

**APPENDIX P: ENVIRONMENTAL MANAGEMENT PROGRAMME**



CEN INTEGRATED ENVIRONMENTAL MANAGEMENT UNIT

Environmental and Rural Development Specialist

ENVIRONMENTAL MANAGEMENT PROGRAMME

BAYHEAD AND LANGEBERG ROAD UPGRADES,

PORT OF DURBAN,

ETHEKWINI METROPOLITAN MUNICIPALITY,

KWAZULU NATAL

DFFE REFERENCE NO: 14/12/16/3/3/1/3289

WATER USE REGISTRATION REFERENCE NO: WU41941

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REVISIONS TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

Version	Date	Comment
1	23-03-2026	EMPr included in Draft Basic Assessment Report
2	16-07-2026	EMPr included in Final Basic Assessment Report Additions and changes are indicated in red

Glossary of Terms

Term	Explanation
Ambient air	Current surrounding atmospheric condition
dB(A) (decibels A-scale)	A frequency-weighted noise unit used for traffic and industrial noise measurement
Environment	The surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation
Environmental Aspect	An element of an organisation's activities, products or services that can interact with the environment
Environmental Impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services
Environmental Impact Assessment (EIA)	A study of the environmental consequences of a proposed course of action. An environmental evaluation or assessment is a study of the environmental effects of a decision, activity or undertaking. It is most often used within an IEM Planning process as a decision support tool to compare different options
Environmental Management System	The part of the overall management system that includes organisational structure, project activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy
Exotic	Any plant species not falling under the indigenous definition.
Integrated Environmental Management (IEM)	A process that involves the authorities and public, and integrates environmental issues with all aspects of Planning
Invasive	Tending to displace, or increase in cover relative to, surrounding vegetation.
Palaeontology	(study of) life in geological past, fossils

Checklist in terms of Appendix 4 of the EIA Regulations, 2014, as amended

Content Requirement for an Environmental Management Programme (Appendix 4 of the EIA Regulations, 2014, as amended)	Relevant Section in this EMPr
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	Chapter 1, Appendix C
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description	Chapter 2
(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 should be avoided, including buffers	Chapter 2
(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	Chapters 3, 4, 5

Content Requirement for an Environmental Management Programme (Appendix 4 of the EIA Regulations, 2014, as amended)	Relevant Section in this EMPr
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 contemplated in paragraph (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 provision for rehabilitation, where applicable;	Chapters 3, 4, 5
(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Chapters 3, 4, 5
(h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Chapters 3, 4, 5
(i) an indication of the persons who will be responsible for the implementation of the impact management actions	Chapters 3, 4, 5
(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented	Chapters 3, 4, 5
(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Chapters 3, 4, 5
(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Chapters 3, 4, 5
(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	Chapter 4
(n) any specific information that may be required by the competent authority	N/A

Chapter 1: Introduction to the Environmental Management Programme

1.1 Background

CEN Integrated Environmental Management Unit (CEN IEM Unit) was appointed by LA Consulting Engineers on behalf of Transnet SOC Limited (Transnet) as the independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) process for the proposed upgrading of Bayhead and Langeberg Roads.

1.2 Purpose of the Environmental Management Programme

The purpose of the Environmental Management Programme (EMPr) is to provide a framework for the management of environmental impacts associated with the construction and operational (maintenance) phase of the upgrading of Bayhead and Langeberg Roads. The EMPr is to serve as a management tool for the Transnet management and contractors responsible for the construction and/or maintenance activities.

This EMPr is a framework programme and outlines procedures and actions to be carried out during the construction, post-construction/ rehabilitation and operational phases. It is aimed at minimising and managing environmental impacts that may arise during the construction, rehabilitation, and/or maintenance activities.

The EMPr identifies and clarifies the roles and responsibilities of key role-players in the implementation of the specific requirements of the EMPr. The EMPr further outlines the monitoring, reporting, auditing and review requirements.

The purpose of this EMPr is to describe:

- How adverse environmental impacts will be managed.
- How environmental damage or degradation will be mitigated.
- Monitoring requirements to ensure the above measures are successful.

1.3 Scope of the Environmental Management Programme

The EMPr is specific to the construction, post-construction, and maintenance of the Bayhead and Langeberg Roads.

The specific aims of the EMPr are to:

- Formulate procedures to rectify negative impacts created through the construction and maintenance of the Bayhead and Langeberg Roads and minimise potential negative secondary environmental impacts.
- Recommend methods to ensure compliance with the EMPr, including record keeping.
- Provide environmental guidelines to ensure environmentally acceptable practices are followed.

The successful implementation of this EMPr is dependent on integrating it into the project's management system. Without regular checks on performance and corrections of deviations from the environmental objectives, procedures and targets, the EMPr will fall into disuse and become ineffective. The EMPr, therefore, includes various elements of an Environmental Management System such as objectives and targets, the allocation of responsibilities, checking of corrective action, regular audits, and management review of the system.

The EMPr should be viewed as a dynamic document, which may require periodic updating and / or revision.

The EMPr is to be kept on-site at all times and made available to the public upon request.

1.4 Methodology

A Basic Assessment was undertaken for the proposed road upgrades under the EIA Regulations, 2014, as amended. This EMPr has been drafted during the Basic Assessment phase and includes the mitigation measures recommended in the Basic Assessment Report (BAR) and specialist studies.

A step-wise approach is used to develop and implement an EMPr:

- Potential impacts must be identified, and their significance assessed – this is undertaken in the Basic Assessment Report (BAR).
- Suitable mitigation measures need to be defined – these have been provided for each identified impact in the BAR.
- A system to ensure that the necessary mitigation is being implemented must be established.
- The effectiveness of the recommended management systems and measures must be monitored.
- The representatives of the developer must be in a position to verify the work undertaken and to monitor the environmental management process.

The EMPr was finalised alongside the BAR, with inclusion of comments received during the public participation review period of the Draft BAR.

1.5 Details of the Environmental Assessment Practitioner

EAP company:	CEN Integrated Environmental Management Unit
Environmental Assessment Practitioner (EAP)	Mrs Lucille Behrens
Professional Registration	Registered EAP with EAPASA, 2016/38
Years of Experience	20

EAP company:	CEN Integrated Environmental Management Unit
Environmental Assessment Practitioner (EAP)	Ms Jemma Booysen
Professional Registration	Candidate EAP with EAPASA, 2021/3519
Years of Experience	1

Refer to **Appendix C** for the EAP's *Curriculum Vitae*.

Chapter 2: Description of Project

2.1 Overview

Transnet is proposing to upgrade the Bayhead and Langeberg Roads located within the Port of Durban, within Ward 32 of the eThekweni Metropolitan Municipality, KwaZulu Natal. The project involves the upgrade and widening of Bayhead and Langeberg Roads to alleviate traffic congestion and improve traffic flow.

2.2 Description of the Project

The Bayhead Road forms part of the Road Over Rail Bridge (Bridge 2-5) at the intersection of Bayhead and South Coast Roads and falls outside of the Port of Durban's Port Limits (approximately



115 metres). In the vicinity of the Amanzimnyama Canal Bridge (Bridge 5-8), approximately 115 metres (m) of the proposed widening of the Bayhead Road will fall outside of the Port Limits but still within Transnet land. The remainder of the Bayhead Road is located within the Port Limits; and approximately 890m of the Bayhead Road is located adjacent to the Port Limits.

The Langeberg Road is approximately 1.75km in length and consists of 4 lanes, two (2) outbound and two (2) inbound. The entire road is located within the port limits.

Classification of Roads: The Bayhead and Langeberg Roads are classified as private roads and are managed by the Port of Durban under Transnet. The roads are not open to unrestricted public use but serve port operations and controlled traffic.

Proposed Upgrades: The project involves the upgrade and widening of Bayhead and Langeberg Roads to improve capacity and accommodate port traffic, as follows:

- Widening existing carriageways by one lane in each direction. The following is being considered for the road widening:
 - to widen both sides of the roads by a minimum of 4m either side, or
 - use the centre median, or
 - a combination of centre median usage and widening to obtain the necessary traffic layout configuration.
- Modification to five bridges (rail and canals) for lane extension and structural integrity.
- Stormwater management enhancements, including improved drainage systems and designated discharge points.
 - Minimum stormwater pipe size will be 375mm diameter.
 - Additional stormwater pipes may be included to service the widening sections.
- Modification and expansion of Bayhead Canal at the Bayhead Canal Bridge (Bridge 3-6):
 - Potential modification of the existing canal upstream of Bayhead Canal Bridge (Bridge 3-6), to splay the abutments and repair to erosion.
 - Expansion of existing culvert with an additional 3.4m x 7m culvert and associated widening of upstream and downstream of canal.

For the above proposed works, it is anticipated that bridge support structures would be required in the canal bed and along the banks/embankments/curbs of the canals; which would result in the removal of sections of the concrete canal bed, embankments/curbs and potentially the removal of the underlying soils and then refilling thereof. Additional stormwater pipes may require additional stormwater discharge points or expansion of stormwater structures along the embankments/curbs of the canals. Details on the width of the widenings and height to be raised of the bridges and stormwater enhancements are unknown at present and will only be determined during the detailed design stages.

Site Office, Site Camp, and Laydown Areas:

An estimated size for the combined site camp and laydown areas is 7000-13000m² (0.7 – 1.3 hectares). This would comprise of the following:

- **Site camp area:** Portable office space for management, engineers and admin staff; approximately 500-1000m² in extent depending on the number of personnel and required facilities.
- **Worker facilities:** Ablution blocks, canteens and rest areas for workers; approximately 300-500m² in extent depending on the size of the workforce.
- **Material storage and laydown areas:** Storage for construction materials and machinery, e.g. asphalt, aggregates, steel, equipment, graders, rollers, pavers and cranes; approximately 5000-10000m² in extent depending on intensity and type of work.
- **Parking:** Designated parking for construction vehicles and machinery; approximately 1000-2000m² in extent.

It is anticipated that the site camp will be designated within the port boundary; in areas previously transformed and that no natural areas will be impacted/ disturbed. The exact size required and final position is unknown at this stage as it will be determined and agreed upon during the project setup phase in consultation with the Port Authority and project stakeholders.

Relocation of Sewer Rising Main: The route of the existing sewer rising main (0.45m diameter) along Bayhead Road would be relocated to the outgoing road verge over a length of approximately 1,655m. The proposed sewer rising main would remain at a 0.45m diameter pipeline.

2.3 Location of the Project

The Bayhead and Langeberg Roads are located in the Port of Durban, within Ward 32 of the eThekweni Metropolitan Municipality, KwaZulu Natal. Refer to **Figure 2-1**, and **Table 2-1** to **Table 2-2**.

Table 2-1: Locality and property details of the site

Province	KwaZulu Natal
District Municipality	eThekweni Metropolitan Municipality
Local Municipality	eThekweni Metropolitan Municipality
Ward number	32
Nearest town	Durban
Portion number/s	1. Portion 175 of Erf 10004 of Durban 2. Portion 56 of Erf 10004 of Durban 3. Portion 203 of Erf 10004 of Durban 4. Portion 1 of Erf 10019 of Durban 5. Portion 0 of Erf 10013 of Durban 6. Portion 0 of Erf 12356 of Durban 7. Portion 0 of Erf 12355 of Durban 8. Portion 0 of King Flats Farm No. 16344 9. Portion 0 of King Royal Flats No. 16576
SG 21 Digit Codes:	1. N0FU00850001000400175 2. N0FU00850001000400056 3. N0FU00850001000400203 4. N0FU00850001001900001 5. N0FU00850001001300000 6. N0FU00850001235600000 7. N0FU00850001235500000 8. N0FU000000001634400000 9. N0FU000000001657600000

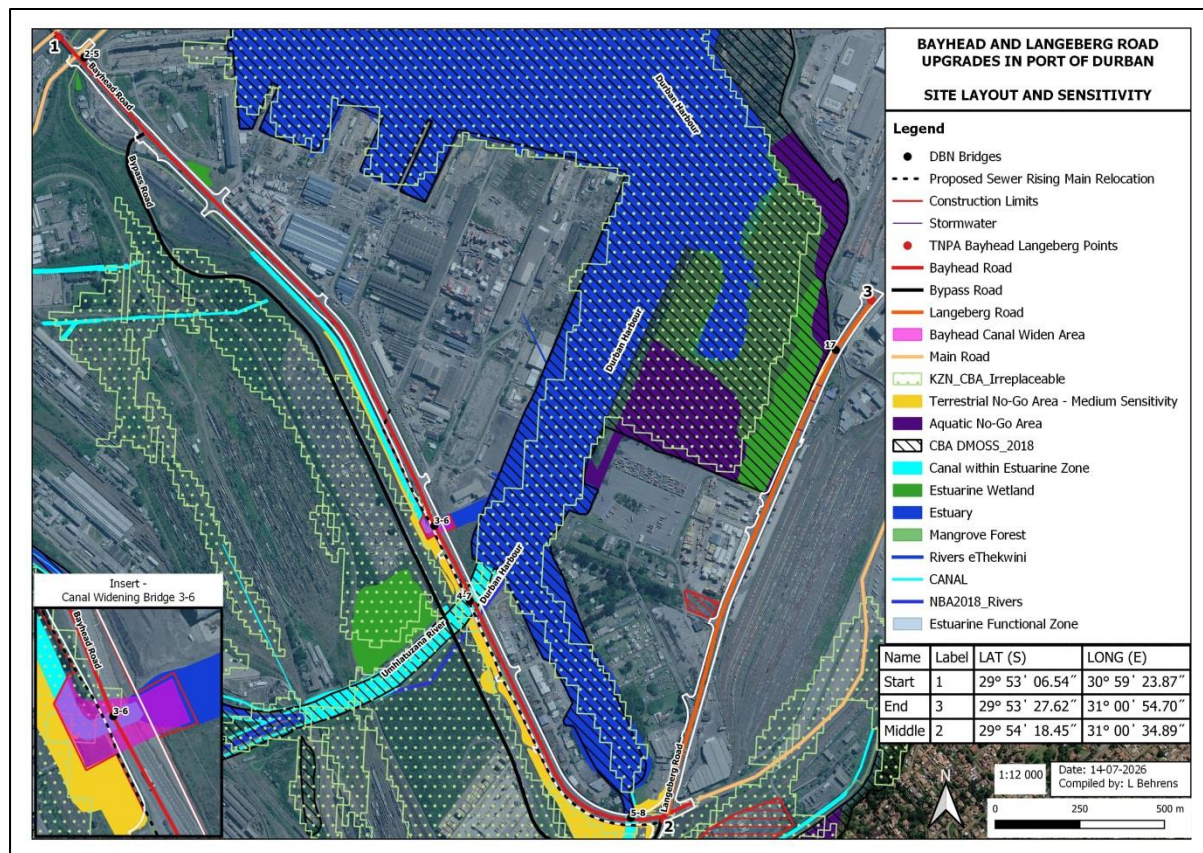
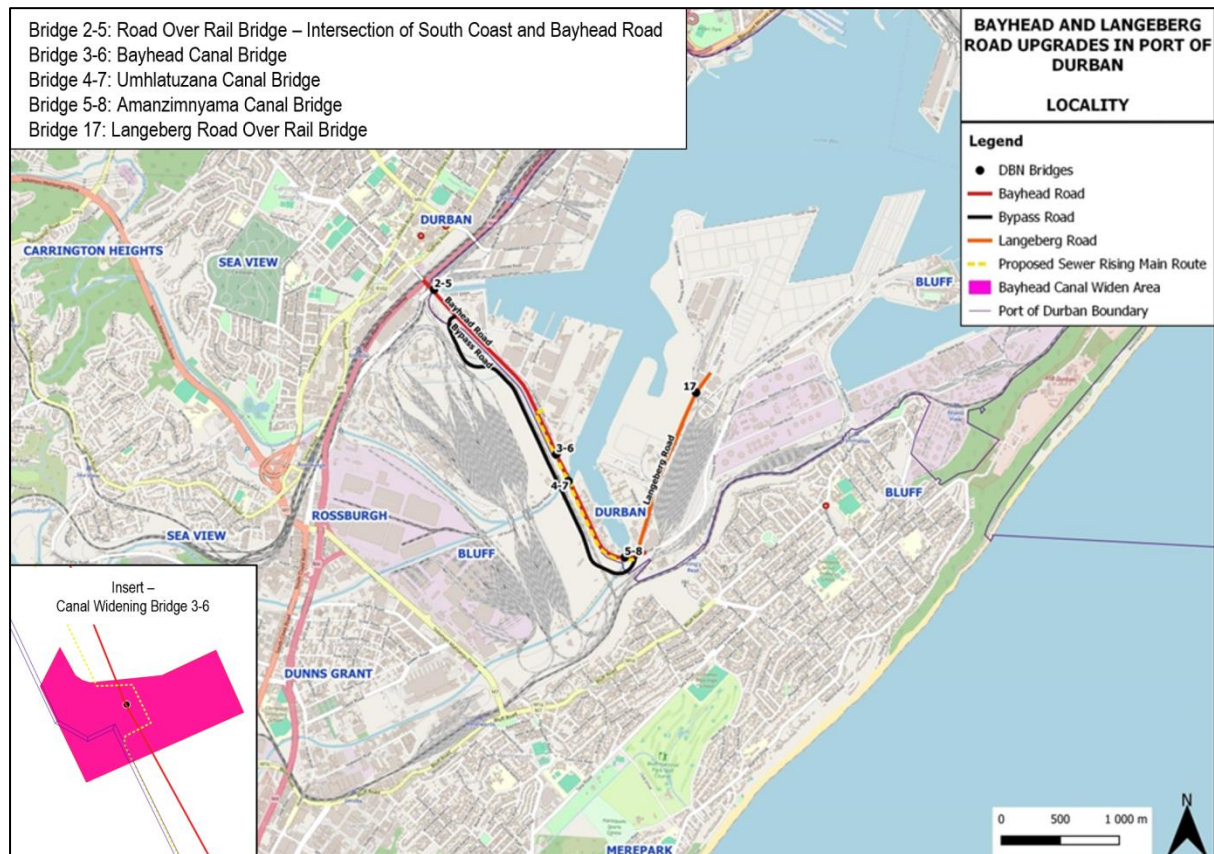


Figure 2-1: Locality Map and Site Layout

Table 2-2: Geographical coordinates of infrastructure upgrades

Geographical coordinates	Start Point	Central / Middle Point	End Point
Bayhead Road	29° 53' 06.54" S 30° 59' 23.87" E	29° 53' 41.26" S 31° 00' 01.83" E	29° 54' 16.65" S 31° 00' 37.95" E
Bayhead Canal Widening	29° 53' 52.01" S 31° 00' 07.34" E	29° 53' 51.55" S 31° 00' 08.31" E	29° 53' 51.31" S 31° 00' 09.59" E
Bayhead Road Over Rail Bridge 2-5	-	29° 53' 08.47" S 30° 59' 26.05" E	-
Bayhead Canal Bridge 3-6	-	29° 53' 51.47" S 31° 00' 07.99" E	-
Umhlatuzana Canal Bridge 4-7	-	29° 53' 58.16" S 31° 00' 12.40" E	-
Amanzimnyama Canal Bridge 5-8	-	29° 54' 18.72" S 31° 00' 31.22" E	-
Langeberg Road	29° 54' 18.45" S 31° 00' 34.89" E	29° 53' 51.56" S 31° 00' 42.86" E	29° 53' 27.62" S 31° 00' 54.70" E
Langeberg Road Over Rail Bridge 17	-	29° 53' 32.59" S 31° 00' 51.08" E	-
Sewer Rising Main	29° 53' 39.71" S 31° 00' 02.67" E	29° 54' 02.33" S 31° 00' 14.40" E	29° 54' 18.36" S 31° 00' 35.58" E

2.4 Sensitivity and Recommended No Go Areas

Overall the footprint for the upgrading of the Bayhead Langeberg Roads is considered to be of low sensitivity, however certain sections adjacent to the roads are considered to be of medium sensitivity. As a result, the following no-go areas have been recommended and are indicated in Figure 2-2:

1. The impacts to the medium sensitivity faunal habitat be avoided and that impacts be confined to the road upgrade footprint only.
2. Any areas not yet infilled in the Estuarine Functional Zone and the estuarine wetlands should be avoided.

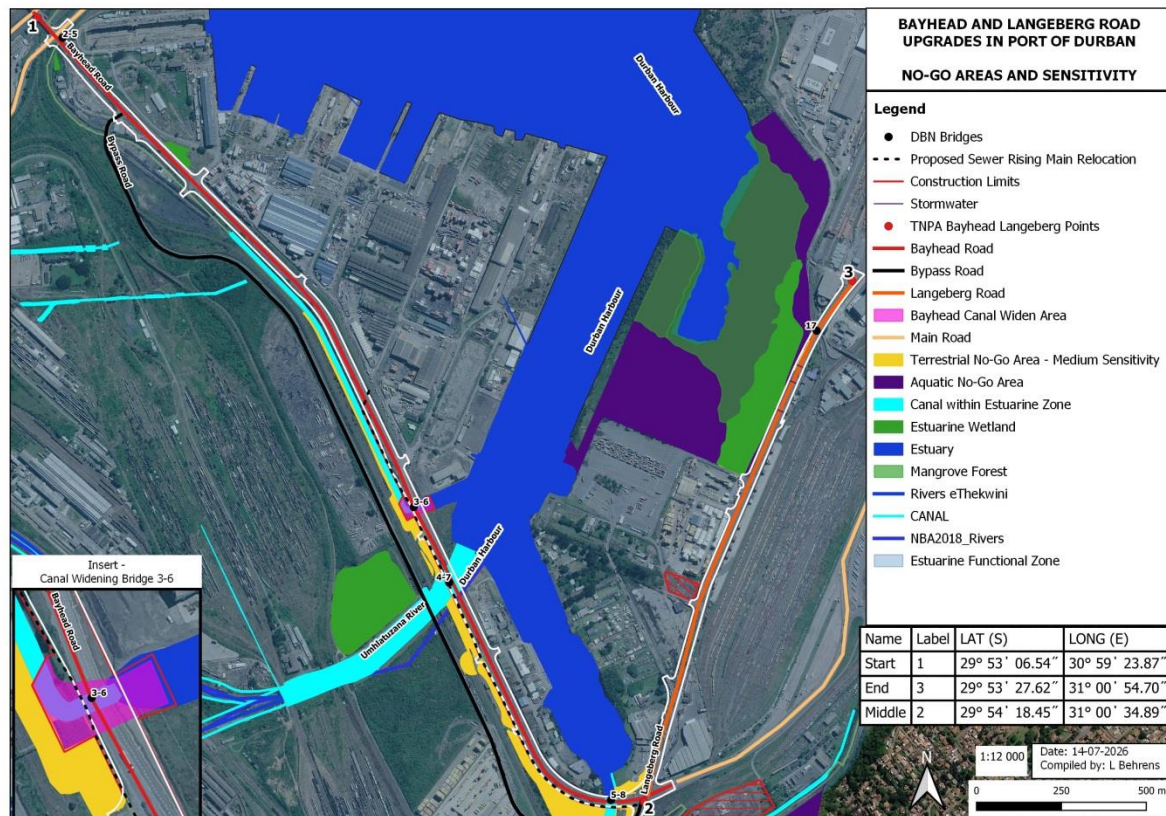


Figure 2-2: Recommended No-Go Areas (Updated)

2.5 Potential Risks / Impacts

Potential impacts that are associated with the proposed road upgrades include the following:

Table 2-3: Identified Impacts

Impacts	Preferred Alternative				No Go Alternative
	Construction Phase		Operational Phase		
	Significance Without Mitigation	Significance With Mitigation	Significance Without Mitigation	Significance With Mitigation	Significance
Impacts Terrestrial Ecosystem Conservation	Low -	Low -	Low -	Low -	No impact
Impacts to Terrestrial Species of Conservation Concern	Low -	Low -	Low -	Low -	No impact
Direct Impacts to Terrestrial Biodiversity/ Ecological Processes	Low -	Low -	Low -	Low -	No impact
Aquatic - Direct ecosystem destruction and modification	Medium -	Low -	Low -	Low -	No impact
Aquatic - Indirect hydrological & geomorphological impacts	Low -	Low -	Low -	Low -	No impact
Aquatic - Water quality	Low -	Low -	Low -	Low -	No impact



Impacts	Preferred Alternative				No Go Alternative
	Construction Phase		Operational Phase		
	Significance Without Mitigation	Significance With Mitigation	Significance Without Mitigation	Significance With Mitigation	Significance
Aquatic - Fragmentation and ecological disturbance	Low -	Low -	Low -	Low -	No impact
Heritage Impact	No/Very Low -	No/Very Low -	No impact	No impact	No impact
Landscape/Visual Impacts	Low -	Low -	Low +	Low +	No impact
Geotechnical Impact	Low -	Very Low -	No impact	No impact	No impact
Traffic Impact	Low -	Low -	Low +	Low +	Low -
Noise Impact	Low -	Low -	Low -	Low -	No impact
Economic: Transport and Logistic Efficiencies Improvements into and from the Port	No impact	No impact	Very High +	Very High +	No impact
Economic: Employment, Income Generation, and Skills Development	Low +	Low +	No impact	No impact	Medium -
Traffic Safety and Convenience Improvement	No impact	No impact	Medium +	Medium +	Medium -
Economic: Economic Multiplier Impacts	Medium +	Medium +	No impact	No impact	No impact
Social: Inconveniences During Construction	Low -	Low -	No impact	No impact	No impact
Social: Increase in Crime, Safety, and Security	Low -	Low -	No impact	No impact	No impact
Waste Impacts	Low -	Very Low -	No impact	No impact	No impact
Climate Change Impacts	Low -	Low -	Low +	Low +	Low -

Chapter 3: Organisational Requirements

3.1 Organisational Overview

Managers should be familiar with the requirements of the EMPr and should execute all construction, post-construction, and maintenance activities in an environmentally responsible manner.

Ultimate responsibility and public accountability for the EMPr and general environmental management during the construction and maintenance resides with the management of Transnet.

The Contractors are responsible for implementing and managing the EMPr during construction and for maintenance, if required. It is recommended that the Contractors appoint a member of their team as the Contractor's Environmental Officer who is responsible for ensuring that the requirements of the EMPr are implemented on a day to day basis.

Where procedures in the EMPr and methods delineated in relevant Method Statements are persistently transgressed and appropriate corrective action is not implemented, the Developer or his representative may order the suspension of related activities or impose a fine on the transgressor.

3.2 Roles and Responsibilities

This section defines the roles of the key parties involved in the implementation of the EMPr and mitigation measures.

3.2.1 Transnet (Developer / Authorisation Holder)

Transnet has the overall accountability and responsibility for environmental management during the construction and maintenance of the road upgrades. Further it is their responsibility to ensure that the conditions of the relevant licenses and the mitigation measures in this EMPr are communicated to, implemented and complied with by the Contractors.

During construction and maintenance (operations), Transnet or its representative will be responsible for:

- Ensuring all conditions of the approvals / licences and EMPr are adhered to.
- An Environmental Control Officer (ECO) is to be appointed, whose primary role shall be to monitor compliance regarding the environmental management activities during construction and operation/maintenance. This appointment may be delegated to the Project Engineers.
- Reviewing and approving any environmental monitoring programmes that are recommended by the ECO or the authorities.
- Advising on actions to be taken in the event of incidents or public complaints.
- Distribution of copies of the EMPr to the project team, including Contractors and Sub-Contractors. This responsibility may be delegated to the Project Engineers.
- Ensuring that measures are taken to address any problems in the implementation of the EMPr. Issuing instructions relating to compliance with the EMPr including the removal of personnel or equipment.
- Approval of Method Statements submitted by the Contractors.
- Providing the results of environmental reports to the relevant authority as and when required.
- Ensuring any required audits are undertaken on a timely basis and that the results of the audits are communicated to all construction personnel.

An ECO must be appointed by the authorisation holder to ensure that the conditions as stipulated in the Environmental Authorisation (EA) as well as the approved EMPr are adhered to **during the construction phase**.

The Transnet Environmental Officer will be responsible for auditing and monitoring during the operation phase regarding maintenance activities.

3.2.2 Authorities

The authorities are responsible for the timely processing and issuing of the necessary permits and authorisations required. Where necessary, the authorities will assist Transnet in understanding and meeting the specified requirements.

The authorities may perform random inspections to ensure compliance with the conditions. In such case, the Transnet will assist the authorities in every possible way so as to facilitate the inspection.

3.2.3 Contractors and Sub-Contractors

The Contractor and sub-contractors are responsible to the Developer or his representative for the effective implementation of the EMPr within their respective line functions during construction.

Specific responsibilities include:

- Appointing a Contractor's Environmental Officer who is responsible for ensuring that the construction requirements of the EMPr are implemented on a day to day basis.
- The full implementation of all of the construction requirements of the EMPr in terms of the approved method statements.
- Ensuring that all sub-contractors are familiar with and implement the EMPr.
- Identifying procedures applicable to the activities they perform and / or control. Compiling method statements to meet the procedures and targets.
- Implementing corrective and preventive actions.
- Reviewing of the EMPr implementation and effectiveness at site meetings with the Developer or his representative and the Environmental Control Officer (ECO).
- Maintaining and submitting records of waste disposal activities and corrective actions taken to rectify environmental problems on site.
- Keeping of a complaints and incidents register on site.
- Implementing site rehabilitation activities, and removal of temporary structures.

3.2.4 Environmental Control Officer

During construction, an ECO is to be appointed by the Developer or his representative to advise and assist the project team where necessary and to monitor the implementation of the EMPr. The ECO reports to the Developer or his representative. The ECO role is to be fulfilled by a person with previous experience (minimum of 3 years) in environmental management and compliance monitoring regarding construction processes.

During construction, the ECO's duties include:

1. Supporting and advising the Developer or his representative, with regards to the review of Method Statements, auditing, monitoring and corrective and preventive action.
2. Undertaking monthly environmental compliance site monitoring for the duration of the construction phase.
3. Recommending environmentally appropriate solutions to environmental problems.
4. Recommending additional environmental management measures as appropriate.
5. Attending Project Progress Meetings to report on environmental compliance, if required.
6. Providing a monthly report on environmental compliance to the Developer or his representative.
7. Overseeing and verifying that rehabilitation is carried out in accordance with the EMPr.

It must be noted that the ECO is responsible for providing an independent evaluation of compliance with the EMPr and not for enforcement of the conditions of the authorisations or EMPr. The responsibility of

enforcement of the conditions of the authorisations and EMPr lies with the Developer or his representative, while the Environmental Management Inspectors may also enforce conditions through compliance notices.

3.3 Environmental Commitment

All persons involved must be made aware of the environmental goals and policy of the Developer and of the appointed project managers and contractors, and encouraged to develop a commitment to compliance with the environmental legislation and to being good neighbours.

All relevant parties, including the applicant/implementing agent, all project managers, contractors, and sub-contractors must be made aware of their responsibility for compliance with the provisions for Duty of Care and remediation of environmental damage contained in Section 28 of the National Environmental Management Act, Act 107 of 1998.

Adhere strictly to the guidelines set out by the National Estuarine Management Protocol and the Integrated Coastal Management Act.

3.4 Method Statements / Plans / Programmes

The Contractors must submit Method Statements to the Developer or his representative and ECO outlining proposed construction activities, phasing and procedures and methods to comply with the targets stipulated in this EMPr.

Method Statements indicate how the procedures will be applied in order to meet the relevant targets and are central to the proper implementation of the EMPr. It is anticipated that in addition to assessing the systems and performance of the EMPr, the ECO will review the formulation of, and adherence to "Method Statements".

Method Statements must be submitted before any work on the project is undertaken. The various method statements must be approved by the Developer or his representative (in consultation with the ECO if required). The Developer or his representative and Contractor must keep copies of these Method Statements and letters of approval (including conditions attached) in a Method Statements file, to be located on site.

The Developer or his representative (and, if required, the ECO) must approve any deviations from the approved Method Statements.

All amendments must be in writing and must be submitted to the Developer or his representative.

3.5 Meetings

It is anticipated that Progress Meetings, attended by the Developer or his representative and other members of the project team will be held on a regular basis. It is recommended that compliance to the EMPr will be discussed at these meetings; this can be done during the Site Progress Meeting. The discussions on the EMPr must continue for the life of the construction phase.

The Developer or his representative may call for additional meetings in response to particular environmental problems. The ECO will attend progress meetings if requested to do so by the Developer or his representative.

Chapter 4: Pre-Construction, Construction, Post-Construction Requirements

4.1 Environmental Management Requirements

The environmental requirements provided in this section address the impacts relating to the construction of the roads to be upgraded.

The Environmental Management Requirements are presented as follows:

- **Impact Management Outcome:** The desired management outcome(s) for a particular construction / decommissioning risk / impact.
- **Impacts:** Identified during the Basic Assessment Process.
- **Mitigation Measures:** Measures to reduce significance of impact.
- **Procedure:** Steps and/or actions required to manage (and minimise) the relevant aspects.
- **Time Periods:** Time periods within which actions must be undertaken.
- **Performance Indicator:** The (quantitative) level of performance, sometimes determined by legislation, which must be met.
- **Monitoring:** Method, frequency and mechanism of monitoring required.
- **Responsibility:** Persons responsible for implementation.

4.1.1 Planning and Designs

Impact Management Outcome:	To ensure that all planning conditions and requirements of the Environmental Authorisation and the EMPr stipulated are met.
Impacts (BAR)	Direct ecosystem destruction and modification impacts Indirect hydrological and geomorphological impacts Water quality impacts Fragmentation and ecological disturbance impacts Terrestrial biodiversity and protected species loss Impact to archaeological resources Noise disturbances Geotechnical

Mitigation Measures (BAR) & Procedure	For all crossing types and designs, flow through road crossings should not be unnecessarily concentrated (or impeded) and flow velocity should not be increased. In this regard, estuarine and stream / river/ canal crossings should be via bridges or box / portal culverts established across the entire width of the channel to avoid flow narrowing and concentration. The bridges and/or box culverts should be sized to transport not only water, but the other materials that might be mobilized (i.e. debris). Erosion protection and energy dissipation measures should be established at all road crossing outlets e.g. stilling basins and reno-mattresses. The culvert concrete base must be at bed level. All culvert inlets and outlets and associated outlet erosion protection structures must not be raised above the estuarine/riparian surface and/or stream/river/canal bed and must be established to reflect the natural downstream slope of the estuarine / riparian surface and/or stream / river/canal bed. If any additional road fill is utilised at estuarine crossings, a porous layer should be established within the road fill at the appropriate elevation to ensure that estuarine interflow and overland flow is able to pass through the road fill. The culverts must be sized to convey major storm events, ideally the 1:100yr flood. Every effort must be made to minimise the upgraded footprint of the existing roads at watercourse crossings. Sewer Pipeline Alignments and Designs: Where crossings of canals are required, crossings should be via pipe bridges. No sewer pipelines must be located within 30m of intact estuarine ecosystems / habitats. Avoid crossing and disturbing wetlands. For any sewer pipelines planned: Buried sewer pipelines will need to be protected to minimize the risk of damage or leakage. This means typically encasing the pipe in concrete or other suitable resistant material. All sewer manholes within 30m of intact estuarine ecosystems and/or canals, and/or wetlands must be sufficiently sealed to ensure that surcharge events do not occur if there is a blockage, damage or leakage. Road Upgrade Re-alignment Recommendations from Faunal Specialist: The layout should be amended to exclude transformation on the southern periphery of the footprint, west of the Bayhead-Langeberg Road intersection. Failure to do so will have a locally significant impact on the connectivity and thus longer-term viability of the KwaZulu Dwarf Chameleon population in the region. Care must be taken not to disturb vegetation immediately adjacent to the footprint in the southern third of the Bayhead Road section, as this vegetation supports KwaZulu Dwarf Chameleons, and is already highly reduced in extent.
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	Road stormwater management: When revising stormwater infrastructure for the road, it will be important to incorporate the following best practice stormwater management design measures recommended based on our understanding of the soils, geology and sensitivity of the terrestrial ecosystems traversed by the road alignment: • Stormwater outlets should not be located at low points within the watercourses. • Stormwater generated by the upgraded road should be discharged at regular intervals and many small outlets should be favoured over few large. • All outlets must be designed to dissipate the energy of outgoing flows to levels that present a low erosion risk. In this regard, suitably designed energy dissipation and erosion protection structures (Reno-mattresses) will need to be installed at appropriate locations. Pre- and post-discharge velocities at each outlet should be calculated to inform the appropriate design of the energy dissipation and erosion protection measures. All outlet erosion protection measures (e.g. Reno-mattresses) must be established to reflect the natural slope of the surface and located at the natural ground-level. • As far as practically possible, conveyance from the road drains to the outlets should be via open drains with rough surfaces that are armoured with erosion protection. Geotechnical: • A materials compaction of 95% Mod AASHTO density is comfortably achievable for the reclamation fill and existing road layerworks. • Road platforms should be graded to ensure they are free draining, and side drainage installed as per the Engineers specifications. • In order to accommodate the Langeberg Road widening on the outbound lane, a fill-retaining structure is required along the existing road/rail-line crossing embankment, which visually achieves a height in the order of 6m. • The design Engineer take into consideration the temporary lateral support of the current roadway, the global stability of the final solution as well as settlement of the retaining structure when designing the final retaining solution. Noise: The road to be constructed using an AP-1 modified binder due to port operational requirements. The AP-1 binder provides higher strength and enhanced chemical resistance suitable for the Port environment.
Time Periods	Planning Phase
Performance Indicator	Ensure that all requirements of the Environmental Authorisation and EMPr are in place and that any approval is obtained in writing prior to commencing any construction activities.
Monitoring	As above

Responsibility	Developer: Overall responsibility Engineer: Ensure designs are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority
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4.1.2 Pre-Construction - Environmental Authorisation Conditions

Impact Management Outcome:	To ensure that all conditions and requirements of the Environmental Authorisation and the EMPr stipulated as pre-requisites for construction are met.
Impacts (BAR)	None
Mitigation Measures (BAR) & Procedure	Review the full Environmental Authorisation and convey the outstanding / pre-construction actions to the responsible team member:
Time Periods	Pre-construction
Performance Indicator	Ensure that all requirements of the Environmental Authorisation are in place and that any approval is obtained in writing prior to commencing any construction activities.
Monitoring	Preconstruction compliance monitoring audit
Responsibility	Developer: Overall responsibility Engineer: Ensure designs are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority

4.1.3 Construction Camp/Office and Working Areas

Impact Management Outcome	To restrict access to the site in order to reduce the potential for accidents, water pollution, fires, and environmental damage to flora, fauna and other sensitive environmental elements. To keep the demarcated and /or fenced off work area as small as possible.
Impacts	Terrestrial Communities and Habitats (Ecosystem Health and Ecosystem Conservation) Terrestrial Biota / Species (Flora and Fauna) Local and Regional Landscape Ecological Processes Ecosystem Destruction and Modification Hydrological and geomorphological Water quality Fragmentation and ecological disturbance
Mitigation Measures (BAR) & Procedure	All sand, stone, and other building materials must be sourced from sites that have Environmental Authorisation and mining licenses. A copy of proof of source of sand, stone, and other building materials must be kept by the applicant and must be made available to any authorised official of DFFE on request. Restrict the spatial extent of construction to the immediate developmental footprint. Utilize "soft starts" and alternative pile-driving techniques (like vibratory driving) to minimize acoustic disturbance to local fauna. The construction footprint must be minimised as far as practically possible. The servitude / footprint must include the infrastructure footprint and a maximum 5m wide temporary working servitude. Prior to the commencement of any construction activities, the following features must be staked out by a surveyor and demarcated using brightly coloured shade cloth: The outer edges of the entire construction corridor / right-of-way. The construction servitude (working area / corridor) width must be minimised as far as practically possible All areas outside of the construction area as demarcated must be considered no-go areas for the entire construction phase. Any contractor found working within No-Go areas must be fined as per fining schedule/system setup for the project. The demarcation work must be signed off by the Environmental Control Officer (ECO) before any work commences. The demarcations are to remain until construction and rehabilitation is complete. Location of a construction camp is to be approved by the Employer and is to be restored to its previous condition after completion of construction.

	The construction camp should be fenced. All materials, equipment, plant and vehicles must be stored within the construction camp. All excavated soils and soil stockpiles must be stored / sited inside the demarcated working areas as defined above. All equipment laydown or storage areas must occur inside the demarcated working areas as defined above. Access to and from the project area should be either via existing roads or within the construction servitude.
Time Periods	Lifespan of construction phase
Performance Indicator	No vegetation to be removed outside of the demarcated areas. No harming or killing of animals. No uncontrolled fires to occur.
Monitoring	All animal mortalities must be recorded and reported to the Developer. A list of plants that are relocated and used in rehabilitation must be kept and their survival success documented. Alien and invasive plant regrowth to be monitored and area to be kept free of alien invasive plants.
Responsibility	Developer: Overall responsibility Engineer: Ensure designs are constructed correctly and that works are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority

4.1.4 Flora and Fauna Management

Impact Management Outcome	To minimise damage to indigenous flora and fauna and the surrounding areas. To ensure minimum disturbance to indigenous flora and fauna occupying the area influenced by construction. To control and prevent alien vegetation growth.
Impacts	Terrestrial Communities and Habitats (Ecosystem Health and Ecosystem Conservation) Terrestrial Biota / Species (Flora and Fauna) Local and Regional Landscape Ecological Processes

	Ecosystem Destruction and Modification Fragmentation and ecological disturbance
Mitigation Measures & Procedure	In terms of management, alien invasive plant control must be practiced on an on-going basis in line with the requirements of Section 2(2) and Section 3 (2) the National Environmental Management: Biodiversity Act (NEM:BA), which obligates the landowner/developer to control invasive and alien plants. A greater degree of alien plant control will need to be exercised around the perimeter of any proposed development and alien plants should be controlled within the site area. Care must be taken to avoid the re-introduction and spread of alien invasive species. All alien invasive vegetation that colonise the construction site must be removed, preferably by uprooting and hand pulling. Hand pulling / uprooting is recommended for herbs, saplings, shrubs. The contractor should consult the ECO regarding the method of removal for species with a stem diameter >200mm. All bare surfaces across the construction site must be checked for alien invasive vegetation every two weeks and alien invasive vegetation removed by hand pulling/uprooting and adequately disposed in a registered landfill site. Herbicides should be utilised where hand pulling/uprooting is not possible. Only herbicides which have been certified safe for use in wetlands by independent testing authority are to be used. The ECO must be consulted in this regard. Avoid the most sensitive estuarine vegetation units and Critical Biodiversity Areas (CBAs). Where a road must cross an estuary, prioritize bridging or elevated structures over solid infill berms to maintain natural water flow. The handling and or killing of any animal species present is strictly prohibited and all staff/personnel must be notified. It must be noted that poaching/snaring is strictly prohibited. Any burrows or nests identified in the construction footprint should be reported immediately. The Contractor is responsible for the removal of alien and invasive vegetation species within all areas disturbed during construction activities. Disturbed areas include (but are not limited to) road reserves, construction camp, site areas and temporary storage areas. All alien and invasive vegetation to be removed from site and disposed of at a registered waste disposal site. Should brushwood be utilised for soil stabilization or mulching, it must be seed free. The Contractor must ensure that an emergency preparedness plan is in place in order to fight accidental fires or veld fires, should they occur. The use of branches of trees and shrubs, collected from the surrounding environment, for fire-making is strictly prohibited. The Contractor to take all reasonable and active steps to avoid increasing the risk of fire through their activities on-site. No ground fires may be lit. No animals are to be harmed or killed during the course of construction.

	No domestic animals are permitted on the site. Fauna (e.g. snakes, frogs, small mammals) that are encountered during the construction phase must be relocated to other parts of the estuarine functional zone under the guidance of the EO or ECO.
Time Periods	Lifespan of construction phase
Performance Indicator	No vegetation to be removed outside of the demarcated areas. No harming or killing of animals. No uncontrolled fires to occur.
Monitoring	All animal mortalities must be recorded and reported to the Developer. Alien and invasive plant regrowth to be monitored and area to be kept free of alien invasive plants.
Responsibility	Developer: Overall responsibility Engineer: Ensure designs are constructed correctly and that works are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority

4.1.5 Runoff, erosion and sediment control

Impact Management Outcome	To limit the disturbance to watercourses and aquatic biodiversity.
Impacts	Direct ecosystem destruction and modification impacts Indirect hydrological and geomorphological impacts Water quality impacts Fragmentation and ecological disturbance impacts Terrestrial biodiversity and protected species loss

Mitigation Measures (BAR) & Procedure	A construction stormwater management plan must be implemented and include the following, but not limited to: Wherever possible, existing vegetation cover along the construction corridor should be maintained during the construction phase. The unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes which will not be developed. Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts. Sediment barriers (e.g.: silt fences/sandbags/hay bales) must be installed immediately downstream of active work areas (including soil stockpiles) as necessary to trap any excessive sediments generated during construction. All bare slopes and surfaces to be exposed to the elements during clearing and earthworks must be protected against erosion using rows of hay-bales, sandbags and/or silt fences aligned along the contours and spaced at regular intervals (e.g. every 2m) to break the energy of surface flows. Once shaped, all exposed/bare surfaces and embankments must be re-vegetated immediately. If re-vegetation of exposed surfaces cannot be established immediately due to phasing issues, temporary erosion and sediment control measures must be maintained until such a time that re-vegetation can commence. All temporary erosion and sediment control measures must be monitored for the duration of the construction phase and repaired immediately when damaged. All temporary erosion and sediment control structures must only be removed once vegetation cover has successfully recolonised the affected areas. After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled-in with appropriate material and silt fences or fascine work must be established along the gully for additional protection until vegetation has re-colonised the rehabilitated area. Implement robust stormwater management infrastructure designed to slow, filter, and settle suspended solids and pollutants before discharge. Direct runoff away from fragile estuarine fringes. Storm water management to be undertaken in all areas susceptible to soil erosion. Erosion measures to be included to disperse run-off so as to reduce the volume and velocity of surface water flow and vulnerable areas to be stabilised, where required. This could include meadow drains or planting of indigenous vegetation. Spoil from cuts may be used in existing erosion gullies. Measures must be implemented to ensure oil, fuel and / or hydrocarbons are prevented from entering nearby watercourses or cause groundwater contamination and include the following, but not limited to: Accidental spills of contaminants onto the ground e.g. oil, concrete, fuel and chemicals must be removed together with the contaminated soil. Spill kits are to be available on site at all times and to be used in cleaning up the spill. The contaminated soil to be disposed of in an appropriate container, depending on its classification (general or hazardous). Refuelling and emergency servicing of vehicles must only be carried out at the construction camp. Drip trays are to be
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	available and utilised during refuelling and emergency servicing. Drip trays are to be placed under stationary vehicles and machinery. Topsoil shall be removed (if required) from all areas where physical disturbance of the surface will occur within the road reserves. The removed topsoil shall be stockpiled on an area outside of the immediate work area, but inside the demarcated work area. Topsoil shall be kept separate from overburden / subsoil layers and shall not be used for building or maintenance of roads. The stockpiled topsoil shall be protected from being blown away or being eroded. Stormwater runoff to be diverted away from stockpiles. Stockpiled soils (topsoil or subsoils) shall be flattened immediately after placement to ensure minimum exposure to wind and water. Topsoil stockpiles are not to be higher than 1.5 m and steeper than 1:3. Existing vegetation must be retained as far as possible to minimise erosion problems. Sediment-laden runoff must be prevented from entering watercourses or drainage lines. Excavations shall take place only within the approved demarcated site. Materials to be sourced from a commercial supplier or from a borrow pit that is licenced with the Department of Mineral Resources. Water quality testing for pH, EC, TSS, Turbidity, Temperature and Dissolved Oxygen to be undertaken as per the General Authorisation for Section 21 (c) and (i) water use activities. It is recommended that slope stabilisation procedures, groundwater control measures during excavation, and continuous inspections by qualified geotechnical specialists during high-risk construction activities is implemented. All cut and fill slopes will be topsoiled, fitted with an approved soil saver, and hydroseeded to promote vegetation establishment and reduce erosion. PVC-coated reno mattresses will be provided at all headwall outlets to ensure that discharge velocities remain below 1 m/s for temporary protection during construction. Implementation of temporary erosion and silt control measures throughout the construction phase to protect downstream environments.
Time Periods	Lifespan of construction phase
Performance Indicator	No contamination of groundwater or surface water No surface water may be affected by silt emanating from the site No erosion on site
Monitoring	The Contractor's Environmental Officer must visually inspect runoff basins, drainage ditches and sediment traps on a daily basis to ensure that they are in an acceptable condition.

	Other potential sources of surface and groundwater pollution must be inspected daily
Responsibility	Developer: Overall responsibility Engineer: Ensure designs are constructed correctly and that works are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority

4.1.6 Cultural Historic, Archaeological and Palaeontological

Impact Management Outcome	To limit damage to possible cultural historic, archaeological and palaeontological artefacts and sites, features and objects
Impacts & Mitigation Measures (BAR)	Impact to archaeological resources Impact to palaeontological resources Impact to Cultural Landscape Cumulative Impact
Procedure – Heritage Resources	In the event of heritage resources are identified, the following actions should be taken immediately: All construction within a radius of at least 20m of the indicator should cease. This distance should be increased at the discretion of supervisory staff if heavy machinery or explosives could cause further disturbance to the suspected heritage resource. This area must be marked using clearly visible means, such as barrier tape, and all personnel should be informed that it is a no-go area. A guard should be appointed to enforce this no-go area if there is any possibility that it could be violated, whether intentionally or inadvertently, by construction staff or members of the public. No measures should be taken to cover up the suspected heritage resource with soil, or to collect any remains such as bone or stone. If a heritage practitioner has been appointed to monitor the project, s/he should be contacted and a site inspection arranged as soon as possible. If no heritage practitioner has been appointed to monitor the project, the head of archaeology at Amafa's Pietermaritzburg office should be contacted; telephone 033 3946 543). All parties concerned should respect the potentially sensitive and confidential nature of the heritage resources, particularly human remains, and refrain from making public statements until a mutually agreed time. Any extension of the project beyond its current footprint involving vegetation and/or earth clearance should be subject to prior assessment by a qualified heritage practitioner, taking into account all information gathered during this initial heritage impact assessment.

	As per the conditions attached to the AMAFA final comment/ approval of the project, the following must be adhered to: • The KwaZulu Natal Amafa and Research Institute should be contacted if any heritage objects are identified during earth-moving activities and all development should cease until further notice. • No structures older than sixty years or parts thereof are allowed to be demolished, altered, or extended without a permit from the KwaZulu-Natal Amafa and Research Institute. • Under no circumstances may any heritage material be destroyed, inundated, collected, or removed from site unless under direction of the KwaZulu Natal and Amafa Research Institute and a heritage specialist. • Should any remains be found on site that is potentially human remains, the South African Police Service (SAPS) should also be contacted. No SAPS official may disturb or exhume such remains, without the necessary permission from the KwaZulu Natal Amafa and Research Institute. • No activities are allowed within 50m of a site, which contains rock art. • Sources of all-natural materials (including topsoil, sands, natural gravels, crushed stone, asphalt, etc.) must be obtained in a sustainable manner and in compliance with the heritage legislation. • Chance Finds Protocol must be observed as detailed in the mitigation measures of the heritage report accompanying this application. As per the conditions attached to the AMAFA permit for the bridge, in the event of any contemplated deviation the prior written approval of Kwa-Zulu Natal Amafa and Research Institute must be obtained: • In such event, a written motivation in support of such deviation must be submitted to Kwa-Zulu Natal Amafa and Research Institute for consideration and; • The Kwa-Zulu Natal Amafa and Research Institute has the right to inspect the site at any time; • Where necessary monthly reports are to be submitted to Kwa-Zulu Natal Amafa and Research Institute on the work being conducted and the findings; • A final report on the work conducted and the findings must be submitted to Kwa-Zulu Natal Amafa and Research Institute not later than thirty (30) days from the date of expiration of this permit, extensions are negotiable; • All archaeological and paleontological Material become, on discovery, the property of the Province of Kwa-Zulu Natal and must be lodged at the repository of Kwa-Zulu Natal Amafa and Research Institute. • It is the responsibility of the Applicant to ensure that artefacts are preserved in its original state while in his/her possession; • The Applicant shall be liable for any damage or destruction caused at any site or to any artefact.
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Time Periods	During clearing of vegetation and excavation activities
Performance Indicator	No cultural historic, archaeological or palaeontological artefacts or sites may be purposefully damaged or destroyed. (It is illegal to disturb fossils or other historic and or cultural sites and objects without the prior consent of the Heritage Resources Authority).
Monitoring	During earthmoving and excavation activities, the Contractor's Environmental Officer must monitor for potential cultural historic, archaeological and palaeontological sites daily, or more frequently at his discretion.
Responsibility	Developer: Overall responsibility Engineer: Ensure designs are constructed correctly and that works are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority

4.1.7 Noise, Dust and Light Management

Management Outcome	To minimise air pollution, noise and light pollution from construction activities
Impacts	Terrestrial Communities and Habitats (Ecosystem Health and Ecosystem Conservation) Terrestrial Biota / Species (Flora and Fauna) Local and Regional Landscape Ecological Processes Ecosystem Destruction and Modification Hydrological and geomorphological Fragmentation and ecological disturbance Nuisance Impacts – Dust / Air Quality Nuisance Impacts - Noise. Visual: Impacts on views from residential areas on the Bluff
Mitigation Measures (BAR)	Temporary noise pollution due to construction works should be minimized by ensuring the proper maintenance of equipment and vehicles and tuning of engines and mufflers as well as employing low noise equipment where possible. Water trucks will be required to suppress dust by spraying water on affected areas producing dust. This will likely be required daily in the drier months or during dry periods.

	No lights must be established within the construction area near the watercourses On-going implementation of dust suppression and control measures on any dust generating surface. Potable water is not to be used for dust suppression. All earth works must stop during high wind conditions (i.e. when wind speeds exceed 35km/h). Trucks transporting any form of soil or fine building materials should be covered with a tarpaulin Construction times must be restricted to daytime hours. A Noise Management Plan for the construction phase must be provided and include the following: - Construction activities must be restricted to daytime hours and must comply with the National Building Regulations (SANS 10400-F: Site Operations, Regulation F6): - Monday to Friday: 06:00 – 18:00 - Saturday: 06:00 – 17:00 - Sundays and public holidays: No construction activities allowed - If additional work is required outside of these hours, an application for exemption must be submitted to the local authority, for approval prior to commencement, in order to prevent unreasonable disturbance to the surrounding area. - A correspondence noise complaint channel to receive and address any noise nuisance complaints timeously. Where a complaint has been received, a measurement should be performed by a qualified consultant or health officer at the complainant's property to verify the complaint. The project manager will then need to facilitate with adequate noise abatement measures if the noise levels are shown to be non-compliant. - Construction areas should be closed off with temporary noise barriers or earth berms if noise complaints are received. - All construction vehicles must be well maintained and in good condition. - Noise generating equipment such as generators, air compressors, etc. should be enclosed in soundproof enclosures. Many manufacturers of the specialised equipment will offer 'soundproof' enclosures that are purpose built for such equipment. - Construction staff working in areas where the 8-hour ambient noise is equal to or exceeds 85dBA, should be provided with ear protection equipment. - Noise intensive operations must be scheduled appropriately and conducted once having notified sensitive receptors in advance. - All construction vehicles must be in sound working order with the prescribed mufflers and silencers
Procedure	On-going implementation of dust suppression and control measures on any dust generating surface. Dust suppression measures may include chemical suppressants or water spraying.

	All earth works must stop during high wind conditions (i.e. when wind speeds exceed 35km/h). Stockpiles to be situated away from sensitive receptors and should take into account the predominant wind direction. Should a dust control method prove to be ineffective by the ECO, alternative methods will need to be conducted by the Contractor. Any changes in the dust control methods shall be for the cost of the Contractor. Any complaints about dust recorded in the complaints register must be immediately investigated by the Developer or his representative and addressed. The Contractor must implement a more rigorous dust-monitoring programme (instrument measurement) if there are persistent complaints about dust in the area. No waste, vegetation or any other material shall be burnt. Vehicles and machinery to be maintained in good running condition. Noise generating activities to be restricted between 06:00 and 18:00 Monday to Saturday, unless otherwise approved by the appropriate competent person in consultation with adjacent landowners/affected persons. Any complaints pertaining to noise and vibrations as recorded in the complaint register must be immediately investigated by the Contractor and addressed. Vehicles and machinery to be kept in good working order with the prescribed mufflers and silencers. No loud music or unnecessary noise, e.g. shouting or hooting, is allowed on site or in the construction camp.
Time Periods	Lifespan of construction
Performance Indicator	Excessive dust generation as determined visually by the ECO is not permitted. Dust levels are not to exceed 1200mg/m²/day (30 day average) for rural areas. No excessive noise or related complaints
Monitoring	Dust must be visually monitored on a daily basis, or more frequently in conditions conducive to dust generation, as determined by the Environmental Officer. The Contractor's Environmental Officer must implement a formal dust monitoring programme and dust suppression techniques be revised, if persistent complaints are recorded.
Responsibility	Developer: Overall responsibility Engineer: Ensure designs are constructed correctly and that works are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority

4.1.8 Waste Management

Management Outcome:	To prevent accumulation of waste materials. To prevent littering Minimise quantities of waste generated Dispose of wastes in the appropriate manner Recycle and reuse waste where possible
Impacts:	Impacts relating to ineffective waste management procedures may lead to the dumping of building rubble, littering and pollution of the surrounding areas as well as unsanitary (toilet) conditions. Construction waste will increase the amount of waste disposed to landfill.
Mitigation Measures (BAR) & Procedure:	Cleared vegetation to be mulched or disposed of at a licensed landfill site and proof of disposal should be available on Green File. Stockpiles of vegetation not to be left on site. Excavated material that will not be used in the construction works, should be used as fill material before the option of disposing the material to landfill is undertaken. Good housekeeping to be undertaken at all times. No illegal dumping or burning of waste allowed. Waste is not to be buried. Awareness raising to be undertaken with the construction workers regarding health and environmental impacts from illegal dumping. Waste bins are to be located at the construction camp. Bins are to have secured lids to prevent waste from being blown into the surrounding area and to prevent animals scavenging in the bins. Waste bins to be correctly labelled and colour coded. Waste containers to be provided at the construction sites and to be collected on a daily basis. Domestic and general construction waste to be disposed of at a licensed landfill site, unless this waste can be recycled or reused. Proof of disposal must be kept at the site office by the Contractor. Portable chemical toilet facilities provided at construction areas to be secured to the ground, cleaned at least weekly. Proof of cleaning to be filed in environmental Green File. No hazardous waste material to be disposed of as general waste. Hazardous waste to be stored separately in impermeable (i.e. leak proof) containers, and if possible sent for recycling.
Time Periods	Lifespan of construction
Performance Indicator	Recycling of waste All waste material must be removed from the site and suitably disposed of; no solid wastes shall be stored on-site for more than one week (i.e. 7 days).
Monitoring	The Contractor's Environmental Officer must inspect on-site waste disposal facilities / temporary storage areas daily, to ensure that they are sufficient and that they are properly maintained.

	During site inspections the Contractor's Environmental Officer must check for waste material, which is inappropriately (temporarily) disposed of or stored. A record must be kept of waste that is disposed of at the landfill site or sent for recycling. The Contractor's Environmental Officer must monitor the site for litter and other waste material.
Responsibility	Developer: Overall responsibility Engineer: Ensure designs are constructed correctly and that works are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority

4.1.9 Fuels and Hazardous Material Management

Management Outcome:	To ensure that materials are appropriately stored in order to minimise the potential for pollution and accidents.
Impacts	Terrestrial Communities and Habitats (Ecosystem Health and Ecosystem Conservation) Terrestrial Biota / Species (Flora and Fauna) Local and Regional Landscape Ecological Processes Ecosystem Destruction and Modification Hydrological and geomorphological Water quality Fragmentation and ecological disturbance
Mitigation Measures (BAR)	The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, etc.) needs to be administered. Mixing and/or decanting of all chemicals and hazardous substances must take place on a drip tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater. Drip trays should be utilised at all dispensing areas and to be placed under stationary vehicles and machinery. No refuelling, servicing or chemical storage should occur within 32m of any watercourse. No vehicles transporting concrete, asphalt or any other bituminous product may be washed on site. Vehicle maintenance should not take place on site unless a specific bunded area is constructed for such a purpose. Hazardous storage and refuelling areas must be bunded prior to their use on site during the construction period following the appropriate SANS codes. The bund wall should be high enough to contain at least 110% of any stored volume. The surface of the bunded surface should be graded to the centre so that spillage may be collected and satisfactorily disposed of. Spill kits for dealing with spills of fuels/chemicals must be available at the site. Spills must be reported to the Environmental Officer (EO)

	and cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site and reported/ records on the incident register. Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site and proof of disposal to be filed in Environmental Green File.
Procedure	Fuel, solvents and other hazardous or toxic substances must be securely stored in a designated area with restricted access (e.g. locked) at the construction camp. A safety data sheet (SDS) to be made available on site for all hazardous substances. Hazardous substances, including diesel or petrol tanks, must be stored on an impermeable lined surface and surrounded by a bund wall. Fuel and hazardous materials containers must be labelled. Ensure all staff and contractors undergo relevant training in the maintenance of equipment to prevent the accidental discharge or spill of fuel, oil, lubricants and other chemicals. Proof of training/ attendance register to be kept in environmental file. All construction vehicles are to be maintained in good working order so as to prevent soil or water pollution from oil, fuel or other leaks. Any spill of potentially hazardous materials must be cleaned up immediately (potentially hazardous materials on site include paint, oil, grease, fuel and turpentine). The area of contaminated soil or spill must be deposited into the hazardous waste container(s). Spill kits are to be available on site at all times and to be used in cleaning up any spills. Spill kits are to be clearly labelled and stored in a designated area. All spills are to be recorded in the environmental incident register. An emergency response plan (e.g. in case of fire or spillages) must be prepared. Generators, pumps and fuel supply needed for equipment must be placed on drip trays. This is to prevent any oil or fuel spills. All contaminated material must be disposed of at a registered hazardous waste disposal facility and proof of disposal filed in the Green file. Drip trays to be placed underneath construction vehicles / equipment to capture any leaks and until such is repaired. No cement or concrete to be mixed on the soil surface. Cement mixing is to be undertaken in trays. Cement mixers must be placed on large trays or similar to prevent accidental spills onto the soil surface. Where cement or concrete is mixed on the soil, contaminated soils should be removed and disposed of at a registered waste disposal site and proof of disposal to be filed in Environmental Green File. Drip trays must be used during the refuelling of construction equipment or vehicles.
Time Periods	Lifespan of construction
Performance Indicator	Fuels and hazardous liquids must be stored in an impervious, bunded and covered area with a capacity of 110% of the largest single storage tank.

Monitoring	The Contractor's Environmental Officer must ensure that materials are stored in the designated area set aside for that purpose. During daily site inspections the Contractor's Environmental Officer must check storage facilities to ensure that they are in a proper state of repair. A record must be kept in the environmental file of any spills and what follow-up action was taken. In the event of a significant spill or leak of hazardous substances (petrol and diesel) during activities, such incident(s) must be reported to all relevant authorities in accordance with Section 30 (5) of the National Environmental Management Act (NEMA) (Act 107 of 1998), pertaining to the control of incidents.
Responsibility	Developer: Overall responsibility Engineer: Ensure designs are constructed correctly and that works are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority

4.1.10 Traffic Management

Management Outcome:	Potential increases in traffic within the area, with resultant potential congestion, road damage, road safety, noise, etc. issues.
Impacts	Increased traffic on local roads, etc. Traffic safety impact due to additional traffic. Deterioration of public road network Closure of roads or detours. Disruptions to Port traffic
Mitigation Measures (BAR)	Construction vehicles must adhere to the speed limits. Signage is to be displayed regarding construction activities and detour routes. A detailed Traffic and Logistics Management Plan must be developed, preferably in consultation with affected port users, terminal operators, depots and transport stakeholders before construction commences. Emergency access, abnormal cargo movements and critical port operations to be specifically provided for. Road closures, lane restrictions, bridge works and diversions to be phased and sequenced to minimise disruption to terminal and depot access. Construction activities to take into account peak container seasons and high-volume periods, so that the most disruptive works are

	avoided or reduced during critical operational windows. Continuous access to Pier 1, Pier 2, depots, transport staging areas, emergency routes and other support facilities must be maintained throughout construction. A formal stakeholder coordination forum or communication mechanism to be established for the duration of construction to provide advance notice of disruptions and allow operational planning. Stormwater, canal and bridge works must be planned to avoid unintended impacts on adjacent logistics infrastructure, particularly during heavy rainfall or severe weather events. Traffic control and monitoring to be undertaken in accordance with the traffic plan.
Procedure	Temporary road construction and traffic accommodation signage must be displayed at the construction site. Access to the site must be managed to ensure safe entry to and exit from the construction site and/or camp. Vehicle loads to be secured/covered such that no loads or part thereof fall from the vehicle and damage other road users. All vehicles used during construction must be roadworthy and maintained. Access roads utilised by the Contractor must be maintained. Use appropriate detailing and street furniture to control truck access to areas outside the appropriate road lanes. This is necessary to prevent damage to other areas of the road reserve and adjacent natural areas.
Time Periods	Lifespan of construction
Performance Indicator	No accidents No spillages of any material onto roads.
Monitoring	Daily monitoring by the Contractor's Environmental Officer to ensure traffic related signage is in place. Construction vehicles entering the site with materials are to be checked to ensure loads are secured or covered as required
Responsibility	Developer: Overall responsibility Engineer: Ensure designs are constructed correctly and that works are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority

4.1.11 Health, Safety and Security

Management Outcome:	Reduction of any safety risks for employees or adjacent landowners Fire prevention and fire response measures are to be in place.
Impacts	Health, Safety and Security risks from construction activities
Mitigation Measures (BAR)	Firefighting equipment (according to the fire risk) to be available on site at all times. No “hot work” is to be undertaken on days where the Fire Danger Index is “orange” or “red”. Hot work is any work that involves burning, welding, cutting, brazing, soldering, grinding, using fire- or spark-producing tools, or other work that produces a source of ignition. The construction area must be demarcated and access controlled for the duration of the construction period. Signs must be erected at strategic locations throughout the construction areas, warning the public and site visitors about the hazards around the construction site and the presence of heavy vehicles. Compliance with the relevant health and safety procedures and regulations during construction.
Procedure	Adequate clean drinking water must be available to construction staff at all times during the construction period. Record of this data should be kept and filed in the environmental green file. Awareness training with construction staff. Security to be provided after hours to protect equipment in the construction camp. Excavations to be demarcated with orange netting. Excavations are to be checked daily, prior to work commencing, for any animals. Signage is to be displayed regarding construction activities. Approved health and safety plan. Visitors to report to the Site Office, and appropriate Protective Personal Equipment (PPE) to be worn by visitors. Smoking will not be permitted in those areas where there is a fire hazard. These areas include the fuel storage areas and any area where the vegetation or other material may support the rapid spread of an initial flame. Where possible, these areas (e.g. at the chemical and hazardous substances storage area) are to be demarcated with no-smoking signs An emergency response plan (e.g. in case of fire or spillages) must be formulated by the contractor. The Contractor should take all reasonable and active steps to avoid increasing the risk of fire through their activities on-site. No fires may be lit.
Time Periods	Lifespan of construction
Performance	No fires or accidents.

Indicator	
Monitoring	Daily inspections of facilities and accessibility of firefighting equipment. The Contractor's Environmental Officer must ensure that materials are stored in the designated area set aside for that purpose. During daily site inspections the Contractor's Environmental Officer must check storage facilities to ensure that they are in a proper state of repair. A record must be kept of any spills and what follow-up action was taken. In the event of a significant spill or leak of hazardous substances (petrol and diesel) during activities, such incident(s) must be reported to all relevant authorities, in accordance with Section 30 (5) of the National Environmental Management Act (NEMA) (Act 107 of 1998), pertaining to the control of incidents. The Contractor's Environmental Officer must monitor the site regularly (as part of daily inspections) and be alert to potential social problems on and off site.
Responsibility	Developer: Overall responsibility Engineer: Ensure designs are constructed correctly and that works are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority

4.1.12 Employment Opportunities & Economic Contributions

Management Outcome:	To ensure local employment and economic contributions.
Impacts	Temporary and limited employment opportunities Economic impact for local/regional economy
Mitigation Measures (BAR)	No additional mitigation measures have been identified
Procedure	Use local labour from surrounding communities. Make use of local suppliers. Progress reporting to stakeholders to be undertaken on a 6 monthly basis. A formal stakeholder coordination forum or communication mechanism to be established for the duration of construction to provide advance notice of disruptions and allow operational planning.

Time Periods	Lifespan of construction
Performance Indicator	Employment of local persons. Materials sourced from local suppliers, where available
Monitoring	Monthly monitoring of staff and supplier records.
Responsibility	Developer: Overall responsibility Engineer: Ensure designs are constructed correctly and that works are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority

4.2 Rehabilitation

Impact Management Outcome	To rehabilitate areas not forming part of the operational footprint
Impacts	Terrestrial Communities and Habitats (Ecosystem Health and Ecosystem Conservation) Terrestrial Biota / Species (Flora and Fauna) Local and Regional Landscape Ecological Processes Ecosystem Destruction and Modification Hydrological and geomorphological Water quality Fragmentation and ecological disturbance
Mitigation Measures (BAR) & Procedure	Rehabilitation is to be implemented and include the following but not limited to: The area between the footprint boundary and any important or sensitive indigenous vegetation should be actively managed and rehabilitated to improve the biodiversity value of this area. All land impacted by the proposed development and which does not form part of the permanent works must be rehabilitated by undertaking the following general tasks:

	- All foreign material must be removed from site. - Land must be regraded / reshaped and topsoils must be reinstated. - Compacted soils must be adequately ripped/loosened where compacted, as informed by the ECO. Re-vegetation should take place via hydroseeding as advised by a botanist. Typically, a commercially available indigenous seed mixes are suitable as well as seeding with Bermuda Grass (<i>Cynodon dactylon</i>) or Buffalo Grass (<i>Stenotaphrum secundatum</i>). Plan to actively rehabilitate any temporarily disturbed riparian buffers or construction laydown areas to a natural state. The re-vegetation should be timed to occur before the wet season (ideally at the onset of the wet season in early spring – August to October) so that watering requirements are minimized and plant growth is most vigorous. Watering should be gentle so that rill erosion is avoided and minimised. Any erosion damage resulting from watering/irrigation must be repaired immediately. Alien and weed vegetation that colonize the rehabilitation areas must be removed and eradicated immediately via hand pulling and should be adequately disposed of at a registered disposal facility and record kept in the environmental file. Once the initial re-vegetation is completed, the planting contractor will need to conduct weekly site visits to remove alien plants (in accordance with the latest revised NEMBA requirements) and address any re-vegetation concerns until re-vegetation is considered successful (i.e. >90% indigenous cover). Thereafter, the rehabilitation must be signed off by the ECO. All disturbed areas beyond the construction site that are intentionally or accidentally disturbed during the construction phase must be rehabilitated immediately to the satisfaction of the ECO. Rehabilitation measures are to be applied to disturbed embankments and long-term monitoring for settlement or erosion in widened road sections be undertaken. Vegetation of the corridor areas that are disturbed during construction and do not form part of the permanent works, must be properly rehabilitated afterward by planting of appropriate grass species that are or were indigenous to the area, and long-term alien plant control initiated and maintained. These actions should create a stable, healthy grassland habitat that serves as movement corridors for the dwarf chameleons and as habitat for their invertebrate prey.
Time Periods	Six months after the end of construction, or by an alternative date stipulated by Developer or his representative.
Performance Indicator	Site rehabilitation to be completed within six months after the end of construction, or by an alternative date stipulated by Developer or his representative.
Monitoring	The Developer's Environmental Officer must monitor site re-vegetation and alien plant regrowth, commencing after construction. Monitor the erosion control measures.
Responsibility	Developer: Overall responsibility

	Engineer: Ensure designs are constructed correctly and that works are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions ECO: Monitor and report on audit findings to competent authority
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4.3 Construction Compliance Monitoring and Auditing

Compliance monitoring will be the responsibility of a suitably qualified/trained ECO (Environmental Control Officer) with any additional supporting EO's (Environmental Officers) having the required competency skills and experience to ensure that monitoring is undertaken effectively and appropriately.

A photographic record of the state of the site and surrounds prior to the commencement of clearing/construction must be kept for reference and rehabilitation monitoring purposes.

The ECO must undertake monthly compliance monitoring audits **to ensure adherence to the conditions stipulated in the EA and EMPr**. Aspects that must be monitored include:

- The condition of the demarcation fence.
- Evidence of any no-go area incursions.
- The condition of the temporary runoff, erosion and sediment control measures and evidence of any failures.
- Evidence of sedimentary deposits / plumes and elevated rates of sedimentation (i.e. vegetation smothering / burial).
- Evidence of elevated river / stream turbidity levels
- Evidence of gully or bed/bank erosion.
- Waste management including the waste bins and the presence of litter within the working area.
- Evidence of solid waste within the no-go areas.
- Evidence of hazardous materials spills and soil contamination.
- Presence of alien invasive and weedy vegetation within the working area.
- Rehabilitation and re-vegetation methods and success.

From the date of the monthly audit site walkover, the ECO has 1 month to compile and submit the construction audit report to the competent authority. These reports must include measurable environmental objectives and compliance indicators for the competent authority to monitor implementation of.

Once the construction and rehabilitation has been completed, the ECO should conduct a close out site audit 1 month after the completion of rehabilitation.

It is recommended that continuous inspections by a qualified geotechnical specialist are conducted for detailed geotechnical monitoring during excavation and construction activities, particularly near bridge structures and canal embankments, slope stabilisation procedures, and groundwater control measures during excavation.

4.4 Complaints and Incident Register

A complaints and incident register must be kept on site. The register must contain all complaints received, incidents that occurred and measures taken to address such complaints and incidents.

Transnet, together with the Contractor, must respond to queries and complaints from the public regarding construction activities within 14 days.

In responding to such queries and / or complaints all such communications must be documented in a complaints register. All remedial action taken on a complaint must be recorded in the complaints register.

4.5 Environmental Awareness Training

The Contractor shall ensure that all staff receive site environmental awareness training in appropriate languages, as well as any refresher courses, pertaining to their role in the operations, including:

- Induction training on project specific environmental awareness relating to the conditions of the EA and EMPr prior to commencing with any work on the project.
- Staff must understand their specific role in managing daily activities required to prevent environmental and social risks, and how to respond to any incidents should these occur.
- Emergency procedures to be followed in the event of an emergency (e.g. staff assembly and site evacuation, medical emergencies, the locations and basic use of fire extinguishers, first aid kits and spills kits, and the use of safety equipment (where relevant), notifications/reporting).
- Management and minimising of waste, including waste separation.
- Water conservation and water quality protection.
- Instruction in erosion control measures.
- Maintenance of equipment to prevent the accidental discharge or spill of fuel, oil, lubricants, and other chemicals.
- Responsible handling of chemicals and spills.

In the event that new personnel are brought onto site by the Contractor during the project, these personnel are to undergo environmental awareness training prior to any work being undertaken. The Contractor is to include environmental awareness training in the toolbox talks on a monthly basis.

4.6 Corrective and Preventive Action

The Developer must devise a Corrective Action Procedure for implementing corrective and preventive action. The Corrective Action Procedure is to be implemented by all contractors and subcontractors on site.

The Correct and Preventive Action Procedure should:

- Report non-compliance with procedures or targets identified during monitoring and inspections (on Incident Forms).
- Report other failures creating environmental problems.
- Report imminent non-compliance and potential environmental problems.
- Delegate responsibility for corrective and preventive action.
- Document the resolution of the reported non-compliance or environmental problem.
- Impose disciplinary action where persistent non-compliance occurs.

All contractors and sub-contractors must retain copies of the Corrective Action Procedure and other appropriate documentation and submit copies of all documentation to the Developer or his representative at a frequency to be determined by the Developer or his representative.

Transgressions relate to actions by the Contractor, Sub-contractor or Contractor team member whereby damage or harm is inflicted upon the environment or any feature of the environment and where any of the conditions or specifications of the EMPr are infringed upon.

In the instance of environmental damage, the damage, where possible, is to be repaired and rehabilitated using appropriate measures, as specified and undertaken by appropriate specialists, for the account of the Contractor or other guilty party.

Where infringement of the specifications or conditions of the EMPr is registered, appropriate remedial action or measures are to be implemented for the account of the Contractor. Where non-repairable damage is inflicted upon the environment or non-compliance with any of the EMPr conditions is registered, the Contractor may face a monetary penalty to an amount specified by the Developer. A first offence warning may be implemented.

4.7 Record Keeping

The following documentation is to be kept on site:

- Environmental Authorisation, Water Use Authorisation and approved EMPr .
- **A copy of proof of source of sand, stone and other building materials**
- Incident and complaints register
- Method statements (where and if applicable)
- Environmental awareness training
- Environmental Compliance Audit reports

Chapter 5: Operational / Maintenance Requirements – Maintenance Management Plan

5.1 Environmental Maintenance Management Requirements

The environmental requirements provided in this section address the impacts relating to the maintenance of the road upgrades.

The Environmental Maintenance Management Requirements are presented as follows:

- **Impact Management Outcome:** The desired management outcome(s) for a particular construction / decommissioning risk / impact.
- **Impacts:** Identified during the Basic Assessment Process.
- **Mitigation Measures:** Measures to reduce significance of impact.
- **Procedure:** Steps and/or actions required to manage (and minimise) the relevant aspects.
- **Time Periods:** Time periods within which actions must be undertaken.
- **Performance Indicator:** The (quantitative) level of performance, sometimes determined by legislation, which must be met.
- **Monitoring:** Method, frequency and mechanism of monitoring required.
- **Responsibility:** Persons responsible for implementation.

Maintenance related activities / actions include the following:

- Repairs relating to blockages, siltation and scouring at the bridges.
- Removal of sand, debris and vegetation from the culverts and operational footprint areas to ensure no blockages at the culverts.
- Repair of erosion protection, banks, headwalls, inlets, outlets, roads and culvert structures to ensure stability of structures.

5.2 Maintenance and Management

Impact Management Outcome:	Ensure the proper functioning of all culvert infrastructure that is likely to require regular on-going maintenance. Prevent degradation of watercourses during maintenance activities
Impacts (BAR)	Terrestrial Biodiversity: • Biodiversity, habitat, and protected species loss Aquatic Biodiversity: • Direct ecosystem destruction and modification impacts • Indirect hydrological and geomorphological impacts • Water quality impacts • Fragmentation and ecological disturbance impacts

	Traffic: - Increased traffic on local roads, etc. - Traffic safety impact due to additional traffic. - Closure of roads or detours. Health, Safety and Security Climate Change Stormwater and soil management
Mitigation Measures (BAR) & Procedure	Terrestrial and Aquatic Biodiversity: It is the applicant's responsibility to ensure the proper functioning of all road infrastructure that is likely to require regular on-going maintenance. A management plan, that includes: 1) an alien plant control programme and 2) allows for some grassy areas, away from the immediate verge, to grow to a height exceeding 60cms that allows for the chameleons to utilise this area, must be put in place for the areas highlighted as being important for KwaZulu Dwarf Chameleons. In terms of management, alien invasive plant control must be practiced on an on-going basis in line with the requirements of Section 2(2) and Section 3 (2) the National Environmental Management: Biodiversity Act (NEM:BA), which obligates the landowner/developer to control alien invasive plants. Traffic: Temporary road construction and traffic accommodation / warning signage must be displayed during maintenance. Health, Safety & Security; Climate Change: Regular maintenance to be undertaken at the culverts regarding removal of sedimentation, waste or debris collected after high storm events. Ensure that all stormwater structures are monitored and maintained to ensure that they are functioning correctly and that proper flows are maintained across the road. Stormwater and soil management: All stormwater drains and open channels must be inspected monthly and cleared following any major rainfall events to prevent blockages and ensure unobstructed flow. Sediment that accumulates within drains, channels, and basins must be routinely removed to maintain the system's design capacity. Sediment expected to contain contamination must be handled and disposed of in accordance with relevant environmental regulations. Fuel, chemical, or material spills must be prevented from entering the stormwater network. Any spills that do occur should be addressed immediately following the relevant spill response and contingency procedures. General: Location of a construction camp for maintenance work is to be approved by the Employer and is to be restored to its previous condition after completion of maintenance work. The construction camp to be fenced with access control. All materials, equipment, plant and vehicles must be stored within the construction camp. If traffic diversion is required, any traffic diversions must be undertaken with the approval of all relevant authorities and in accordance with all relevant legislation. Traffic diversion must only take place on existing disturbed areas and remain within the existing road reserve or re-directed to other existing routes. Erosion rills and gullies must be filled-in with appropriate material. Waste from maintenance activities is to be disposed of at a licensed landfill site, unless this waste can be recycled or reused. Proof of disposal must be kept by the Transnet

	or contractor undertaking maintenance works. Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater. Drip trays to be utilised at all dispensing areas. No refuelling, servicing or chemical storage to occur within 32m of any watercourse. No vehicles transporting concrete, asphalt or any other bituminous product may be washed on site. Chemicals/fuels used during maintenance activities must be stored in a bund to avoid spillage and contamination of land. A safety data sheet to be made available on site. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site (e.g. spill kits). Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site and proof of disposal should be available in Environmental Green File. Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site and proof of disposal should be available in Environmental Green File. Generators, pumps and fuel supply needed for equipment must be placed on drip trays. Drip trays to be placed underneath vehicles / equipment to capture any leaks and until such is repaired. Drip trays must be used during the refuelling of equipment or vehicles.
Time Periods	Operational lifetime
Performance Indicator	No sedimentation and debris build up in culverts No erosion Stormwater drainage is functional No alien and invasive plants
Monitoring	Erosion and/or sedimentation in the onsite and downstream streams / rivers and wetlands. Presence of alien invasive plants. Water quality and evidence of pollution. Infrastructure stability and longevity
Responsibility	Developer: Overall responsibility Engineer: Ensure operational works are compliant with EA and EMPr conditions Contractor: Ensure construction phase is compliant with EA and EMPr conditions Transnet Environmental Officer: Monitor and report on audit findings to competent authority

5.3 Maintenance (Operational) Monitoring and Reporting

Aspects that must be monitored during the operation phase include:

- Erosion and/or sedimentation in the vicinity of the roads, bridges and downstream streams / rivers and wetlands.
- Presence of alien invasive plants.
- Water quality upstream and downstream of canals from bridges.
- Infrastructure stability and longevity.

Monitoring of maintenance activities include:

Part of the site that is monitored	Frequency of monitoring	Monitoring Procedure	How results are analysed and presented	Comments
Road / bridges within the canal / estuary extents	Prior to the commencement of maintenance activities, during and after completion of maintenance activities. Compliance monitoring to be undertaken on a weekly / monthly basis depending on the level and timeframe required for maintenance activities	Photographs of the sites are to be taken prior, during and on completion of maintenance activities. The Transnet Environmental Officer is to conduct monitoring inspections / audits when maintenance activities are being undertaken.	Transnet Environmental Officer to record the monitoring and compliance results in an audit report, with recommended corrective actions. Report to include the maintenance activities being undertaken.	None
Upstream and downstream of canals from bridges	1 month prior to commencement of maintenance activities Weekly during maintenance activities as required in the General Authorisation for Section 21 (c) and (i) activities	Water quality testing for pH, EC, TSS, Turbidity, Temperature and Dissolved Oxygen Photographic records of sites to be taken prior and during maintenance activities The Transnet Environmental Officer to conduct monitoring inspections / audits when maintenance activities are being undertaken.	Water quality test results and photographs to be recorded in a report	None

5.4 Complaints and Incident Register

Transnet must respond to queries and complaints from the public regarding maintenance activities within 14 days. In responding to such queries and / or complaints all such communications must be documented in a complaints register. All remedial action taken on a complaint must be recorded in the complaints register.

An incident register must be kept and contain all incidents that occurred during maintenance activities and measures taken to address such incidents.

5.5 Environmental Awareness Training

Transnet shall ensure that all staff receive site environmental awareness training in appropriate languages, as well as any refresher courses, pertaining to their role in the operations, including:

- Induction training on project specific environmental awareness relating to the conditions of the EA and EMP prior to commencing with any work on the project.

- Staff must understand their specific role in managing daily activities required to prevent environmental and social risks, and how to respond to any incidents should these occur.
- Emergency procedures to be followed in the event of an emergency (e.g. staff assembly and site evacuation, medical emergencies, the locations and basic use of fire extinguishers, first aid kits and spills kits, and the use of safety equipment (where relevant), notifications/reporting).
- Management and minimising of waste, including waste separation.
- Water conservation and water quality protection.
- Instruction in erosion control measures.
- Maintenance of equipment to prevent the accidental discharge or spill of fuel, oil, lubricants, and other chemicals.
- Responsible handling of chemicals and spills.
- All staff must receive proper training on correct use of Personal Protective Equipment (PPE).
- Ensure all staff are medically cleared and deemed fit prior to attending induction training or commencing any work on site.

5.6 Record Keeping

Transnet is to keep the following documentation on file for the operational phase:

- Environmental Authorisation, Water Use Authorisation and approved EMPr.
- Incident and complaints register
- Method statements (where and if applicable)
- Environmental awareness training
- Environmental Compliance Audit reports

Appendix A: Example of Environmental Incident Log

DATE	INCIDENT LODGED BY (Name and Capacity)	DETAILS OF INCIDENT	PROPOSED ACTION	REMEDIAL ACTION	DATE INCIDENT TO BE ADDRESSED BY	DATE REMEDIAL ACTION WAS UNDERTAKEN AND INCIDENT CLOSED	SIGNATURE	
							LOGGED IN	CLOSED OUT

Appendix B: Example of Complaint Register and Complaint Form

DATE	COMPLAINT LODGED BY (Name and Capacity)	DETAILS OF COMPLAINT	PROPOSED ACTION	REMEDIAL ACTION	DATE COMPLAINT TO BE ADDRESSED BY	DATE ACTION WAS UNDERTAKEN AND COMPLAINT CLOSED	SIGNATURE	
							LOGGED IN	CLOSED OUT

Complaint Form

Complaint Record Sheet	File No Reference	Date	
Complaint Lodged By:			
Capacity of Complainant			
Complaint Logged by			
Details of Complaint:			
Proposed Remedial Action			
Notes by ECO / Auditor			
ECO	Date	Auditor	Date
Resident Engineer	Date		

Appendix C: EAP Curriculum Vitae



CEN
Integrated Environmental Management Unit
Reg No: 1996/032402/23

Lucille Behrens: 082 922 1645 lucille@environmentcen.co.za

CURRICULUM VITAE

LUCILLE BEHRENS (maiden name Van Staden)

Name of Firm	CEN Integrated Environmental Management Unit
Date of birth	20 August 1976
Position in Firm	Senior Environmental Scientist
Specialisation	Environmental Management
Nationality	South African
Years of experience	19
HDI Status	White female, no disabilities
Languages	English, Afrikaans

KEY QUALIFICATIONS

Lucille has 19 years' experience in the Environmental Management field. Lucille has undertaken a number of Environmental Impact Assessments (i.e. Basic Assessments; Scoping and EIA) under the EIA Regulations of 2006, 2010 and 2014. Her roles have included being the Environmental Assessment Practitioner (EAP), Assistant EAP, Project Manager and Environmental Scientist for EIA related projects. Her responsibilities have included undertaking environmental assessments, compilation of regulated EIA's (i.e. scoping reports, EIA reports, Basic assessments and EMPs) and incorporating specialists into the EIA team for any required specialist studies. Lucille has also undertaken and been involved with the regulated public participation process required for EIAs.

Her experience in compiling environmental management plans relate to construction, maintenance operations and wildlife management. Lucille has been involved in environmental compliance monitoring and auditing (environmental control officer) on a number of construction sites and borrow pits. She has also gained experience in GIS mapping.

Lucille has also been involved in waste studies and sustainable development projects, for example green procurement, elimination of illegal dumping strategies and water conservation and demand management plan.

EDUCATION

Qualification	Institution	Year
BSc (Hons) (Environmental Monitoring and Modelling)	UNISA	2008
BSc (Environmental Management)	UNISA	2005
BA (Hons) (Criminology)	University of Pretoria	1998
BA	University of Pretoria	1997

CV: Lucille Behrens

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COURSES & CONFERENCES

Course / Conference	Date
Management Training Session – Nelson Mandela Metropolitan University: Business School	2008
The Environment And the Project Cycle	March 2008
Technical and Business Report Writing	March 2009
Institute of Waste Management South Africa – Eastern Cape Mini Conference	August 2009
Project Management, Incl. MS Projects	March 2010
Legal Workshop on the Key Implications of the National Environmental Management: Integrated Coastal Management Act	April 2010
Environmental Awareness and Legal Liability for Management	May 2010
Green Star SA Accredited Professional Course	September 2011
WASTECON	October 2012
Contaminated Land Workshop	February 2013
Water Law in South Africa Workshop	August 2013
Institute of Waste Management of Southern Africa – Eastern Cape Conference: The Green Revolution	September 2013
National Wetlands Indaba	October 2013
IWRM, the NWA, and Water Use Authorisations, focusing on Water Use License Applications – Procedures, Guidelines, IWWMP's and Monitoring, Carin Bosman Sustainable Solutions	September 2014
Water Use Licence Training – Section 21 c and i water use activities	August 2016
ISO 14001:2015 Environmental Management Systems Implementation	August 2016
Renewable Energy Workshop	June 2020
IAIAsa Virtual Symposium	October 2020
Council for Geoscience Conference 2021	March 2021
Environmental Law Update Workshop	April 2021
IAIAsa Climate Impact Assessment Webinar	May 2021
Environmental Law Annual Conference	September 2021
National Wetlands Indaba	October 2021

PROFESSIONAL MEMBERSHIP / REGISTRATION

Institution Name	Membership	Year Joined
International Association of Impact Assessments (South Africa)	Member (No. 2668)	2010
Environmental Assessment Practitioners Association of South Africa (EAPASA)	Registered EAP 2016/38	2019

EMPLOYMENT RECORD

August 2013 – Present: CEN IEM Unit

On 1 August 2013, Lucille joined the CEN Integrated Environmental Management Unit as **Senior Environmental Scientist**. Her responsibilities include:

- Project management,
- Environmental Impact Assessments (Basic Assessment, Scoping and EIA and associated public participation),
- Co-ordinating and assessing specialist studies,
- Environmental Management Plans/Programmes,
- Environmental Compliance Monitoring,
- GIS mapping.

CV: Lucille Behrens

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July 2007 – July 2013: BKS (Pty) Ltd / AECOM SA (Pty) Ltd

On 1 October 2012 Lucille was appointed as a **Senior Environmental Scientist** for the Infrastructure and Management Sector of BKS in Port Elizabeth after BKS and its subsidiaries rebranded on 1 November 2012 to become AECOM SA (Pty) Ltd. Her responsibilities included:

- Project management, including financial management on projects,
- Environmental Impact Assessments (basic assessment, scoping and EIA and associated public participation),
- Co-ordinating and assessing specialist studies,
- Environmental Management Plans/Programmes,
- Environmental Compliance Monitoring,
- Waste and Sustainability Strategies,
- Business development focusing within the Eastern Cape, KwaZulu Natal.
- GIS mapping.

In 2009, Lucille was promoted to **Senior Environmental Scientist** and was responsible for project management, environmental impact assessments (basic assessment, scoping and EIA and associated public participation), environmental management plans, environmental compliance monitoring, waste and sustainability strategies within the Eastern Cape.

In 2007, Lucille joined BKS (Pty) Ltd as an **Environmental Scientist**. Her responsibilities included undertaking environmental impact assessments (basic assessment, scoping and EIA and associated public participation), compiling environmental management plans and undertaking environmental compliance monitoring.

August 2000 – June 2007: Shamwari Game Reserve (Mantis Collection)

Lucille was the **Wildlife / Environmental Co-Ordinator** for Shamwari Game Reserve (Mantis Collection) from November 2003 – June 2007. During this time, her responsibilities included the following:

Compiling environmental management plans for construction operations and wildlife management for reserves in South Africa, United Arab Emirates and Morocco. Undertaking environmental compliance monitoring of construction sites within game reserves. Monitoring environmental aspects (e.g. water usage) within Mantis game reserves and organising related wildlife permits.

In November 2001, Lucille transferred to the Wildlife Department as the PA to the Wildlife Director.

In 2000, Lucille joined Shamwari Game Reserve and during this time her roles included Personal Assistant to the General Manager, Switchboard Operator and Reservationist.

June 1999 – July 2000: Formax

Computer room supervisor, Data Capturer

1997: University of Pretoria

Practical Tutor, Information Science Department

EXPERIENCE RECORD – SELECTED PROJECTS

ENVIRONMENTAL IMPACT ASSESSMENTS:

- Basic Assessment for the Expansion of BORBET SA Furnaces, Nelson Mandela Bay Municipality – *BORBET SA / LAQS*
- Scoping and Environmental Impact Assessment for the Proposed Seraphim Solar Cell Facility in the Coega SEZ, Nelson Mandela Bay Municipality – *Seraphim Energy*
- Scoping and Environmental Impact Assessment for the Proposed Newlyn Manganese Storage and Conveyor Facility in Coega SEZ, Nelson Mandela Bay Municipality – *Newlyn Group*
- Basic Assessment for the Proposed Beenleegte Hydro Power Facility in Somerset East - *Navitas*
- Basic Assessment for the Proposed Little Fish Hydro Power Facility in Somerset East - *Navitas*
- Basic Assessment for the Proposed Coegakop Wellfield and Water Treatment Works – *NMBM*

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- Basic Assessment for the Upgrading of the Emsengeni Access Road, Kirkwood – *LA Consulting Engineers*
- Basic Assessment for the Proposed Stormwater Management Infrastructure in Colchester, Nelson Mandela Bay Municipality - *NMBM*
- Basic Assessment for the Proposed Alexandria Community Health Centre - *Archworks*
- Scoping & Environmental Impact Assessment for the Kei Road Water Conveyance (pipeline and water treatment works) - *Aurecon*
- Basic Assessment for the St Francis Stormwater Upgrade - *Aurecon*
- Basic Assessment for the Proposed SACE Ranger PV Plant, Uitenhage – *SACE*.
- Basic Assessment of the Proposed Clearing of Vegetation for Fence Construction at SAPS Training Institute, Addo, Sundays River Valley Municipality – *Engineering Advice & Services*.
- Basic Assessment for Construction and Operation of a Filling Station with Rest and Retail Facilities, an Agri-Business Retail / Wholesale Facility adjacent to the Nanaga Farm Stall on the Remainder of Portion 8 Nanaga Hoogte No 229, Sundays River Valley Municipality – *Pantheon Trust*
- Scoping & Environmental Impact Assessment for the Malabar Extension 6 Phase 2 Housing Development, Nelson Mandela Bay Municipality, Eastern Cape – *NMBM (undertaken whilst in employ at AECOM)*
- Scoping & Environmental Impact Assessment for the Residential Development on Farm Grants Valley 396/2, Ndlambe Municipality – *ACME Capital (undertaken whilst in employ at BKS)*

ENVIRONMENTAL MANAGEMENT PROGRAMMES:

- Environmental Management Programme for the Kirkwood Revitalisation Programme within the Sundays River Valley Municipality - *LA Consulting Engineers*
- Environmental Management Programme for the Rural Roads Prioritized Infrastructure Project within the Sundays River Valley Municipality - *LA Consulting Engineers*
- Coastal Management Programme for the Nelson Mandela Bay Municipality

ENVIRONMENTAL COMPLIANCE MONITORING:

- Environmental Control Officer: Graaff Reinet Wellfield – *LA Consulting Engineers*
- Environmental Control Officer: Coegakop Wellfield Phase 1: Drilling of boreholes and installation of bulk water pipelines in Port Elizabeth – *Aurecon*
- Environmental Control Officer: Upgrading of Roads and Stormwater in Valencia, Addo – *LA Consulting Engineers*
- Environmental Control Officer: Upgrading of Roads and Stormwater in Emsengeni, Kirkwood – *LA Consulting Engineers*
- Environmental Control Officer: Construction of the Kuyga Rising Main – *Hatch Goba*
- Environmental Control Officer: Upgrading of Access Roads in Moses Mabida, Kirkwood – *LA Consulting Engineers*
- Environmental Control Officer: Upgrading of Stormwater Infrastructure in Summerstrand – *Hatch Goba*
- Environmental Control Officer: Upgrading of Roads and Stormwater in Nomathamsanqa, Addo – *LA Consulting Engineers*

WATER USE LICENCE APPLICATIONS (WULA):

- WULA for the Proposed Beenleegte Hydro Power Facility in Somerset East - *Navitas*
- WULA for the Proposed Little Fish Hydro Power Facility in Somerset East - *Navitas*
- WULA for the Proposed Coegakop Wellfield and Water Treatment Works – *NMBM*
- WULA for the Upgrading of the Emsengeni Access Road, Kirkwood – *LA Consulting Engineers*
- WULA for the Proposed Malabar Phase 2 Extension 6 Housing Development - *NMBM*
- WULA for Proposed Gqunu Village Bridge Crossing and Road Upgrades - *Department of Land Reform and Rural Development*.

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SUSTAINABILITY / OTHER PROJECTS:

- Environmental Screening for the Port St Johns Community Access Roads – *LA Consulting Engineers*
- Environmental Screening for the Pearston Bulk Water Supply Augmentation – *BVi Consulting Engineers*
- Due Diligence for Zone 10 of the Coega Special Economic Zone – *Coega Development Corporation*
- Environmental Sensitivity Review for the Kirkwood Revitalisation Programme within the Sundays River Valley Municipality - *LA Consulting Engineers*
- Environmental Sensitivity Review for the Rural Roads Prioritized Infrastructure Project within the Sundays River Valley Municipality - *LA Consulting Engineers*
- Environmental Screening Assessment on Portion 62 of Ongegunde Vryheid No 746, St Francis for Mixed Land Use– *Aurecon*



Curriculum Vitae

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Nationality South African
Languages English
Driver's license Code B

PERSONAL PROFILE

I obtained my BSc (Environmental Sciences) from Nelson Mandela University majoring in Geography and Zoology, following the completion of my BSc Honours in Environmental Geography in 2023. I then went on to complete my MSc (Geography) while working as a senior EAPs assistant and ECO for a number of development projects centered in the Eastern Cape Province of South Africa. This later expanded into candidate EAP duties after becoming registered with EAPASA, allowing for me to assist in the EIA process. My university research themes have equipped me with a solid foundation in environmental management and geography, as well as basic skills in GIS mapping for use in EIA work. My short-of-two years working at an environmental consultancy have provided me with experience in Environmental Control Officer (ECO) services and Environmental Impact Assessment (EIA) services, specifically associated with Basic Assessment Reports.

EDUCATION AND PROFESSIONAL STATUS

Qualifications

MSc (Geography), Nelson Mandela University, Eastern Cape Province, South Africa, 2025 (completed, graduation in December 2025)
BSc Honours (Environmental Geography), Nelson Mandela University, 2013
BSc (Environmental Science), Nelson Mandela University, 2012

Research

Geospatial detection of Acacia cyclops populations using multispectral remote sensing data in the Keiskamma river catchment, Algoa Bay, South Africa (BSc Honours, 2023)
Retrieving estuarine chlorophyll-a concentrations from remotely sensed data in Algoa Bays, Eastern Cape (MSc, 2024-2025)

Registration and Membership

Registered as Candidate Environmental Assessment Practitioner with EAPASA since 2024 (Registration No 2024/9015)

EMPLOYMENT AND JOB RESPONSIBILITIES

March 2024 – current
CEN INTEGRATED ENVIRONMENTAL MANAGEMENT UNIT
Candidate Environmental Assessment Practitioner under supervision (Part-time)
• EIA services
• ECO services

LIST OF ENVIRONMENTAL PROJECTS AND ROLES

Basic Assessments & related reports

- Elizade WWTW development (draft phase)
- Road and stormwater upgrade in Durban Port for TNPA (draft)
- Formulation of informal suburbs, Toksa, in Thornhill (beginning phase: screening report)
- Formulation of informal suburbs, Ramaphosa, in Patersonia (beginning: screening report)

Environmental Authorization Application

- Elizade WWTW development (draft phase)

Water Use License Applications

- Collector sewer upgrade, Oceanview, Jeffreys Bay (compilation of WULA summary report and associated reports) (draft phase)

Environmental Auditing

- Addo Eco Lodge and associated infrastructure in Addo Elephant National Park
- Standford pumpstation expansion
- Port St Francis residential development
- Fairview business and associated infrastructure development
- Motherwell fuel storage expansion
- Clarkson WWTW, bulk sewer line and pumpstation development
- Road rehab/ upgrade, Makhanda

REFERENCES

Mike Cohen:
Founder at CEN Integrated Environmental Management Unit
(steenbok@aerosat.co.za)

Lucille Behrens:
Senior EAP at CEN IEM Unit and supervisor for second half of 2025
(lucille@environmentcen.co.za)

Claire De Jongh:
Former senior EAP at CEN IEM Unit and supervisor for 2024 and first half of 2025
(clairejarvis@hotmail.co.za)



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