attend environmental awareness training sessions (undertaken by the ECO) before commencing work on site. During this training, the ECO will explain the EMP and the conditions contained therein. Attention will be given to the construction process and how the EMP fits into this process.

In addition to training, general environmental awareness must be fostered among the project's workforce to encourage the implementation of environmentally sound practices throughout its duration. This ensures that environmental accidents are minimized and environmental compliance maximized.

Environmental awareness training and education should be ongoing throughout the construction phase, and should be undertaken regularly if deemed necessary (especially if it becomes apparent that there are repeat contraventions of the conditions of the EMP), or as new workers come to site. Translators should be utilized where needed.

Environmental awareness could be fostered in the following manner:

- Induction course for all workers on site, before commencing work on site.
- Refresher courses as and when required.
- Daily toolbox talks at the start of each day with all workers coming on site, where workers might be alerted to particular environmental concerns associated with their tasks for that day or the area/habitat in which they are working.

Courses must be given by suitably qualified personnel and in a language and medium understood by workers/employees.

## 11.2 ORGANISATIONAL STRUCTURE

This section describes the roles and responsibilities of the key stakeholders involved in the development, implementation and review of the EMP.

### 11.2.1 PROJECT PROPONENT

The Project Proponent will be ***NEP Construction PTY (LTD) in co-operation with the Department of Human Settlements.*** Ultimately, they will be responsible for the development and implementation of the EMP and for ensuring that the conditions in the eventual Environmental Authorization (EA) are

satisfied. Although construction activities will be contracted out, the liability associated with non-compliance still rests with the Project Proponent. The Project Proponent (and not the Contractor) is therefore responsible for liaising directly with the relevant authorities with respect to the preparation and implementation of the EMP and meeting EA conditions.

The Project Proponent must inform the Contractor of the EA and EMP obligations, as well as **Method Statements** to be prepared and environmental training to be undertaken by the Contractor in terms of these obligations.

The Project Proponent must identify a **Project Manager (PM)** who has overall responsibility for managing the Project, Contractors and for ensuring that the environmental management requirements are met. During the construction phase, the Project Manager will be the Proponent's construction manager; during the operations phase this role will be fulfilled by the operations manager.

All decisions regarding environmental procedures and protocol must be approved by the Project Manager, who also has the authority to stop any construction activity in contravention of the EMP or EA.

An **Environmental Control Officer (ECO) must** be employed by the Project Proponent for the duration of the project. The ECO should have appropriate training and experience in the implementation of environmental management specifications. The ECO provides feedback to the Project Manager regarding all environmental matters. Contractors are answerable to the ECO (or Project Manager, depending on contractual arrangements) for non-compliance with the requirements stated in the EMP or EA.

### 11.2.2 ENVIRONMENTAL CONTROL OFFICER (ECO)

The appointed Environmental Control Officer (ECO) is responsible for monitoring the site at regular intervals (including pre-construction set-up and final rehabilitation), in order to ensure that the provisions of this EMP is adhered to and that sound environmental management is ensuing on site.

The ECO must inspect all areas of the site that may be affected by construction-related activities, including the working area, site camp, stockpile areas and access roads. After each ECO inspection the ECO must compile an ECO report detailing the ECO's observations on site, any instances of non-compliance and any issues or aspects that require attention, follow-up or remedial action. The ECO reports must be submitted to the Applicant, the ER, Construction Contractor(s) and the Competent Authority. The ECO inspection reports should include both photographic and written records.

The ECO will have the following responsibilities:

- Maintenance, update and review of the EMP.
- Liaison between the Project Proponent, Contractors, authorities and other lead stakeholders on all environmental concerns.
- Compilation and administration of an environmental monitoring plan to ensure that the environmental management measures are implemented and are effective.

- Monitoring the performance of the Contractor (and Sub-contractors) and ensuring compliance with the EMP and associated Method Statements.
- Validating the regular site inspection reports, which are to be prepared by the Contractor's Environmental Officer (EO).
- Checking the EO's *record of environmental incidents* (spills, impacts, legal transgressions etc) as well as corrective and preventive actions taken.
- Checking the EO's *public complaints register* in which all complaints are recorded, as well as action taken.
- Issuing of site instructions to the Contractor for corrective actions required.
- Assisting in the resolution of conflicts.
- Communication of all modifications to the EMP to the relevant stakeholders.
- Conducting regular audits to ensure that the system for implementing the EMP is operating effectively.

### 11.2.3 CONTRACTOR

The Contractor should appoint a **Contractor's Representative**, who is responsible for the on-site implementation of the EMP and EA. The Contractor's representative can be the site agent; site engineer; a dedicated environmental officer; or an independent consultant. The Contractor must ensure that the Contractor's Representative is suitably qualified to perform the necessary tasks and is appointed at a level such that she/he can interact effectively with other site Contractors, labourers, the Environmental Control Officer and the public. The Contractor's Representative ensures that all Sub-contractors working under the Contractor abide by the requirements of the EMP.

The Contractor is answerable to the Project Manager (PM) for all environmental issues associated with the project. Contractor performance will, amongst others, be assessed on health, safety and environmental management criteria.

The Contractor will be required to provide the following **Method Statements,** setting out in detail how the management actions contained in an EMP and EA will be implemented in order to ensure that the environmental management objectives are achieved. The Method Statements must be reviewed and approved by the Project Proponent.

> Stockpiles

> Excavation stabilisation

> Oil and chemicals

> Cement

> Storage of fuel and oils

> Use of dangerous and toxic materials

> Toilets and ablution facilities

> Waste Management

> Dust

> Workshop equipment, maintenance and storage

> Noise

> Fires

> Erosion and sedimentation

> Flora and Fauna (Including no-go areas)

> Crime, safety and security

> Hydrology

The Contractor may appoint an **Environmental Officer (EO)**, or officers, if more than one is required. Their primary role is to coordinate the environmental management activities of the Contractor on site. The EO may be required to perform the following roles:

- Support the ECO in the monitoring and execution of the Contractors or Sub-contractors' Method Statements by maintaining a permanent presence on site.
- Inspect the site as required to ensure adherence to the management actions of the EMP, EA and the Method Statements.
- Complete Site Inspection Forms on a regular basis (eg. daily or weekly).
- Provide inputs to the regular (eg. monthly) environment report to be prepared by the ECO.
- Liaise with the construction team on issues related to implementation of, and compliance with, the EMP and EA.
- Maintain a *record of environmental incidents* (spills, impacts, legal transgressions etc) as well as corrective and preventive actions taken, for submission to the Project Proponent.
- Maintain a *public complaints register* in which all complaints are recorded, as well as action taken, for submission to the Project Proponent.

## 11.3 CHECKLISTS

The table below provide the main mitigation measures and/or management interventions to minimise or reduce the negative impacts and enhance positive impacts identified by the specialists associated with the proposed development.

The intent is for the document to be a live, dynamic document that should be maintained and updated throughout the project lifecycle, *inter alia*, by including the necessary Environmental Authorisation from the approving Authority as an attachment.

The table below provide the main mitigation measures and/or management interventions appropriate to the Planning and Construction Phases of the proposed project. The tables present the objectives to be achieved and the management actions that need to be implemented in order to reduce the negative impacts and enhance the positive impacts per management activity. The associated monitoring and implementation frequencies and the responsible person(s) are indicated.

| Activity/Impact | | Action Required | Responsible Party | Monitoring Frequency |
|---|---|---|---|---|
| 1. | Construction and operational activities planning | The construction/operational activities must conform to the conditions of authorisation contained in the Environmental Authorisation and mitigation measures contained within this EMPr | Proponent | Continuous |
| 2. | Appointment of the ECO | The Proponent must appoint an independent Environmental Control Officer (ECO) who must monitor the Contractor's compliance with the EMPr and who must complete ECO checklist reports (audits) on a regular basis (at least once a month). | Proponent | Once-off |
| | | The Proponent must provide the ECO with a copy of the EMPr. | ECO | Once-off |
| | | The ECO must form part of the project management team and should attend the monthly project progress meetings. | ECO | Continuous |
| | | The Contractor must ensure that the construction crew attend an environmental briefing and training session presented by the ECO prior to commencing activities on site. | ECO, Contractor | Once-off |
| 3. | EMPr | This EMPr must be made binding to the main Contractor and to individual Contractors, and must be included in the tender documentation for the construction contract. | Proponent | Once-off |
| 4. | Licences/ permits and permissions | The Proponent must ensure that all pertinent licences/permits, certificates and permissions required for the project have been obtained prior to any activities commencing on site and ensure that they are strictly enforced/adhered to. These documents must be made available on site at all times, and the Contractor must be made aware of their content. | Contractor, Proponent, ECO | Prior to commencement of work |
| | | The Contractor must maintain a database of all pertinent permits and permissions required for the contract. | Contractor, Proponent, ECO | Continuous |
| 5. | Method Statements | The Contractor must submit written Method Statements to the PM and ECO for the activities identified during consultation. | Contractor, PM, ECO | As required |
| | | Method Statements must be submitted at least five working days prior to the proposed commencement of work on an activity to allow the PM (and/or ECO) time to study and approve the method statement. | Contractor, PM, ECO | As required |
| | | The Contractor may not commence work on that activity until such time as the Method Statement has been approved in writing. | Contractor, PM, ECO | Continuous |
| | | The Contractor must carry out the activities in accordance with the approved Method Statement. | Contractor, PM, ECO | Continuous |

| Activity/Impact | Action Required | Responsible Party | Monitoring Frequency |
|---|---|---|---|
| | Under certain circumstances, the PM may require changes to an approved Method Statement. In such cases the proposed changes must be agreed upon in writing between the Contractor and the PM, and appropriate records retained. | Contractor, PM, ECO | Continuous |
| | Approved Method Statements must be readily available on the site and must be communicated to all relevant personnel. Approval of the Method Statement shall not absolve the Contractor from any of his/her obligations or responsibilities in terms of the EMPr specifications. | Contractor, Proponent | Continuous |
| 6. Existing services and infrastructure | The Contractor must ensure that existing services (e.g. roads, pipelines, power lines and telephone services) are not damaged or disrupted unless required by the contract and with the permission of the PM, ensuring the necessary way-leaves; permissions and permits are in place. | Contractor, PM, ECO | Continuous |
| | The Contractor must be responsible for the repair and reinstatement of any existing infrastructure that is damaged, or services which are interrupted, at his/her own cost. | Contractor | As required |
| | The Contractor must adhere to any time limits for the repairs that may be stipulated by the PM in consultation with the Contractor. | Contractor, ECO | As required |
| 7. Environmental incidents | The Contractor must take timeous corrective action to mitigate an incident appropriate to the nature and scale of the incident and must also rehabilitate any residual environmental damage caused by the incident or by the mitigation measures themselves. The Contractor must adhere to any time limits for such corrective actions that may be stipulated by the ECO in consultation with the PM. | ECO, Contractor | Continuous |
| 8. Labour | Local labour must be used wherever possible to stimulate the local economy. | Contractor | Once-off |
| | The Contractor should use labour intensive construction measures where appropriate, practical and financially feasible. | Contractor | Once-off |
| | The workforce should be trained to benefit individuals beyond the completion of the project. | Contractor | Once-off |
| | The Contractor should use local suppliers where possible. | Contractor | Once-off |
| | The PM must ensure that all staff working on the project must be in possession of a South African Identity Document or a relevant work permit. A register must be kept on site of all staff working on site. | PM | Continuous |
| | Equal opportunities for employment should be created to ensure that all sectors of society (especially women) have equal access to such opportunities. | Contractor | Continuous |
| 9. Training of staff | The Contractor must ensure that all construction staff receive environmental awareness training concerning, amongst others, the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts, protection of any animals encountered on site, no-go areas, the use of toilets and basic sanitation, and basic health and safety on site. | Contractor, ECO | Once-off |
| | It is the Contractor's responsibility to provide the site foreman with environmental training (including explaining the content of the EMPr and any Conditions of Approval) and is to ensure that the foreman has sufficient understanding to pass this information onto the construction staff. | Contractor, ECO | Once-off |
| | Training must be provided to the staff members in the use of the appropriate fire-fighting equipment. | Contractor, Health and Safety Officer | Once-off |
| | The Contractor must ensure that all staff operating machinery/construction vehicles are adequately trained to carry out the designated tasks. | Contractor, Health and Safety Officer | Once-off |

| Activity/Impact | Action Required | Responsible Party | Monitoring Frequency |
|---|---|---|---|
| 10. Worker health and safety | A Health and Safety Plan must be developed and implemented by the Contractor for the construction period to ensure worker safety.<br>Should any injury be obtained as a result of work the Contractor must ensure the necessary medical attention is received.<br>The necessary Health and Safety file and incident register must be kept on site at all times. | Contractor, Health and Safety Officer | Continuous |
| 11. Site access & traffic management | Construction vehicles, machinery and workers must be restricted to the designated access roads, and may not drive through undeveloped vegetation outside of the existing access route except where that vegetation falls within the authorised working area (development footprint) at the site. | Contractor<br>ECO | Continuous |
| 12. Vegetation clearing | Vegetation clearing may only commence once the working area has been clearly demarcated to the ECO's satisfaction. | Proponent<br>Contractor<br>ECO | Once-off |
| 13. EMPr | This EMPr must be made binding to the main Contractor and to individual Contractors, and must be included in the tender documentation for the construction contract. | Proponent | Once-off |
| 14. Topsoil & subsoil management | Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas on site.<br>The topsoil must be adequately protected from being blown away or eroded by storm water.<br>Removed subsoil should be stockpiled separately from topsoil.<br>Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped on the site | Contractor<br>ECO | Continuous |
| 15. Excavations & earthworks | Use of heavy machinery can substantially increase the likelihood, intensity and significance of potential negative environmental impacts, and it is thus essential that earthworks be performed under constant supervision, and that operators must be made aware of all the environmental obligations, as there is always the potential to inflict damage to sensitive areas.<br>Use of machinery should be restricted to only that which is strictly required, and the unnecessary or excessive movement/ use of such machinery must be kept to a minimum.<br>Excavations and earth-moving may only take place within the demarcated working area | Contractor<br>ECO | Continuous |
| 16. Groundwater contamination | Ensure vehicles are serviced and refuelled in bunded areas | Contractor | Continuous |
| | Ensure vehicles are checked weekly for faults and serviced timeously if faulty | Contractor | As required |
| | Should any leaks occur ensure contaminated soil is dug up to 1 cm below the level of visible contamination and disposed of as hazardous waste | Contractor | As required |
| | Drip trays should be placed under all vehicles remaining stationary for more than 24 hours | Contractor | Continuous |
| 17. Noise | Limit construction activities to normal working hours | Contractor | Continuous |
| | Coincide any excessively noisy activities to minimise duration of inconvenience | Contractor | As required |

| Activity/Impact | Action Required | Responsible Party | Monitoring Frequency |
|---|---|---|---|
| | Ensure noise standards are complied with and that construction staff are provided with personal protective equipment when undertaking noisy operations | Contractor | Continuous |
| 18. Safety | No children on construction site.<br>Safety fence and controlled access should be enforced<br>Safety signs with necessary information displayed | Proponent<br>Contractor<br>ECO | Continuous |
| 19. Stockpiles | Soil stockpiles must not be situated within 50m of any water course. | Contractor, ECO | Monthly |
| | If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or cloth, depending on the duration of the project. Stockpiles may further be protected by the construction of berms or low brick walls around their bases. | Contractor, ECO | Monthly |
| | Stockpiles must be kept clear of weeds and alien vegetation growth by regular weeding. | Contractor, ECO | Monthly |
| | Where contamination of soil is expected, analysis must be done prior to disposal of excess soil to determine the appropriate disposal method. Proof from an applicable waste disposal site where contaminated soils are dumped if and when a spillage / leakage occur must be provided to the ECO upon request. | Contractor, ECO | Monthly |
| | Stockpiles must not exceed 2m in height unless otherwise permitted by the PM and / or ECO. | Contractor, ECO | Monthly |
| 20. Erosion control | Wind screening and stormwater control must be undertaken where required by the ECO to prevent soil loss from the site. | Contractor, ECO | Twice monthly |
| | The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion, if required by the ECO.<br>Other erosion control measures that can be implemented are as follows:<br>• Brush packing with cleared vegetation;<br>• Mulch or chip packing;<br>• Planting of vegetation; and<br>• Hydro-seeding / hand sowing. | Contractor, ECO<br>Contractor, ECO | Twice monthly |
| | Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented. | Contractor, ECO | Twice monthly |
| | All erosion control mechanisms need to be regularly maintained. | Contractor, ECO | Twice monthly |
| | Re-vegetation of disturbed surfaces must occur as soon as possible after construction activities are completed. | Contractor, ECO | Twice monthly |
| | No impediment to the natural water flow o site other than approved erosion control or rehabilitation works is permitted. | Contractor, ECO | Twice monthly |
| | Stockpiles not used in three (3) months after stripping should be seeded to prevent dust and erosion, as advised by the ECO | Contractor, ECO | Twice monthly |
| 21. Hazardous materials | Use and or storage of materials, fuels and chemicals which could potentially leak into the ground must be controlled. | Contractor, ECO | Monthly |
| | Any hazardous substances must be stored at least 50m from any of the watercourses on site in a bunded area. | Contractor, ECO | Monthly |
| | The Contractor must ensure that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of preventing unauthorised entry. Such materials may also be temporarily stored on drip-trays. | Contractor, ECO | Monthly |
| | Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp must be collected and removed from the site for appropriate disposal at a licenced waste disposal facility or sewage works. | Contractor, ECO | Monthly |

| Activity/Impact | Action Required | Responsible Party | Monitoring Frequency |
|---|---|---|---|
| | All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund wall must be high enough to contain 110% of the total volume of the stored hazardous material. Such bunded areas must be regularly emptied of accumulated rainwater. Wastewater from such emptying, if contaminated, must be disposed at an appropriately licenced waste disposal facility or sewage works. | Contractor, ECO | Monthly |
| | In the event of a spill, the Contractor must take prompt action to clear polluted areas and prevent spreading of the pollutants. The Contractor will be liable to arrange for professional service providers to clear affected areas, if required. | Contractor, ECO | As required |
| | Proper facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater. These pollution prevention measures for storage must include a bunded containment area with a wall high enough to contain at least 110% of any stored volume. This containment area must be sited at least 50m away from any drainage line, in a site approved by the ECO. | Contractor, ECO | Monthly |
| | Cement storage and batching must only take place in a bunded area, and any runoff | | |
| | Any spillage, which may occur, must be investigated and immediate action must be taken. This must be reported to the ECO and to the relevant authorities if so required by the ECO. | Contractor, ECO | As required |
| 22. Cement and concrete batching | Concrete must not be mixed on the ground, but in a bunded area with any runoff captured for disposal as hazardous wastewater. | Contractor, ECO | Continuous |
| | The batching area is to be located in an area of low environmental sensitivity, as approved by the ECO. | Contractor, ECO | Once-off |
| | Cement bags must only be stored in a covered, bunded area and not directly on the ground. Used cement bags must be disposed of as hazardous waste. | Contractor, ECO | Weekly |
| 23. Hydrology and stormwater | Silt fences must be used where required by the ECO to remove any suspended silt from stormwater before it enters the stormwater system. | Contractor, ECO | Monthly |
| | Temporary cut-off drains and berms must be used where necessary to capture stormwater and promote infiltration. | Contractor, ECO | Monthly |
| | No rubble, litter or sand may be deposited into any freshwater systems or water courses. | Contractor, ECO | Monthly |
| 24. General materials handling, use and storage | Choice of location for storage areas must take into account prevailing winds, distances to the seasonal watercourses (50m minimum), general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary. | Contractor, ECO, Health and Safety Officer | Once-off |
| | Storage areas must be designated, demarcated and fenced. Storage areas must be secure so as to minimize the risk of crime. They must also be safe from access by unauthorised persons. Fire prevention facilities must be present at all storage facilities. | Contractor, ECO | Monthly |
| | Material Safety Data Sheets (MSDSs) must be readily available on site for all chemicals and hazardous substances to be used on site. Where possible, the available MSDSs should include information on ecological impacts and measures to minimise negative environmental impacts during accidental spills. | Contractor, ECO, Health and Safety Officer | Once-off, as required |
| | Clear signage must be placed at all storage areas containing hazardous substances / materials. | Contractor, ECO, Health and Safety Officer | Once-off |

| Activity/Impact | Action Required | Responsible Party | Monitoring Frequency |
|---|---|---|---|
| | The Contractor must be responsible for the training and education of all personnel on site who will be handling the hazardous material about its proper use, handling and disposal. The Contractor must ensure that information on the management of spill and accidental ingestion is kept on site. Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures. | Contractor, Health and Safety Officer | Once-off |
| | The provisions of the Hazardous Chemical Substances Regulations promulgated in terms of the Occupational Health and Safety Act 85 of 1993 and the SABS Code of Practice must be adhered to. This applies to solvents and other chemicals possibly used in the construction time. | Contractor, Health and Safety Officer | Continuous |
| | The Contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training. | Contractor, Health and Safety Officer | Continuous |
| | All excess cement and concrete mixes must be contained on the construction site prior to disposal off site. | Contractor, ECO | Monthly |
| | Hazardous substances must be stored at least 50m away from any water bodies on site to avoid pollution. | Contractor, ECO | Monthly |
| 25. Fuel storage | Topsoil and subsoil to be protected from contamination. | Contractor, ECO | Monthly |
| | Fuel and material storage must be away from stockpiles on site in appropriate containers in a bunded area. | Contractor, ECO | Twice monthly |
| | Chemicals must be mixed on an impermeable surface and provisions must be made to contain spillages or overflows into the soil. | Contractor, ECO | Monthly |
| | Any storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. Drip trays may be used for temporary storage of such materials. | Contractor, ECO | Monthly |
| | Contaminated soil must be contained and disposed of off-site at an approved hazardous waste disposal site. | Contractor, ECO | Monthly |
| 26. Transportation | Material must be appropriately secured to ensure safe passage between destinations during transportation. Loads must have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor must be responsible for any clean-up resulting from the failure by his employees or suppliers to property secure transported materials. | Contractor, ECO, Health and Safety Officer | Monthly |
| 27. General waste management | Litter generated by the construction crew must be separated on site into general waste and recyclables and collected in covered rubbish bins. General waste is to be removed to a licenced landfill site on a weekly basis and recyclables must be taken to a recycling centre monthly. | Contractor, ECO | Weekly/ Monthly |
| | Ensure that no refuse wastes are burnt on the premises or on surrounding premises. No fires shall be allowed on site, unless in designated areas approved by the PM and by the ECO or by the Health and Safety Officer. | Contractor, ECO, PM, Health and Safety Officer | Monthly |
| | The Contractor must supply waste bins/skips throughout the site at locations where construction personnel are working. The bins must be provided with lids and an external closing mechanism to prevent their contents blowing out and must be scavenger-proof to deter animals that may be attracted to the waste. The Contractor must ensure that all personnel immediately deposit all waste in the waste bins for removal by the Contractor. Bins must be emptied on a weekly basis and the waste removed to the construction camp where it must be properly contained in scavenger, water and windproof | Contractor, ECO | Monthly |

| Activity/Impact | Action Required | Responsible Party | Monitoring Frequency |
|---|---|---|---|
| | containers until disposed of. The bins must not be used for any purposes other than waste collection. | | |
| | Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders waste generated on the premises be placed, dumped or deposited on adjacent/surrounding properties during or after the construction period of the project. | Contractor, ECO | Monthly |
| | If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled. | Contractor, ECO | Monthly |
| 28. Hazardous waste management | The waste, resulting from the use of hazardous materials, must be disposed of at a registered hazardous waste disposal site by a certified waste disposal Contractor as approved by the ECO. A disposal certificate must be obtained from the disposal Contractor. | Contractor, ECO | As required |
| | Staff must be trained in the identification of hazardous waste. | Contractor, ECO | As required |
| | Temporary storage and disposal of hazardous waste is regulated by legislation which must be complied with, i.e. the Occupational Health and Safety Act. | Contractor, ECO | Monthly |
| 29. Noise | The Contractor must aim to adhere to the relevant noise regulations and limit noise to within standard working hours. | Contractor, ECO | Monthly |
| | Construction site camp and other noisy facilities must be located well away from noise sensitive neighbours. | Contractor, ECO | Once-off |
| | Truck traffic must be routed away from noise sensitive areas, where possible. | Contractor, ECO | As required |
| | All noise and sounds generated must adhere to SABS 0103 specifications for maximum allowable noise levels for residential areas. No pure tone sirens or hooters may be utilised except where required in terms of SABS standards or in emergencies. | Contractor, ECO | Monthly |
| | Noisy operations must be combined so that they occur where possible at the same time. | Contractor, ECO | Monthly |
| | Construction activities must be contained to reasonable working hours. Night-time activities near noise sensitive receptors must not be allowed. | Contractor, ECO | Monthly |
| | With regard to unavoidable noisy construction activities, the Contractor must liaise with local residents to inform them of such events. | Contractor | As required |
| | As construction workers operate in a noisy environment, it must be ensured that their working conditions comply with the requirements of the Occupational Health and Safety Act (Act No 85 of 1993). Where necessary, ear protection gear must be worn. | Contractor, ECO, Health and Safety Officer | Monthly |
| | Noise suppression measures must be applied to all construction equipment where required. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site. | Contractor, ECO, Health and Safety Officer | Monthly |
| 30. Worker health and safety | Safety measures, work procedures and first aid must be implemented on site. | Contractor, , Health and Safety Officer | Monthly |
| | A Health and Safety Plan in terms of the Occupational Health and Safety Act (Act No. 85 of 1993) must be drawn up to ensure worker safety. | Contractor, Health and Safety Officer | Once-off |
| | Workers must be thoroughly trained in using potentially dangerous equipment. | Contractor, Health and Safety Officer | As required |

| Activity/Impact | Action Required | Responsible Party | Monitoring Frequency |
|---|---|---|---|
| | Contractors must ensure that all equipment is maintained in a safe operating condition. | Contractor | Monthly |
| | A safety officer must be appointed. | Contractor | Once-off |
| | A record of health and safety incidents must be kept on site. | Contractor, , Health and Safety Officer | Monthly |
| | Any health and safety incidents must be reported to the project manager immediately. | Contractor, , Health and Safety Officer | As required |
| | First aid facilities must be available on site at all times. All incidents requiring first aid occurring on site must be recorded in the incidents book on site. | Contractor, , Health and Safety Officer | Monthly |
| | A record must be kept of medication administered or precautions taken and the time and dates when this was done. This can then be used as evidence in court should any claims be instituted against the Contractor. | Contractor, , Health and Safety Officer | Monthly |
| | Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers / local residents. | Contractor, ECO, Health and Safety Officer | Monthly |
| 31. Personal Protective Equipment | Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc. | Contractor, ECO, Health and Safety Officer | Monthly |
| | No person is to enter the portion of the site where construction activities are being undertaken without the necessary PPE. | Contractor, ECO, Health and Safety Officer | Monthly |
| | SABS Standards and specifications governing dangerous processes such as welding must be strictly applied, with a view to proper protection of the public and workers. | Contractor, ECO, Health and Safety Officer | As required |
| 32. Fauna and Flora | Implement the eradication programme for invasive species in terms of the Conservation of Agricultural Resources Act (Act No. 43 of 1983). | Contractor, ECO | Monthly |
| | Institute the rehabilitation of areas as soon as construction activity allows it. | Contractor, ECO | As required |
| | No disturbance, capture or injury of any fauna will be permitted. Should any fauna be found on site it must be removed from site by the ECO or a suitably qualified person. | Contractor, ECO | Continuous |

## 12. MONITORING, AUDITING AND REPORTING

The Applicant ***NEP Construction PTY (LTD) in co-operation with the Department of Human Settlements*** is responsible for ensuring that all environmental management measures prescribed in this EMPr, as well as any other conditions specified by the relevant authorities, are implemented and adhered to during all phases of the proposed development. The Applicant may delegate the responsibilities for implementing the requirements to other persons/entities, however the Applicant remains responsible for ensuring that the delegated responsibilities are carried out.

It is the responsibility of the project team or their delegate to ensure that regular monitoring of environmental issues addressed in this management plan is undertaken. The applicant is

responsible for the monitoring of the infrastructure.

Site inspections to determine maintenance needs during the operational phase are imperative for good housekeeping.

Internal environmental audits must be undertaken at regular monthly intervals throughout the construction phase to ensure compliance.

The applicant will be responsible for maintaining a database of all records pertaining to the environment for the study area.

All incidents such as spills of toxic or any other substance that may negatively affect the environment must be reported to the relevant authorities.

## FINES

The ECO can impose fines on the Contractor for any contraventions of this EMPR. The imposition of fines will enable the ECO to ensure that the requirements of the EMPR are taken seriously by the Contractor.

For an alternative method of ensuring Environmental Compliance, it should be considered that the ECO must issue a "Compliance Certificate" once a month. This certificate must be attached to the Contractor's "Payment Certificate" and no Contractor will be paid without such a certificate. (Experience with this method of enforcement has proven very successful in the past.)

The Contractor shall be advised in writing of the nature of the infringement and the amount of the fine. The Contractor shall also take the necessary steps (e.g. training) to prevent a recurrence of the infringement.

The Contractor is also advised that the imposition of spot fines does not replace any legal proceedings the authorities, landowners and/or members of the public may institute against the Contractor.

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