

APPENDIX F: AQUATIC SPECIALIST STUDY

Proposed Upgrade of Bayhead and Langeberg Roads in the Port of Durban, eThekweni Municipality, KwaZulu-Natal

AQUATIC AND WETLAND ASSESSMENT REPORT

25th March 2025



Prepared for: **Life Africa Consulting (Pty) Ltd**

**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Project Details

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**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

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**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Declaration of Independence

This is to certify that the following report has been prepared as per the requirements of:

- Section 32 (3) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations 2017 as per Government Notice No. 40772 Government Gazette, 4 December 2014 (as amended); and
- The Department of Water & Sanitation for Water Use Licensing and wetland assessment, as outlined in the 'Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals' contained in the Government Gazette No. 40713 of 24 March 2017.

I, **Ryan Edwards**, hereby declare that this report has been prepared independently of any influence or prejudice as may be specified by the Department of Water and Sanitation (DWS), Department of Forestry, Fisheries and the Environment (DFFE) and/or the KZN Department of Economic Development, Tourism and Environmental Affairs (EDTEA).

Signed:



Date:

25-March 2025



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Table of Contents

1. Introduction & Background	1
1.1. Location and Description of the Proposed Development Activities	1
1.2. DFFE Screening Tool	2
1.3. Scope of Work	3
1.4. Key definitions and concepts	5
1.4.1. Freshwater Ecosystems	5
1.4.2. Estuarine Ecosystems	6
1.5. Legislative Context Relevant to Freshwater Ecosystems	7
1.5.1. National Water Act (Act No. 36 of 1998) ('NWA')	7
1.5.2. National Environmental Management Act (No. 107 of 1998) ('NEMA')	8
1.5.3. Conservation of Agricultural Resources Act (No. 43 of 1983) ('CARA')	8
1.6. Legislative Context Relevant to Estuarine Ecosystems	8
2. Methods	9
2.1. Desktop Review of Ecosystem Context	9
2.2. Baseline Assessment	10
2.2.1. Determination of the Extent of the Study Area	10
2.2.2. Data Collection	12
2.3. Risk Assessment	12
2.3.1. Impact Categories	12
2.3.2. Impact Scenarios	13
2.4. Section 21(c) and 21(i) Water Use Risk Assessment Matrix	14
3. Desktop Assessment	15
3.1. Review of Ecosystem Context and Setting	15
3.1.1. Climate Setting	15



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

3.1.2.	Geology and Topography	15
3.1.3.	Drainage and River Setting	16
3.1.4.	Wetland Ecosystem Setting	17
3.1.5.	Water Resource Management Context	18
3.1.6.	Terrestrial Vegetation Type	18
3.1.7.	Conservation Context	19
3.2.	Desktop Mapping within 500m and Confirmation of the Study Area	24
4.	Infield Baseline Assessment	28
4.1.	Sampling, Classification & Habitat Characteristics	28
4.1.1.	Estuarine Functional Zone	33
4.1.2.	Man-made Canals	36
4.2.	Present Ecological State (PES) Assessment (Desktop)	40
4.3.	Ecological Importance & Sensitivity (EIS) Assessment	42
4.4.	Specialist Opinion on DFFE Screening Tool Site Sensitivity	45
5.	Risk Assessment	45
5.1.	Activities and Impacts Assessed	45
5.2.	Key Assumptions	45
5.3.	DWS Risk Matrix Assessment	50
6.	Recommended Mitigation Measures	52
6.1.	Project Planning and Design Measures	52
6.1.1.	No-Go Areas and Buffer Zone Determination	52
6.1.2.	Culvert Upgrade Recommendations	53
6.1.3.	Sewer Pipeline Alignments and Designs	53
6.1.4.	Sewer Pump Station Design (if applicable)	54
6.2.	Construction Phase	55
6.2.1.	Demarcation of 'No-Go' Areas and Construction Corridors	55
6.2.2.	Method Statement for Pipeline Decommission and Reconnection	55
6.2.3.	Runoff, Erosion and Sediment Control	56



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

6.2.4.	Hazardous substances / materials management	56
6.2.5.	Invasive Alien Plant Control	57
6.2.6.	Noise, Dust and Light Pollution Minimisation	58
6.2.7.	Prohibitions Related to Animals	58
6.2.8.	General Rehabilitation Guidelines	58
6.2.9.	Construction phase monitoring measures	59
6.3.	Operational Phase	60
6.3.1.	Management and Maintenance of Infrastructure	60
6.3.2.	Alien Invasive Plant Management and Maintenance	60
6.3.3.	Monitoring	60
6.3.4.	Remediation / Rehabilitation	60
7.	License and Permit Requirements	61
7.1.	Environmental Authorisation Requirements	61
7.2.	Water Use License Requirements	62
7.3.	Coastal Authorisation and Permit Requirements	62
8.	Assumptions, Limitations & Level of Confidence	63
9.	Conclusion	64
10.	References	66



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

List of Figures

Figure 1. Project locality map.	2
Figure 2. Aquatic biodiversity theme outputs for the project site from the DFFE Screening Tool.	3
Figure 3. Drainage and river ecosystem setting of the study area, within catchment U60F.	16
Figure 4. Study area in relation to the wetland mapping from the National Wetland Map Version 5 (NBA, 2018).	17
Figure 5. Study area in relation to Strategic Water Source Areas (CSIR, 2017).	18
Figure 6. Study area in relation to the KZN Terrestrial Conservation Plan (EKZNW, 2016).	21
Figure 7. Study area in relation to the KZN Freshwater Conservation Plan (EKZNW, 2007).	22
Figure 8. Study area in relation to NEM:BA threatened ecosystems layer – original extent.	23
Figure 9. Study area in relation to NEM:BA threatened ecosystems layer – remaining extent.	24
Figure 10. Rivers and wetlands within 500m of the project site categorised into hydro geomorphic types.	26
Figure 11. Indication of the ‘likelihood of impact’ related to rivers and wetlands.	27
Figure 12. Delineation map showing the location and extent of watercourses assessed within 500m of the project site.	30
Figure 13. Delineation map showing the location and extent of watercourses assessed within 500m of the project site – northern section.	31
Figure 14. Delineation map showing the location and extent of watercourses assessed within 500m of the project site – southern section.	32



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

List of Tables

Table 1. Data sources and GIS information consulted to inform the freshwater ecosystem assessment...	9
Table 2. Qualitative 'likelihood of impact' ratings and descriptions.....	11
Table 3. Overview of the key climatic characteristics of the region.....	15
Table 4. Summary of the key biophysical characteristics of the Durban Bay Estuarine Functional Zone...	33
Table 5. Summary of the key hydro-geomorphic and biophysical characteristics of Canal Unit C01.	36
Table 6. Summary of the key hydro-geomorphic and biophysical characteristics of Canal Unit C02.	37
Table 7. Summary of the key hydro-geomorphic and biophysical characteristics of Canal Unit C03.	38
Table 8. Summary of the key hydro-geomorphic and biophysical characteristics of Canal Unit C04.	39
Table 9. DWS Estuary Health Index.....	41
Table 10. Provisional Present Ecological Health Status for Durban Bay (DFFE & MER, 2016).	42
Table 11. Summary of Durban Bay Estuary Importance taken directly from: (Van Niekerk et al. 2019b)...44	
Table 12. Summary of impacts assessed for the project activities.....	47
Table 13. Summary of the DWS 'Risk Assessment Matrix' results.	51



1. Introduction & Background

1.1. Location and Description of the Proposed Development Activities

The applicant, Transnet National Ports Authority (TNPA), is proposing the widening of the Bayhead and Langeberg Roads in the Port of Durban, in the eThekweni Municipality, KwaZulu-Natal. The project entails the following:

- Widening existing carriageways by one lane in each direction
- Modification to six bridges (rail and canals) for lane extension and structural integrity
- Two (2) gates are proposed in order to regulate access, improve security, and manage traffic flow into specific port areas:
 - Bayhead Road Gate: This gate will be situated between the Shell Service Station and Bayhead Park A intersection; and will entail expansion to the Bayhead Road by approx. 10m on either side of the inbound and outbound lanes.
 - Bypass Road Gate: This gate will be situated on the Bypass Road at the truck parking area; and will entail the expansion of approx. 16m.
- Stormwater management enhancements, including improved drainage systems and designated discharge points.
- Modification of the existing canal upstream of Bridge 3-6 to splay the abutments and repair to erosion.
- Expansion of existing culvert at Bridge 3-6 with an additional 3.4m x 7m culvert and associated widening of upstream and downstream of canal.
- Proposed route for sewer rising main.

A locality map of the proposed development activities is shown in Figure 1.

Verdant Environmental have been appointed by LA Consulting, on behalf of TNPA, to undertake an aquatic and wetland assessment to inform the legislative processes.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

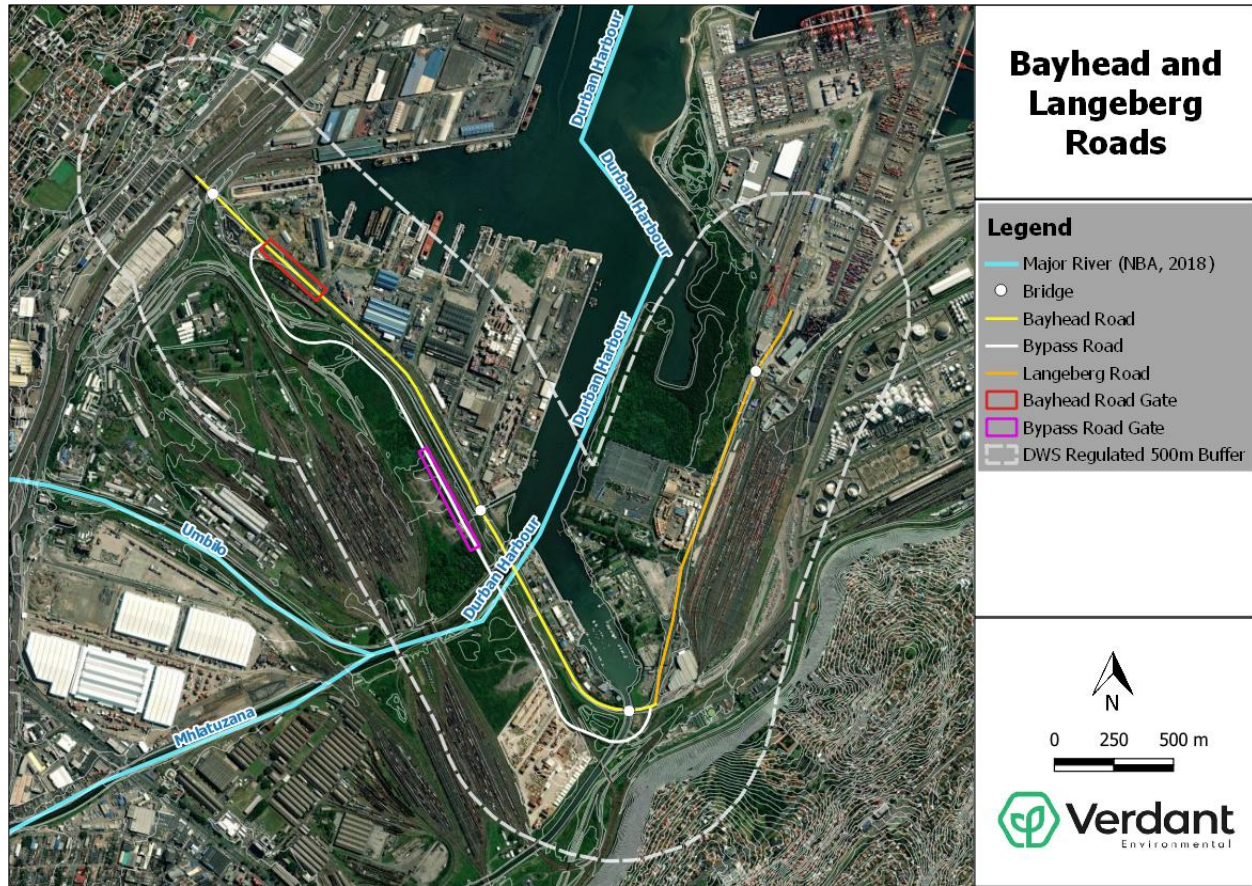


Figure 1. Project locality map.

1.2. DFFE Screening Tool

In accordance with the Environmental Impact Assessment (EIA) Regulations (as amended) published under the National Environmental Management Act (Act No. 107 of 1998) (NEMA), the issuing of an Environmental Authorisation (EA) requires the undertaking of a Basic Assessment (BA) or Environmental Impact Assessment (EIA) process, with associated Public Participation Process (PPP) and a specialist studies. The need for a particular specialist study is determined based on the environmental sensitivities of the site, identified using the Department of Forestry, Fisheries and the Environment's (DFFE's) national web-based environmental screening tool.

The project site falls within a region identified as being of "Very High sensitivity" in terms of the Aquatic Biodiversity theme (Figure 2). The surrounding area is rated as "Low sensitivity".



Proposed Upgrade of Bayhead and Langeberg Roads: Aquatic and Wetland Assessment MARCH 2025

A site sensitivity verification assessment is required to confirm the aquatic sensitivity of the site and the assessment level and reporting requirements. If the site is considered to be of low sensitivity, then an Aquatic Biodiversity Compliance Statement is required. If the aquatic sensitivity is medium to very high, then an Aquatic Biodiversity Specialist Assessment is required, as set out by the National Environmental Management Act (NEMA) (Act No. 107 of 1998) Regulations of 2020 (as amended) (GN R. 320 of 2020).

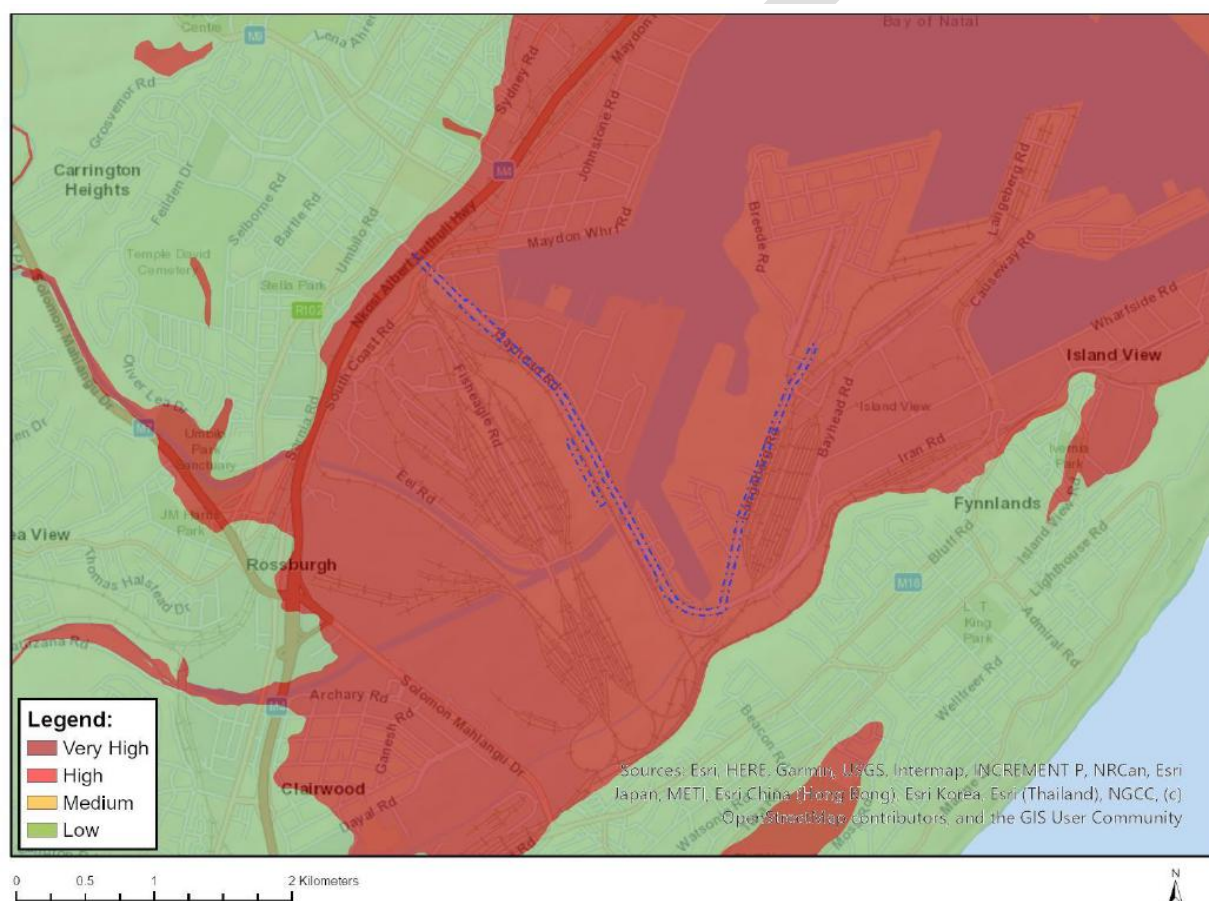


Figure 2. Aquatic biodiversity theme outputs for the project site from the DFFE Screening Tool.

1.3. Scope of Work

The scope of work completed as part of this assessment was as follows:



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

- Desktop review of the biophysical setting and freshwater and estuarine ecosystem conservation planning context of the project site through a review of all available spatial datasets in a Geographical Information System (GIS).
- Desktop mapping of all watercourses (i.e. stream / river channels, riparian areas, wetlands, dams etc.) and the estuarine functional zone (EFZ) within a 500m radius of the project activities in a Geographical Information System (GIS) using available wetland, river and estuarine inventories, colour aerial photography and available contours for the study area.
- Aquatic and wetland impact likelihood assessment to identify the ecosystems to be measurably negatively affected by the proposed project activities and to be taken forward for the infield assessment.
- Review of existing and relevant estuarine ecological studies for the port.
- A site visit was undertaken to confirm the nature and state of watercourses within the estuarine functional zone (EFZ) areas being impacted.
- Following the site visit all relevant background information, recent and historical data and any other estuary reports were collated and synthesized to provide context to the assessment of impacts. The Estuary Management Plan was key in guiding the principles against which the assessment was carried out. No formal biotic sampling was undertaken as there is sufficient available information and data for the estuary.
- Mapping of the delineated estuary: The latest delineation of the estuary was used to determine the estuary boundary.
- Assessment of the present ecological state (PES) of the estuary by reviewing the latest assessments.
- The potential and likely direct and indirect impacts of the project on estuarine and wetland ecosystems including cumulative impacts were identified and described.
- Project design, construction phase and operational phase mitigation measures to avoid, minimize and/or rehabilitate the potential impacts have been provided.
- The qualitative risk of the proposed development activities on the local estuary and wetlands was assessed using the DWS risk matrix for Section 21(c) and 21(i) water uses.
- An opinion on the legislative requirements of the proposed activities in terms of all environmental and water legislation was provided.



1.4. Key definitions and concepts

An ecosystem is a group of plants, animals and other organisms interacting with each other and with non-living (abiotic) components of their environment. Ecosystems can be classified broadly into terrestrial and aquatic ecosystems. Terrestrial ecosystems occur on land where water is a limiting factor, whereas aquatic ecosystems occur within landforms that are permanently or periodically inundated with flowing or standing water (Ollis *et al.*, 2013).

1.4.1. Freshwater Ecosystems

Freshwater ecosystems are a subset of the Earth's aquatic ecosystems and include all inland freshwater rivers, streams, wetlands, lakes, ponds and springs. This broad range of freshwater ecosystem types contains a multitude of habitats of varying ecological complexity and diversity (Wrona *et al.*, 2016). Wetlands, streams and rivers fall under the umbrella term of "freshwater ecosystems".

Wetlands, streams and rivers fall under the umbrella term of 'watercourse' in the National Water Act (Act No. 36 of 1998) (NWA) of South Africa. Section 1(1)(xxiv) of the NWA defines a 'watercourse' as:

- a river or spring;
- a natural channel in which water flows regularly or intermittently;
- a wetland, lake or dam into which, or from which, water flows; and
- any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

This assessment focusses on the assessment of natural watercourses and their associated habitats / ecosystems likely to be measurably affected by the proposed development, focussing specifically on wetlands. For the purposes of this assessment, wetlands, streams and rivers are defined as follows:

- **Wetlands** are areas that have water on the surface or within the root zone for extended periods throughout the year such that anaerobic soil conditions develop which favour the growth and regeneration of hydrophytic vegetation (plants which are adapted to saturated and anaerobic soil conditions). In terms of Section 1 of the NWA, wetlands are legally defined as: (1) "...land which is transitional between terrestrial and aquatic systems where



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.”

- **Rivers and streams** are natural channels that are permanent, seasonal or temporary conduits of freshwater. In terms of ecological habitats, rivers and streams comprise in-stream aquatic habitat and riparian habitat. Generally, riparian zones mark the outer edge of stream and river systems. Streams and rivers are differentiated in terms of channel dimensions and generally fall within the broad category of rivers / riverine ecosystems in this report.
- **Instream habitat** is the aquatic habitat (or alluvial in the case of intermittent / ephemeral watercourses) within the active channel that includes the water column, river bed and the inundated active channel margins, and associated vegetation. In terms of Section 1 of the NWA, instream habitat is legally defined as habitat that includes “...the physical structure of a watercourse and the associated vegetation in relation to the bed of the watercourse.”
- **A riparian zone** is a habitat, comprising bare soil, rock and/or vegetation that is: (i) associated with a watercourse; (ii) commonly characterised by alluvial soils; and (iii) inundated or flooded to an extent and with a frequency sufficient to support vegetation species with a composition and physical structure distinct from those of adjacent land areas (DWAF, 2005). In terms of Section 1 of the NWA, riparian habitat is legally defined as: ‘habitat that “...includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.”

1.4.2. Estuarine Ecosystems

The Estuaries are referred to as any body of water that has a connection to the ocean, and is either permanently or periodically open to the sea (Celliers et al., 2009). Estuaries are ecosystems characterised by the mixing of freshwater and seawater, where water flow is influenced by the tides, where wave action is reduced, and where sediment and nutrients are deposited during normal conditions and eroded during floods (Hay and McKenzie, 2005). Estuaries are highly productive ecosystems, and provide a number of important ecological functions that yield



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

significant benefits to people (Celliers et al., 2009). The definition of an estuary provided in Section 1(ix) of the NWA is as follows:

An “estuary” means a partially or fully enclosed body of water -

- which is open to the sea permanently or periodically; and
- within which the sea water can be diluted, to an extent that is measurable, with freshwater drained from land.

1.5. Legislative Context Relevant to Freshwater Ecosystems

Rivers and wetlands are not formally protected by law but their alteration is regulated by three different pieces of legislation in South Africa, namely:

- National Water Act (No. 36 of 1998) ('NWA');
- National Environmental Management Act (No. 107 of 1998) ('NEMA'); and
- Conservation of Agricultural Resources Act (No. 43 of 1983) ('CARA').

1.5.1. National Water Act (Act No. 36 of 1998) ('NWA')

Section 21 of the National Water Act (No 36 of 1998) lists eleven (11) activities that constitute water uses that require a Water Use License (WUL) prior to the activities commencing, unless the use is excluded. The water uses included in Section 21 are:

- a) taking water from a water resource;
- b) storing water;
- c) impeding or diverting the flow of water in a watercourse;
- d) engaging in a stream flow reduction activity contemplated in section 36;
- e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
- f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- g) disposing of waste in a manner which may detrimentally impact on a water resource;
- h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- i) altering the bed, banks, course or characteristics of a watercourse;
- j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and



- k) using water for recreational purposes.

Typically, development activities that directly and indirectly alter the characteristics of watercourses are considered Section 21(c) and 21(i) water uses and are the most common water uses.

1.5.2. National Environmental Management Act (No. 107 of 1998) (‘NEMA’)

Listed Activities that may negatively affect watercourses are included in three (3) Listing Notices in the EIA Regulations (2017) published under Section 24(5) and 44 of NEMA. Listed activities require Environmental Authorisation (EA) subject to conducting either a basic assessment or full Environmental Impact Assessment (EIA) prior to the project activities commencing.

1.5.3. Conservation of Agricultural Resources Act (No. 43 of 1983) (‘CARA’)

Regulated activities that may negatively affect watercourses are included in the CARA Regulations as amended (2001) published under Section 29 the CARA. Formal approval / permission from an executive officer is required before such regulated activities can take place.

1.6. Legislative Context Relevant to Estuarine Ecosystems

In South Africa, activities in estuaries are primarily governed by the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008) (NEM:ICZMA) and the National Water Act (Act 36 of 1998), along with the National Estuarine Management Protocol published in terms of the NEM:ICZMA, which provides guidance for estuarine management plans.

However, Section 1(xvii) of NWA includes an estuary as part of the definition of a water resource i.e. a “water resource includes a watercourse, surface water, estuary, or aquifer.”



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

2. Methods

2.1. Desktop Review of Ecosystem Context

Freshwater ecosystems are typically linear features that are connected over regional scales in the landscape and embedded in the terrestrial matrix. Furthermore, freshwater ecosystems are typically located at topographical low points in the landscape, thereby collecting and conveying materials (water and dissolved and particulate matter) from within their entire catchment (UN Environment, 2018). It is thus important to first contextualise the onsite freshwater ecosystems in terms of local and regional setting, and conservation planning. An understanding of the biophysical and conservation context of the site will assist in the assessment of the importance and sensitivity of the onsite freshwater ecosystems, the setting of management objectives and the assessment of the significance of anticipated impacts. The following data sources and GIS spatial information listed in Table 1 was consulted to inform the specialist assessment. The data type, relevance to the project and source of the information is provided.

Table 1. Data sources and GIS information consulted to inform the freshwater ecosystem assessment.

Data/Coverage Type		Relevance	Source
Biophysical / Ecological Context	Latest Google Earth™ imagery	<i>To supplement available aerial photography where needed and to inform catchment level impacts</i>	Google Earth™ On-line
	National Rivers (GIS Coverage)	<i>Highlight potential onsite and local rivers and map local drainage network</i>	DWS
	South African Quaternary catchments	<i>Locates the project area within the principal water resource management units in South Africa</i>	DWS
	South African Quinary catchments	<i>Locates the project area within the principal water resource management units in South Africa</i>	DWS
	DWA Eco-regions (GIS Coverage)	<i>Understand the regional biophysical context in which water resources within the study area occur</i>	DWA (2005)
	South African Vegetation Map (GIS Coverage)	<i>Classify vegetation types and determination of reference vegetation</i>	SANBI (2006 - 2018)



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Data/Coverage Type		Relevance	Source
	South African Inventory of Inland Aquatic Ecosystems (SAIIAE), 2018 – River Ecosystems	<i>Shows location of river within the relevant inventories</i>	Van Deventer et al. (2018a)
	South African Inventory of Inland Aquatic Ecosystems (SAIIAE), 2018 – Wetland Ecosystems	<i>Shows location of wetlands within the relevant inventories</i>	Van Deventer et al. (2018a)
Conservation Context	The National Freshwater Ecosystem Priority Area (NFEPA) Assessment (2011) – Wetland FEPAs	<i>Shows location of national wetland ecosystem conservation priorities</i>	CSIR (2011)
	The National Freshwater Ecosystem Priority Area (NFEPA) Assessment (CSIR, 2011) – River FEPAs	<i>Shows location of national river ecosystem conservation priorities</i>	CSIR (2011)
	National Biodiversity Assessment – Terrestrial Realm (GIS Coverage)	<i>Terrestrial ecosystem / vegetation type threat status</i>	Skowno et al. (2018)
	National Biodiversity Assessment – Inland Aquatic / Freshwater Realm (GIS Coverage)	<i>Freshwater ecosystem / vegetation type threat status</i>	Van Deventer et al. (2018b)
	Strategic Water Sources Areas (2017)	<i>Shows location Strategic Water Source Areas</i>	(WRC, WWF-SA & CSIR, 2017)
	KZN Biodiversity Sector Plan: Critical Biodiversity Areas Irreplaceable (GIS Coverage)	<i>Provincial conservation planning importance.</i>	EKZNW (2016)
	KZN Biodiversity Sector Plan: Critical Biodiversity Areas Optimal (GIS Coverage)	<i>Provincial conservation planning importance.</i>	EKZNW (2016)
	KZN Terrestrial KZN Aquatic Systematic Conservation Plan (GIS Coverage)	<i>Provincial conservation planning importance.</i>	EKZNW (2011)
	KZN Aquatic Systematic Conservation Plan (GIS Coverage)	<i>Provincial conservation planning importance.</i>	EKZNW (2007)

2.2. Baseline Assessment

2.2.1. Determination of the Extent of the Study Area

For the purposes of this assessment, the study area for infield assessment comprised **all rivers within 100m and wetlands within 500m of the of the development footprint that stand to be measurably negatively impacted**. The wetlands and rivers likely to be impacted were identified using the 'likelihood of impact' guidelines developed by Verdant Environmental in Table 2.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Table 2. Qualitative 'likelihood of impact' ratings and descriptions.

Likelihood of Impact Rating	Description of Rating Guidelines
Definite	These resources are likely to require impact assessment and a Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons: ➤ resources located within the footprint of the proposed development activity and will be impacted by the project; and/or ➤ resources located within 15m upstream and/or upslope of the proposed development activity and trigger requirements for Environmental Authorisation according to the NEMA: EIA regulations; and/or ➤ resources located within 15m or downslope of the development and trigger requirements for Environmental Authorisation according to the NEMA: EIA regulations; and/or ➤ resources located downstream within the following parameters: ○ within 15m downstream of a low-risk development; ○ within 50m downstream of a moderate risk development; and/or ○ within 100m downstream of a high-risk development e.g. mining, large industrial land uses.
Likely / Possible	These resources may require impact assessment and a Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons: ➤ resources located within 32m but greater than 15m upstream, upslope or downslope of the proposed development; and/or ➤ resources located within a range at which they are likely to incur indirect impacts associated with the development (such as water pollution, sedimentation and erosion) based on development land use intensity and development area. This is generally resources located downstream within the following parameters: ○ within 32m downstream of a low-risk development; ○ within 100m downstream of a moderate risk development; and/or ○ within 500m downstream of a high-risk development (note that the extent of the affected area downstream could be greater than 500m for high-risk developments or developments that have extensive water quality and flow impacts e.g. dams / abstraction and treatment plants);
Unlikely	These resources are unlikely to require impact assessment or Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons: ➤ resources located a distance upstream, upslope or downslope (>32m) of the proposed development and which are unlikely to be impacted by the development project; and/or ➤ resources located downstream but well beyond the range at which they are likely to incur impacts associated with the development (such as water pollution, sedimentation and erosion). This is generally resources located downstream within the following parameters: ○ greater than 32m downstream of a low-risk development; ○ greater than 100m downstream of a moderate risk development; and/or ○ greater than 500m downstream of a high-risk development (note that the extent of the affected area downstream could be greater than 500m for high-risk developments or developments that have extensive water quality and flow impacts e.g. dams / abstraction and treatment plants);



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Likelihood of Impact Rating	Description of Rating Guidelines
None	These resources will not require impact assessment or a Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons: ➤ resources located within another adjacent sub-catchment, and which will not be impacted by the development in any way, shape or form.

2.2.2. Data Collection

A field assessment to delineate and assess the rivers and wetlands within the study area was undertaken on **18 March 2025**. Data collection involved the following:

- Systematic soil sampling across all valley lines, valley bottom areas, valley heads, hillslopes and depressions using a clay auger to confirm the presence and extent of wetland and alluvial (riparian) soils according to the guideline: '*A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas*' (DWAF, 2005). Soil sample points were recorded onsite using a hand-held GPS. A total of 4 transects were undertaken across the airstrip site.
- The recording of the dominant plant species and general composition of the wetland and riparian vegetation in the vicinity of the soil sample points based on visual observations. Observations points were recorded onsite using a hand-held GPS.
- The recording of the landscape / terrain position at each sample point based on visual observations. Observations points were recorded onsite using a hand-held GPS.
- The recording of existing river and wetland impacts (such as extent of existing infilling) using a hand-held GPS.
- Systematic sampling of aquatic macro-invertebrates in accordance with the SASS5 (South African Scoring System) method (Dickens & Graham, 2002).

2.3. Risk Assessment

2.3.1. Impact Categories

Wetland and river ecosystem impacts can be grouped into the following broad impact types:

1. **Direct ecosystem modification or destruction / loss impacts** – This impact refers to the direct physical destruction and/or modification of wetland communities, habitat and



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

associated biota. Such impacts may be attributed to a range of activities including vegetation / habitat clearing (stripping / grubbing), earthworks (i.e. excavation and infilling) and deep flooding by impoundments.

2. **Alteration of hydrological and geomorphological processes** – This impact refers to all the indirect impacts resulting from human activities within the watercourse or catchment that alter hydrological and geomorphological processes i.e. rates of erosion and sedimentation. This includes activities that: (i) modify landcover characteristics that alter the quantity and pattern of catchment runoff and sediment inputs e.g. earthworks, surface hardening, plantations, etc.; (ii) activities that regulate, reduce or increase flows e.g. impoundment / dams, abstraction, return flows and decant flows; and activities alter wetland flow hydraulics e.g. establishment of drains, flow canalisation, flow constrictions and flow diversions.
3. **Water pollution impacts** – This impact refers to the alteration of the chemical and biological characteristics of soil and water within watercourses and the associated ecological impacts. In the context of this impact assessment, water quality is assessed in relation to changes to its fitness for use (e.g. for domestic, recreational or agricultural purposes) and ability to maintain the health of aquatic ecosystems. This impact includes a full spectrum of activities ranging from direct inputs (e.g. spillages / point source discharges) through to diffuse source inputs from land use activities that affects the quality of water entering watercourses (e.g. hazardous substances handling, storage & transport; urban stormwater management; irrigation return flows and acid mine drainage).
4. **Ecological connectivity and edge disturbance impacts** – This impact refers to the alteration of local and regional ecological processes resulting from the transformation of land and disturbance within and/or surrounding a watercourse. Key ecological processes of relevance in this regard include ecological connectivity and edge effects edge effects that are impacted by habitat fragmentation, patch size reduction, increased alien invasive plant invasion, noise pollution, vibrations, light pollution, and the occurrence of barriers to propagule and animal movement.

2.3.2. Impact Scenarios

The impact assessment was undertaken for the following mitigation scenarios only:

1. **Realistic Poor Mitigation Scenario:** This scenario involves the implementation of the proposed development plan and designs that are currently proposed with the



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

associated implementation of standard construction and operational phase mitigation measures. In terms of implementation success, this scenario assumes a realistic / likely poor implementation scenario based on the author's experience with such activities.

2. **Realistic Good Mitigation Scenario:** This scenario involves the implementation of the development plan and designs that incorporate all the project planning and design, construction, operational and decommissioning phase mitigation measures recommended by the author. In terms of implementation success, this scenario assumes a realistic best-case scenario for implementation based on the author's experience with such activities.

2.4. Section 21(c) and 21(i) Water Use Risk Assessment Matrix

Government Notice 4167 of 2023 published in terms of Section 39 of the NWA sets out the terms and conditions for the General Authorisation of Section 21(c) and 21(i) water uses, key among which is that only developments posing a 'Low Risk' to watercourses can apply for a GA. To this end, the DWS have developed a Risk Assessment Matrix/Tool (Version 2) to assess water risks associated with development activities. The DWS Risk Matrix/Assessment Tool (V2, 2023) was applied to the proposed project.



3. Desktop Assessment

3.1. Review of Ecosystem Context and Setting

3.1.1. Climate Setting

An overview of the key climatic characteristics of the national vegetation type (i.e. KwaZulu Natal Coastal Belt – within the Indian Ocean Coastal Belt Bioregion) and Ecoregion (North Eastern Coastal Belt) is provided in Table 3 below.

Table 3. Overview of the key climatic characteristics of the region.

Aspect	Description
Elevation Above Mean Sea Level	0 - 300 a.m.s.l.
Mean Annual Precipitation (MAP)	600 - 700 mm/annum
Potential Evapotranspiration (PET)	1646 mm/annum
Mean Annual Simulated Runoff for Quaternary Catchment	150 - 250 mm
Rainfall seasonality	Mid Summer, Late Summer, Early Summer

3.1.2. Geology and Topography

The study area is underlain predominantly by calcarenite, clayey sand, red and grey dune sand, limestone, conglomerate of the Maputaland Group on the north-westernmost end of Bayhead Road, the remainder of the study area is underlain by quaternary alluvium, sand and calcrete.

The site topology is predominantly flat with some minor rises and fluctuations in micro-topography.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

3.1.3. Drainage and River Setting

The project site falls within quaternary catchment U60F. The project activities fall within the Estuarine Functional Zone (EFZ) of the Durban Bay Estuary (Figure 3). The majority of the DWS regulated area also falls in the Durban Bay EFZ, with the exception of the north-western-most portion of Bayhead Road.

Several canalised rivers feed into and traverse the estuary and cross the study area, namely:

- Durban Harbour Canal (below the confluence of the Mhlatuzana and uMbilu Rivers), and
- Amanzimyana Stream (canalised), located along the southern section of Bayhead Road which is approximately 100m from the intersection with Langeberg Road.

Both canals have tidal influence and are thus estuarine in nature.

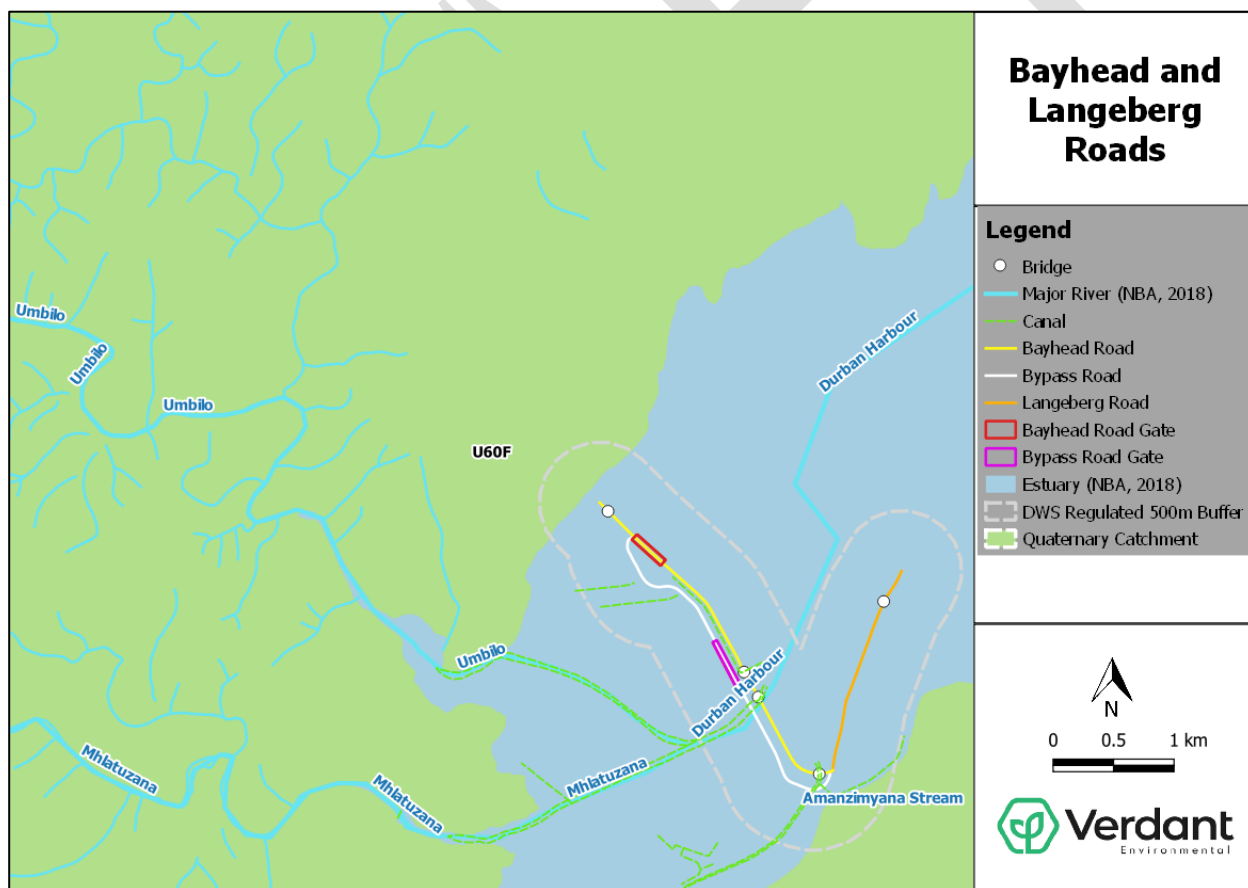


Figure 3. Drainage and river ecosystem setting of the study area, within catchment U60F.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

3.1.4. Wetland Ecosystem Setting

In terms of the National Wetland Map (Van Deventer et al., 2018), only the Durban Bay Estuary is located within the DWS regulated 500m Buffer study area. A **Floodplain Wetland** is modelled to occur to the south-east, and a few **Seep Wetlands** and **Unchannelled Valley Bottom Wetlands** are modelled to occur to the west and north of the study area. (Figure 4). **Floodplain Wetlands** and **Unchannelled Valley Bottom Wetlands** of the **Indian Ocean Coastal Belt Bioregion** are considered 'Critically Endangered' and 'Poorly Protected', while **Seep Wetlands** of the **Indian Ocean Coastal Belt Bioregion** are considered 'Critically Endangered' and 'Not Protected' (Van Deventer et al. 2018). The **Durban Bay Estuary** is also considered 'Critically Endangered' and 'Not Protected' (Van Deventer et al. 2018).

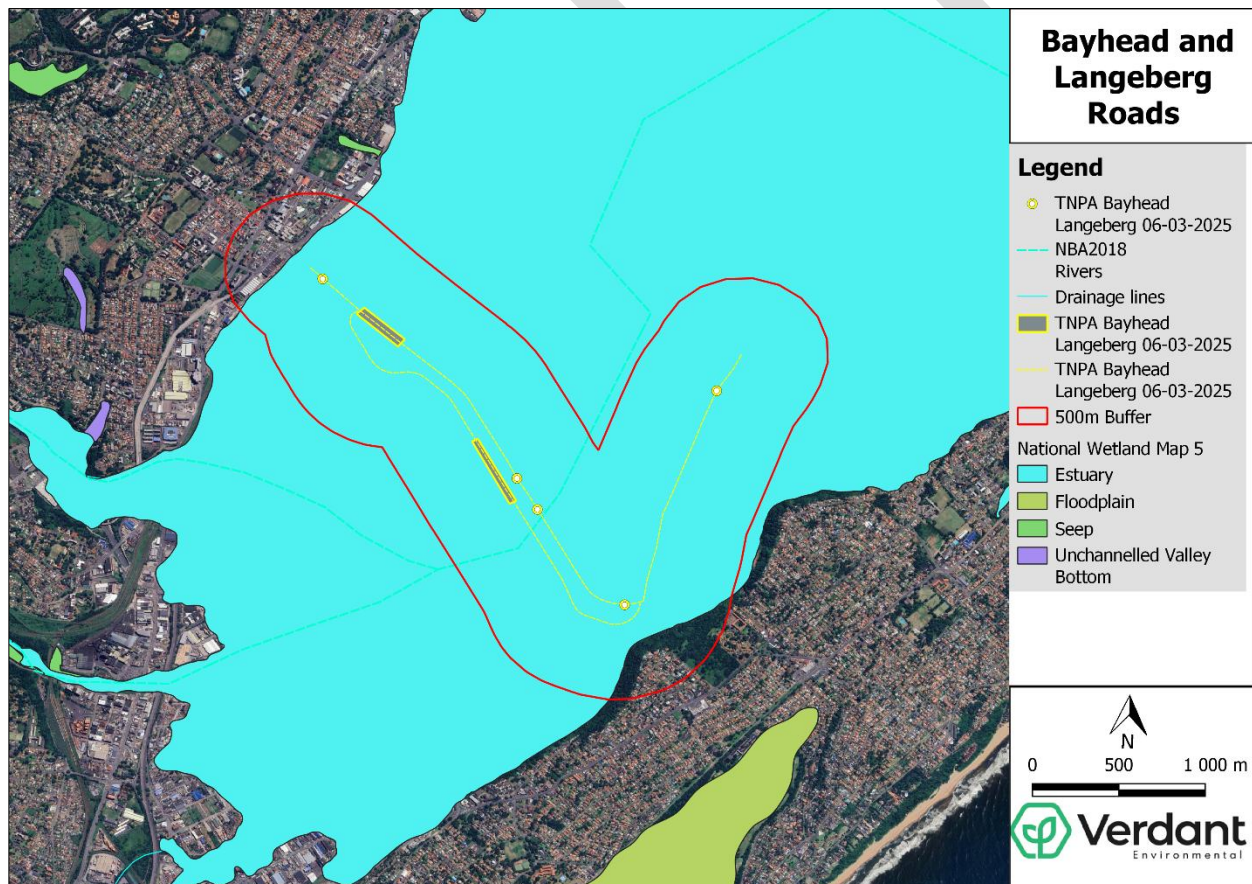


Figure 4. Study area in relation to the wetland mapping from the National Wetland Map Version 5 (NBA, 2018).



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

3.1.5. Water Resource Management Context

The study area falls within the Zululand Coast Surface Water Strategic Water Source Area (SWSA – WRC, WWF-SA & CSIR, 2017) (Figure 5).

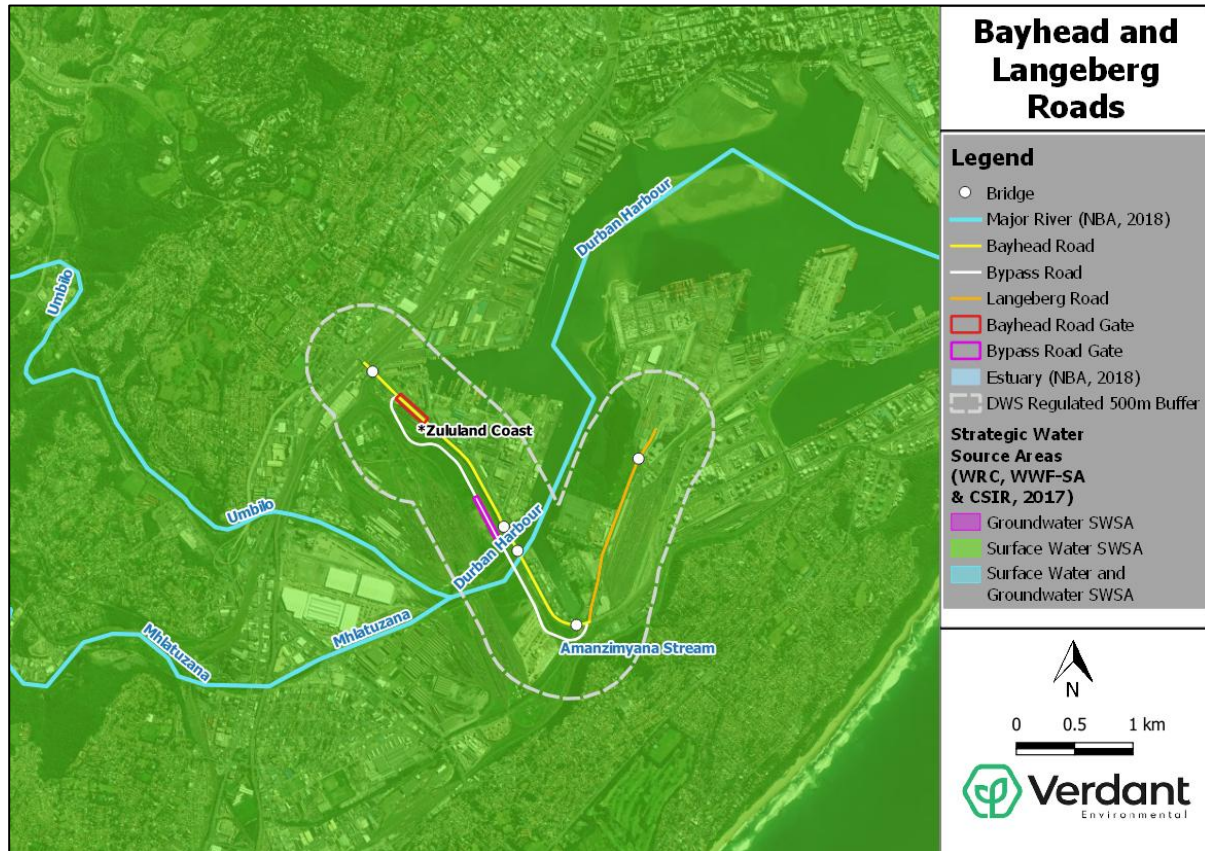


Figure 5. Study area in relation to Strategic Water Source Areas (CSIR, 2017).

3.1.6. Terrestrial Vegetation Type

The majority of the DWS regulated 500m buffer study area is classified as non-terrestrial and forms part of the Estuarine Functional Zone for the Durban Bay Estuary; with the exception of the north-western-most portion of Bayhead Road which falls within KwaZulu-Natal Coastal Belt Grassland and a patch of Mangrove Forest which adjoins a portion of Langeberg Road.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

KwaZulu-Natal Coastal Belt Grassland falls within the KwaZulu-Natal Coastal Belt vegetation type in Mucina and Rutherford (2006) which forms part of the Indian Ocean Coastal Belt. This vegetation type is described by Mucina & Rutherford (2006) as comprising *“Highly dissected undulating coastal plains which presumably used to be covered to a great extent with various types of subtropical coastal forest (the remnants of one of which are described in Chapter 12 as Northern Coastal Forest). Some primary grassland dominated by Themeda triandra still occurs in hilly, high rainfall areas, where pressure from natural fire and grazing regimes prevailed. At the present the KwaZulu Natal Coastal Belt is affected by an intricate mosaic of very extensive sugarcane fields, timber plantations and coastal holiday resorts with interspersed secondary Aristida grasslands, thickets and patches of coastal thornveld”*.

Mangrove Forest is described by Mucina & Rutherford (2006) as comprising *“Species-poor and often monospecific, low and dense forests of mangroves (and fringing thickets of Hibiscus tiliaceus and Acrostichum aureum) in tidal zones of lagoons and estuaries.*

3.1.7. Conservation Context

Noteworthy conservation planning features include:

- According to the KZN Terrestrial Conservation Plan (EKZNW, 2016 – see Figure 6):
 - Three portions of Bayhead Road for part of a Critical Biodiversity Area (CBA Irreplaceable).
 - In addition, the proposed Bypass Road Gate falls within a CBA: Irreplaceable and large portion of the Bypass Road falls within a CBA: Irreplaceable.
- According to the KZN Freshwater Conservation Plan (EKZNW, 2007 – see Figure 7):
 - Most of the study area has been flagged as ‘Available’.
 - Both the Durban Harbour Canal and the Amanzimnyana Stream Canal have been ‘Earmarked’.
- According to the National Biodiversity Assessment (SANBI, 2018):
 - KwaZulu-Natal Coastal Belt Grassland is listed as Endangered (EN)
 - Mangrove Forest is listed as Least Concern (LC)
 - The Durban Bay Estuary is listed as Critically Endangered (CR) and Not Protected (NP)
 - The relevant reach of the Durban Harbour Canal is listed as Endangered (EN) and Poorly Protected (PP) at the national scale.
- According to the National Freshwater Ecosystem Priority Areas project (CSIR, 2011):



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

- The Durban Bay Estuary is considered a NFEPA Estuary.
 - No wetland NFEPAs are modelled to occur within the DWS regulated 500m Buffer.
 - The study area does not fall within a River FEPA area.
- According to KZN Forests (EKZNW, 2010):
 - Two patches of forest occur within the DWS regulated 500m buffer study area. One patch along the estuary mouth adjoining Langeberg Road is flagged as Mangrove Forest, which is considered 'Critically Endangered' provincially (Jewitt, 2018), and one patch to the south of Bypass Road and east of Langeberg Road has been flagged as a patch of KwaZulu-Natal Coast Forests: Southern Moist Coastal Lowlands Forests which is considered 'Critically Endangered' provincially (Jewitt, 2018).
- According to the KZN Vegetation Map (EKZNW, 2011) and the latest threat status for provincial vegetation types (Jewitt, 2018):
 - KwaZulu-Natal Coast Belt Grassland is considered 'Critically Endangered' and 'Nominally Protected'
 - Mangrove Forests are considered 'Critically Endangered' and 'Moderately Protected'
 - KwaZulu-Natal Coast Forests: Southern Moist Coastal Lowlands Forests are considered 'Critically Endangered' and 'Poorly Protected'
 - Subtropical Coastal Lagoons: Estuary is considered 'Least Threatened' and 'Fully Protected'.



Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025

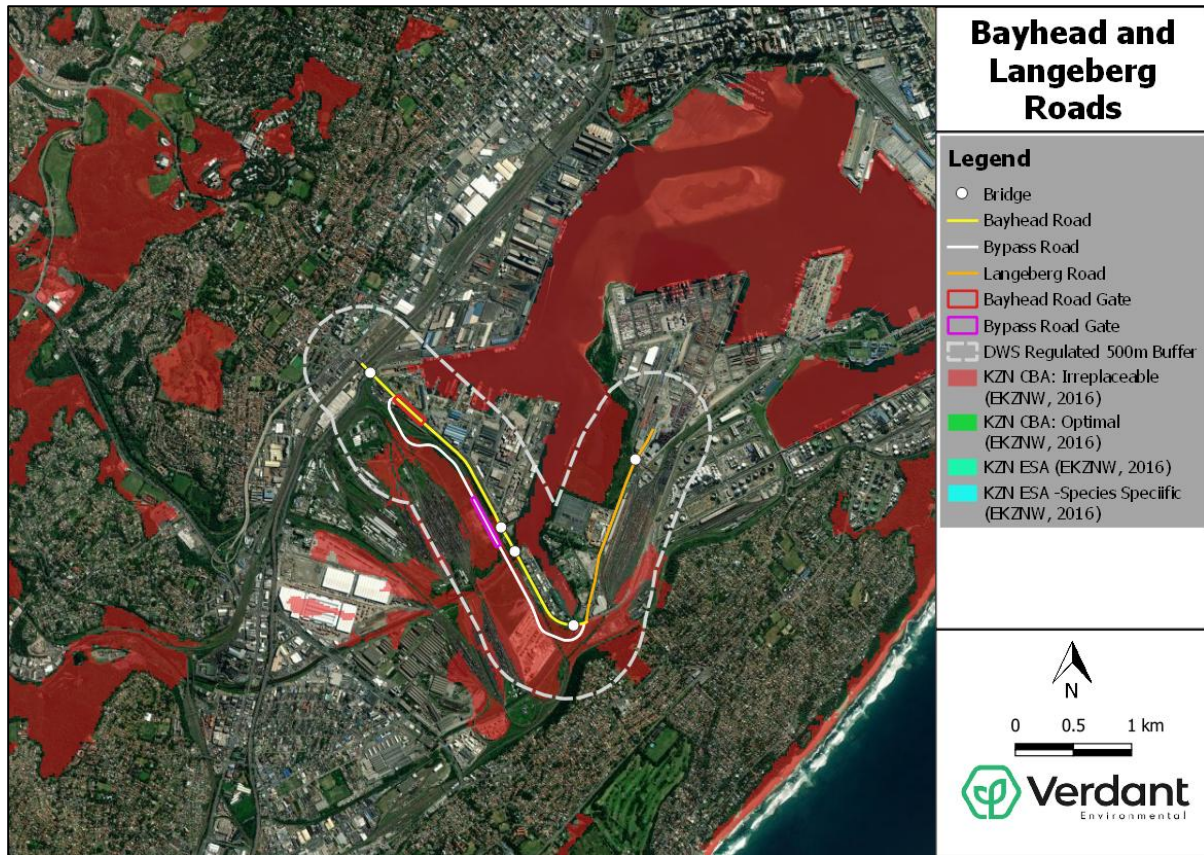


Figure 6. Study area in relation to the KZN Terrestrial Conservation Plan (EKZNW, 2016).



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

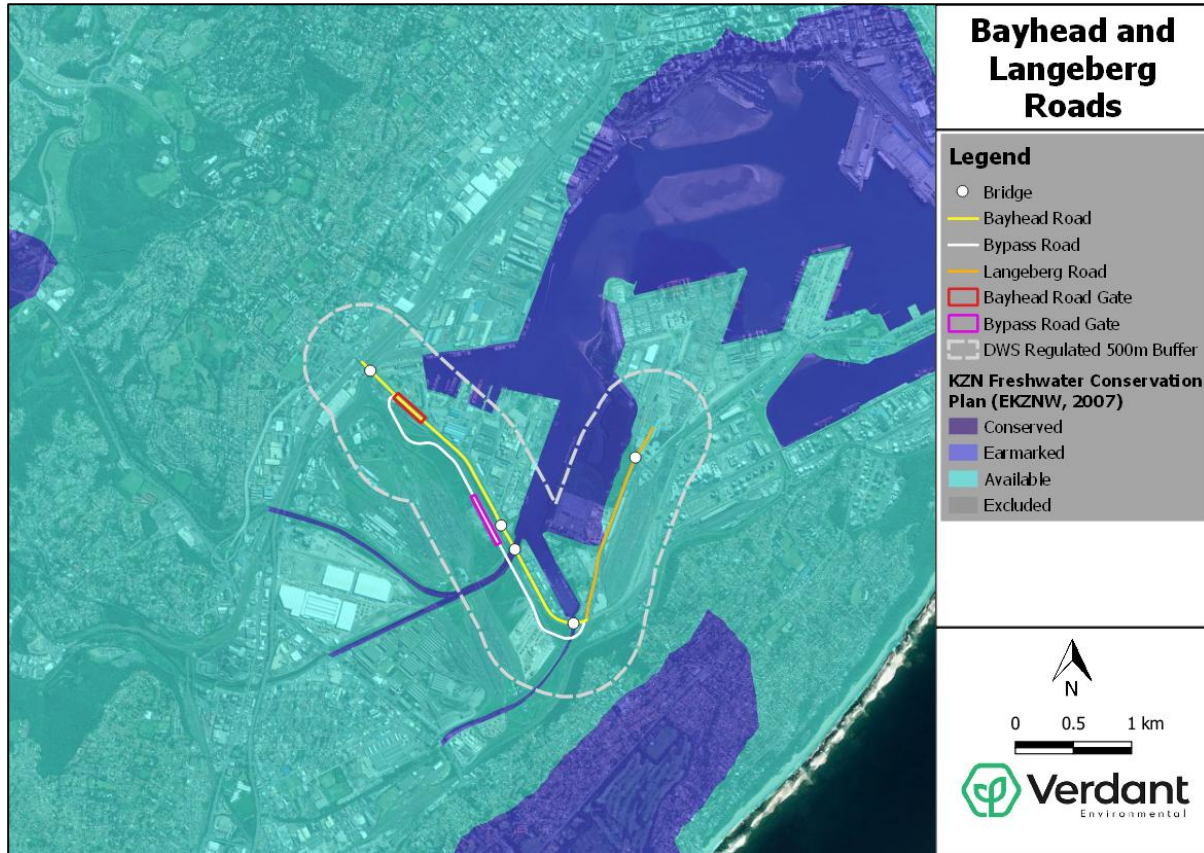


Figure 7. Study area in relation to the KZN Freshwater Conservation Plan (EKZNW, 2007).

In addition, the revised national list of ecosystems that are threatened and in need of protection been published in Government Gazette 47526 (Notice No.689) on 18 November 2022 in terms of the National Environmental Management: Biodiversity Act (NEMBA). The location and extent of the threatened ecosystems in relation to study area are shown in Figures 8 and 9 below. Both the original extent and remaining extent maps indicate the study area occurs within the Durban Bay Estuary EFZ that is a threatened ecosystem type. According to the National List of Threatened Ecosystems (SANBI, 2022):

- KwaZulu-Natal Coastal Belt Grassland is listed as Endangered (EN)
- Mangrove Forest is listed as Least Concern (LC)
- Northern Coastal Forest is listed as Least Concern (LC)
- Portions of the study area are also considered as Non-Terrestrial (Estuarine Functional Zone).
- Remnant patches of Northern Coastal Forest, Mangrove Forest, KwaZulu-Natal Coast Belt Grassland and the Estuarine Functional Zone are mapped in the remaining extent layer



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

within the DWS regulated 500m buffer study area and along the proposed road alignments to be upgraded/widened.

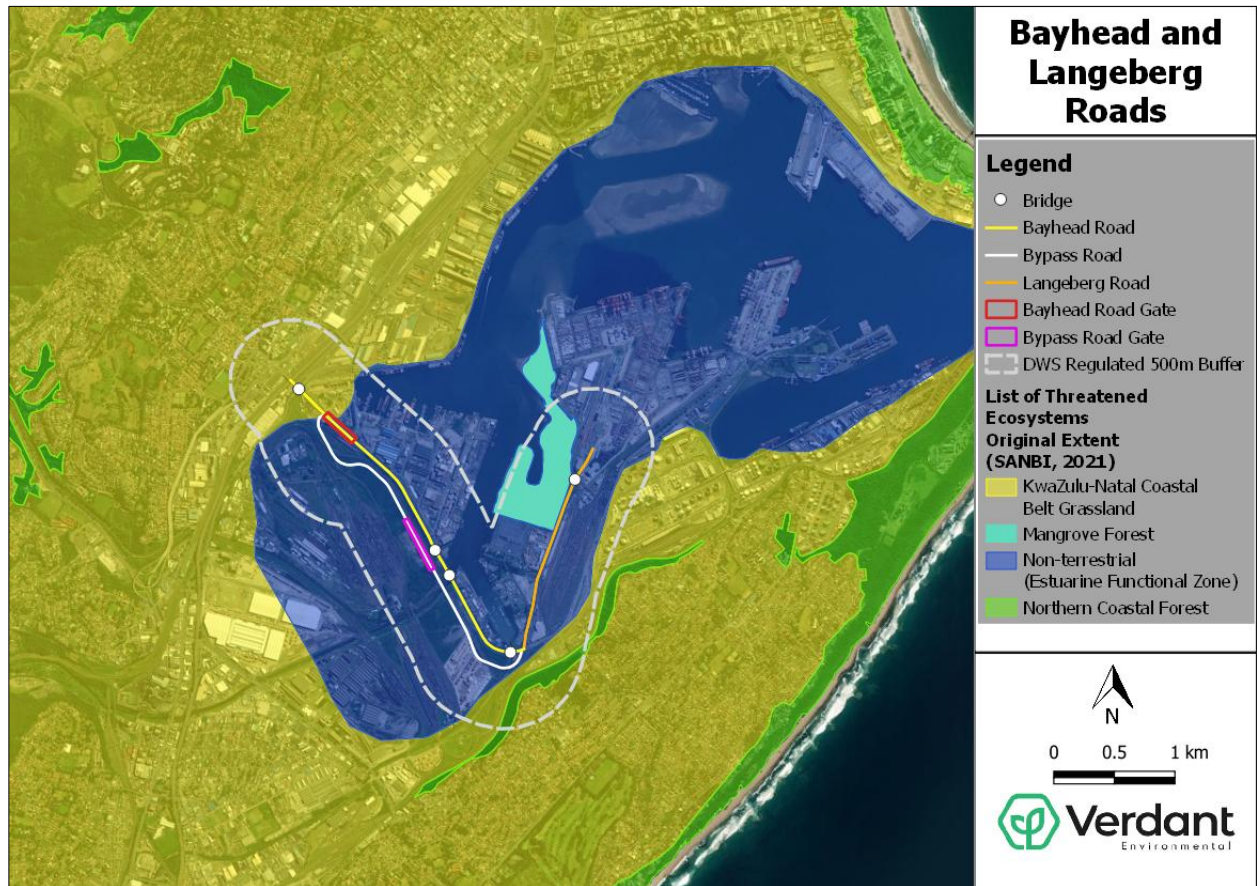


Figure 8. Study area in relation to NEM:BA threatened ecosystems layer – original extent.

**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

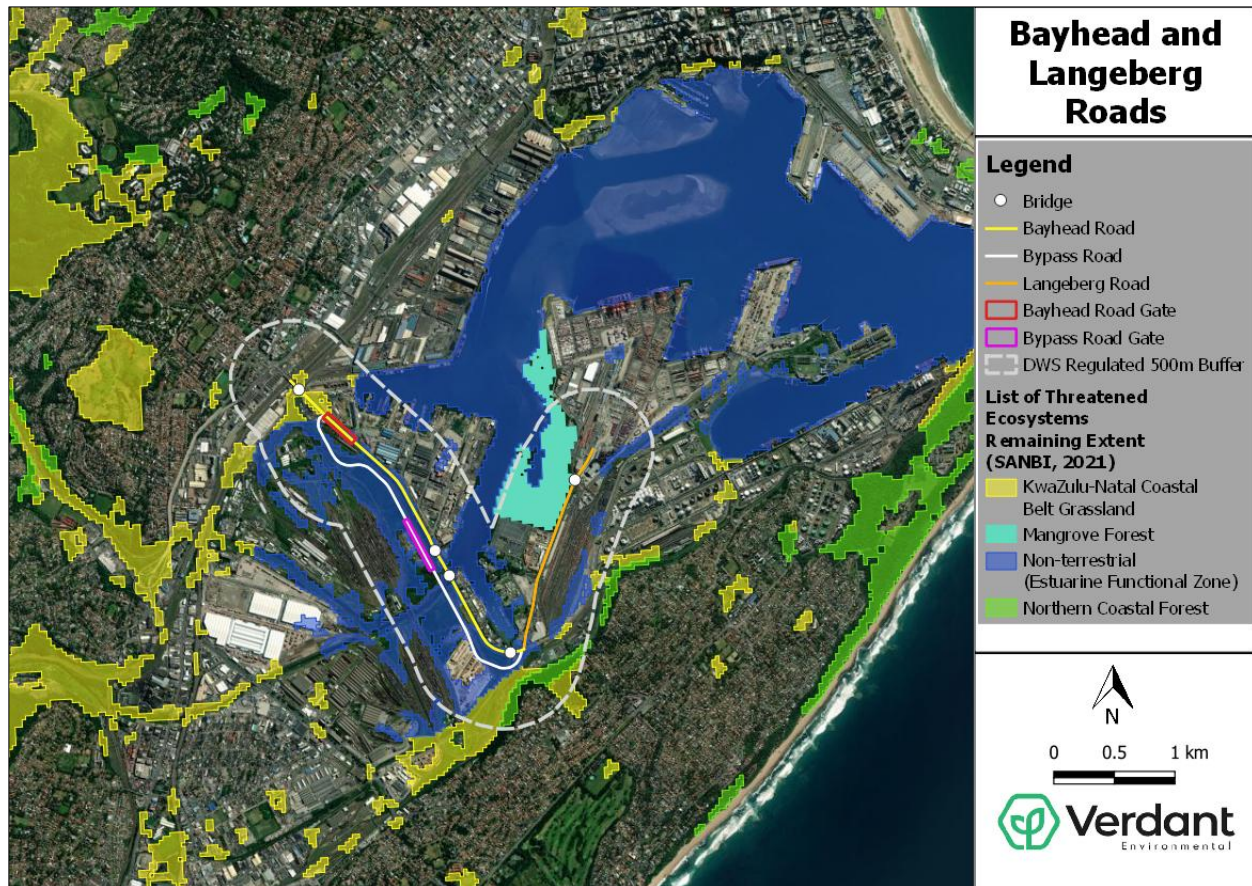


Figure 9. Study area in relation to NEM:BA threatened ecosystems layer – remaining extent.

3.2. Desktop Mapping within 500m and Confirmation of the Study Area

All the potential wetlands (natural and artificial) occurring within 500m of the proposed development activities were mapped and classified in terms of hydrogeomorphic (HGM) types as shown in Figure 10. At the desktop scale, the key features mapped include:

- Durban Bay Estuarine Functional Zone (EFZ).
- Several man-made canals including the Amanzimnyana Stream Canal and the Durban Harbour Canal (C02).

For the purposes of defining the study area for field assessment, an indication of the 'likelihood of impact' for each of the mapped rivers and wetlands is depicted visually on the map in Figure 11.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**



This indicates that the EFZ areas in the vicinity of the development activities are likely to be impacted, along with the canals being crossed.



Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025

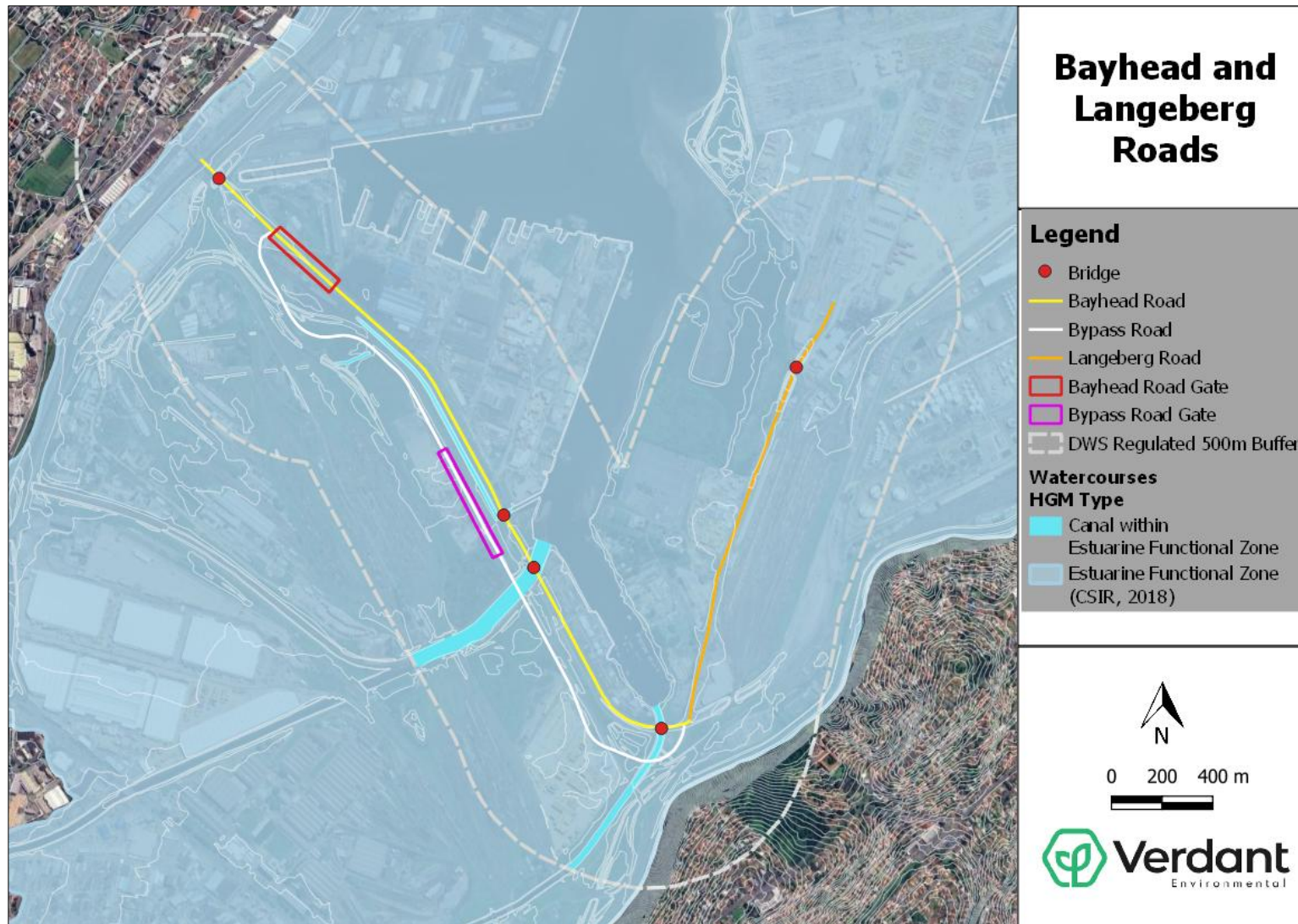


Figure 10. Rivers and wetlands within 500m of the project site categorised into hydro geomorphic types.



Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025

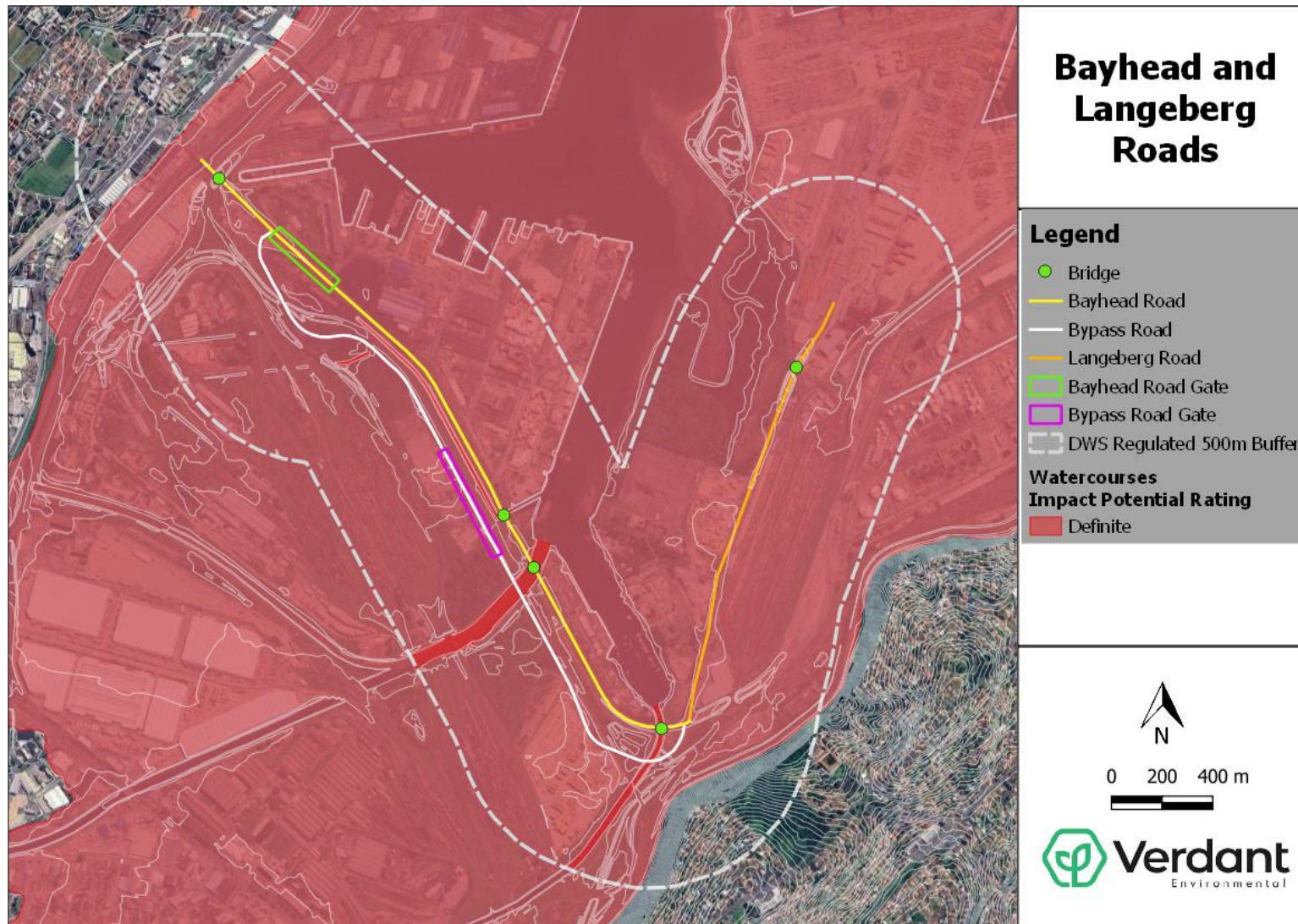


Figure 11. Indication of the 'likelihood of impact' related to rivers and wetlands.



4. Infield Baseline Assessment

The infield baseline assessment focused on the aquatic ecosystems likely to be measurably negatively impacted by the project development activities. The extent (infield delineation), classification, habitat characteristics, present ecological state (PES) and ecological importance and sensitivity (EIS) of the rivers and wetlands are discussed in this section of the report.

4.1. Sampling, Classification & Habitat Characteristics

The project footprint is located within the EFZ of the Durban Bay Estuary. Soil and vegetation sampling was undertaken where access was not restricted by fencing and/or dense vegetative growth during the rapid site visit. Several canals are located within the larger system. Significant development associated with the harbour and various industries including the existing Bayhead Road, Langeberg Road, Railway Lines and Bypass Road have resulted in large portions of the estuary being drained and infilled. The EFZ study area was subdivided further into the following units for assessment purposes:

- Estuarine Functional Zone (EFZ01) including the following features:
 - Modified dryland areas on imported fill material, associated with the current road fill. This was the dominant feature occurring along the roads.
 - Modified wetland areas in low lying areas on imported fill material. These areas have been mapped in Figures 12 – 14.
 - Intact and functional estuarine ecosystems were not encountered along and near the roads to be upgraded. The distances to modified but intact estuarine ecosystems is as follows:
 - Subtidal zone: Located >39m from the project activities.
 - Mangroves: Located >85m from the project activities.
 - Inter-tidal mudflats / sandflats mudflats: Located >75m from the project activities.
- Man-made Canals:
 - Amanzimnyana Stream Canal (C01), crossed by roads.
 - Durban Harbour Canal (C02), crossed by roads.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

- Canal Three (C03), near to road, within 10m.
- Canal Four (C04), near to road, approximately 80m away.

These sub-units are shown on the delineation map in Figures 12 – 14 below and a summary of the key biophysical characteristics of the watercourse units assessed in the field in the study area is provided in the tables that follow.



Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025

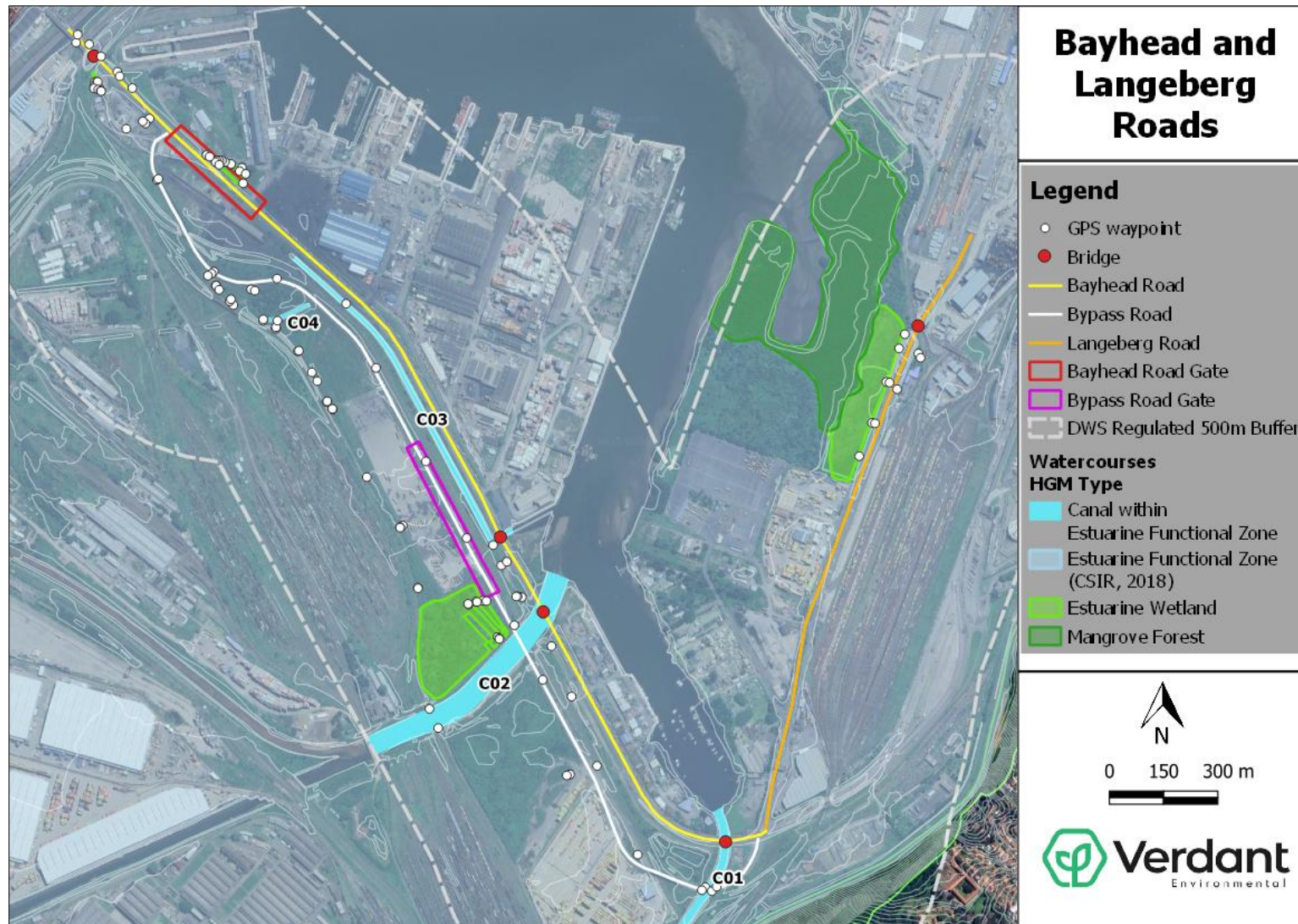


Figure 12. Delineation map showing the location and extent of watercourses assessed within 500m of the project site.



Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025

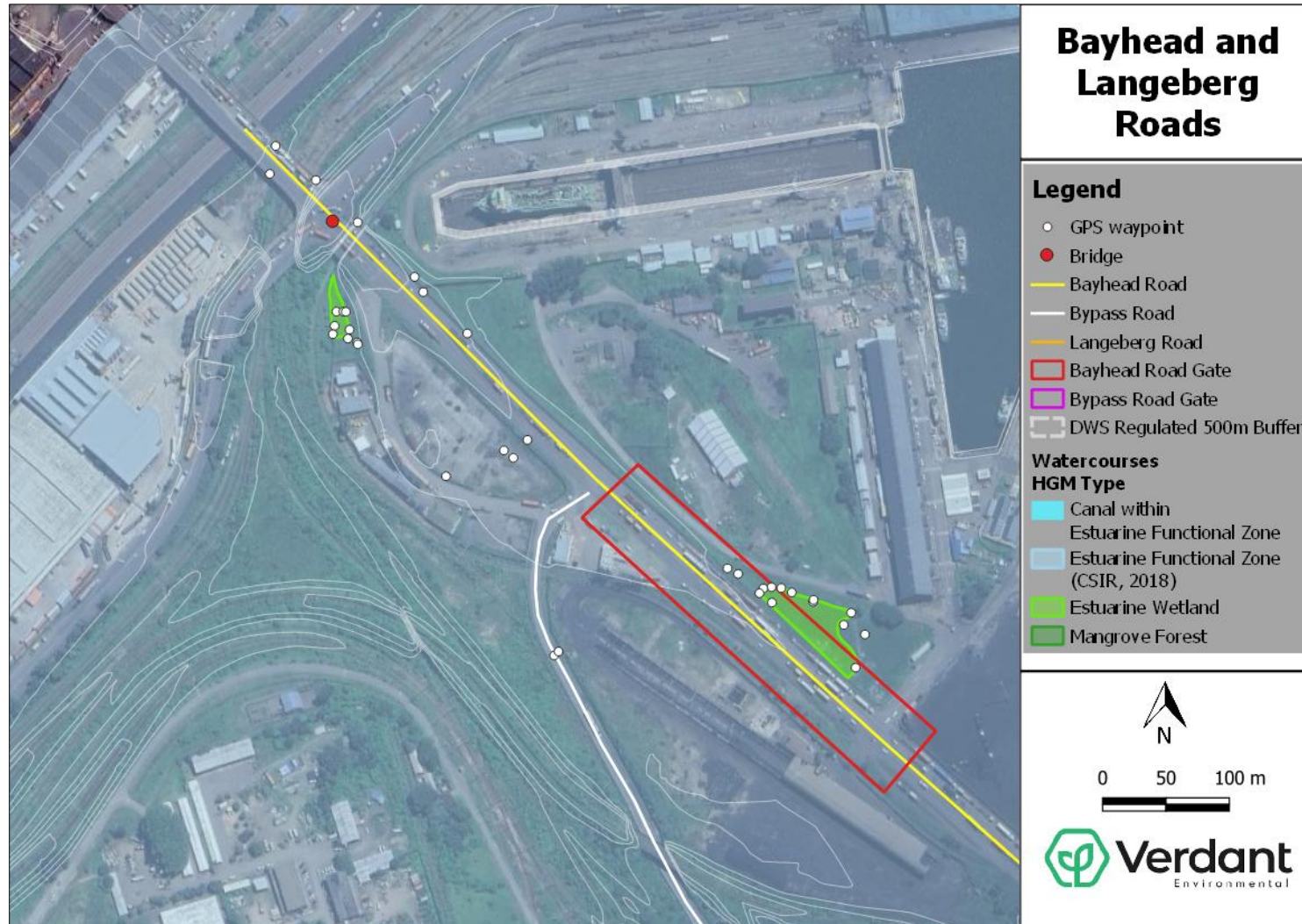


Figure 13. Delineation map showing the location and extent of watercourses assessed within 500m of the project site – northern section.



Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025

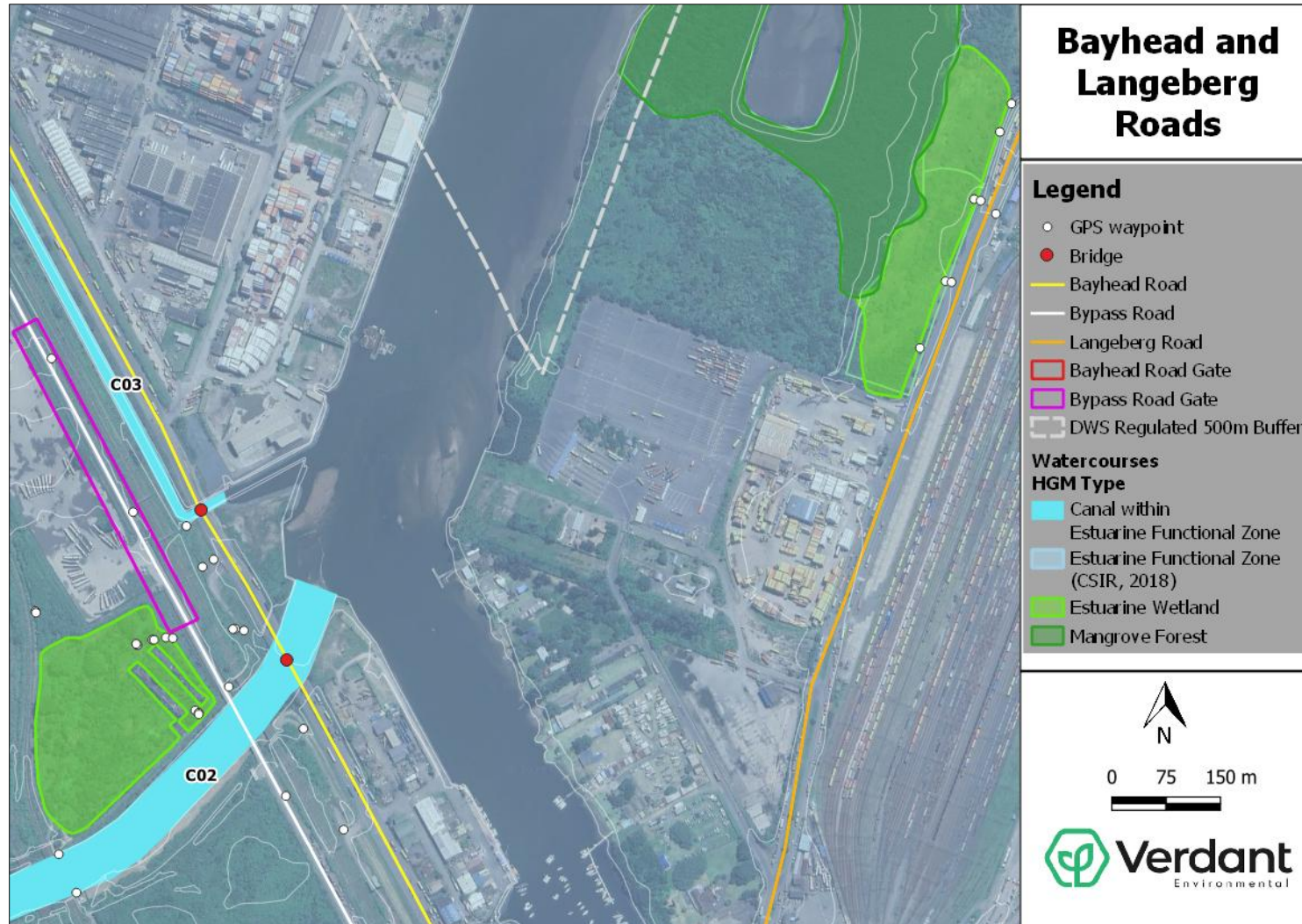


Figure 14. Delineation map showing the location and extent of watercourses assessed within 500m of the project site – southern section.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

4.1.1. Estuarine Functional Zone

A summary of the biophysical details of the Durban Bay estuary in the vicinity of the project activities is provided in Table 4 below. Most of the areas along the road include highly modified and transformed dryland likely comprising secondary vegetation on fill material. Some temporary wetlands were however confirmed via soil sampling and vegetation observations, most of which have likely formed on modified and man-made landforms. Intact and functional estuarine ecosystems like mangroves and mudflats are located >85m from the project activities.

Table 4. Summary of the key biophysical characteristics of the Durban Bay Estuarine Functional Zone.

Unit EFZ01: Durban Bay Estuarine Functional Zone	
HGM classification	Estuarine Functional Zone
Sampled soil characteristics	<u>Temporary Wetland Soils above fill material Sample 1:</u> 0 – 20 cm grey clay with a bit of silt (10YR 3/1) with distinct medium sized orange mottles at moderate levels of abundance - refusal at 20 cm fill material below. <u>Temporary Wetland Soils Sample 2:</u> 0 – 30 cm dark grey almost black (Gley 1 3/N or Gley 2.5/N) fine sandy loam, no mottles 30 – 40 cm dark grey almost black (Gley 1 3/N or Gley 2.5/N) fine sandy loam, distinct small orange mottles low abundance 40 – 50 cm pale-yellow brown (2.5Y 6/3) fine sand, distinct small orange mottles low abundance
Vegetation characteristics	Vegetation along Bayhead Road, Bypass Road and Langeberg Road within the Estuarine Functional Zone comprises primarily narrow bands of pioneer and opportunistic grasses including <i>Sporobolus pyramidalis</i>, <i>S. africanus</i>, <i>Panicum maximum</i>, <i>Sorghum bicolor</i>, <i>Paspalum urvillei</i>, <i>Melinis repens</i> and <i>Dactyloctenium australe</i> with low to moderate levels and alien and indigenous weeds (<i>Bidens pilosa</i>, <i>Conyza sp</i>, <i>Ipomoea cairica</i>, <i>Tagetes minuta</i>, <i>Ipomoea purpurea</i>) and alien trees and shrubs (<i>Lantana camara</i>, <i>Tecoma stans</i>, <i>Tithonia diversifolia</i>, <i>Ricinus communis</i>, <i>Chromolaena odorata</i>) often growing densely along road servitudes, railway embankments, and old concrete platforms alternating with mowed and maintain lawns within the various commercial/properties that occur adjacent to the alignment and some occasional mature indigenous trees that have been left in scattered clumps (<i>Ficus natalensis</i>, <i>Ficus trichopoda</i>, <i>Strelitzia nicolai</i>, <i>Brachylaena discolor</i>, <i>Erythrina lysistemon</i>, <i>Phoenix reclinata</i>). Various drains along the margins of platformed areas have been colonised by <i>Arundo donax</i> and in some areas <i>Phragmites australis</i> (just beyond Bypass Road).



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Unit EFZ01: Durban Bay Estuarine Functional Zone	
	One area along the left bank of the Durban Harbour Canal to the south of Bypass Road retains slightly higher mature indigenous tree cover (although alien and weedy species are still relatively prolific). Lastly beyond the existing maintained road servitude to the left of Langeberg Road in an area fenced off and mapped at the national scale as Mangrove Forests there is a hygrophilous grassland community dominated by <i>Imperata cylindrica</i>, with moderate <i>Digitaria eriantha</i> cover and some <i>Panicum maximum</i> noted on the margins with scattered indigenous trees species noted including <i>Phoenix reclinata</i>, <i>Clerodendrum glabrum</i>, <i>Stelitzia nicolai</i> and <i>Brachylaena discolor</i>, with some low <i>Schinus terebinthifolius</i> invasion.
Other comments	Most of the areas along Bayhead Road, Bypass Road and Langeberg Road visited during the site visit have been infilled by road and railway embankments and embankments for various commercial/industrial developments in the area.

Selected Photos of Unit EFZ01:



Photo 01: View of alien shrubland to the right of Bayhead Road looking east.



Photo 02: View of infilled area to the left of Bayhead Road looking east.



Proposed Upgrade of Bayhead and Langeberg Roads: Aquatic and Wetland Assessment MARCH 2025

Photo 03: View looking north from a bridge along Bayhead Road towards vegetation growing along railway line below.



Photo 04: View to the left of Bayhead Road looking at ruderal and alien vegetation growing on a cement platform.



Photo 05: View from Bypass Road looking north towards Bayhead Road with vegetation growing along the railway line running between these two roads.



Photo 06: View along Bypass Road of vegetation growing along road servitude looking south.



Photo 07: View of area fenced off along Langeberg Road to the north of the road alignment.



Photo 08: View from embankment along Langeberg Road looking south towards built up area with vegetation growing on an infilled area.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**



Photo 09: View of Langeberg Road looking south across the road.



Photo 10: View of ruderal grasses growing along the edge of Langeberg Road.

4.1.2. Man-made Canals

A summary of the biophysical details of the canals within the larger Durban Bay estuary in the vicinity of the project activities is provided in Tables 5 – 8 below. The Amanzimyana Stream canal drains the Jacobs industrial area to the south and is largely a stormwater channel. In contrast, the Durban Harbour Canal drains two perennial rivers.

Table 5. Summary of the key hydro-geomorphic and biophysical characteristics of Canal Unit C01.

Unit C01: Amanzimyana Stream	
Classification	Canal
Flows	Perennial flow
Vegetation characteristics	Vegetation along the canal downstream of the Bypass Road Bridge comprises a mixture of grass, tree, shrub and herb cover with moderately high cover of <i>Chrysanthemoides monilifera</i>, moderate cover of an <i>Ipomoea sp</i> growing amongst other vegetation, moderate scattered cover of <i>Brachylaena discolor</i>, <i>Melinis repens</i>, <i>Panicum maximum</i>, scattered <i>Tecoma stans</i>, <i>Tagetes minuta</i>, <i>Lantana camara</i> and moderate to high cover of <i>Conyza sp</i> and scattered <i>Stelitzia nicolai</i>, with one <i>Ficus natalensis</i> noted as well at the sample point. Upstream of the bridge along the left bank, vegetation is similar to downstream. Upstream of the bridge along the right bank of the canal cover is dominated by <i>Tecoma stans</i> primarily with low <i>Schinus terebinthifolius</i> cover.
Other comments	Water in canal brown turbid with metallic sheen and chemical odour noted.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Selected Photos of Canal Unit C01:



Photo 11: View of channel of Unit C01 looking upstream.



Photo 12: View of channel of Unit C01 looking downstream.

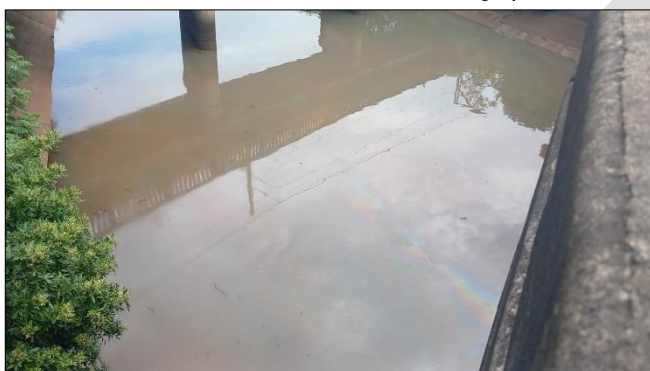


Photo 13: View of metallic sheen on the surface of the water.



Photo 14: View of channel of Unit C01 looking upstream.

Table 6. Summary of the key hydro-geomorphic and biophysical characteristics of Canal Unit C02.

Unit C02: Durban Harbour Canal	
Classification	Canal
Flows	Perennial flow (from uMbilo and uMmhlatusana Rivers)
Vegetation characteristics	The left bank of the canal was colonised by high cover of <i>Panicum maximum</i> and scattered clumps of <i>Strelitzia nicolai</i> at moderate levels of abundance, low cover of <i>Sorghum bicolor</i> noted amongst the dominant <i>Panicum maximum</i> , with a few <i>Ricinus communis</i> noted and low cover of other indigenous trees such as <i>Trema orientalis</i> and <i>Phoenix reclinata</i> . The right bank of the canal was colonised by a mowed lawn that transitioned into a dense <i>Tecoma stans</i> dominated alien woodland/shrubland with moderate cover of <i>Tithonia diversifolia</i> , <i>Ipomoea purpurea</i> and low cover of <i>Ricinus communis</i> and <i>Arundo donax</i> .
Other comments	Water within the canal was brown and turbid.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Selected Photos of Canal Unit C02:



Photo 15: View of channel of Unit C02 looking downstream towards Bypass Road in the distance to the north.



Photo 16: View of channel of Unit C02 looking downstream towards one of the bridges along Bayhead Road to the north.



Photo 17: View of channel of Unit C02 looking from Bayhead Road downstream into the Durban Harbour.

Table 7. Summary of the key hydro-geomorphic and biophysical characteristics of Canal Unit C03.

Unit C03: Artificial Canal	
Classification	Canal
Flows	Perennial flow
Vegetation characteristics	The left bank of this canal was characterised by a shortly cropped lawn and scattered mature <i>Ficus trichopoda</i> trees and some planted exotic shrubs, the right bank comprised ruderal and alien vegetation growing along an existing railway line.
Other comments	Water within the canal was turbid brown.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Selected Photos of Canal Unit C03:



Photo 18: View of channel of Unit C03 looking upstream.



Photo 19: View of channel of Unit C03 looking downstream.



Photo 20: View of channel of Unit C03 looking across.

Table 8. Summary of the key hydro-geomorphic and biophysical characteristics of Canal Unit C04.

Unit C04: Artificial Canal	
Classification	Canal
Flows	Perennial flow
Vegetation characteristics	The canal banks were colonised by a mixture of alien shrubs weeds and trees and some ruderal grasses which included moderate cover of <i>Chromolaena odorata</i> and <i>Tithonia diversifolia</i> high cover of <i>Tecoma stans</i> , scattered clumps of <i>Ricinus communis</i> and low cover of grasses such as <i>Sporobolus pyramidalis</i> , <i>Sorghum bicolour</i> and <i>Panicum maximum</i> . One white mangrove (<i>Avicennia marina</i>) was visible growing within the canal at the sample point.
Other comments	This canal was sampled upstream of the road alignment as fencing and dense cover prevented access near the road alignment.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Selected Photos of Canal Unit C04:



Photo 21: View of channel of Unit C04 looking downstream.

4.2. Present Ecological State (PES) Assessment (Desktop)

This section presents and discusses the PES of the Durban Bay estuary. PES is defined as a measure of the similarity or deviation from a natural or reference state (Macfarlane *et al.*, 2020). According to the National Biodiversity Assessment 2018 the Durban Bay Estuary is currently considered to be **Severely to Critically Modified E/F PES Class** (Van Niekerk *et al.* 2019a).



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Table 9. DWS Estuary Health Index.

Condition (% of pristine)	≥91 %	90-75	75 - 61	60 - 41	40-21	≤20					
Continuum	A	A/B	B	B/C	C	C/D	D	D/E	E	E/F	F
Ecological Management Category (DWS)	A Natural	B Largely natural / few changes		C Moderately modified		D Largely modified		E Highly degraded		F Extremely degraded	
NBA Ecological modification	Natural/Near natural			Moderate		Heavily		Severe/Critical			
Functionality	Retain Process & Pattern (Representation)			Some loss of Process & Pattern		Significant loss of Process & Pattern		Little Process & Pattern			
Restoration cost	None/ Low			Low/ Medium		High		Very high, potentially irreversible structural changes			

Category	Description
A	Unmodified, approximates natural condition. The natural abiotic processes should not be modified. The characteristics of the resource should be determined by unmodified natural disturbance regimes. There should be no human induced risks to the abiotic and biotic processes and function.
B	Near natural with few modifications. A small change in natural habitats and biota may have taken place, but the ecosystem functions are essentially unchanged.
C	Moderately modified. A loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	Heavily modified. A large shift natural processes and ecosystem functions and/or loss of habitat, biota have occurred.
E	Severely modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	Critically modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural abiotic processes and associated biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

The Durban Bay Estuarine Management Plan (DFFE & MER, 2016) indicates that the Estuary is **Severely Modified PES Class E** as the estuary has experienced direct loss impacts from an estimated original area extent of 35 km² to an area 13.5 km², and the historically shallow mouth has been dredged and stabilised and widened (DFFE & MER, 2016). Currently the estuary retains very little of the estuarine support habitats i.e. wetlands, reedbeds, intertidal mudflats and mangroves. Approximately 15ha of the original 440ha of mangroves remains and is now formally protected (MER, 2009). Sediment distribution patterns in the Bay have been altered as a result with the establishment of deeper channels, especially in the upper reaches have become sediment collection points for sediment feeding into the estuary from its upstream catchment (DFFE & MER, 2016). Associated indigenous vegetation loss has also been extensive with total loss of seagrass beds as well as the loss of sand and mud bank habitat available for juvenile biota (DFFE & MER, 2016). Water quality issues associated with waste and effluent feeding in from



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

upstream catchment activities as well as activities within the Port of Durban are persistent and this is having a significant negative impact on estuarine health (DFFE & MER, 2016).

Table 10. Provisional Present Ecological Health Status for Durban Bay (DFFE & MER, 2016).

Estuarine Process or Biotic Component	Weight	Score	Weighted Score
Hydrology	25	60	15
Hydrodynamics and mouth condition	25	90	23
Water quality	25	20	5
Physical Habitat Alteration	25	20	5
Habitat health score			48
Final Microalgae	20	20	4
Macrophytes	20	5	1
Final Invertebrates	20	20	4
Fish	20	10	2
Birds	20	10	2
Biotic Health Score			13
Estuarine Health Score			30
Provisional Present Ecological Category			E

4.3. Ecological Importance & Sensitivity (EIS) Assessment

This section discusses the results of the Ecological Importance and Sensitivity (EIS) assessment. Ecological Importance (EI) is the expression of the importance of rivers and wetlands in terms of the maintenance of biological diversity and ecological functioning at a local and landscape level (Kotze et al., 2020). Ecological Sensitivity (S) refers to ecosystem fragility or the ability to resist or recover from disturbance (Kotze et al., 2020).

According to the Durban Bay Estuarine Management Plan (DFFE & MER, 2016) the estuary provides important ecosystem services which includes not only its value as a nursery ground for marine fish and invertebrates, water quality enhancement/ assimilation services, flood attenuation services during flood events but also the provisioning and cultural services afforded to residents and visitors through its use as a major port and economic hub, the various recreational opportunities it provides as well as aesthetic values and as a tool for environmental education purposes (DFFE & MER, 2016). An assessment of these goods and services illustrates



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

that it is important not only from an ecological perspective but also from a social and economic perspective and that estuarine functioning should be preserved and improved (DFFE & MER, 2016). According to available desktop information the Durban Bay Estuary is currently considered to be of High EIS (Van Niekerk et al. 2019b).

However, although falling within the Durban Bay EFZ, the modified and transformed ecosystems along the roads are assessed as having the following EIS:

- Modified dryland on fill material – Low EIS
- Modified wetlands on fill material – Moderate EIS
- Major canals – Moderate EIS
- Minor canals – Low EIS



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Table 11. Summary of Durban Bay Estuary Importance taken directly from: (Van Niekerk et al. 2019b).

Name	Ecosystem type	Biodiversity Importance Rating (>80 =High Importance, 60 - 80=Important >60 = Average Importance) (Turpie et al. 2002, Turpie en Clark 2009)	Biodiversity priority core set (national and/or CAPE)	Biodiversity Priority Rating (5 =High priority)	In MPA or priority area	Adjacent terrestrial PA	Ramsar status	IBA	EBSA	DAFF Important Fish Nurseries (Very High - Medium = Priority)	Ecosystem type	Biodiversity Importance Rating (>80 =High Importance, 60 - 80=Important >60 = Average Importance) (Turpie et al. 2002, Turpie en Clark 2009)	Biodiversity priority core set (national and/or CAPE)
Durban Bay	Subtropical Estuarine Bay	High Importance	SA/KZN	Priority						High			



4.4. Specialist Opinion on DFFE Screening Tool Site Sensitivity

The DFFE screening tool assigns the site as being of “High sensitivity” in terms of the Aquatic Biodiversity theme. Based on the EIS assessment conducted, the “High sensitivity” rating for the site is appropriate. For this reason, an Aquatic Biodiversity Specialist Assessment is required, as set out by the National Environmental Management Act (NEMA) (Act No. 107 of 1998) Regulations of 2020 (as amended) (GN R. 320 of 2020).

5. Risk Assessment

This section deals with the assessment of the construction and operational phase impacts of the project on the estuarine ecosystems encountered.

5.1. Activities and Impacts Assessed

The activities requiring assessment for this study are as follows:

- Activity A1: Expansion and operation of the existing road infrastructure including stormwater management upgrades, bridge upgrades and establishment of new gates. The proposed activities will also include the relocation of the existing sewer reticulation pipeline along the road alignment which will tie-into the existing sewer reticulation network.

5.2. Key Assumptions

The following assumptions and limitations apply to the impact assessment:

- The proposed new sewer pipeline will tie into the existing sewer reticulation network.
- No detailed site development layout has been provided at the time of this assessment.
- The realistic good mitigation scenario assumes the following:



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

- All the planning and design measures recommended in Section 7.1 will be adhered to. If any of the recommended mitigation measures provided in Section 7.1 cannot be adhered to, the impact and risk assessments will need to be revised.

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**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Table 12. Summary of impacts assessed for the project activities.

Activity Assessed	Project Phasing	Impact Group	Impact Description
A1: Expansion and Upgrade of Bayhead and Langeberg Roads	Construction activities: Site clearing, stripping and grubbing; earthworks and reshaping; runoff and sediment control, hazardous materials use, storage and management; flow diversion, dewatering, dust control, rehabilitation, monitoring	A1-C1: Direct ecosystem destruction and modification impacts	• Direct impacts and modification of the Estuarine Functional Zone and associated modified aquatic, wetland and terrestrial ecosystems. • Accidental direct impacts and modification of portions of the Estuarine Functional Zone during construction.
		A1-C2: Indirect hydrological and geomorphological impacts	• Erosion and/or sedimentation of EFZ and associated modified aquatic, wetland and terrestrial ecosystems due to catchment soil and vegetation clearing and landcover disturbance during construction. • Temporary alteration of flows within canals during instream construction works, with resultant erosion and sedimentation impacts.
		A1-C3: Water quality impacts	• Pollution of EFZ ecosystems due to the mishandling of hazardous substances and/or improper maintenance of machinery during construction (e.g. oil and diesel leaks and spills). • Any erosion leading to sedimentation of EFZ downstream could also lead to raised water turbidity and suspended solids concentrations, also affecting water quality. • Pollution of the canals and EFZ due to accidental damage to and rupture of sewer pipes during decommission and reconnection activities in the construction phase.
		A1-C4: Fragmentation and ecological disturbance impacts	• Temporary fragmentation of EFZ as a result of the construction activities across / near canals. • Expanded / more intense edge impacts to the EFZ. Associated impacts include: (i) deterioration in vegetation quality and cover, (ii) potential for increased alien invasive plant invasion due to disturbance, (iii) noise pollution and vibrations associated with earthworks and the use of heavy machinery that could affect local



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Activity Assessed	Project Phasing	Impact Group	Impact Description
			wildlife; and (iv) light pollution associated with construction crews and the use of heavy machinery use at night which could affect locally occurring nocturnal EFZ species.
	Operational activities: Stormwater management, sewage reticulation, maintenance and repair of infrastructure, vehicular use, rehabilitation, monitoring	A1-01: Direct ecosystem destruction and modification impacts	Accidental direct impacts and modification of portions of the EFZ during infrastructure repair and maintenance activities.
		A1-02: Indirect hydrological and geomorphological impacts	- Erosion and/or sedimentation of EFZ and associated modified aquatic, wetland and terrestrial ecosystems due to point source discharge of stormwater at outlets, especially if poorly designed. - Small increase in surface water inputs to canals and low-lying areas of the EFZ as a result of road widening and increased stormwater generation. Such increases are predicted to be negligible relative to entire catchment inputs. - Impacts to floodpeaks of canals are predicted to be negligible as bridges are being upgraded and flow is not being concentrated.
		A1-03: Water quality impacts	- Pollution of downstream portions of the EFZ due to the mishandling of hazardous substances and/or improper maintenance of machinery during repair and maintenance activities (e.g. leaks from oil and diesel storage tanks / containers). - Pollution of downstream portions of the EFZ due to polluted stormwater discharges. - Any erosion leading to sedimentation of EFZ downstream could also lead to raised water turbidity and suspended solids concentrations, also affecting water quality. - Potential accidental releases/spills from wastewater (sewer) pipelines and manholes through inadequate design, improper use of flush toilets (leading to blockages for example) or other unforeseen events (such as release of stormwater into sewer system, leading to potential overflow from manholes).



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Activity Assessed	Project Phasing	Impact Group	Impact Description
			Potential accidental releases/spill from onsite sewer pump station (if planned) due to mechanical failure/malfunction or other unforeseen events leading to pollution of downstream portions of EFZ.
		A1-04: Fragmentation and ecological disturbance impacts	Expanded / more intense edge impacts to EFZ ecosystems as a result of development adjacent to the EFZ. Associated impacts include: (i) deterioration in vegetation quality and cover, (ii) potential for increased alien invasive plant invasion due to disturbance, (iii) noise pollution and vibrations associated with aircraft could affect local wildlife; and (iv) light pollution.



5.3. DWS Risk Matrix Assessment

The project site occurs entirely within the estuarine functional zone of the Durban Bay estuary and thus all ecosystem features are considered to be estuarine in nature. For the purposes of this assessment, we have applied the DWS Risk Matrix Assessment to these features only and not to the estuary as a whole. The results of the risk assessment for the proposed activities are summarised in Table 13 below.

Under a good mitigation scenario, all the predicted impacts are assessed as being of low risk. This is because the ecosystem features to be impacted in the vicinity of the project activities are already highly modified and transformed. In addition, the activities are linear in nature and have a relatively small footprint. Other risks of the proposed activities like the accidental rupture of sewer pipelines can be effectively mitigated with careful planning. The only aspect of the development that poses some risk is the proximity of the activities to intact and functional estuarine ecosystems because they are planned to occur within the EFZ, which is sensitive to further negative cumulative impacts. However, the closest intact and functional ecosystems are >85m from the project activities, which are unlikely to be measurably impacted. The PES score of the estuary is thus unlikely to change as a result of the proposed activities provided that the mitigation measures recommended are effectively implemented.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

Table 13. Summary of the DWS 'Risk Assessment Matrix' results.

Phase	Impact	Intensity of Impact on Resource Quality					Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood (Probability) of impact	Significance (max = 100)	Risk Rating
		Abiotic Habitat (Drivers)			Biota (Responses)										
		Hydrology	Water Quality	Geomorph	Vegetation	Fauna									
CONSTRUCTION	A1-C1 Direct ecosystem destruction and modification impacts	4	0	4	4	1	8	1	5	14	2	28	100%	28	L
	A1-C2 Indirect hydrological and geomorphological impacts	1	0	1	1	1	2	2	2	6	2	12	80%	9.6	L
	A1-C3 Water quality impacts	0	1	0	0	1	2	2	1	5	2	10	40%	4	L
	A1-C4 Fragmentation and ecological disturbance impacts	0	0	0	1	1	2	2	1	5	2	10	100%	10	L
OPERATIONAL	A1-C1 Direct ecosystem destruction and modification impacts	3	0	3	3	1	6	1	4	11	2	22	60%	13.2	L
	A1-C2 Indirect hydrological and geomorphological impacts	1	0	1	1	0	2	2	4	8	2	16	100%	16	L
	A1-C3 Water quality impacts	0	1	0	0	1	2	2	4	8	2	16	60%	9.6	L
	A1-C4 Fragmentation and ecological disturbance impacts	0	0	0	1	1	2	4	4	10	2	20	60%	12	L



6. Recommended Mitigation Measures

This section outlines the mitigation measures recommended to avoid, reduce / minimise, and rehabilitate the freshwater ecosystem impacts discussed in Section 6 that precedes this section.

‘Impact Mitigation’ is a broad term that covers all components involved in selecting and implementing measures to conserve biodiversity and prevent significant adverse impacts as a result of potentially harmful activities to natural ecosystems. The mitigation of negative impacts on freshwater ecosystems is a legal requirement for authorisation purposes and must take on different forms depending on the significance of impacts and the particulars of the target area being affected.

6.1. Project Planning and Design Measures

6.1.1. No-Go Areas and Buffer Zone Determination

‘Buffer zones’ (also termed development “set-backs”) are essentially strips of vegetated undeveloped land typically designed to act as a protective barrier between human activities and sensitive habitats such as wetlands, rivers and forests. Research shows that buffer zones are useful at performing a wide range of functions such as sediment trapping and nutrient retention, and in doing so, play an important role in protecting water resources from the adverse impacts that are typically associated with various land-uses and developments. Although there are no legislative requirements regarding the establishment of buffers around water resources in the South African legislation, the application of buffers is aligned with the principles of the National Water Act (1998), which is to provide for the sustaining of water quality and preserving natural aquatic habitats and ecosystem functions.

Being an existing road upgrade and widening exercise, buffer zones are not applicable. The Recommended No-Go Area for this project includes any areas not yet infilled in the Estuarine Functional Zone and the estuarine wetlands as mapped in Figure 10.



6.1.2. Culvert Upgrade Recommendations

The proposed upgrades will improve the current situation in terms of having better capacity to convey flows and reducing velocities of water discharged by culverts. Nevertheless, the following best practice planning and design measures should be investigated for inclusion into the project design:

- 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.

6.1.3. 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:



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

- 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.

6.1.4. Sewer Pump Station Design (if applicable)

The following design recommendations for sewer pump stations apply:

- All sewer infrastructure, including pump station and sewer pipelines, must be designed according to best-practice environmental principles and requirements.
- Pump stations must be fenced off to prevent unauthorized access by humans/wildlife which could cause damage to infrastructure and cause accidental malfunction and/or spillage of untreated wastewater.
- Reasonable measures must be taken to provide back-up for mechanical, electrical, operational or process failure and malfunction at pump stations. At a minimum there should be an alarm system to warn of an electrical failure and sufficient standby equipment to provide for reasonable assurance that the pump station can be functional within 24 hours.
- The pump station must be placed within a lined, impermeable concrete bunded area with the capacity to hold untreated wastewater in an emergency and provide for sufficient time for maintenance staff to address any faults/ problems. This is to limit the risk of untreated wastewater overflowing in the event of any leakage or accidental spillage at the pump station.
- Signage should be provided at a visible location at pump stations to inform staff and guests in the area of the purpose of the pump station. Emergency telephone contact details should also be provided on the signs so that pump station failure, leakage or electrical power outages affecting the system can be easily reported to relevant management personnel.



6.2. Construction Phase

The following mitigation measures must be implemented in conjunction with any generic measures provided in the Environmental Management Programme (EMPr).

6.2.1. Demarcation of 'No-Go' Areas and Construction Corridors

- Prior to the commencement of any construction activities, the following must be staked out by a surveyor and demarcated using brightly coloured shade cloth:
 - The outer edge of any no-go areas.
 - The outer edge of the construction footprint.
- Prior to the commencement of any construction activities, the following must be staked out by a surveyor and signage with depths must be provided:
 - The alignment of all underground sewer pipelines within 15 of project activities.
 - The alignment of all underground water pipelines within 15 of project activities.
 - The alignment of all underground gas / hydrocarbon pipelines within 15 of project activities.
- All areas demarcated as no-go areas should remain demarcated 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.

6.2.2. Method Statement for Pipeline Decommission and Reconnection

- A detailed method statement must be developed by the project / resident engineer, ECO and contractor to provide detailed and clear steps to follow during the temporary disconnection, pipeline removal / decommissioning and establishment of a new pipeline and connection.



6.2.3. Runoff, Erosion and Sediment Control

- Wherever possible, existing vegetation cover on the development site 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.

6.2.4. Hazardous substances / materials management

- The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, etc.) needs to be administered.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

- 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 should be utilised at all dispensing areas.
- No refuelling, servicing or chemical storage should occur within 30m of any sensitive no-go areas/watercourses.
- 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.
- All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.
- 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.
- Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.

6.2.5. Invasive Alien Plant Control

- All alien invasive vegetation that colonise the construction site must be removed, preferably by uprooting. The contractor should consult the ECO regarding the method of removal.
- All bare surfaces across the construction site must be checked for IAPs every two weeks and IAPs removed by hand pulling/uprooting and adequately disposed.
- 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. The herbicide contractor must be certified to apply/utilise the herbicide in question.



6.2.6. Noise, Dust and Light Pollution Minimisation

- 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 and buffer zones.

6.2.7. Prohibitions Related to Animals

- The handling and/or killing of any animal species present is strictly prohibited and all staff/personnel must be notified of such incidents.
- 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.
- Poaching/snaring is strictly prohibited.

6.2.8. General Rehabilitation Guidelines

- 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.
- All land impacted by the proposed development must be rehabilitated by undertaking the following general tasks:
 - All foreign material must be removed from site.
 - Land must be regraded / re-shaped and top soils must be reinstated.
 - Compacted soils must be adequately ripped/loosened where compacted, as informed by the ECO.
 - Re-vegetation should take place as follows:
 - For temporary and dryland areas - via broadcast seeding or hydroseeding using an appropriate indigenous seed mix as advised by a qualified ecologist.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

6.2.9. Construction phase monitoring measures

- 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 watercourses prior to the commencement of clearing/construction must be kept for reference and rehabilitation monitoring purposes.
- The ECO must undertake bi-monthly compliance monitoring audits. Estuarine ecosystem aspects that must be monitored related to monitoring estuarine ecosystem impacts 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.
 - Visual assessment of stormwater quality and instream water quality.
 - The condition of 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.
- Once the construction and rehabilitation has been completed, the ECO should conduct a close out site audit 1 month after the completion of rehabilitation.



6.3. Operational Phase

6.3.1. Management and Maintenance of Infrastructure

- It is the applicant's responsibility to ensure the proper functioning of infrastructure that is likely to require regular on-going maintenance. This includes the stormwater management infrastructure, sewerage infrastructure and road infrastructure.
- It is important that the location and extent of the watercourses in the vicinity of project activities be incorporated into all formal maintenance and repair plans for the project.

6.3.2. Alien Invasive Plant Management and Maintenance

- 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 IAPs on their property.

6.3.3. Monitoring

It will be important that long-term monitoring of the potential freshwater ecosystem impacts be undertaken to proactively identify any environmental issues and impacts that may arise as a result of the operational phase of the project. The following key aspects should be monitored:

- Erosion and/or sedimentation in the onsite and downstream
- Presence of alien invasive plants; and
- Water quality and evidence of pollution.

6.3.4. Remediation / Rehabilitation

Where appreciable direct vegetation/habitat impacts, water quality impacts (i.e. due to spills) or erosion/sedimentation impacts resulting from storm water releases to canals or the estuarine functional zone result, these must be reported immediately to the relevant environmental authorities, and an independent estuarine ecologist appointed to conduct a site inspection to assess the residual impacts and determine the need for any onsite remediation or rehabilitation



requirements. Following this assessment, an implementable remediation and/or rehabilitation plan may need to be compiled and implemented to the satisfaction of KZN EDTEA and DWS.

7. License and Permit Requirements

7.1. Environmental Authorisation Requirements

From a purely water resources (wetlands and rivers) perspective:

- Activity 12 in Listing Notice 1 in terms of the NEMA: Environmental Impact Assessment (EIA) Regulations (of 2014, as amended) has been triggered as the development encroaches into the watercourse on site or is within 32m of the watercourse on site “The development of— (1) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;”
- Activity 19 in Listing Notice 1 in terms of the NEMA: Environmental Impact Assessment (EIA) Regulations (of 2014, as amended) may be triggered in the event that the proposed activities encroach into watercourses on site “The infilling or depositing of any material of more than [5] 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than [5] 10 cubic metres from [(i)] a watercourse”.
- Activity 14 in Listing Notice 3 in terms of the NEMA: Environmental Impact Assessment (EIA) Regulations (of 2014, as amended) may be triggered in the event the proposed project activities encroach into watercourses on site or are within 32m of a watercourse on site within CBA “The development of – (xxii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs—(a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.”



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

There may however be other listed activities from a terrestrial vegetation and biodiversity perspective that could be associated with the development, including the clearance of natural indigenous vegetation for example, that need to be investigated. These have not been identified at this stage as further investigations into the terrestrial habitat and vegetation found on the development site will be required to inform the identification of listed activities and EIA requirements from a terrestrial vegetation and biodiversity perspective.

7.2. Water Use License Requirements

In terms of the legal definitions provided in the NWA, the canals and artificial wetlands encountered along the project activities can be considered watercourses. In addition, the project activities will occur within the Durban Bay EFZ. Section 1(xvii) of NWA includes an estuary as part of the definition of a water resource i.e. a “water resource includes a watercourse, surface water, estuary, or aquifer.” Thus, the project activities have the potential to impact both watercourses and water resources. Therefore, the proposed activities likely constitute water uses in terms of Chapter 4 and Section 21 of the NWA that require a water use license (WUL). The following water uses may be applicable:

- Section 21 (c): impeding or diverting the flow of water in a watercourse; and
- Section 21 (i): altering the bed, banks, course or characteristics of a watercourse.

The project EAP will need to determine if any of these water uses are applicable in consultation with the DWS. If water use license is needed, a General Authorization is likely applicable because the risks are low.

7.3. Coastal Authorisation and Permit Requirements

For activities in the coastal zone, approvals under the National Environmental Management: Integrated Coastal Management Act (NEM: ICMA) (No. 24 of 2008) are required, including coastal authorisations, coastal use permits, and coastal water discharge permits. Types of authorisations and permits include:

- Coastal Use Permits (Section 65): These permits are required for activities that involve the use of coastal public property, such as access, recreation, or development.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

- Coastal Waters Discharge Permits (Section 69): Permits are required for discharging effluent into coastal waters, unless a general discharge authorisation applies.
- General Discharge Authorisation (Section 69): A general authorisation may be granted for certain types of effluent discharge that meet specific requirements.
- Dumping Permits (Section 71): These permits are required for any dumping of materials into the coastal zone.
- Authorisation to Reclaim Land (Sections 7B and 7C): Authorisations are needed for reclaiming land in the coastal zone.

The project EAP will need to determine if any of these authorisations are applicable.

8. Assumptions, Limitations & Level of Confidence

The following limitations and assumptions apply to this assessment:

- Although all watercourses occurring within 500m of the proposed activities were mapped at a desktop level, field investigations were confined to only those watercourses where an appreciable 'risk of potential impact' was determined. This includes only the features within 50m of the project activities. Beyond this study area, ecosystems were only assessed at a desktop level.
- The mapping and classification of the watercourse units outside of the study area but occurring within a 500m radius of activities should be considered preliminary and coarse in resolution. These units were not verified in the field.
- Sampling by its nature means that not all parts of the study area were visited. The assessment findings are thus only applicable to those areas sampled, which were extrapolated to the rest of the study area.
- A Soil Munsell Colour Chart was used to determine the soil matrix colour of the soil sampled. However, it is important to note that the recording of the colours using the soil chart is highly subjective and varies significantly depending on soil moisture and the prevailing light conditions. In this case, soils sampled were dry and waterlogged and sampling was undertaken in sunny conditions.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

- Soil wetness indicators (i.e. soil mottles, grey soil matrix), which in practice are primary indicators of hydromorphic soils, are not seasonally dependent (wetness indicators are retained in the soil for many years) and therefore seasonality has no influence on the delineation of wetland areas.
- All vegetation information recorded was based on the onsite visual observations of the author and no formal vegetation sampling was undertaken. Furthermore, only dominant and noteworthy plant species were recorded. Thus, the vegetation information provided has limitations for true botanical applications.
- The assessment of impacts is predictive and was based on the information and site development provided by the client. The 'realistic good mitigation scenario' impact significance ratings and assessment outcomes assumes that all the mitigation measures recommended in Section 7 will be adhered to.

9. Conclusion

The project footprint is located with the Estuarine Functional Zone of the Durban Bay Estuary. The Estuarine Functional Zone was subdivided further into the following units for assessment purposes:

- Estuarine Functional Zone (EFZ01) including the following features:
 - Modified dryland areas on imported fill material, associated with the current road fill. This was the dominant feature occurring along the roads.
 - Modified wetland areas in low lying areas on imported fill material. These areas have been mapped in Figures 12 – 14.
 - Intact and functional estuarine ecosystems were not encountered along and near the roads to be upgraded. The distances to modified but intact estuarine ecosystems is as follows:
 - Subtidal zone: Located >39m from the project activities.
 - Mangroves: Located >85m from the project activities.
 - Inter-tidal mudflats / sandflats mudflats: Located >75m from the project activities.
- Man-made Canals:
 - Amanzimyana Stream Canal (C01), crossed by roads.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

- Durban Harbour Canal (C02), crossed by roads.
- Canal Three (C03), near to road, within 10m.
- Canal Four (C04), near to road, approximately 80m away.

The project site occurs entirely within the estuarine functional zone of the Durban Bay estuary and thus all ecosystem features are considered to be estuarine in nature. For the purposes of this assessment, we have applied the DWS Risk Matrix Assessment to these features only and not to the estuary as a whole.

Under a good mitigation scenario, all the predicted impacts are assessed as being of low risk. This is because the ecosystem features to be impacted in the vicinity of the project activities are already highly modified and transformed. In addition, the activities are linear in nature and have a relatively small footprint. The only aspect of the development that poses some risk is the proximity of the activities to intact and functional estuarine ecosystems because the activities are planned to occur within the EFZ, which is sensitive to further negative cumulative impacts. However, the closest subtidal environments are >39m, the closest intertidal mudflats / sandflats are 75m and the closest mangrove ecosystems are >85m from the project activities. These intact ecosystems are unlikely to be measurably impacted. The PES score of the estuary is thus unlikely to change as a result of the proposed activities provided that the mitigation measures recommended are effectively implemented.



**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

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Proposed Upgrade of Bayhead and Langeberg Roads: Aquatic and Wetland Assessment MARCH 2025

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**Proposed Upgrade of Bayhead and Langeberg Roads:
Aquatic and Wetland Assessment
MARCH 2025**

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DRAFT



**Thank you. If you have any questions, please
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SPECIALIST DECLARATION



forestry, fisheries & the environment

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SPECIALIST DECLARATION FORM – AUGUST 2023

Specialist Declaration form for assessments undertaken for application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

REPORT TITLE

Proposed Upgrade of Bayhead and Langeberg Roads in the Port of Durban, eThekweni Municipality, KwaZulu-Natal: Aquatic and Wetland Assessment Report

Kindly note the following:

1. This form must always be used for assessment that are in support of applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting, where this Department is the Competent Authority.
2. This form is current as of August 2023. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.dffe.gov.za/documents/forms>.
3. An electronic copy of the signed declaration form must be appended to all Draft and Final Reports submitted to the department for consideration.
4. The specialist must be aware of and comply with 'the Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the act, when applying for environmental authorisation - GN 320/2020', where applicable.

1. SPECIALIST INFORMATION

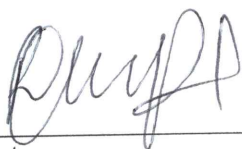
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Specialist Company Name	Verdant Environmental
Specialist Name	Ryan John Edwards
Specialist Identity Number	8211235044083
Specialist Qualifications:	Master of Science Environmental Science
Professional affiliation/registration:	SACNASP No.: 400089/13
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SPECIALIST DECLARATION FORM – AUGUST 2023

2. DECLARATION BY THE SPECIALIST

I, Ryan John Edwards declare that –

- I act as the independent specialist in this application;
- I am aware of the procedures and requirements for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (NEMA), 1998, as amended, when applying for environmental authorisation which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. "the Protocols") and in Government Notice No. 1150 of 30 October 2020.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing –
 - any decision to be taken with respect to the application by the competent authority; and
 - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of section 24F of the NEMA Act.



Signature of the Specialist

Verdant Environmental

Name of Company:

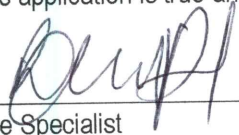
12 Jan 2026

Date

SPECIALIST DECLARATION FORM – AUGUST 2023

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Ryan John Edwards, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.


Signature of the Specialist

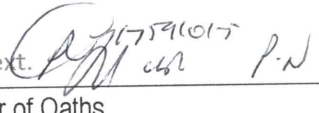
Verdant Environmental

Name of Company

12 January 2026

Date

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 P.N. Khanyezi
Signature of the Commissioner of Oaths

Click or tap to enter a date. 2026. 01. 12

Date

