

# Proposed Seaview and Greenbushes Bulk Water Infrastructure Expansion, Port Elizabeth

## Draft Environmental Management Programme

Report Prepared for

**Bosch Stemele (Pty) Ltd.**

Report Number 485194/2/Rev2



Report Prepared by

 **srk** consulting

March 2017

# **Proposed Seaview and Greenbushes Bulk Water Infrastructure Expansion, Port Elizabeth**

## **Draft Environmental Management Programme**

### **Report Prepared for**

Bosch Stemele Pty Ltd  
PO Box 27158  
Greenacres  
6057

### **Report Prepared by**

SRK Consulting (South Africa) (Pty) Ltd.  
Ground Floor Bay Suites  
1a Humewood Rd.  
Humerail  
Port Elizabeth 6001  
South Africa  
e-mail: [portelizabeth@srk.co.za](mailto:portelizabeth@srk.co.za)  
website: [www.srk.co.za](http://www.srk.co.za)

Tel: +27 (0) 41 509 4800

Fax: +27 (0) 41 509 4850

**SRK Project Number 485194**

**March 2017**

### **Compiled by:**

Luc Strydom  
Environmental Consultant

Tammy Burton  
Environmental Scientist

Karissa Nel  
Senior Environmental Scientist

Email: [knel@srk.co.za](mailto:knel@srk.co.za)

### **Authors:**

L. Strydom, T. Burton & K. Nel

### **Peer Reviewed by:**

Rob Gardiner  
Partner, Principal Environmental  
Scientist

# Table of Contents

<b>1</b>	<b>Introduction .....</b>	<b>1</b>
<b>2</b>	<b>Scope of Report.....</b>	<b>1</b>
2.1	Environmental Assessment Practitioner (EAP) .....	1
2.1.1	Expertise of EAP .....	1
2.1.2	Environmental Assessment Practitioner Details .....	2
<b>3</b>	<b>Project Description .....</b>	<b>4</b>
<b>4</b>	<b>Environmental Objectives .....</b>	<b>6</b>
4.1	Planning and Design.....	6
4.2	Construction phase .....	6
4.2.1	Impacts on Terrestrial Ecology and Biodiversity .....	6
4.2.2	Impacts on Wildlife: .....	7
4.2.3	Impacts on Surface Water and Aquatic Resources: .....	7
4.2.4	Impacts on Soil and Landscape .....	8
4.2.5	Drainage and Stormwater Management .....	8
4.2.6	Impacts on Traffic.....	8
4.2.7	Noise Impacts.....	8
4.2.8	Impacts on Air Quality: .....	9
4.2.9	Impacts on Archaeological Resources:.....	9
4.2.10	Impacts on Cultural/ Historical Resources: .....	9
4.2.11	Impacts on Palaeontological Resources: .....	9
4.2.12	Waste Management: .....	9
4.2.13	Socio-Economic Impacts:.....	9
4.2.14	Impacts on Existing Infrastructure and Services:.....	10
4.2.15	Impacts on Landowners and Private Property .....	10
4.3	Rehabilitation after construction .....	10
4.4	Operational phase.....	10
4.4.1	Loss of Water .....	11
4.4.2	Safety issues due to potential inadequate servitude maintenance .....	11
4.4.3	Improved water supply .....	11
4.4.4	Visual Impacts .....	11
4.4.5	Aquatic Impacts.....	11
4.4.6	Socio-Economic Impacts.....	11
4.5	Closure/ Decommissioning Phase .....	12
<b>5</b>	<b>Impact Management.....</b>	<b>15</b>
<b>6</b>	<b>Alien Vegetation Management Plan.....</b>	<b>32</b>

Species Specific Control Measures .....	32
<b>7 Rehabilitation Plan .....</b>	<b>32</b>
<b>8 Monitoring, Reporting and Auditing .....</b>	<b>33</b>
<b>9 Environmental Awareness Plan .....</b>	<b>33</b>
<b>10 Organisational Structure .....</b>	<b>34</b>
10.1 The Developer: Nelson Mandela Bay Municipality (NMBM) .....	34
10.2 The Contractor .....	34
10.3 The Environmental Control Officer (ECO) .....	34
<b>11 EMPr Procedure .....</b>	<b>34</b>
<b>Appendices .....</b>	<b>36</b>
Appendix A: CV of Environmental Assessment Practitioner .....	37
Appendix B: Site Layout Diagram .....	38
Appendix C: Contractor Code of Conduct .....	39
Appendix D: Guidelines for the identification of archaeological and historical material .....	41

## List of Figures

Figure 1: Site locality map .....	3
Figure 2: Terrestrial CBA and protected area map for the proposed alignments .....	13
Figure 3: Aquatic systems surrounding the proposed site .....	14

## List of Tables

Table 1: List of plant species of special concern identified in the study area .....	6
Table 2: Mitigation and management measures for the construction phase .....	15
Table 3: Mitigation and management measures for the operational phase .....	30

## Acronyms

**CBA:** Critical Biodiversity Area

**DEA:** Department of Environmental Affairs (National)

**DEDEAT:** Department of Economic Development, Environmental Affairs and Tourism

**EAP:** Environmental Assessment Practitioner

**ECPHRA:** Eastern Cape Provincial Heritage Resources Authority

**ECO:** Environmental Control Officer

**EIA:** Environmental Impact Assessment

**EMPr:** Environmental Management Programme

**NEMA:** National Environmental Management Act

**NMBM:** Nelson Mandela Bay Municipality

**RP:** Representative Person (developer) who is responsible for the implementation of the EMPr.

# 1 Introduction

SRK Consulting (SRK) has been appointed by Bosch Stemele on behalf of the Nelson Mandela Bay Municipality (NMBM) to undertake an environmental assessment process for the proposed expansion of the Seaview and the Greenbushes bulk water infrastructure expansion, which includes the compilation of this Draft Environmental Management Programme (EMPr).

## 2 Scope of Report

The environmental management measures recorded in this EMPr are based on information supplied to SRK during the compilation of the Basic Assessment Report, including information from the applicant and the recommendations from specialists. This EMPr has been compiled to comply with the specific requirements of the National Environmental Management Act (No. 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations (2014).

It should be noted that the EMPr is written as if the project has been authorised. This approach in no way presupposes that the project will be authorised, rather, the style of writing is aimed at making the EMPr easier to read and more easily converted into a practical management tool should the application be approved.

SRK has exercised all due care in reviewing the supplied information provided during the course of the environmental assessment process and has included the requirements of commenting authorities. The appropriateness and practicality of the management measures presented in this EMPr has been considered in terms of comments received and discussed with the applicant as necessary. The NMBM is fully responsible for the implementation of the EMPr.

SRK cannot be held responsible for failure of NMBM to comply with the EMPr. The EMPr is by nature a dynamic document and NEMA provides for continual updating of the EMPr, with approval from the Competent Authority.

The aim of this EMPr is to ensure that construction, operation, and maintenance activities are conducted such that potential negative environmental impacts are minimised and positive impacts are enhanced. This EMPr is not a health and safety plan and this EMPr makes no attempt to satisfy the requirements of the Occupational Health and Safety Act

### 2.1 Environmental Assessment Practitioner (EAP)

#### 2.1.1 Expertise of EAP

This EMPr was prepared by Tammy Burton and Karissa Nel and reviewed by Rob Gardiner.

**Tammy Burton (BSc Hons, CEAPSA and NDip Safety Management)** is an Environmental Scientist in the SRK Port Elizabeth office. She has four years experience in the field of Environmental Management (locally) and two years experience in the field of Environmental and Safety Management in a construction environment (based in Mozambique). Her expertise includes Environmental Basic Assessments, Environmental Impact Assessments, Mining Environmental Management Plans, Environmental Auditing, Waste License and Water Use License Applications, environmental leading indicator assessment, HSE Officer work, construction environmental project coordination and corporate social community development.

**Karissa Nel (MEM, CEAPSA)** is a Senior Environmental Scientist, with more than 10 years environmental consulting experience in Environmental Impact Assessments (EIA), Environmental Management Programmes (EMPr), environmental auditing and licensing. Her training is in zoology, microbiology, aquatic ecosystems, wetland assessment and environmental management. Karissa's CV is attached as Appendix A.

**Rob Gardiner (MSc, MBA, Pr Sci Nat)** is a Principal Environmental Scientist and head of SRK's Environmental Department in Port Elizabeth. He has more than 20 years environmental consulting

experience covering a broad range of projects, including Environmental Impact Assessments (EIA), Environmental Management Systems (EMS), Environmental Management Programmes (EMPr), and environmental auditing. His experience in the development, manufacturing, mining and public sectors has been gained in projects within South Africa, Lesotho, Botswana, Angola, Zimbabwe, Suriname and Argentina.

## 2.1.2 Environmental Assessment Practitioner Details

EAP	Tammy Burton
Company:	SRK Consulting (South Africa) (Pty) Ltd
Qualifications:	BSc Hons
Professional Registration	Certified Environmental Assessment Practitioner South Africa though the Interim Board of EAPASA
Tel:	(041) 405 4800
Fax:	(041) 405 4850
Postal Address	PO Box 21842, Port Elizabeth, 6000
Email	Email: <a href="mailto:tburton@srk.co.za">tburton@srk.co.za</a>

EAP	Karissa Nel
Company:	SRK Consulting (South Africa) (Pty) Ltd
Qualifications:	MEM
Professional Registration	Certified Environmental Assessment Practitioner South Africa though the Interim Board of EAPASA
Tel:	(041) 405 4800
Fax:	(041) 405 4850
Postal Address	PO Box 21842, Port Elizabeth, 6000
Email	Email: <a href="mailto:knel@srk.co.za">knel@srk.co.za</a>



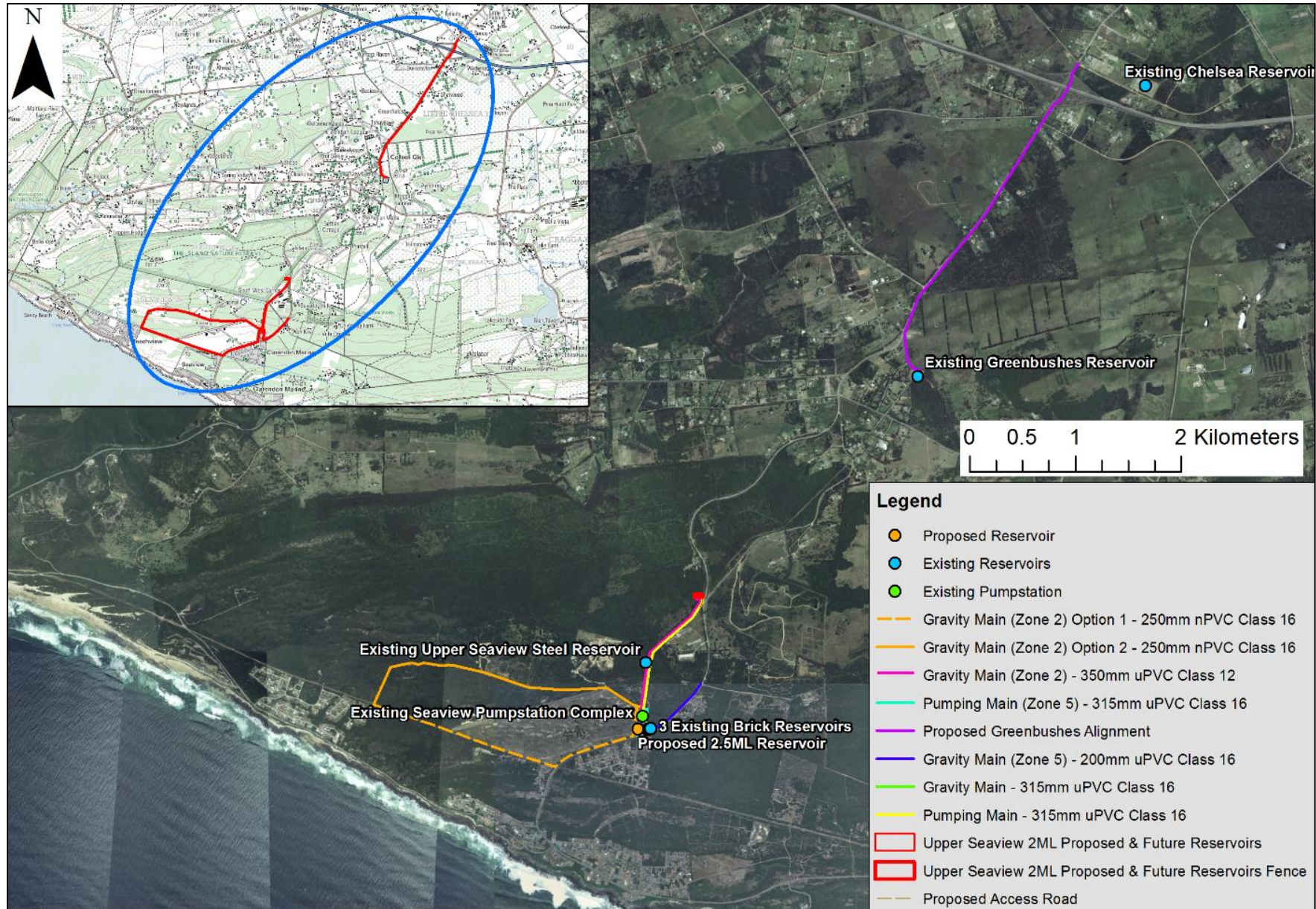


Figure 1: Site locality map



### 3 Project Description

The proposed development aims to expand current bulk water supply infrastructure in order to address the future provision of potable water to the Seaview and Greenbushes supply areas. The Nelson Mandela Bay Municipality proposes to develop Phase 1 which entails the provision of bulk water infrastructure to 8,020 erven within Supply Zones 1, 2, 4 & 5 for the Seaview Area and Supply Zone 7 for the Greenbushes Area. The proposed bulk infrastructure for this phase is based on current water demands and is currently at planning stage.

This project, with minor changes, was authorised in August 2009, however this authorisation has lapsed and a new Basic Assessment process therefore had to be undertaken (Please refer to Appendix G2).

#### **Seaview Bulk Water Supply (Phase 1)**

This supply area is currently supplied from the Seaview pump station 1.2 ML sump/ reservoir and via a number of small local schemes drawing water directly from the two adjacent Churchill pipelines. The proposed infrastructure development aims to construct those elements of the long-term plan which are required for bulk water supply to the area now and to eliminate the minor connections from the Churchill pipelines where feasible. The existing Seaview pump station complex will be expanded to accommodate the proposed bulk infrastructure.

#### **The infrastructure planned for the Seaview supply area is as follows:**

- The construction of a 2.5 ML clear water bulk storage reservoir (T.W.L = 79.5 mamsL) at the existing lower Seaview pump station complex to serve Zone 1 & 4 (please refer to Appendix A for a map of the supply zones). It is anticipated that this reservoir will have a grassed embankment;
- The clearance of a  $\pm 2,400$  m<sup>2</sup> footprint for the establishment of a 2.5 ML clear water bulk storage reservoir (T.W.L = 160 mamsL) at the proposed Upper Seaview Bulk Storage greenfield reservoir site to gravity serve Zone 2 & 5. This footprint includes space for a potential additional future reservoir. The entire footprint will be fenced. It is anticipated that this reservoir will have a grassed embankment;
- The construction of a 3 m wide gravel access road to the proposed 2.5 ML reservoir at the Upper Seaview Bulk Storage Reservoir site. It is anticipated that the alignment of this access road will fall within pipeline servitude;
- The augmentation of the pump station at the existing Seaview pump station complex to supply the proposed 2.5 ML reservoir at the Upper Seaview reservoir site at 160 mamsl (53 L/s);
- The construction of a pumping main, 315 mm diameter class 12 and 16 uPVC pipeline (yellow line) from the Seaview pump station complex to the 2.5 ML Upper Seaview Bulk Storage Reservoir, approximately 1400 m in length within an existing 5 m wide servitude;
- The construction of a gravity main 350 mm  $\varnothing$  uPVC pipeline (pink line), from the Seaview pump station complex to the 2.5 ML Upper Seaview Bulk Storage Reservoir, approximately 1,300 m in length within an existing 5 m wide servitude,
- The construction of a pumping main 315 mm  $\varnothing$  class 16 uPVC pipeline (light blue line) at the Seaview pump station complex, approximately 250 m in length within the footprint of the complex;
- The construction of a gravity main 200 mm  $\varnothing$  class 16 uPVC pipeline (dark blue line), approximately 700 m in length from the Seaview Pump Station Complex north and parallel

to the Seaview road within an existing 5 m wide road reserve. It is noted that SRK's recommendation to move the upper part of this alignment to the southern side of the Seaview Road (to avoid the northern steep sided embankment) has been accepted by the Engineer. Design plans will therefore be amended accordingly;

- The construction of a 250 mm  $\varnothing$  class 16 uPVC gravity main pipeline connecting Zones 2 & 5 from the storage reservoir at the Seaview pump station complex. Two alignment options are being assessed:
  - Option 1 (preferred)(solid orange line): The alignment (approximately 2900 m in length) follows the Seaview Road up to the Churchill pipeline servitude where the alignment turns towards the west and follows the existing pipeline servitude to a point where it connects to existing infrastructure at Beachview; and
  - Option 2 (dotted orange line): This alignment (approximately 2,460 m in length) follows an existing gravel road which starts just north of the Seaview pump station complex and runs in a westerly direction. At a point where the gravel road turns north, the alignment continues further westwards through forest and then turns southwestwards to a point where it connects into existing infrastructure at Beachview;
- The construction of a 315 mm (70 m in length) class 16 uPVC gravity main pipeline (green line) connection to existing Seaview pipework, south of the Seaview pump station complex;
- Gravity connections from the service reservoirs to existing and proposed reticulation (inter-connections between proposed and new pipelines within the Seaview pump station complex, 150 mm, 200 mm, 250 mm, 300 mm and 450 mm via connections of not more than 20 m in length each); and
- Installation of metering at the Seaview pump station complex.

There is an existing power supply at Lower Seaview pump station. The NMBM Electricity Directorate will be contacted to determine whether there is spare capacity for the proposed requirements.

#### **Proposed abandonment and/ or demolition**

- There are three brick reservoirs south of the Seaview pump station complex which supplies Seaview and Kini Bay. These reservoirs are currently in poor condition and it is proposed that these reservoirs also be abandoned and demolished once the proposed reservoir at the Seaview pump station is constructed; and
- Claredon Marine is supplied via a connection to the existing 120 kL Upper Seaview steel reservoir off the existing Seaview rising mains pumping to Greenbushes/ Chelsea. It is proposed that the reservoir will be abandoned/ demolished once the proposed Upper Seaview reservoir (160 mamsl) is constructed.

#### **Greenbushes Bulk Water Supply (Phase 1)**

The existing Greenbushes reservoir currently supplies the Chelsea Reservoir via a 525 mm gravity pipeline and a 375 mm gravity pipeline. However, the 525 mm gravity pipeline is dedicated to an emergency supply to the Chelsea Reservoir, which has a supply function outside the project area. Due to increasing developments inland and up to Cape Road it is necessary to augment the reticulation of water to this area. Therefore, it is proposed to install a 750 mm (outside diameter) gravity main steel pipeline, approximately 3,500 m in length, connecting the Greenbushes reservoir to the existing pipework near the existing Chelsea reservoir site. It is noted that this pipeline will tie into an existing 375mm diameter pipeline that connects to the Chelsea Reservoir.

## 4 Environmental Objectives

This section specifies the impact management objectives and outcomes used to determine the extent of management action(s) required to mitigate the impacts identified during the impact assessment process.

### 4.1 Planning and Design

There were no impacts identified for this phase, however a number of the mitigation measures proposed in the subsequent phases are relevant to the design phase and influences design considerations (see Table 1 and Table 2).

The objective of this phase is to design the bulk water infrastructure with minimal environmental impacts during the subsequent phases.

### 4.2 Construction phase

Construction is expected to continue over a period of 16 months. The following impacts and associated management objectives are described for the construction phase:

#### 4.2.1 Impacts on Terrestrial Ecology and Biodiversity

Clearing of vegetation as well as in-filling and cutting of landforms for infrastructure will result in loss of vegetation and disturbance to natural habitats. According to the NMBM Bioregional Plan, most of the vegetation types that falls within the study area are classified critically endangered, endangered or vulnerable. Furthermore, the proposed Upper Seaview Reservoir and access road as well as the road reserve for sections of the Seaview 350 mm Gravity Main pipeline and 315 mm Rising Main pipeline fall within a Protected Area known as the Island Nature Reserve. Moreover the Greenbushes pipeline alignment falls within a threatened ecosystem classified by the National Environmental Management: Biodiversity Act (G 34809, GoN 1002, 9 December 2011) Vulnerable Algoa Sandstone Fynbos (code FFs 29) as well as within a terrestrial CBA.

Vegetation clearing will result in the loss of potential threatened, rare, endemic or protected plant species. The Vegetation Specialist identified at least twelve plant species of special concern that occur within the study area and will be potentially destroyed by construction activities. However most of these species tend to have widespread distributions and would thus not be under any significant threat as a result of proposed construction works.

**Table 1: List of plant species of special concern identified in the study area**

Botanical Name	Family	Status
<i>Acrolophia capensis</i>	Orchidaceae	PNCO
<i>Astephanus marginatus</i>	Apocynaceae	PNCO
<i>Carpobrotus edulis</i>	Mesembryanthemaceae	PNCO
<i>Carpobrotus sp.</i>	Mesembryanthemaceae	PNCO
<i>Cynanchum sp.</i>	Apocynaceae	PNCO
<i>Erica chloroloma</i>	Ericaceae	PNCO
<i>Indet.</i>	Scrophulariaceae	PNCO
<i>Indet.</i>	Rutaceae	PNCO
<i>Indet.</i>	Restionaceae	PNCO
<i>Scadoxus puniceus</i>	Amaryllidaceae	PNCO
<i>Secamone alpinii</i>	Apocynaceae	PNCO

Botanical Name	Family	Status
<i>Sideroxylon inerme</i>	Sapotaceae	NFA

PNCO: Protected by the Provincial Nature Conservation Ordinance of 1974

NFA: Protected by the National Forests Act 84 of 1998

Some sections of the road reserve are characterised by a number of alien invasive plant species (e.g. Eucalyptus, Pine, Rooikrans, Long-leaved Wattle, Black Wattle, Port Jackson willow and American nightshade) and are therefore more susceptible to the establishment and spread of invasive plant species.

The impact management objective for this impact is:

- Minimise impacts to natural vegetation, Protected Area's (i.e. Island Nature Reserve), the terrestrial Critical Biodiversity Area and the Vulnerable Algoa Sandstone Fynbos threatened ecosystem;
- Minimise the spread of invasive alien plants through appropriate invasive alien control (refer to Section 6); and
- Rehabilitate disturbed areas of the site as soon as possible.

#### 4.2.2 Impacts on Wildlife:

Clearance of vegetation and earthworks activities will have a direct impact on fauna and reptile habitats. Gathering of stormwater in open trenches during construction may also pose a risk to the livelihood of fauna. Clearing of large trees could result in destruction of animal and bird habitats. Noise resulting from construction activities may furthermore displace and disturb local wildlife.

The impact management objective for this impact is:

- Minimise wildlife disturbance.

#### 4.2.3 Impacts on Surface Water and Aquatic Resources:

Six natural and six artificial wetlands were observed within 500 m of proposed construction activities (Refer to Figure 3). A portion of the Greenbushes alignment falls within an Aquatic CBA 2 within quaternary catchment M20A (Baakens estuary). There is also a drainage line that crosses both the Seaview 350 mm diameter Gravity Main and 315 mm diameter Rising Main north of the existing Upper Seaview Steel Reservoir (25°21'51.8"E; 33°59'46"S).

Construction clearing activities and earth works could potentially have an impact on instream/riparian vegetation of potential wetlands in close proximity. When vegetation is cleared, large quantities of loose earth may easily be washed from the construction area and be transported downstream during high rainfall events, resulting in increased sedimentation of aquatic systems occurring downstream. This would impact on vegetation and biota of these systems, but could also influence the geomorphology and overall functioning, in severe circumstances, of downstream watercourses and wetlands. Furthermore Construction activities could cause contamination of watercourses on site and downstream if proper management is not practiced. Accidental spills of hydrocarbons (oils, diesel, etc.) or leakage of such substances from construction machinery may enter the watercourse directly, through surface runoff during rainfall events or subsurface movement (through groundwater) and then migrate to downstream systems. Such chemicals, fuels or pollutants would alter the water quality within the systems, having an effect on ecology in the form of biodiversity loss, i.e. the loss of vegetation and aquatic fauna that are sensitive to changes in water quality (especially from toxicant inputs). Ablution facilities that are not properly maintained during the construction phase may also result in pollution of ground and surface water. Solid waste in the form of general litter left by labourers such as construction materials (gloves, excess materials, cement, etc.) as well as domestic litter (plastic and styrofoam) can also affect the aquatic systems in close proximity and downstream if waste is not appropriately managed and disposed of. This can establish a barrier to water movement and may also alter the quality of water within the resource negatively

The impact management objective for this impact is:

- Minimise impacts to Aquatic CBA;
- Minimise impacts to hydrological regime of affected watercourses;
- Minimise impacts that may result from water contamination and may affect the water quality and functioning of aquatic systems;
- Minimise potential for increased erosion and sedimentation; and
- Minimise destruction of aquatic habitats, ecosystems and biota.

#### **4.2.4 Impacts on Soil and Landscape**

The clearing of vegetation for proposed works will expose soils and increase the risk of soil erosion through wind and storm water run-off, particularly on slopes and potential embankment cuttings. Construction vehicles are likely to compact soil in construction areas which may suppress plant growth if not appropriately rehabilitated. Soils could be contaminated by potential plant and equipment leaks and/ or spills or could be contaminated with subsoil (which cannot be used for rehabilitation).

The management objectives for this impact are:

- Minimise soil contamination impacts resulting from construction activities;
- Minimise risk of erosion; and
- Minimise disturbance to vegetation regrowth via soil compaction.

#### **4.2.5 Drainage and Stormwater Management**

Construction activities within the road reserve could potentially change the profile of road verges and/ or negatively impact stormwater channels which may result in stormwater ponding and/ or exacerbate erosion.

The management objectives for this impact are:

- Minimise disturbance to stormwater flow paths; and
- Ensure accurate profiling of stormwater flow paths following construction.

#### **4.2.6 Impacts on Traffic**

Equipment, materials and possible abnormal loads will need to be transported to site using existing provincial roads which may result in traffic congestion and disruptions. The provincial road expected to be the most affected is the Seaview Road, where plant will need to turn off to access the proposed pipeline alignments and reservoirs (e.g. the turnoff point for the access road to the proposed Upper Seaview Reservoir). There is also a possibility for temporary blocking off of section of one lane in certain areas due to construction vehicles and activities occurring within the road reserve which may extend slightly into the road. This will therefore present a temporary safety risk for vehicles travelling on the Seaview Road. Temporary detour roads are proposed to accommodate vehicles and pedestrians where necessary.

The impact management objective for this impact is:

- Minimise disturbance of regular traffic along the Seaview Road and at road crossings; and
- Prevent safety impacts on surrounding residents and vehicle on the road.

#### **4.2.7 Noise Impacts**

Noise generation (and potential vibrations) will be forthcoming as a result of construction activities such as excavation of trenches using earth moving equipment and directional drilling under roads as well as the general movement of heavy vehicles. Impacts will however be temporary in nature and are not anticipated to be significant.

The management objectives for this impact are:

- Minimise noise impacts; and
- Legal compliance with regard to noise generation.

#### **4.2.8 Impacts on Air Quality:**

Temporary emissions that may be generated during the construction phase are in the form of wind-blown dust from clearing, excavation and stockpiling activities as well as vehicle entrainment on dirt access roads and exhaust emissions from construction vehicles and equipment. These impacts will likely be most experienced by vehicles and pedestrian by-passers adjacent to the road reserve.

The impact management objective for this impact is:

- Minimise air pollution.

#### **4.2.9 Impacts on Archaeological Resources:**

Although the proposed activities are located in an area of low archaeological cultural sensitivity, it is possible that archaeological heritage material exists below the surface and could be impacted during construction.

The impact management objective for this impact is:

- Preservation of archaeological resources.

#### **4.2.10 Impacts on Cultural/ Historical Resources:**

The three brick reservoirs south of the Seaview Complex Pump Station are currently in poor condition and it is proposed that these reservoirs, as well as the Upper Seaview Steel Reservoir may potentially be demolished.

The impact management objective for this impact is:

- Preservation of cultural/ historical resources.

#### **4.2.11 Impacts on Palaeontological Resources:**

Although the proposed alignment is located in an area of low palaeontological cultural sensitivity, it is possible that palaeontological heritage material exists below the surface and could be impacted during construction.

The impact management objective for this impact is:

- Preservation of palaeontological resources.

#### **4.2.12 Waste Management:**

Construction waste as well as small amounts of domestic waste will be generated. Lack of proper management of the waste on the site may lead to wind-blown litter and dumping creating a negative visual impact and potentially impacting on aquatic ecosystems. Sewage will be generated at construction sites and if workers do not use provided chemical toilet and/ or ablution facilities sewage could potentially result in soil and surface water contamination. Hazardous substances such as cement, tar/bitumen and diesel/oil all have the potential to contaminate water sources and the surrounding environment (soil, surface/groundwater, etc.) if not managed properly

The impact management objective for this impact is:

- Prevent pollution of terrestrial and aquatic habitats; and
- Legally compliant management of solid waste.

#### **4.2.13 Socio-Economic Impacts:**

Employment Creation (positive impact):



The project may generate local temporary employment opportunities and skills development for semi-skilled and unskilled workers.

The impact management objective for this impact is:

- Maximise employment of local labour; and
- Maximise skills transfer.

Deterioration of Existing Roads (negative impact):

The increase in heavy construction vehicles and equipment and potential abnormal loads may lead to excessive wear and tear of existing provincial roads, particularly the Seaview Road.

The management objectives for this impact are:

- Minimise damage to existing road infrastructure.

#### **4.2.14 Impacts on Existing Infrastructure and Services:**

Construction activities (mainly excavations for pipeline installation) may impact existing infrastructure along servitudes and pipeline alignments. This includes damage and interference to existing pipelines, powerlines, telephone lines, provincial road crossings (e.g. Wyndomayne Road, N2 off ramp to Seaview Road, N2 on ramp from Seaview Road and potentially the N2 on and off ramps from the Seaview Road) and stormwater infrastructures (e.g. culverts and side drains – i.e. Erf 486, Erf 62/10 and Erf 80/10).

Pipelines will however be laid under provincial roads via directional drilling in order to limit disturbance to road infrastructure and avoid traffic disruptions to road users

The impact management objective for this impact is:

- Avoid damage to existing infrastructure and services.

#### **4.2.15 Impacts on Landowners and Private Property**

Pipeline construction activities may inconvenience landowners, particularly those whose driveways, gardens and fences may be intersected by the proposed pipeline alignments (particularly on the Greenbushes pipeline alignment).

The management objectives for this impact are:

- Avoid damage to private property.

### **4.3 Rehabilitation after construction**

Rehabilitation should commence immediately after construction in the relevant areas using uncontaminated topsoil previously stripped (as a result of construction activities). Rehabilitated areas should be monitored regularly and measures must be implemented to ensure that topsoil does not wash away or become infested with invasive alien plants. If erosion and/or sedimentation of downstream areas occur, appropriate measures must be implemented to prevent further erosion and to trap any excessive sediments generated during and after construction.

The management objectives for this impact are:

- Rehabilitation as soon as possible after construction to prevent impacts (refer to Section 7).

### **4.4 Operational phase**

The following impacts and associated management objectives are described for the operational phase:

#### 4.4.1 Loss of Water

Leaks or bursts in the pipeline, or failure of the reservoirs, are unlikely risks if the infrastructure is designed and built properly. However, these incidents would have the potential to cause damage to road infrastructure and adjacent land.

The management objective for this impact is:

- Ensure regular maintenance of newly installed infrastructure to prevent water loss.

#### 4.4.2 Safety issues due to potential inadequate servitude maintenance

Overgrown pipeline maintenance servitudes or alternatively over-use of service roads could result in safety concerns for vehicles accessing the pipeline or erosion and undermining of roads if not properly maintained.

The management objective for this impact is:

- Ensure regular maintenance of pipeline servitudes to prevent safety risks.

#### 4.4.3 Improved water supply

The proposed development aims to expand current bulk water supply infrastructure in order to address the future provision of potable water to the Seaview and Greenbushes supply areas. Water supply will be improved and secured within Supply Zones 1, 2, 4 & 5 for the Seaview Area and Supply Zone 7 for the Greenbushes Area. Formal water supply will also be provided to the two existing informal settlement adjacent to the existing seaview pump station complex.

The management objective for this impact is:

- Ensure optimisation of infrastructure functioning to provide improved water supply.

#### 4.4.4 Visual Impacts

A visual impact of the proposed 2.5 ML Upper Seaview Reservoir from the Seaview Road could potentially occur if it is not adequately designed or positioned in relation to the landscape. The proposed reservoir site is hidden within the forest (large trees) which will act as a natural visual barrier if forest is not unnecessarily cleared during construction.

The management objective for this impact is:

- Minimise visual impacts resulting from the proposed Upper Seaview Reservoir.

#### 4.4.5 Aquatic Impacts

Sedimentation of wetlands during operation can occur should soil become exposed in areas due to inadequate rehabilitation measures or erosion. The construction of infrastructure services and roads in watercourses could potentially influence the natural hydrology of the system if designs do not allow for flows to be similar to the pre-development scenario.

The management objectives for this impact are:

- Ensure ongoing rehabilitation of eroded areas; and
- Ensure the natural hydrology of stormwater and stream flows are not altered.

#### 4.4.6 Socio-Economic Impacts

There is a potential for local job creation for pipeline and access road maintenance works during the operational phase of the project.

The management objectives for this impact are:

- Ensure the services of local contractors are used for maintenance activities.

## 4.5 Closure/ Decommissioning Phase

The life expectancy of the new infrastructure is approximately 50 years. It is however unlikely that the pipelines will be decommissioned. However, should the pipeline be decommissioned, a Decommissioning Plan must be prepared and implemented, to mitigate and manage potential negative impacts on the biophysical and socio-economic environments. Post closure measures are not applicable for the listed activities.

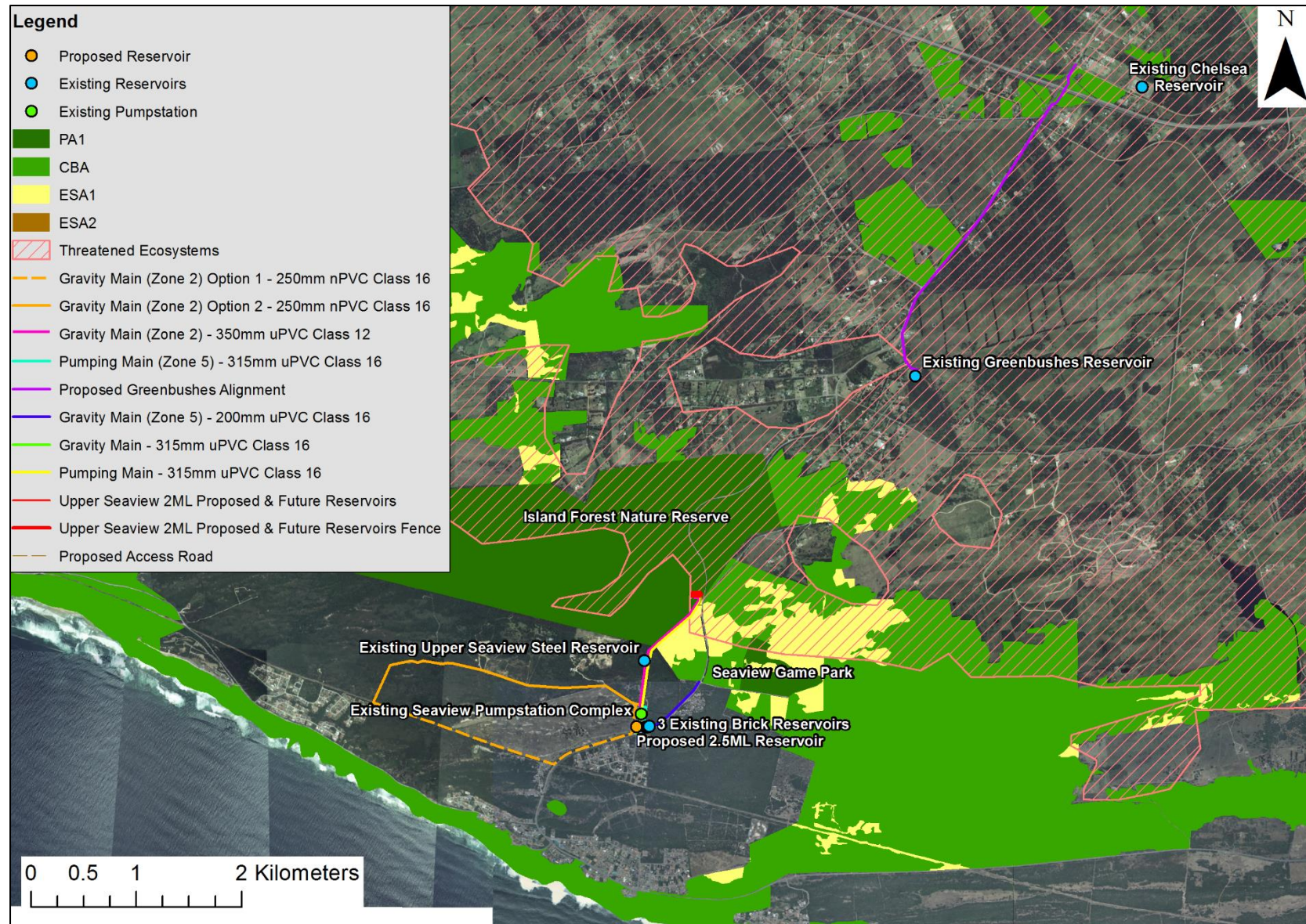


Figure 2: Terrestrial CBA and protected area map for the proposed alignments



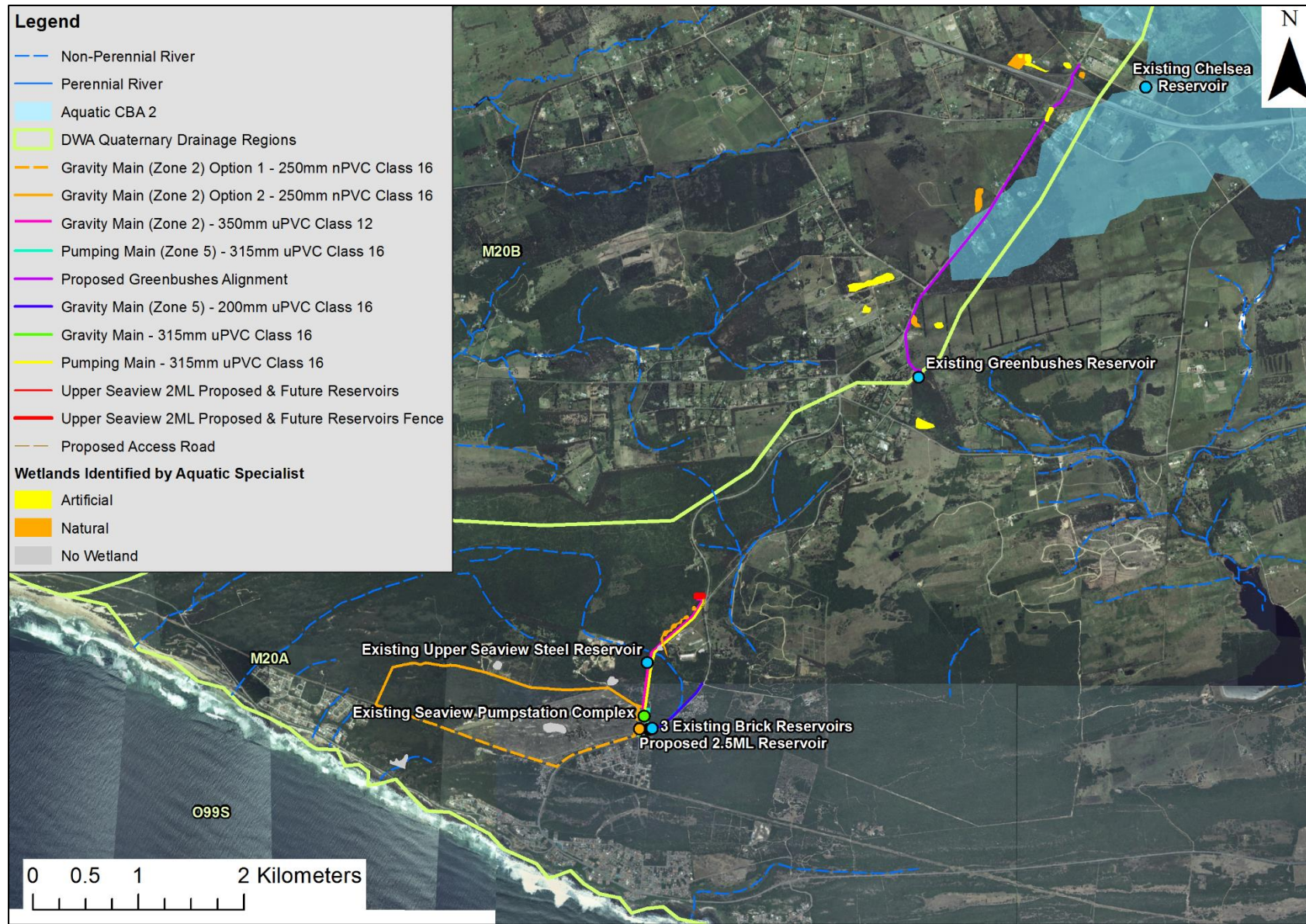


Figure 3: Aquatic systems surrounding the proposed site

## 5 Impact Management

This section specifies the impact management outcomes and impact management actions required for the aspects and potential impacts related to the proposed bulk water infrastructure expansion. The manner in which the impact management objectives and outcomes, identified above, will be achieved. Where applicable actions will include activities 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

The above are detailed in Table 2 and Table 3 for the construction and operational phases respectively.

**Table 2: Mitigation and management measures for the construction phase**

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
Construction and domestic waste generated during construction	<p><u>Waste Management Impacts</u></p> <p><u>Solid Waste</u></p> <p>Construction waste as well as small amounts of domestic waste will be generated. Lack of proper management of the waste on the site may lead to wind-blown litter and contamination. Pollution and accumulation of construction waste such as rubble, creates a negative visual impact and could potentially have an impact on surrounding natural ecosystems.</p>	<p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>• All non-hazardous waste generated on site shall be collected and appropriately disposed of at a registered municipal landfill site;</li> <li>• Appropriate scavenger-proof solid waste receptacles fitted with lids must be provided and must be regularly emptied. The contractor shall be responsible for the disposal of domestic waste generated as a result of work activities;</li> <li>• Recycling of waste per waste stream and reuse of waste where possible must be undertaken. Waste receptacles should be labelled accordingly;</li> <li>• Where possible, waste should be recycled and re-used;</li> <li>• No waste is to be buried or burned on the site;</li> <li>• Littering and contamination of ground or water sources during construction must be prevented by effective construction camp management;</li> <li>• Littering is strictly prohibited. Litter shall be disposed of in the on-site bins;</li> <li>• Records of disposal of all waste generated on site shall be maintained; and</li> <li>• All temporary soil stockpiles, construction materials, litter and rubble must be</li> </ul>	Duration of construction	Contractor and Sub-contractors



Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
		removed on completion of construction activities. No dumping or burning of waste material is permitted.		
	<p><u>Sewage management</u> Sewage will be generated at construction sites and if workers do not use provided chemical toilet and/ or ablution facilities sewage could potentially result in soil and surface water contamination.</p>	<p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>• Chemical toilets must be provided for workers and these must be regularly serviced (and proof of correct sewage disposal maintained for auditing purposes);</li> <li>• The construction camp and necessary ablution facilities meant for construction workers must be beyond the 32m of any of the watercourses;</li> <li>• Toilets are to be provided by the contractor for workers at a ratio of at least 1 toilet per 20 workers or as per specifications of the supplier, and must be situated in close proximity to all work areas;</li> <li>• Prohibit the use of natural areas as toilets; and</li> <li>• Monitor the sewerage facilities for spillages, and handle any spillages as hazardous waste.</li> </ul>	Duration of construction	Contractor and Sub-contractors
Operation of construction vehicles and traffic control measures and use of equipment, including maintenance	<p><u>Traffic Safety</u> Equipment, materials and possible abnormal loads will need to be transported to site using existing provincial roads which may result in traffic congestion and disruptions. There is also a possibility for temporary blocking off of section of one lane in certain areas due to construction vehicles and activities occurring within the road reserve which may extend slightly into the road. This will therefore present a temporary safety risk for vehicles travelling on the Seaview Road.</p>	<p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>• Ensure that there are flag men in place on the Seaview Road at access points to construction work fronts;</li> <li>• Contractor must identify optimal ways to minimize disruptions and interruptions to traffic;</li> <li>• Existing roads must be utilised as far as reasonably practical;</li> <li>• Use appropriate road signage, in accordance with the South African Traffic Safety Manual, providing flagmen, barriers etc. at the various access points, when necessary;</li> <li>• Establish speed limits (not more than 40km per hour) for all construction related traffic;</li> <li>• Ensure that heavy construction vehicles are suitably marked to be visible to other road users and pedestrians;</li> <li>• Operation, storage and maintenance of machinery and construction-related equipment in close proximity to wetlands must be limited as far as possible;</li> </ul>	Duration of construction	Contractor and NMBM

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
		<ul style="list-style-type: none"> <li>No unnecessary driving over verges and/or private property;</li> <li>Appropriate traffic warning signage to be in place; and</li> <li>It is recommended that abnormal loads and vehicles transporting materials to site avoid peak traffic hours.</li> </ul>		
	<p><u>Deterioration of existing roads</u></p> <p>The increase in heavy construction vehicles and equipment and potential abnormal loads may lead to excessive wear and tear of existing provincial roads, particularly the Seaview Road</p>	<p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>Ensure that vehicle axle loads do not exceed the technical design capacity of provincial roads;</li> <li>Establish speed limits (not more than 40km per hour) for all construction related traffic;</li> <li>Ensure that construction vehicle tyres are inflated according to the manufacturer's specifications for optimum load/inflation pressure; and</li> <li>No indiscriminate driving will be allowed by construction vehicles.</li> </ul>	Duration of construction	Contractor
	<p><u>Contamination of soil</u></p> <p>Soils could be contaminated by potential plant and equipment leaks and/ or spills or could be contaminated with subsoil (which cannot be used for rehabilitation).</p>	<p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>Maintenance of equipment on site is prohibited;</li> <li>Drip trays must be in place under all leaking equipment and during re-fuelling of equipment;</li> <li>Plant and equipment must be checked regularly for potential leaks and ground / soil pollution (hydrocarbon spillages). Action must be taken as soon as spillages have been identified; and</li> <li>Machinery and vehicles are to be removed from site for maintenance and repair. No repair / maintenance will be conducted on site.</li> </ul>	Duration of construction	Contractor
Storage and handling of environmentally hazardous materials	<p><u>Contamination of soil and water</u></p> <p>Leaks and spills of environmentally hazardous materials (e.g. cement, oils and fuels) has the potential to impact on surface and/ or groundwater resources if not correctly managed. Accidental spills of hydrocarbons (oils, diesel, etc.)</p>	<p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be administered;</li> <li>Spillages should be cleaned up immediately and contaminants properly drained and disposed of using appropriate waste facilities (not to be disposed of within the natural environment). Any contaminated soil from the construction site must be removed and disposed of appropriately;</li> </ul>	Duration of construction	Contractor

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
	<p>or leakage of such substances from construction machinery may enter the watercourse directly, through surface runoff during rainfall events or subsurface movement (through groundwater) and then migrate to downstream systems. Such chemicals, fuels or pollutants would alter the water quality within the systems, having an effect on ecology.</p>	<ul style="list-style-type: none"> <li>• Drip-trays must be provided beneath standing vehicles and machinery, and routine checks should be done to ensure that these are in a good condition;</li> <li>• No waste water or hazardous substances will be disposed of into the surrounding environment;</li> <li>• Storage areas for hazardous material must be concreted, bunded, covered, labelled and well ventilated;</li> <li>• All fuel, oil and other hydrocarbon storage areas will be bunded to contain 110% of the stored volume;</li> <li>• Bunded areas will be constructed of a material impermeable to the hazardous substance stored within;</li> <li>• The bunded areas will be constructed with an internal sump whereby spillages will easily flow and allow for easy clean up;</li> <li>• Bunded areas will be clearly marked with their volume capacity and appropriate safety signage;</li> <li>• Spill kits to be made available at areas of possible spillages of hazardous substances;</li> <li>• Rainwater entering the bunded areas, will be considered hazardous and will be treated as such;</li> <li>• Should the bunded areas be damaged, this will be immediately rectified.</li> <li>• Contaminated soils and materials should be disposed of in a separate hazardous waste bin prior to collection and disposal; and</li> <li>• All hazardous waste must be disposed of at a registered hazardous waste disposal facility and proof of disposal maintained.</li> </ul> <p>Should cement be used on site, the following guidelines apply:</p> <ul style="list-style-type: none"> <li>• Any cement batching activities should occur outside of the delineated wetland boundaries and conducted on an impermeable surface. Cement products/ wash may not be disposed of into the natural environment;</li> <li>• Carefully control all on-site operations that involve the use of cement and concrete;</li> </ul>		

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
		<ul style="list-style-type: none"> <li>• Limit cement and concrete mixing to single sites where possible;</li> <li>• Use plastic trays or liners when mixing cement and concrete: Do not mix cement and concrete directly on the ground;</li> <li>• Dispose of all visible remains of excess cement, cement bags and concrete after the completion of tasks at a licensed waste disposal facility; and</li> <li>• Dispose of in the approved manner (solid waste concrete may be treated as inert construction rubble, but wet cement and liquid slurry, as well as cement powder must be treated as hazardous waste).</li> </ul>		
Clearing of vegetation for construction works as well as earthworks, vehicle movement on unpaved surfaces and stockpiling of soils	<p><u>Impacts on Terrestrial Ecology:</u></p> <p>Loss and disturbance of fauna and flora habitat and biodiversity and the spread of invasive alien vegetation may be promoted through the disturbance to land.</p>	<p><u>DESIGN MEASURES:</u></p> <ul style="list-style-type: none"> <li>• Ensure design plans specify construction footprints within servitudes which are to be adequately demarcated during the construction phase;</li> <li>• It is recommended that vegetation within the future planned reservoir construction area be left intact until commencement of future construction activities; and</li> <li>• The 2.5 ML Upper Seaview Reservoir must be accurately surveyed and marked prior to vegetation removal or commencement of construction. In addition, it is recommended that the fence line for the reservoir first be erected prior to establishment of the reservoir in order to contain construction activities and minimise the construction footprint.</li> </ul> <p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>• It is recommended that a Botanical Specialist survey of the final development footprint be undertaken prior to commencement of construction works to identify any protected plants or trees in terms of all relevant legislation that may require a permit for destruction and/ or translocation;</li> <li>• A permits in terms of Section 7 and 15 of the National Forest Act of 1998 must be obtained prior to commencement of construction;</li> <li>• Construction footprints must be demarcated to minimise unnecessary clearing of vegetation and disturbance to soils;</li> <li>• Sensitive vegetation that may be impacted by construction activities should be cordoned off prior to clearing and earthworks activities to restrict the</li> </ul>	Design, construction and defects liability period (1 year)	Engineers, Contractor, ECO and Search and Rescue Team

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
		<p>movement of vehicles and potential disturbance to vegetation;</p> <ul style="list-style-type: none"> <li>• Immediately prior (i.e. a few days before) to excavation, vegetation within the construction footprint should preferably be cleared by brush cutters / slashers to encourage any fauna and reptiles present to move out of the area;</li> <li>• Excavation of trenches as well as clearing of vegetation to be conducted in a phased manner;</li> <li>• Minimise cleared and disturbed areas by using already transformed areas where possible. An already transformed area should also be utilised for the contractor's site camp;</li> <li>• All cleared vegetation (other than invasive aliens) should preferably be chipped and used as mulch;</li> <li>• Rehabilitation of cleared areas with topsoil and indigenous vegetation as soon as construction is completed (refer to Section 7). Disturbed areas will be ripped and scarified in order to promote vegetation growth. A seed mix of indigenous vegetation species will be prepared for the rehabilitation of the site should natural vegetation not succeed;</li> <li>• Use existing access roads and do not establish any new roads without authorisation;</li> <li>• Harvesting or removal of any plant material is strictly prohibited – other than for search and rescue purposes (with permits in place) and for the authorised clearing of vegetation for construction;</li> <li>• Appoint an independent Environmental Control Officer (ECO) for the duration of the construction to monitor construction activities;</li> <li>• Pipeline cross section widths and working spaces (i.e. construction footprints) must be identified and agreed upon in consultation with the ECO – working spaces must consider space required for: <ul style="list-style-type: none"> <li>○ Battering of trench slopes;</li> <li>○ Storage of topsoil;</li> <li>○ Storage of excavated material suitable for backfill/ unsuitable for backfill;</li> </ul> </li> </ul>		

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
		<ul style="list-style-type: none"> <li>○ Storage of bedding sand;</li> <li>○ Stringing of pipe along the trench before installation;</li> <li>○ Machinery and equipment along the trench before installation;</li> <li>○ Limitations where alignments cross environmentally sensitive areas; and</li> </ul> <ul style="list-style-type: none"> <li>• Pipeline installation and reservoir establishment Method Statements must include environmental considerations and must be forwarded to the ECO for approval before construction.</li> <li>• The SSC noted in Table 1 of this report will require permits from the respective departments where appropriate;</li> <li>• Certain species (such as trees and cosmopolitan species that are however protected by the legislation) are not necessarily suited to relocation and permits must be obtained before destruction;</li> <li>• The Vegetation Specialist recommended that any <i>Acrolophia capensis</i> and <i>Scadoxus puniceus</i> species (Protected by the Provincial Nature Conservation Ordinance of 1974) within any areas to be destroyed be translocated as they are suited to relocation. Dormant species including bulbs and species belonging to the Iridaceae were not observed but may be present within the proposed servitude. These should be relocated during the construction phase if necessary;</li> <li>• Cleared invasive alien plants must be removed and disposed of at the landfill and proof retained for auditing purposes;</li> <li>• Remove all invasive alien plants from disturbed areas before they reach seed-bearing age. This needs to occur on a regular basis (at least monthly) until the end of the contractor's liability period (refer to Section 6); and</li> <li>• CARA listed species require removal as per Conservation of Agricultural Resources Act and a management plan should be incorporated into the EMPr to retain the servitude invasive free.</li> </ul>		
	<u>Impacts on Fauna and Faunal</u>	<u>CONSTRUCTION MEASURES:</u>	Duration of	Contractor



Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
	<p><u>Habitat</u></p> <p>Clearance of vegetation and earthworks activities will have a direct impact on fauna and reptile habitats.</p>	<ul style="list-style-type: none"> <li>Immediately prior (i.e. a few days before) to excavation, vegetation within the construction footprint should preferably be cleared by brush cutters / slashers to encourage any fauna and reptiles present to move out of the area; and</li> <li>No faunal or reptile species are to be disturbed, trapped, hunted or killed.</li> </ul>	Construction	
	<p><u>Impacts on Soil and landscape</u></p> <p>The clearing of vegetation for proposed works will expose soils and increase the risk of soil erosion through wind and storm water run-off, particularly on slopes and potential embankment cuttings.</p>	<p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>Erosion due to work undertaken on steep slopes must be avoided through the implementation of appropriate erosion control measures.</li> <li>The construction process should be phased so as to limit the extent of exposed areas at any one time, and so that for any specific area, the time between initial disturbance and completion of construction is as short as possible;</li> <li>To minimise the risk of erosion, the extent of disturbed vegetation and soil should be kept to a minimum;</li> <li>Topsoil must be stripped from the proposed pipeline footprint and stockpiled (separately from subsoil) for further use in rehabilitation;</li> <li>Topsoil should only be exposed for minimal periods of time and adequately stockpiled (less than 1.5 m high) to prevent the topsoil loss and runoff. They should furthermore be protected against erosion of wind through covering or barricading;</li> <li>Ensure the pipeline is aligned and constructed as to take into account any undermining activities. Any potential embankment cuttings must be appropriately stabilised and revegetated;</li> <li>Note that authorisation from the Department of Mineral Resources is required for the establishment of borrow pits should material be required for the establishment of the Upper Seaview Reservoir access road or any potential maintenance works; and</li> <li>Cut and fill to be avoided as far as reasonably practical.</li> </ul>	Duration of Construction	Contractor
	<p><u>Aquatic Impacts</u></p> <p>Destruction of wetland habitat,</p>	<p><u>CONSTRUCTION:</u></p> <ul style="list-style-type: none"> <li>All stockpiles must be protected from erosion, stored on flat areas where run-</li> </ul>	Duration of Construction	Contractor

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
	sedimentation into wetlands and pollution into wetlands and potential to affect water quality.	<p>off will be minimised, and be surrounded by bunds;</p> <ul style="list-style-type: none"> <li>• Stockpiles must be located away from river channels;</li> <li>• Preventing wet conditions to develop on the road reserve in the case of Wetlands 4 and 9. Drainage systems should allow water to flow through a pipe, under the road. This will prevent damming and the enhanced wetland conditions on the road reserve will disappear;</li> <li>• Care should be taken to ensure that the construction does not create new depressions where water can accumulate;</li> <li>• Proper drainage and management of stormwater is necessary to avoid undesirable accumulation of rainwater and erosion;</li> <li>• Avoid erosion at all times to avoid sedimentation or pollution of nearby wetlands or drainage lines. Erosion control measures should form part of the planning as well as the construction and implementation phases of the development. A rehabilitation plan should be put into place that will address any erosion of the general area;</li> <li>• Re-vegetating of cleared areas with suitable indigenous species as soon as possible after the disturbance, together with an alien species monitoring and eradication program during the liability period should prevent encroachment of alien species.</li> <li>• Construction activities must be limited to the pipeline servitude. No vehicles may moves across any watercourse or wetland area;</li> <li>• Wetlands and watercourses (go and no-go areas) will be demarcated and no activity will be allowed within no-go areas, unless otherwise approved by the ECO;</li> <li>• Authorisation must be obtained from the Department of Water and Sanitation for the WULA's for the wetlands identified by the Aquatic Specialist;</li> <li>• The construction site camp should not be sited within 50 m of any wetland or watercourse and preferably further away if possible;</li> <li>• Any erosion gullies/ channels created during construction should be filled immediately to ensure silt does not drain into the wetland; and</li> </ul>		

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
		<ul style="list-style-type: none"> <li>Should sedimentation and erosion of the pipeline servitude/ construction site prove to be significant, erosion berms in the pipeline servitude are recommended to be installed and/ or sediment barriers (e.g. silt fences, sandbags or hay bales) immediately downstream of active work areas (particularly on channel banks) as necessary, to trap any excessive sediments generated during construction.</li> </ul>		
	<p><u>Nuisance Impacts</u></p> <p>Impacts on the air quality of the surrounding area, such as the generation of dust, and exhaust emissions.</p>	<p>Impacts on air quality:</p> <p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>Dust suppression measures (e.g. dust shields and wetting) need to be implemented to reduce the liberation of dust (especially under windy conditions and in high traffic areas);</li> <li>Construction footprints must be demarcated to minimise unnecessary clearing of vegetation and disturbance to soils;</li> <li>Avoid clearing of vegetation until such time excavations are required;</li> <li>Excavation of trenches as well as clearing of vegetation to be conducted in a phased manner;</li> <li>An environmental complaints register must be made available and should any complaints be received (including dust complaints), these should be logged in the complaints register and reported to the responsible person on site. The register must list:                             <ul style="list-style-type: none"> <li>Complainant name and contact details;</li> <li>Date complaint was lodged;</li> <li>Person who recorded complaint;</li> <li>Nature of complaint;</li> <li>Actions taken to investigate the complaint and outcome of the investigation;</li> <li>Action taken to remedy the situation;</li> <li>Date on which feedback was provided to complainant;</li> </ul> </li> <li>Subsoil from trenches must be used for backfill and should additional</li> </ul>	Duration of construction	Contractor

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
		<p>material be left, it should be disposed of to landfill;</p> <ul style="list-style-type: none"> <li>• If possible, locate soil stockpiles in sheltered areas where they are not exposed to wind;</li> <li>• Topsoil stockpiles must be used for rehabilitation;</li> <li>• There should be strict speed limits on dusty roads (i.e. not more than 40km per hour); and</li> <li>• Bare surfaces must be rehabilitated as soon as possible with indigenous vegetation that will be able to grow in the area.</li> </ul> <p>Noise impacts:</p> <p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>• Construction activities to be limited to normal working hours 06h00-18h00 Mondays – Saturdays and 08h00 – 14h00 on Sundays);</li> <li>• Should after-hours work be required, residents must be given notice beforehand;</li> <li>• All operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993);</li> <li>• No sound amplification equipment such as sirens, loud hailers or hooters are to be used on site except in emergencies and no amplified music is to be permitted on site;</li> <li>• Equipment that is fitted with noise reduction facilities (e.g. side flaps, silencers, etc.) must be used as per operating instructions and maintained properly during site operations;</li> <li>• Maintain construction equipment and vehicles in good working order; and</li> <li>• A complaints register must be made available and should any complaints be received, these should be logged in the complaints register and reported to the responsible person on site.</li> </ul>		

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
	<p><u>Stormwater Impacts</u></p> <p>Activities could change the profile of road reserves and negatively impact stormwater flow paths.</p>	<p><u>DESIGN MEASURES:</u></p> <ul style="list-style-type: none"> <li>Scour chambers must be designed to prevent scour damage and erosion where raw water is to be discharged; and</li> <li>Design measures must accommodate pipeline watercourse crossings as during flooding events, pipelines can be exposed to damage. Appropriate stormwater design and mitigation measures must be implemented at these points (i.e. crossing at the Seaview 350 mm Gravity Main and 315 mm Rising Main) and any other watercourse crossings along proposed alignments.</li> </ul> <p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>Correct drainage measures must be installed and disturbed areas must be suitably levelled following installation of the pipelines and associated ancillaries;</li> <li>Natural and artificial drainage gradients must be reinstated;</li> <li>Stockpiling will only be done in areas that will not interfere with the natural drainage paths of the environment;</li> <li>Steep areas may require berms and temporary drainage diversion;</li> <li>Appropriate dewatering measures must be in place and discharge from any pumps shall be disposed of in accordance with the instructions given by the ECO; and</li> <li>Installation of permanent drainage measures and rehabilitation of disturbed areas must be implemented as early as possible.</li> </ul>	Design and duration of construction	Engineer and Contractor
Excavation activities	<p><u>Archaeological, Cultural/ Historical and Palaeontological disturbance:</u></p> <p>Damage or destruction of archaeological, cultural or historical and palaeontological resources.</p>	<p>Historical/Cultural Heritage</p> <p><u>DESIGN MEASURES:</u></p> <p>Before the commencement of construction activities, a historian must be appointed to provide input regarding the age and historical value of the potential heritage structures (i.e. brick reservoirs at Seaview Pump Station Complex and Upper Seaview Steel Reservoir) should they need to be demolished, and whether a permit would be required before demolition.</p>	Design	NMBM and Historian
		Archaeology	Duration of	Contractor, ECO and

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
		<p><u>CONSTRUCTION MEASURES</u></p> <ul style="list-style-type: none"> <li>An archaeologist should be appointed to monitor the vegetation clearing of the areas that could not be covered during the survey owing to inaccessibility. Further recommendations on whether an archaeologist should conduct further monitoring during the excavations for the infrastructure or possible phase 2 mitigation should be at the discretion of the appointed archaeologist monitoring the area on the results of the vegetation clearing;</li> <li>The environmental control officer (ECO) as well as the construction managers/ foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites; and</li> <li>If concentrations of archaeological and/ or historical heritage material, marine shells, and / or human remains are uncovered during construction, all work must cease immediately and be reported to the Albany Museum (Tel. 046 622 2312) and/or the Eastern Cape Provincial Heritage Resources Agency (ECPHRA) (Tel. 043 745 0888) so that systematic and professional investigation/ excavation can be undertaken.</li> </ul>	construction	Archaeologist
		<p><u>CONSTRUCTION MEASURES</u></p> <p>Palaeontology</p> <ul style="list-style-type: none"> <li>Monitoring of all substantial (&gt; 1m) bedrock excavations on an on-going basis for chance fossil finds (e.g. petrified wood, shells, bones &amp; teeth) by ECO;</li> <li>Reporting of new palaeontological finds to ECPHRA for possible specialist mitigation. Should any well-preserved fossil remains (e.g. vertebrate bones and teeth, petrified wood, plant or trace fossil assemblages, fossil shells) be encountered during excavation, these should be safeguarded, preferably in situ, and reported by the ECO to ECPHRA (i.e. The Eastern Cape Provincial Heritage Resources Authority. Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; smokhanya@ecphra.org.za and/or the Albany Museum, Somerset Street, Grahamstown (+27 46 622 2312)). This is necessary so that the fossil specimens may be professionally examined, recorded and, if necessary, excavated at the</li> </ul>	Duration of construction	NMBM, Contractor and ECO and potentially a Palaeontology Specialist

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
		<p>developer's expense; and</p> <ul style="list-style-type: none"> <li>The specialist involved would require a collection permit from SAHRA (Contact details: Mrs Colette Scheermeyer, P.O. Box 4637, Cape Town 8000; Tel: 021 462 4502; Email: cscheermeyer@sahra.org.za). Fossil material must be curated in an approved repository (e.g. museum or university collection) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.</li> </ul>		
	<p><u>Impacts on Fauna and Faunal Habitat</u></p> <p>Clearance of vegetation and earthworks activities will have a direct impact on fauna and reptile habitats. Gathering of stormwater in open trenches during construction may also pose a risk to the livelihood of fauna. Clearing of large trees could result in destruction of animal and bird habitats. Noise resulting from construction activities may furthermore displace and disturb local wildlife.</p>	<p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>Any trees that are to be cut down should be checked by the ECO for any nests that could be impacted;</li> <li>Ends of trenches to be sloped to allow trapped animals to escape;</li> <li>Trenches to be checked by construction staff daily to assist any trapped animals; and</li> <li>Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This can be prevented by excavating and backfilling trenches as construction progresses.</li> </ul>	Duration of construction	Contractor and ECO
	<p><u>Damage and/ or interruption of services</u></p> <p>Damage or destruction of existing service infrastructure and/ or private property.</p>	<p><u>DESIGN MEASURES:</u></p> <ul style="list-style-type: none"> <li>Identify and demarcate existing utilities and in-situ services prior to construction;</li> <li>Ensure that routing of the pipelines prevent the disruption of services as far as possible and that effective communication is maintained with utility providers to avoid and minimize interruptions of services during pre-construction and construction;</li> <li>Ensure Eskom is approached to agree upon appropriate safety clearance distances when working under powerlines and potential need for temporary disconnection of powerlines; and</li> </ul>	Design and Duration of construction	Engineer and Contractor

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
		<p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>Should any damage to existing infrastructure or private property occur, the relevant service provider/ landowners should be contacted and appropriate repairs/ replacements commissioned to the satisfaction of the service provider /landowner.</li> </ul>		
	<p><u>Landowner issues and private property</u></p> <p>Pipeline construction activities may inconvenience landowners, particularly those whose driveways may be intersected by the proposed pipeline alignments.</p>	<p><u>CONSTRUCTION MEASURES:</u></p> <ul style="list-style-type: none"> <li>Notice (in advance) to be given to all neighbours whose property will be affected by pipeline crossings; and</li> <li>Contractors to establish landings over private property driveways.</li> </ul>	Duration of construction	Contractor
Workers on site	<p><u>Employment opportunities and skills development</u></p> <p>There would be a positive socio-economic impact as a number of short term jobs (i.e. 45) will be created during the construction phase. This will result in skills development for semi-skilled and unskilled workers</p>	<p><u>CONSTRUCTION MEASURES</u></p> <ul style="list-style-type: none"> <li>Maximise opportunities for the training of unskilled workers from local communities and use local sub-contractors, where possible;</li> <li>Increase employment opportunities (e.g. secondary service provision of food, toilet hires, and equipment etc.); and</li> <li>Source construction materials from local sources and suppliers, where possible.</li> </ul>	Duration of construction	NMBM and Contractor
	<p><u>Potential Fires</u></p> <p>Presence of construction workers on site may lead to various impacts on the surrounding area and disturbance such as fire.</p>	<p><u>CONSTRUCTION MEASURES</u></p> <ul style="list-style-type: none"> <li>No fires are permitted on site;</li> <li>Smoking shall only be permitted in designated smoking areas in the site camp;</li> <li>A fire officer shall be appointed by the contractor who shall be responsible for co-ordinating rapid, appropriate responses in the event of a fire; and</li> <li>Sufficient fire-fighting equipment shall be maintained and accessible on site at all times.</li> </ul>	Duration of construction	Contractor



**Table 3: Mitigation and management measures for the operational phase**

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
Pipeline and related infrastructure maintenance	<u>Loss of water</u> Due to the potential wear and tear of pipes and reservoirs if not regularly maintained	<u>OPERATIONAL MEASURES:</u> <ul style="list-style-type: none"> <li>Pipelines and reservoirs should be regularly inspected for any possible damage or corrosion to prevent water leakages. Any damaged pipes should be immediately replaced; and</li> <li>Any maintenance activities required must be carried out in accordance with the construction mitigation measures as listed above (Construction Phase).</li> </ul>	Duration of operation	NMBM
Servitude maintenance	<u>Safety issues</u> Due to potential inadequate servitude maintenance and sedimentation of wetlands due to inadequate erosion control as well as potential wetland hydrology alteration.	<u>OPERATIONAL MEASURES:</u> <ul style="list-style-type: none"> <li>According to the Engineer's design report, a complete operation and maintenance manual with a training programme will be supplied in duplicate by the Engineer to the Nelson Mandela Bay Municipality on commissioning of the project. Nelson Mandela Bay Municipality will be responsible for the operation and maintenance of the proposed infrastructure. The NMBM must ensure that access road servitudes are appropriately maintained;</li> <li>Ensure that the natural hydrology and stormwater flows are maintained; and</li> <li>Any erosion gullies/ channels that occur during operation must be filled, stabilised and revegetated as soon as possible as part of maintenance procedures. Also, disturbed and bare ground surfaces should be rehabilitated with suitable indigenous vegetation to stabilise soils.</li> </ul>	Duration of operation	NMBM
	<u>Local Job Creation</u> Potential for local job creation for pipeline and access road maintenance works	<u>OPERATIONAL MEASURES:</u> During pipeline routine maintenance and repair work, the Municipality should use the services of local contractors based on the Expanded Public Works Programme and NMBM Exempted Micro-Enterprises Supply Chain requirements.	Duration of operation	NMBM
Establishment of 2.5 ML Upper Seaview Reservoir	<u>Potential Visual Impacts</u> Potential visual impact of the proposed 2.5 ML Upper Seaview Reservoir from the Seaview Road if it is not adequately designed or positioned in	<u>DESIGN MEASURES:</u> <ul style="list-style-type: none"> <li>The proposed 2.5 ML Upper Seaview Reservoir must be designed and positioned in such a way to minimise its visual appearance from the Seaview Road. The engineering design should be based on site topography and adjacent vegetation;</li> <li>Avoid use of intrusive lighting; and</li> </ul>	Design duration and operation	Project Engineers and NMBM

Environmental Aspect	Potential Environmental Impact	Recommended Mitigation measures		
		Management and mitigation measure	Time-frame	Responsibility
	relation to the landscape.	<ul style="list-style-type: none"><li>Avoid unnecessary clearing of forest which naturally acts as a visual barrier.</li></ul>		

## 6 Alien Vegetation Management Plan

All alien invasive and declared weeds, in terms of the Conservation of Agricultural Resources Act (CARA, Act 43 of 1983) as well as the Alien and Invasive Species Regulations (2014) of the National Environmental Management: Biodiversity Act (NEMBA, Act 10 of 2004) are to be systematically eradicated, and any of these species colonising disturbed ground after the completion of construction are to be eradicated and destroyed prior to attaining the seed formation phase.

The following measures are to be implemented in all disturbed areas to control the spread of alien vegetation:

- i) All alien invasive species and declared weeds must be identified and systematically removed (manually if possible), prior to attaining the seed formation;
- ii) A record of all invasive species found during construction and operation in open areas is to be kept and updated;
- iii) Utilize registered herbicides approved by the ECO/ Conservation Official where required. Only people suitably trained in herbicide application are to administer the chemicals;
- iv) Management measures used to control invasive plants such as the clearing and use of herbicide should be recorded;
- v) All manually cleared alien plants must be disposed of carefully and must not be dumped in any areas of indigenous vegetation, even temporarily;
- vi) Species-specific control measures should be used (see below measures);
- vii) Monitoring for the duration of the construction period is to be undertaken by the ECO together with general construction audits (described in section 8 below); and
- viii) Annual monitoring is to take place after construction has been completed by the ECO until rehabilitation of the area is complete and to the satisfaction of the Conservation Official.

### Species Specific Control Measures

The following control measures are specific to the species listed below which are likely to be found in disturbed areas along the pipeline alignment.

#### Acacia species

*Acacia cyclops* (rooikrans), *Acacia longifolia* (long-leaved wattle), *Acacia mearansii* (black wattle) and *Acacia saligna* (Port Jackson Willow) need to be controlled on a continuous basis as the plants easily coppice and produce large quantities of seed that remain dormant for extended periods of time. Seed germination is stimulated by fire. Any large scale clearing must be followed up with several rounds of manual removal of seedlings and herbicide application. Control of this species is difficult and is a long-term process.

## 7 Rehabilitation Plan

The following measures are applicable to all disturbed areas resulting from construction activities:

- i) The contractor shall be responsible for the re-establishment of vegetation on all areas disturbed during construction. This responsibility shall extend until expiry of the defects liability period;
- ii) No exotic plants may be used for rehabilitation purposes. Only indigenous plants of the area may be used. Rehabilitation should be based on the original plant species composition of the plant community affected by the development;

- iii) Rehabilitation of the disturbed areas must be implemented as soon as construction in that particular area is complete to stabilise topsoils and to maximise viability of the natural seed bank and reduce loss of topsoil during storage;
- iv) Disturbed soils around construction areas should be suitably prepared (e.g. removal of alien vegetation, loosening of the soil if required, and spreading of topsoil);
- v) No seeding of replaced topsoil should be required, unless topsoil has been stored for a period longer than 12 months. Stockpiles should ideally be stored for no longer than six months;
- vi) Rehabilitated areas should be watered bi-weekly for the first two months after rehabilitation. If sufficient plant growth has not established after a two month period, the still exposed areas (particularly on slopes) should be hydroseeded with an indigenous seed mix (specialist guidance shall be sought to determine the exact requirements) to prevent erosion of those areas. This should be guided and monitored by the ECO;
- vii) The use of seed nets is recommended to prevent erosion;
- viii) Rehabilitation of slopes must be carried out so as to ensure the recovery of established drainage patterns; and
- ix) All compacted areas that do not form part of the footprint of the activity (including the contractor camp site and spoil sites) must be ploughed/ scarified, landscaped to approximate the natural slope of the area and aerated followed by re-vegetation.

## 8 Monitoring, Reporting and Auditing

Site inspections by an Environmental Control Officer (ECO) must be conducted on a monthly basis during construction to ensure continued compliance with the conditions of the environmental authorisation and the measures contained in the approved EMPr.

Monthly audit reports are to be prepared by the ECO and submitted to the developer, engineering representative, contractor, and competent authority.

Monitoring measures during the operational phase is as follows:

- Regular visual inspections must be conducted of bulk water infrastructure to check for wear or damage according to an infrastructure maintenance plan.

## 9 Environmental Awareness Plan

On-site training must be provided for all contractors and personnel during both the construction and operational phases of the project. No personnel may be allowed onto site without having been instructed on the requirements of the approved EMPr and the Environmental Authorisation conditions.

The training must deal specifically with triggers that would require the implementation of mitigation measures contained in the EMPr. These include, but are not limited to:

- Identification and avoidance of environmentally sensitive features on/ near the site, specifically watercourses and wetlands;
- Identification of potential heritage resources (see app for guidelines for the identification of archaeological and historical material);
- Materials handling practices; and
- Waste management practices.

It is incumbent upon the contractor to convey the sentiments of the EMPr to all personnel involved in the construction operations (including sub-contractors) and the specific provisions of the EMPr. This should be done via regular toolbox talks as well as more formal training sessions, and attendance registers maintained for auditing purposes.

## 10 Organisational Structure

The general roles and responsibilities of various parties are outlined below.

### 10.1 The Developer: Nelson Mandela Bay Municipality (NMBM)

NMBM shall ultimately be responsible for the implementation of the EMPr and shall appoint a representative, the Responsible Person (RP), who shall:

- Ensure that the Contractor is duly informed of the EMPr and associated responsibilities and implications of this EMPr;
- Monitor the Contractor's activities with regard to the requirements outlined in the EMPr;
- Act as a point of contact for local residents and community members;
- Ensure that the Contractor remedies problems in a timely manner and to the satisfaction of the authorities; and
- Notify the authorities and the Environmental Control Officer (ECO) should problems arise that are not remedied effectively, or of any change in the development or changes in project specification that could significantly impact negatively on the environment.

### 10.2 The Contractor

The contractor will be responsible for:

- Ensuring all activities on the site are undertaken in accordance with the EMPr;
- Informing all employees and sub-contractors of their roles and responsibilities in terms of the EMPr;
- Ensuring that all employees and sub-contractors comply with this EMPr; and
- The Contractor has a duty to demonstrate respect and care for the environment in which they are operating. They will be responsible for the cost of rehabilitation, to the satisfaction of the ECO, of any environmental damage that may result from non-compliance with the EMPr, environmental regulations and relevant legislation.

### 10.3 The Environmental Control Officer (ECO)

An Environmental Control Officer (ECO) who is a qualified environmental professional with the relevant environmental expertise, and independent of the RP, shall be appointed for the duration of the construction activities. The ECO's duties are as follows:

- The ECO shall undertake an initial site visit in conjunction with the Contractor, during which sensitive areas that should be avoided will be identified, and environmental concerns discussed;
- Photographs should be taken of the construction area and area allocated for the construction camp from logged (co-ordinate) points by the ECO before construction commences and after construction has been completed;
- Undertake monthly audits on the implementation of the EMPr and submit audit reports to the project engineers, NMBM and the environmental authorities on request; and
- Undertake a post-construction inspection, which may result in recommendations for additional clean-up and rehabilitation measures.

## 11 EMPr Procedure

The EMPr implementation procedure is outlined below:

- The ECO shall undertake an initial site visit in conjunction with the RP and the Contractor, during which sensitive areas that should be avoided will be identified, and environmental concerns discussed;
- Photographs should be taken of the construction area and area allocated for the construction camp from logged (co-ordinate) points by the ECO before construction commences and after construction has been completed;
- The contractor shall train his employees regarding the importance of the EMPr;
- The ECO shall undertake monthly audits of the construction activities and submit the reports to DEDEAT, the project engineers and the developer in order to ensure that the EMPr is being implemented; and
- The ECO shall undertake a final audit of the site on completion of construction and submit a Final Audit Report to DEDEAT and the developer.

# Appendices

## **Appendix A: CV of Environmental Assessment Practitioner**



## **Appendix B: Site Layout Diagram**

## **Appendix C: Contractor Code of Conduct**

## Nelson Mandela Bay Municipality (NMBM)

### ENVIRONMENTAL CODE OF CONDUCT FOR BUILDING CONTRACTORS

Contractors shall ensure that all sub-contractors, employees, suppliers, agents, etc., are fully aware of the environmental issues detailed in the Environmental Management Plan. Contractors must investigate and comply with all existing regulations and laws/ bylaws unless the Relevant Authority grants specific written authority waiving compliance with any legislation.

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

#### DO:

- Clear your work areas of litter and building rubbish at the end of each day – use the waste bins provided and ensure that litter will not blow away.
- Maintain waste removal system.
- Dispose of cigarettes and matches carefully. (These pose a fire risk and furthermore littering is an offence.)
- Use the toilet facilities provided and keep them clean.
- Report dirty or full toilet facilities.
- Prevent contamination or pollution of streams and water channels.
- Concrete batching areas should be appropriately placed and cement effluent from washing areas should be contained and evaporated and the remaining sludge disposed of at a registered disposal facility.
- Report injured animals.
- Report heritage remains immediately.
- Ensure that vehicles and machinery do not leak fuel or oils.
- Report all fuel or oil spills immediately & stop the spill continuing.
- Confine work and storage of equipment to within the immediate work area.
- Prevent excessive dust and noise.
- Use safety equipment and comply with all safety procedures.
- Ensure a working fire extinguisher is immediately at hand if any “hot work” is undertaken e.g. Welding, grinding, gas cutting etc.
- Drive on designated routes only.
- Respect existing services at all times.

#### DO NOT:

- Remove or damage vegetation without direct instruction.
- Injure, trap, feed or harm any animals – this includes birds, frogs, snakes, lizards etc.
- Remove any heritage remains.
- Make fires.
- Allow cement or cement bags to blow around.
- Litter or leave food lying around.
- Allow waste, litter, oils or foreign materials into streams.
- Enter any fenced off or marked area.
- Overnight on site.
- Speed or drive recklessly.

## **Appendix D: Guidelines for the identification of archaeological and historical material**

## **Guidelines for the identification of archaeological and historical material**

### 1. Human Skeletal material

Human remains, whether the complete remains of an individual buried during the past, or scattered human remains resulting from disturbance of the grave, should be reported. In general the remains are buried in a flexed position on their sides, but are also found buried in a sitting position with a flat stone capping and developers are requested to be on the alert for this.

### 2. Freshwater mussel middens

Freshwater mussels are found in the muddy banks of rivers and streams and were collected by people in the past as a food resource. Freshwater mussel shell middens are accumulations of mussel shell and are usually found close to rivers and streams. These shell middens frequently contain stone tools, pottery, bone, and occasionally human remains. Shell middens may be of various sizes and depths, but an accumulation which exceeds 1 m<sup>2</sup> in extent, should be reported to an archaeologist.

### 3. Stone artefacts

These are difficult for the layman to identify. However, large accumulations of flaked stones which do not appear to have been distributed naturally should be reported. If the stone tools are associated with bone remains, development should be halted immediately and archaeologists notified

### 4. Fossil bone

Fossil bones may be found embedded in geological deposits. Any concentrations of bones, whether fossilized or not, should be reported.

### 5. Large stone features

They come in different forms and sizes, but are easy to identify. The most common are roughly circular stone walls (mostly collapsed) and may represent stock enclosures, remains of wind breaks or cooking shelters. Others consist of large piles of stones of different sizes and heights and are known as isisivane. They are usually near river and mountain crossings. Their purpose and meaning is not fully understood, however, some are thought to represent burial cairns while others may have symbolic value.

### 6. Historical artefacts or features

These are easy to identify and include foundations of buildings or other construction features and items from domestic and military activities.

# SRK Report Distribution Record

Report No.

Copy No.

Name/Title	Company	Copy	Date	Authorised by
Mr Andries Struwig	DEDEAT	1	06 March 2017	R Gardiner
Mr Rowan Bode	Bosch Stemele	Electronic	06 March 2017	R Gardiner
Mr David Bligh	DWS	Electronic	06 March 2017	R Gardiner
Thabo Nokoyo	DAFF	3	06 March 2017	R Gardiner
Jill Miller	NMBM	4 & Electronic	06 March 2017	R Gardiner
Librarian	Walmer Public Library	5	06 March 2017	R Gardiner
SRK Library	SRK Port Elizabeth	6	06 March 2017	R Gardiner

Approval Signature:



This report is protected by copyright vested in **SRK Consulting**. It may not be reproduced or transmitted in any form or by any means whatsoever to any person without the written permission of the copyright holder, SRK.