Proposed Development of a Residential Dwelling on Portion 257 of Melkhoutefontein 480, Riethuiskraal, Hessequa Local Municipality, Western Cape

Specialist Aquatic Biodiversity Assessment

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DECLARATION OF SPECIALIST INDEPENDANCE

- I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);
- At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in a professional capacity;
- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being members of the general public;
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse any proposed developments, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data;
- I do not have any influence over decisions made by the governing authorities;
- I undertake to disclose 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 a competent authority to such a relevant authority and the applicant;
- I have the necessary qualifications and guidance from professional experts in conducting specialist reports relevant to this application, including knowledge of the relevant Act, regulations and any guidelines that have relevance to the proposed activity;
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- All the particulars furnished by me in this document are true and correct.

Specialist: Dr. James Dabrowski (Ph.D., Pr.Sci.Nat. Water Resources – Reg. No 114084)

Date: November 2024

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1. INTRODUCTION

Confluent Environmental was appointed by Ellis Farming Enterprises CC to undertake an aquatic biodiversity assessment survey for the proposed construction of a single residential dwelling on Portion 257 of Farm 480, Melkhoutefontein located adjacent to the Goukou River, in between Riversdale and Still Bay in the Western Cape (Figure 1). The scope of work for this report is guided by the legislative requirements of the National Environmental Management Act (NEMA).

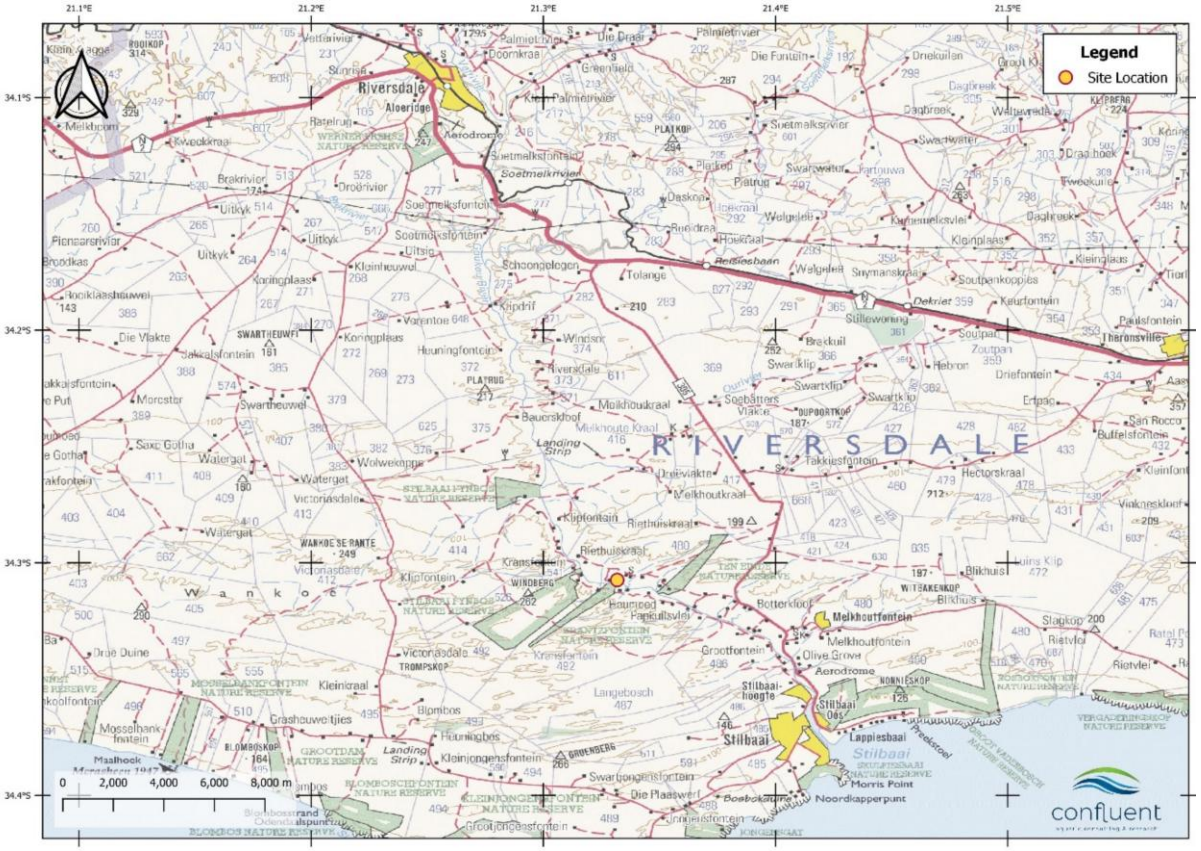

Figure 1: Map indicating the proposed location of the residential dwelling.

1.1 National Environmental Management Act

According to the protocols specified in GN 1540 (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 National Environmental Management Act, 1998, when Applying for Environmental Authorisation), assessment and reporting requirements for aquatic biodiversity are associated with a level of environmental sensitivity identified by the national web-based environmental screening tool (screening tool). An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of:

- **Very High** sensitivity for aquatic biodiversity, must submit an Aquatic Biodiversity Specialist Assessment; or
- **Low** sensitivity for aquatic biodiversity, must submit an Aquatic Biodiversity Compliance Statement.

The screening tool classified the site as being of **Very High** aquatic biodiversity as part of the proposed development footprint falls within:

- An aquatic Critical Biodiversity Area (CBA1)
- The estuarine functional zone (EFZ) of the Goukou Estuary;

According to the protocol, a site sensitivity verification must be undertaken to confirm the sensitivity of the site as indicated by the screening tool.

1.2 National Water Act (NWA, 1998)

The Department of Water & Sanitation (DWS) is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers.

A watercourse means:

- 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 watercourse, and
- A reference to a watercourse includes, where relevant, its bed and banks.

For the purposes of this assessment, a wetland area is defined according to the NWA (Act No. 36 of 1998):

"Land which is transitional between terrestrial and aquatic systems where 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".

Wetlands must therefore have one or more of the following attributes to meet the NWA wetland definition (DWAF, 2005):

- A high water table that results in the saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil;
- Wetland or hydromorphic soils that display characteristics resulting from prolonged saturation, i.e. mottling or grey soils; and
- The presence of, at least occasionally, hydrophilic plants, i.e. hydrophytes (water loving plants).

No activity may take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). According to Section 21 (c) and (i) of the National Water Act, an authorization (Water Use License or General Authorisation) is required for any activities that impede or divert the flow of water in a watercourse or alter the bed, banks, course or characteristics of a watercourse. The regulated area of a watercourse for section 21(c) or (i) of the Act water uses means:

a) The outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;

b) In the absence of a determined 1 in 100-year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act); or

c) A 500 m radius from the delineated boundary (extent) of any wetland or pan.

According to Section 21 (c) and (i) of the NWA, any water use activities that do occur within the regulated area of a watercourse must be assessed using the DWS Risk Assessment Matrix (GN 509) to determine the impact of construction and operational activities on the flow, water quality, habitat and biotic characteristics of the watercourse. Low Risk activities require a General Authorisation (GA), while Medium or High Risk activities require a Water Use License (WUL).

1.3 Scope of Work

The objectives of this assessment included the following:

- To undertake a desktop analysis and site inspection to verify the sensitivity of aquatic biodiversity as **Very High** or **Low**; and
- Compile an Aquatic Biodiversity Compliance Statement or Aquatic Biodiversity Specialist Assessment based on the site verification of the sensitivity of the site.
- Determine whether any activities fall within the regulated area of a watercourse as defined by the NWA.

2. APPROACH

The following rationale was adopted to determine the sensitivity of aquatic biodiversity within the footprint of the site:

- In the event that watercourses are confirmed to fall within the development footprint and that these watercourses will be impacted by the development, then the site sensitivity is confirmed as **Very High** and a full specialist freshwater assessment is required; and
- In the event that no watercourses are identified within the development footprint the site sensitivity is confirmed as **Low** and an Aquatic Compliance statement is required.

The determination of the site sensitivity relied upon the following approaches:

- Interrogation of available desktop resources including:
    - DWS spatial layers;
    - National Freshwater Ecosystem Priority Areas (NFEPA) spatial layers (Nel et al., 2011);
    - National Wetland Map 5 and Confidence Map (CSIR, 2018) – the latest national wetland inventory map for South Africa;
    - Western Cape Biodiversity and Spatial Plan (WCBSP) for Hessequa (CapeNature, 2017).

- A site visit was undertaken, during which time the following activities were undertaken:
    - Identification and classification of watercourses within the footprint of the site according to methods detailed in Ollis et al. (2013);
    - Soil augering to confirm the presence of soil indicators (DWAF, 2005) that may indicate the presence of a wetland (if applicable); and
    - Identification of hydrophilic plant species that may indicate the presence of wetland plant species (if applicable).

3. ASSUMPTIONS AND LIMITATIONS

3.1 Estuarine Assessment

- Estuaries are complex, dynamic systems influenced by multiple environmental and anthropogenic variables. A comprehensive assessment that considers all of these variables did not form part of the scope of work. Assessments of the ecological state of the estuary were therefore derived using appropriate desktop resources.
- The dynamic nature of estuaries means that the structure of physical habitat and associated estuarine fauna and flora can change rapidly in response to tidal and hydrological (e.g. flooding events) influences. This assessment is based on a single site visit that took place in August 2024 and represents a ‘snapshot’ in time.
- No sampling of biota was undertaken (e.g. fish, invertebrates, microphytes, etc.) and all biotic data was derived from desktop sources.

4. METHODS

4.1 Estuarine Assessment

4.1.1 Present Ecological State of the Goukou Estuary

The 2018 National Biodiversity Assessment (NBA) evaluated the ecological health of all estuaries in South Africa (Van Niekerk et al., 2019a). This assessment considered both abiotic and biotic components, namely hydrology, hydrodynamics and mouth condition, water chemistry, sediment processes, microalgae, macrophytes, invertebrates, fish and birds. Each estuary was assigned a condition score based on the similarity to natural for these various abiotic and biotic components. For each of the components, a panel of experts estimated the change in health as a percentage (0 – 100 %) of the natural state. Scores were weighted (25 % for each abiotic and 20 % for each biotic component) and aggregated (to provide an overall score that reflects the present health of the system as a percentage of that under natural conditions.

Table 1: Estuary health scoring system indicating the relationship between the six Ecological Categories and the loss of ecosystem condition and functionality.

Category	Description
A	**Natural:** The natural biotic 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	**Largely Natural:** 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	**Largely Modified:** A large loss of natural habitat, biota, and basic ecosystem function has occurred.
E	**Seriously Modified:** The loss of natural habitat, biota and basic ecosystem function 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.

Van Niekerk et al. (2019b) assessed the overall ecological importance and sensitivity of estuaries based on several criteria including the size (i.e. surface area), habitat importance, zonal rarity type and biodiversity importance. These criteria were each rated (out of a score of 100) and the average of all criteria was used as the final EIS Score (Table 2).

Table 2: Description of EIS Scores for estuaries derived by Van Niekerk et al. (2019b).

EIS Score	Description
0 – 60	Average Importance
61 – 80	Important
80 – 100	High Importance

5. DESKTOP SURVEY

The site falls immediately adjacent to the Goukou which falls within Primary Catchment H (Breede) area and in quaternary catchment H90D (Figure 1). The Goukou River originates from the Langeberg Mountains to the north of Riversdale and flows in a southerly direction, before forming the Goukou Estuary at Still Bay. The property falls within the Southern Coastal Belt (22) Level 1 ecoregion (22.02 Level 2 Ecoregion), which is characterised by moderately undulating plains with altitude ranging from 0 to 300 m above mean sea level. Mean annual precipitation for the catchment area is approximately 450 mm per year and occurs all year-round, with peaks in October to November and March to April. Dominant natural vegetation in the catchment area comprises broadly of Hartenbos Dune Thicket, while the broader main river valleys (in which the property is located) is Gouritz Valley Thicket (Figure 3).

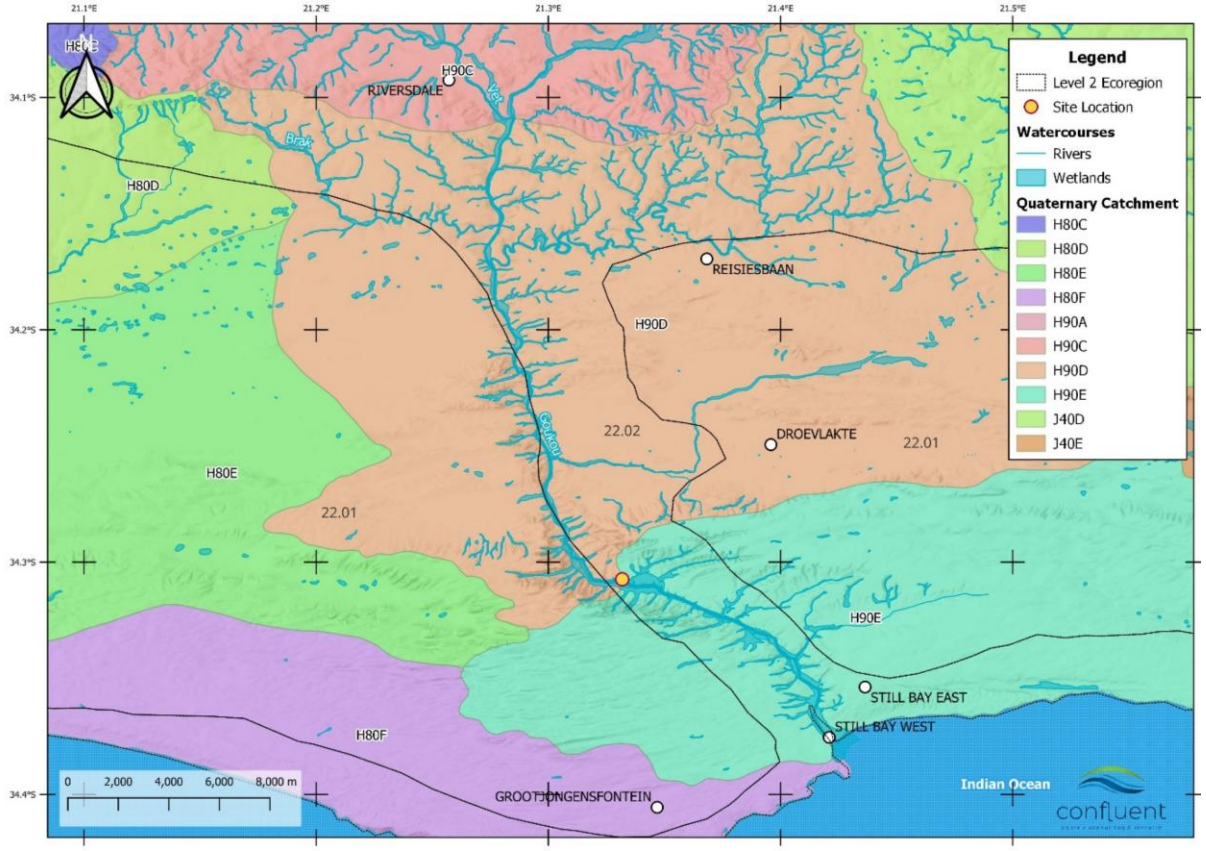

Figure 2: Map indicating the location of the property relative to the quaternary catchment area.

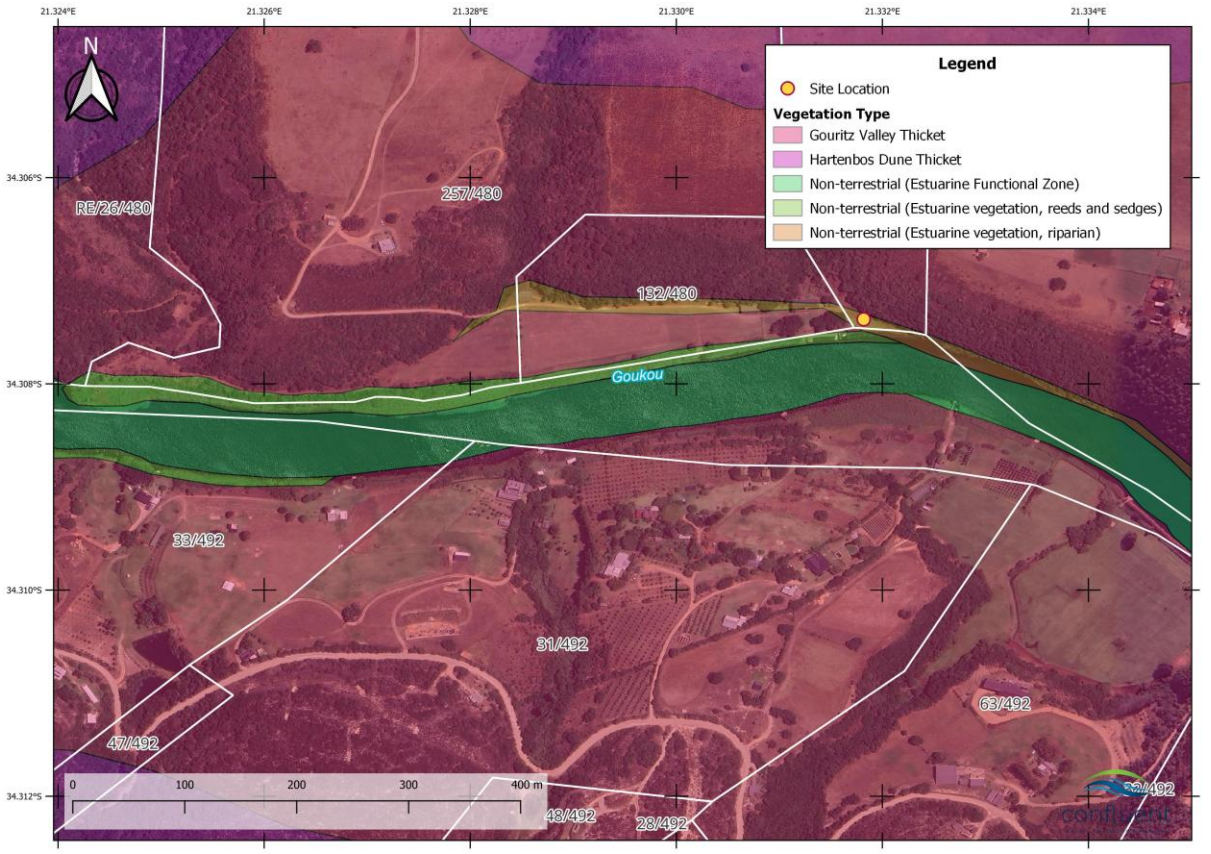

Figure 3: Map of vegetation types

According to geospatial data sources the section of the Goukou River adjacent to the property is estuarine and the footprint of the proposed residential dwelling is located in the Estuarine Functional Zone (EFZ - Figure 4). In South Africa, the EFZ is defined as the area that not only delineates the boundaries of the estuarine waterbody, but also the supporting physical and biological processes and adjacent habitats necessary for estuarine function and health (Van Niekerk et al., 2019a). It includes all dynamic areas influenced by long-term estuarine sedimentary processes, multiple ecotones of floodplain and estuarine vegetation that contribute organic material and provide refuge from strong currents during high flow events.

EFZs are currently delineated by the 5 m contour line and therefore include large areas of land (much of which has been developed) that border the actual open estuarine water body. The EFZ is now commonly used to delineate the spatial extent of the entire estuary. Large sections of the Goukou EFZ and the floodplain of the river have been transformed from natural terrestrial and estuarine vegetation into agricultural and residential developments.

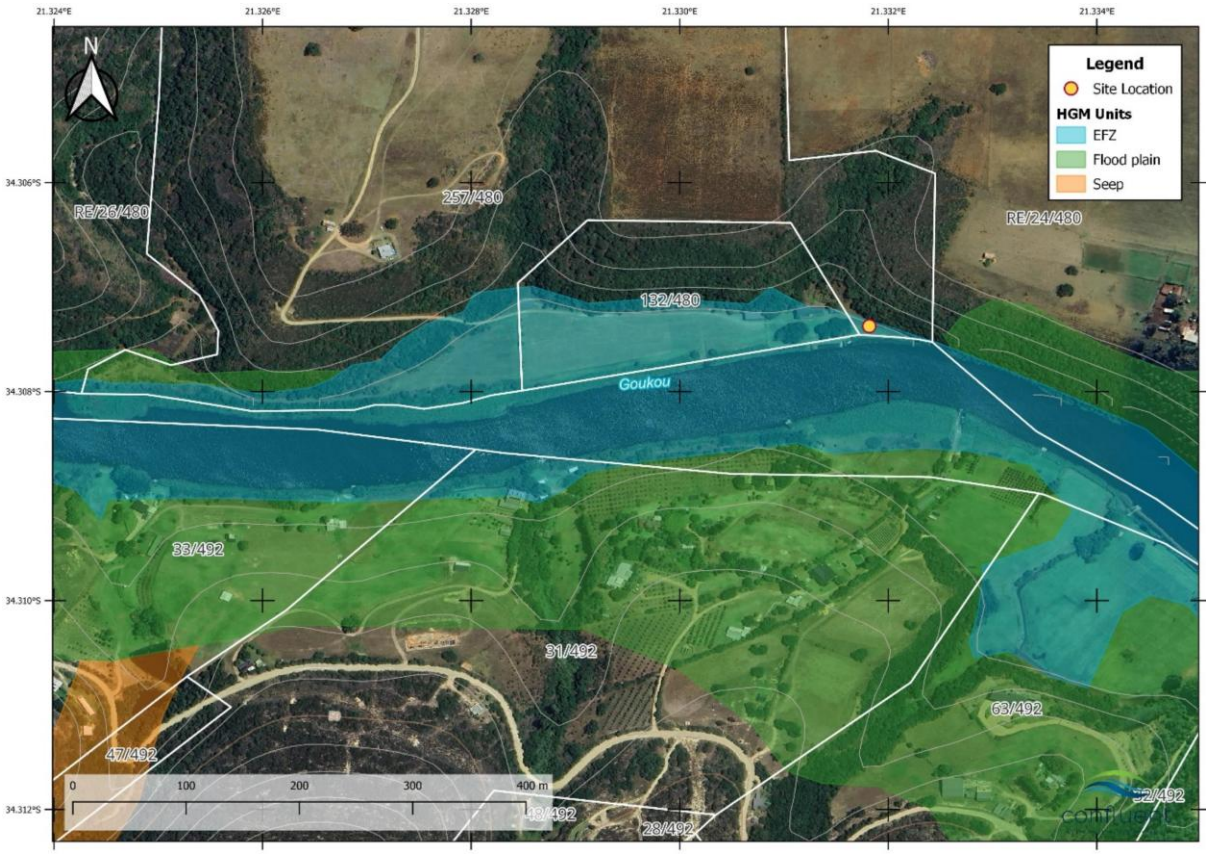

Figure 4: Mapped estuarine and wetland habitats.

5.1 Estuary Classification

The Goukou Estuary is classified as a Predominantly Open estuary which is characterised by the following (Van Niekerk et al., 2019c):

- They are open to the sea for more than 90 % of the time.
- They are linear systems in which mixing processes are dominated by both fluvial inputs and tidal action creating vertical and horizontal salinity gradients.

- They usually support wetlands, salt marshes, macrophyte beds and marine and estuarine fauna.
- They vary in size from as little as 10 ha to as much as 7 500 ha.

5.2 Conservation & Biodiversity Planning

5.2.1 National Freshwater Ecosystem Priority Areas

The property falls within sub-quaternary catchment (SQC) 9343, which, according to the National Freshwater Ecosystem Priority Atlas (NFEPA, Nel et al., 2011), has not been classified as a Freshwater Ecosystem Priority Area (FEPA) (Figure 5).

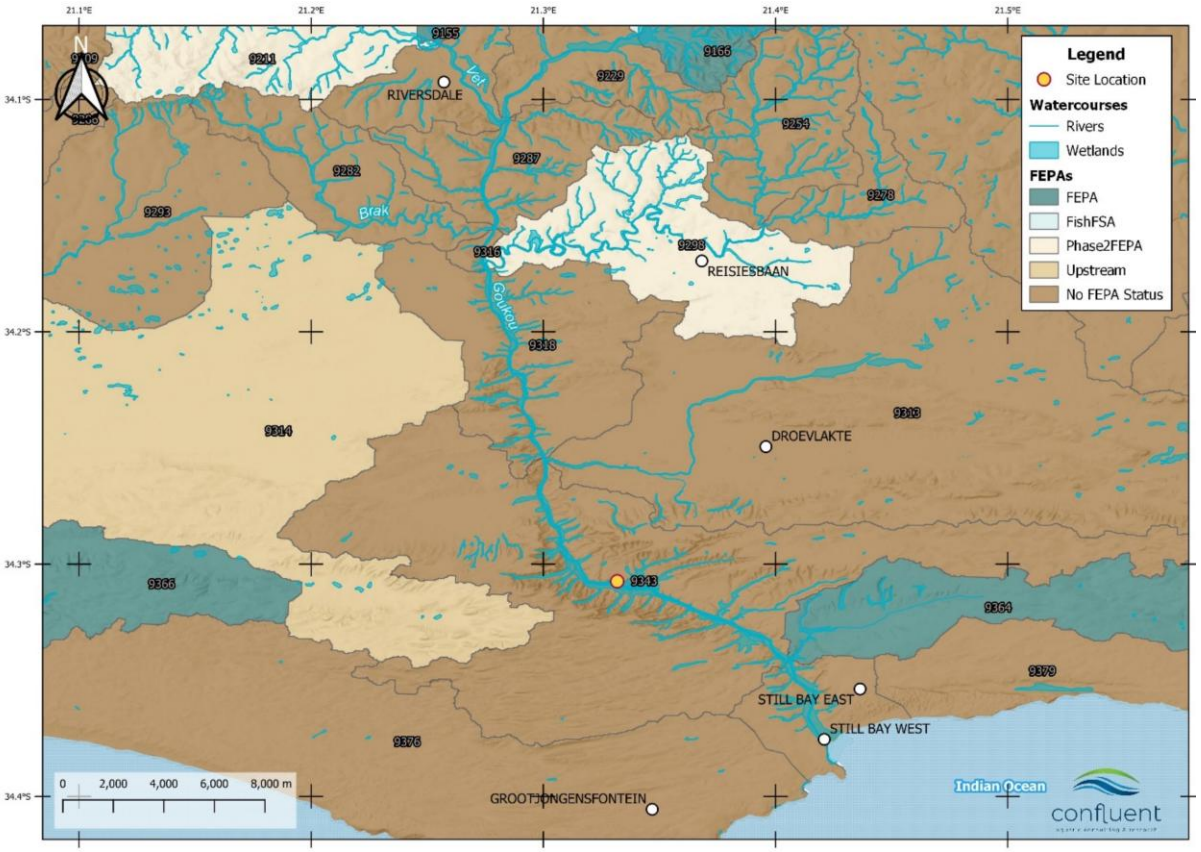

Figure 5: Map illustrating the loaction of the project area in relation to FEPA sub-quaternary catchments.

5.2.2 Western Cape Biodiversity Spatial Plan

The main purpose of a biodiversity spatial plan is to ensure that the most recent and best quality spatial biodiversity information can be accessed and used to inform land use and development planning, environmental assessments and authorisations, natural resource management and other multi-sectoral planning processes. The WCBSP plan achieves this by providing a map of terrestrial and freshwater areas that are important for conserving biodiversity pattern and ecological processes – these areas are called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs).

According to the Western Cape Spatial Biodiversity Plan, the development footprint falls within an aquatic Critical Biodiversity Area 1 (CBA1) (Figure 6). Management objectives associated with CBAs are provided in Table 3.

Table 3: Definitions and management objectives of the Western Cape Biodiversity Spatial Plan.

Category	Description	Management Objective
CBA 1 (Estuaries)	Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.

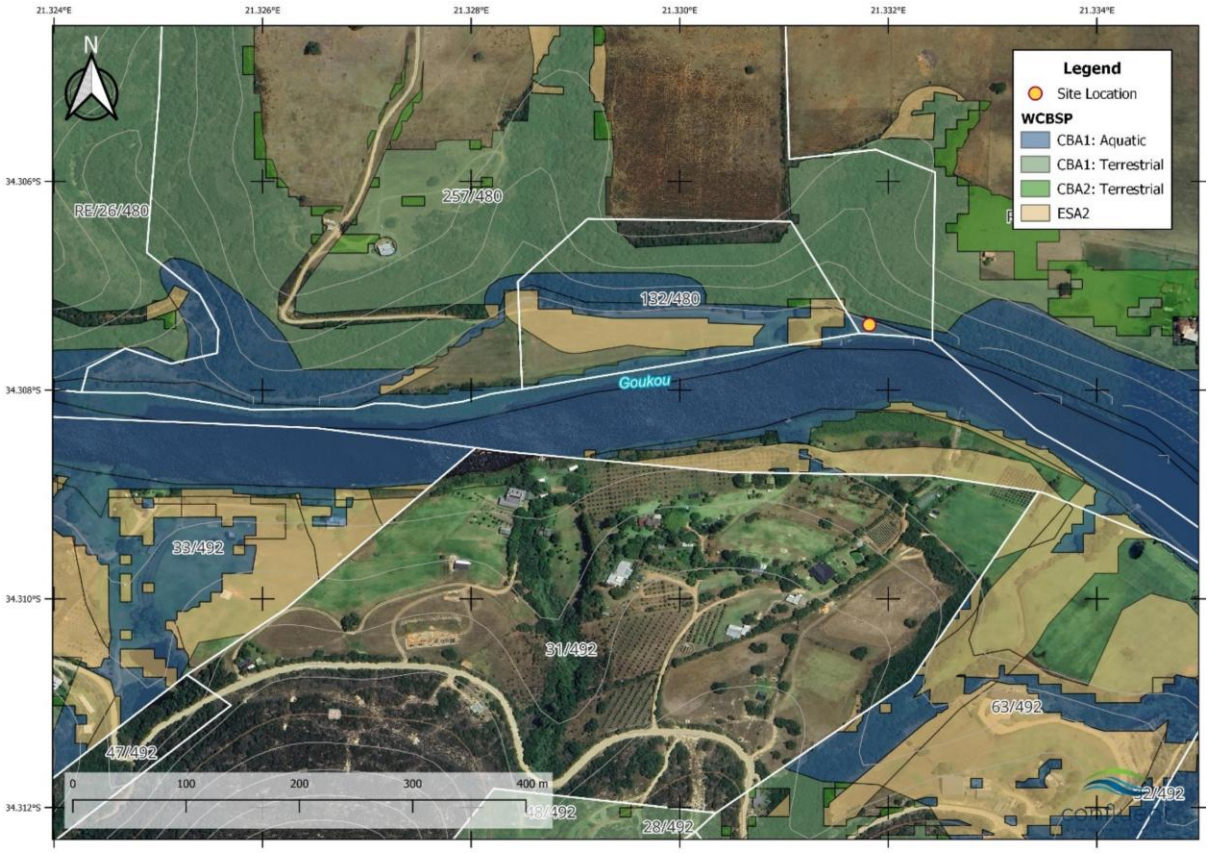

Figure 6: Map indicating the area of development in relation to the Western Cape Spatial Biodiversity Plan (WCBSP).

5.3 National Biodiversity Assessment

According to 2018 National Biodiversity Assessment (NBA) (Van Niekerk et al., 2019a), the PES of the Goukou Estuary is C (**Moderately Modified**), indicating that loss of natural habitat and biota has occurred but the ecosystem functions are essentially unchanged (According to Van Niekerk et al. (2019d) the ecosystem threat status of Warm Temperate Predominantly Open estuaries is **Vulnerable** and these systems are poorly protected in South Africa. The ecological importance is regarded as being **High** and has a **High** biodiversity priority rating (Van Niekerk et al., 2019e).

Table 4). Apart from modifications to hydrology (caused by high abstraction rates from the river for irrigation) modifications to microalgae and invertebrate assemblages are the most important drivers of change from the natural state. According to Van Niekerk et al. (2019d) the ecosystem threat status of Warm Temperate Predominantly Open estuaries is **Vulnerable** and these systems are poorly protected in South Africa. The ecological importance is regarded as being **High** and has a **High** biodiversity priority rating (Van Niekerk et al., 2019e).

Table 4: Summary of the Present Ecological Status (PES) and Ecological Importance of the Goukou River Estuary (Van Niekerk et al., 2019b).

Index	Category
Hydrology	*D*
Hydro-dynamics	*A*
Physical Habitat	*C*
Water Quality	*C*
Microalgae	*D*
Macrophytes	*C*
Invertebrates	*D*
Fish	*C*
Birds	*C*
Overall PES	**C**
Ecological Importance	**High**

5.4 Resource Quality Objectives

The classification of water resources and development of Resource Quality Objectives (RQOs) for the Breede-Gouritz Catchment Management Area was finalised in 2018. Quaternary catchment H90D, falls within the I18 Hessequa Integrated Unit of Analysis (IUA). The Water Resource Class for this IUA is III, sustainable minimal protection and high utilization. The Target Ecological Category (TEC) for the Goukou River has been set as C (Moderately Modified). Specific RQOs have been produced for the estuary in alignment with the TEC. These include specific limits at which indicators of water quantity and quality, habitat and biota must be maintained (Table 5). The scale of the proposed development is unlikely to affect the hydrodynamics, water quality, habitat or biotic RQOs for such a large system.

Table 5: Numeric RQOs for the Goukou Estuary

Component	Sub-component	Indicator	RQO Narrative	RQO Numeric
Quantity	Flow	MMR/MAR (% Nat)	Maintain flow regime as close to natural as possible	
Quality	Nutrients	DIN	Inorganic nutrient concentrations not to exceed TPCs for macrophytes and microalgae	River inflow: NOx-N not to exceed 100 µg/ℓ over 2 consecutive months, NH3-N not to exceed 20 µg/ℓ over 2 consecutive months; Estuary (except during upwelling or floods): average NOx-N not to exceed 100 µg/ℓ, no single measurement to exceed 150 µg/ℓ, average NH3-N not to exceed 20 µg/ℓ during survey, no single measurement to exceed 100 µg/ℓ
		DIP		River inflow: PO4-P not to exceed 20 µg/ℓ over 2 consecutive months; Estuary (except during upwelling or floods): average PO4-P not to exceed 20 µg/ℓ during survey, no single measurement to exceed 50 µg/ℓ
	Salinity	Salinity	Salinity distribution not to exceed TPCs for fish, invertebrates, macrophytes and microalgae	Salinity should not exceed 0 at head of estuary, average salinity in Zone C < 20, Average salinity 11 km upstream from

Component	Sub-component	Indicator	RQO Narrative	RQO Numeric
				mouth > 20 for no more than 3 months of the year, salinity <40 in saltmarsh sediments
	System variables	pH	System variables not to exceed TPCs for biota	6.0 < pH > 8.0 (black water system)
		Dissolved oxygen		Entire estuary and river inflow: DO >5 mg/ℓ
		Enterococci	Concentrations of waterborne pathogens should be maintained in an Acceptable category for full contact recreation	≤185 Enterococci/100 ml) (90th percentile)
		Escherichia coli		≤500 E. coli/100 ml (90th percentile)
Habitat	Hydrodynamics	Mouth state	Maintain connectivity with marine environment at a level that ensures water quality and habitat remains suitable for biota typically found in the estuary	Estuary mouth permanently open
		Tidal variation	Flood regime is sufficient to maintain natural Bathymetry and sediment characteristics	Average tidal amplitude near the mouth during low flows (summer) must not change by >30% from established baseline.
	Sediment	Sediment characteristics, Channel shape/size	Flood regime to maintain natural bathymetry and the sediment characteristics	Channel shape/size, sediment grain size and organic matter must not change by >30% from established baseline
Biota	Microalgae	Biomass and community composition of phytoplankton and benthic microalgae community	Maintain the composition and richness of phytoplankton and benthic microalgae groups and medium-low biomass	Median phytoplankton chlorophyll a (minimum 5 sites) not to exceed 3.5 µg/ℓ; prevent formation of localized phytoplankton blooms; maintain a high median intertidal benthic microalgal biomass; median intertidal benthic chlorophyll a (minimum 5 sites) not to exceed 42 mg/m^2; site specific chlorophyll a concentration not to exceed 20 µg/ℓ and cell density not to exceed 10000 cells/ℓ.
	Macrophytes	Extent, distribution and richness of macrophytes	Maintain extent, distribution and richness of macrophyte groups, limit colonisation/spread of the EFZ by alien species	Maintain the present area (2014) covered by the macrophyte habitats: Open surface water area: 206, Sand and mud banks: 35, Submerged macrophytes: 5, Salt marsh: 57, Reeds and sedges: 21; maintain pockets of reeds in lower and middle reaches (linked to freshwater seepage sites); maintain the reed and sedge stands in the upper reaches of the estuary; rehabilitate 20% of the floodplain habitat by removing agriculture and invasive plants; maintain the integrity of the riparian zone
	Invertebrates	Macrofauna Community composition, abundance and richness	Maintain composition, richness and abundance of different groups of benthic macrofauna and zooplankton	Maintain rich populations of the mudprawn *Upogebia africana* on mudbanks in the middle estuary (Zones A and B); mudprawn density should not deviate from average baseline levels by more than 25% in each season; maintain rich invertebrate communities associated with the REI zone in the upper estuary (zooplankton and benthos); the dominant species in the zone (zooplankton and benthos) should not deviate from average baseline levels by more than 40% in each season
	Fish	Fish community composition, abundance and richness	Maintain composition, richness and abundance of different groups of fish, prevent colonisation/increase of alien species	Fish assemblage should comprise the 5 estuarine association categories in similar proportions (diversity and abundance) to that under the reference (see 2015 EWR report); numerically assemblage should comprise: Ia estuarine residents (50-80% of total abundance), Ib marine and estuarine breeders (10-20%), IIa obligate estuarine-dependent (10-20%), IIb estuarine associated species (5-15%), IIc marine opportunists (20-80%), III marine vagrants (not more than 5%), IV indigenous fish (1-5%), V catadromous species (1-5%); Category Ia species should contain viable populations of at least 4 species (; Category IIa obligate dependents should be well represented by large exploited species
	Birds	Avifauna Community composition,	Maintain composition, richness and abundance of different avifauna groups	The estuary should contain a diverse avifaunal community that includes representatives of all the original taxonomic groups (see 2015 EWR report).; tern roosts

Component	Sub-component	Indicator	RQO Narrative	RQO Numeric
		abundance and richness		should be seen at the estuary on a regular basis; apart from gulls, terns and regionally increasing species such as Egyptian Goose, the estuary should generally support more than 200 birds; numbers of birds other than gulls, terns and regionally increasing species should not fall below 120 for three consecutive counts; numbers of waterbird species drop should not below 15 for 3 consecutive counts.

5.5 Goukou Estuary Management Plan (EMP)

Estuaries are recognised as particularly sensitive and dynamic ecosystems, and therefore require above-average care in the planning and control of activities related to their use and management. For this reason, the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008, as amended by Act 36 of 2014) (ICMA), via the prescriptions of the South African National Estuarine Management Protocol (the Protocol), require Estuary Management Plans (EMPs) to be prepared for estuaries in order to create informed platforms for efficient and coordinated estuarine management. The Goukou EMP identified five key management priorities for which management objectives were defined:

- Water quantity and quality;
- Recreational activities;
- Living resource management;
- Land use and development (including mitigation for environmental hazards); and
- Funding and educational awareness

The most relevant management actions that are aligned to these objectives and that are applicable to the proposed development include the following:

- *Action 3.1: Ensure appropriate development in and around the Goukou River estuary through environmental authorization and implementation of IDP/SDF - considering ecosystem services and sense of place*. Key indicators include:
    - Spatial zonation and prescription of the Goukou River EMP captured in the IDP and SDF.
    - Goukou River Environmental Advisory Forum (EAF) registered as an Interested & Affected Party for all development and rezoning applications.
    - Database of all new developments and comment made by Goukou River EAF through EIA process.
    - Developments tabled at EAF meetings.
    - Construction sites monitored for compliance with environmental authorisation and approved environmental management plan.
- *Action 3.2: Develop appropriate setback lines for development that considers major floods and sea level rise for inclusion into the IDP/SDF.* Key indicators include:
    - Coastal management lines developed and gazetted.
    - Coastal management lines incorporated into IDP & SDF.
    - Development excluded from sensitive areas, including EFZ.

- Applicable building controls applied to high risk areas.

Given these actions it is important that the Goukou River EAF be included as an I&AP for this development. Furthermore, construction of the dwelling within the EFZ is not aligned with Action 3.2

6. SITE ASSESSMENT

The site was assessed on the 26th of August 2024. The footprint of the dwelling covers a mowed lawn area (comprising predominantly of *Cenchrus clandestinus*) that slopes gently down towards the Goukou River (Figure 7). The development area therefore occurs within a transformed area, and, while it is in close proximity to the Goukou River, is not representative of natural estuarine habitat as indicated by the WCBSP and the national vegetation map. The river is lined by a narrow zone (± 2m) of estuarine vegetation that includes *Phragmites australis, Cyperus textilis* and *Juncus krausii*. While the property is located approximately 12 km upstream of the river mouth, the river is clearly estuarine in nature and experiences daily tidal fluctuations. The geomorphological zonation of the Goukou River at this location is E (Lower Foothills) and is characterised by a broad (up to 80 m wide), deep, low gradient channel with limited instream habitat heterogeneity.

The property has remained relatively unchanged over recent past. The proposed development area has been clear of riparian vegetation since at least 2003, with the only major change being the expansion of the residential dwelling and the construction of a garage and store on Portion 132 of Farm 480. Otherwise, the extent of cleared lands and the width of fringing wetland vegetation along the banks of the Goukou River remains the same (Figure 8).

While the development will not result in any modification to functional estuarine habitat, it does occur in very close proximity to the river and according to WML Coast (2023) is also located within the 1:100 year floodline. The dwelling will therefore be susceptible to periodic flood events which could negatively affect estuarine habitat if not planned and designed appropriately. For this reason, the sensitivity of the site is considered to be **Very High**.

Figure 7: View of the Goukou River (A); view of the proposed development area from the north (B); and from the east (C); narrow fringe of estuarine vegetation comprised mainly of Phragmites australis along the Goukou River (D); Cyperus textilis (E); and Juncus kraussi (F).

Figure 8: Google Earth satellite image from 2004 (left) and 2023 (right). The red elipse indicates the position of the proposed dwelling.

7. IMPACTS ASSOCIATED WITH THE DEVELOPMENT

The site development plan (SDP) is shown in (Figure 9) and includes a dwelling, parking bay, conservancy tank and rainwater tank. The conservancy tank will be located outside of the 1:100-year floodline. The proposed development will not result in any additional construction of infrastructure within the dynamic, tidal extent of the estuary and construction and operational phase activities will not impact on the base flows or hydrological regime (i.e. timing and magnitude of surface flows) of the estuary and are of such a scale that will in no way impact on the frequency of estuary mouth closure.

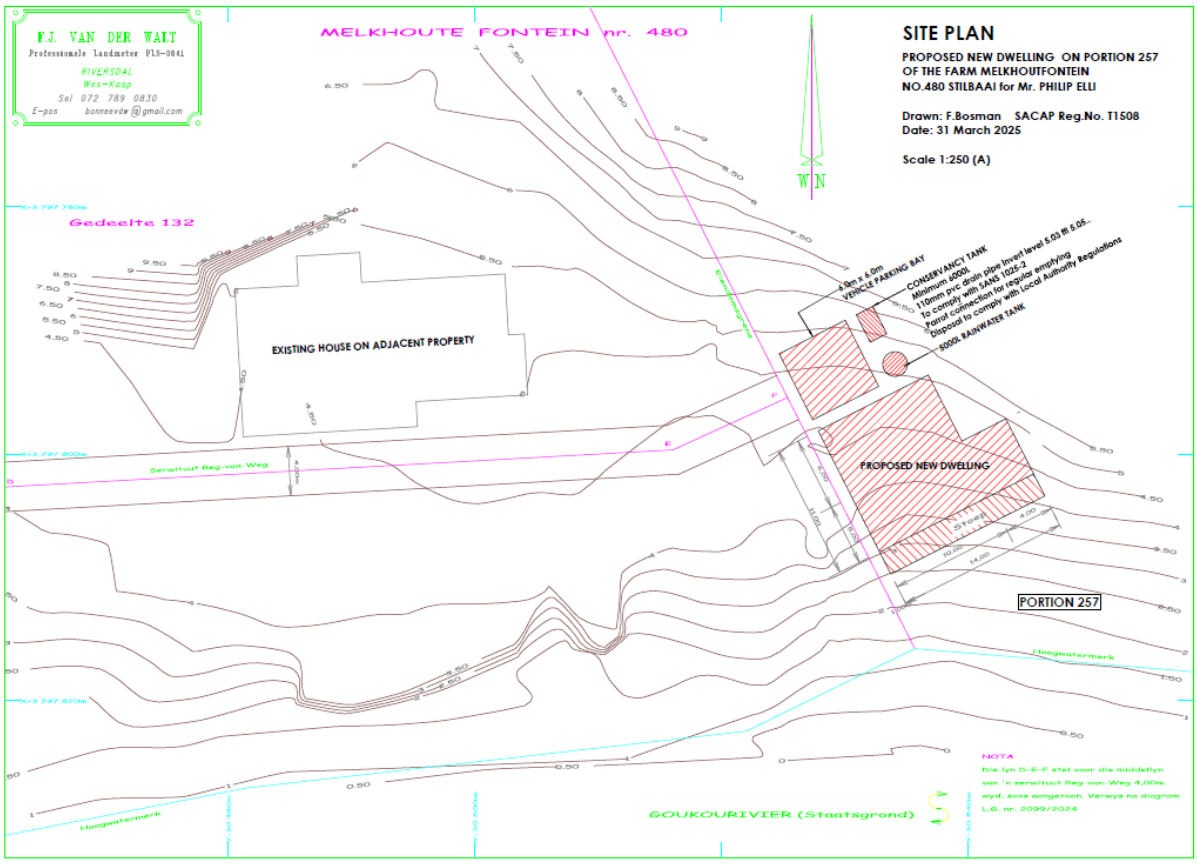

Figure 9: Proposed SDP

A floodline assessment (WML Coast, 2023) concluded that the development footprint is located within the 1:100-year floodline (Figure 11) and made the following recommendations:

- The dwelling should be built on piled supports (pillars);
- The floor level of the dwelling should be above the 1 in 100-year flood level to limit flood risk;
    - Setting out point “HUIS5” is situated on an elevation of 5.25 m MSL, if this level is used as the house floor level, the house will be elevated above the present 1 in 100-year flood level.
    - To account for the future 1 in 100-year flood event the floor level should be above 5.5 m MSL, which is easily achievable within the current development footprint.
- Riverbank scour could result in undermining of the foundations of the house, the design of the house should consider potential scour of the riverbank due to flood events, however;
    - Model predicted scour velocities for the 1 in 100-year flood event at the lowest elevation of the dwelling are in the order of 0.7 m/s.
    - This flow velocity is mild and it is not expected that the riverbank, at the house footprint will be scoured significantly.

Two alternatives were considered for the impact assessment and are described as follows:

- Alternative A follows the design recommendations of the floodline assessment described above and is constructed on top of supporting pillars according to the SDP in Figure 9 and Figure 10.
- Alternative B is constructed by cutting into the slope to create a level area for foundations.

Figure 10: South facing section drawing of the proposed dwelling, supported on pillars (Alternative A).

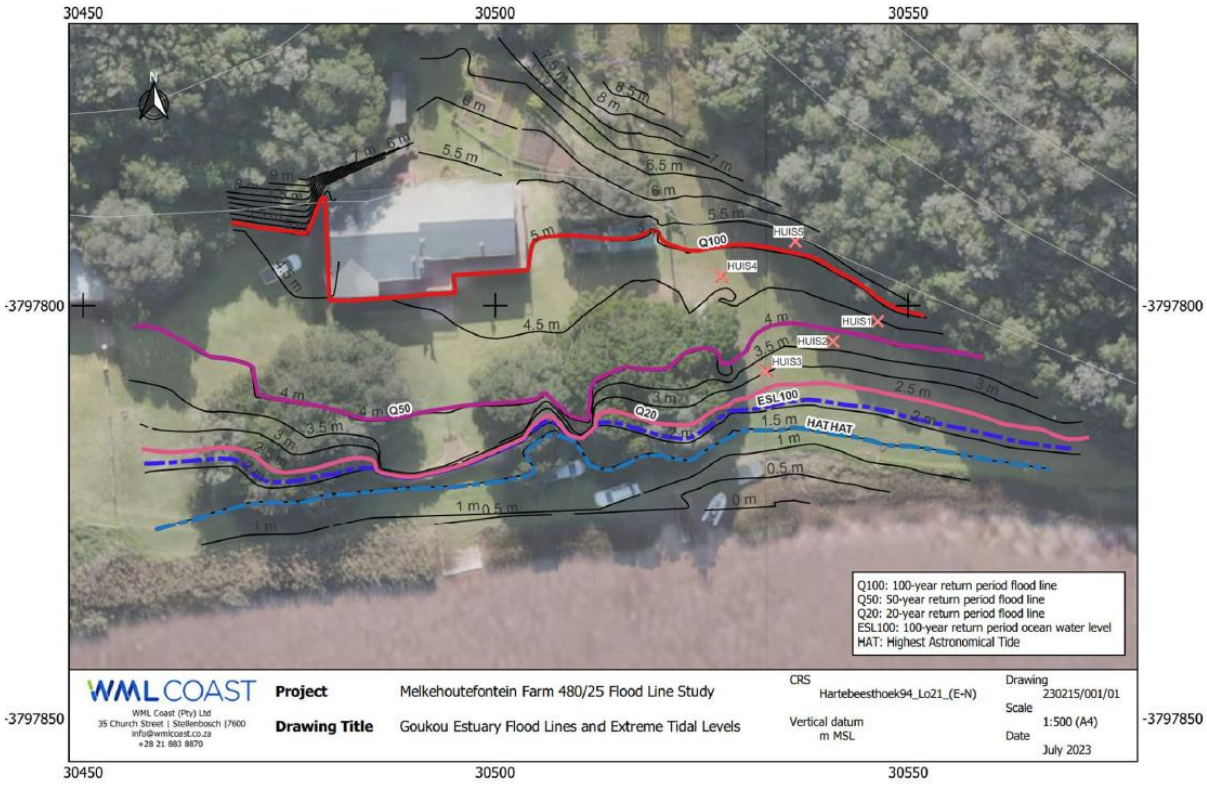

Figure 11: Goukou Estuary flood lines and extreme tidal levels (Present Case) as determined by WML Coast (Pty) Ltd (2023). Red crosses align to the perimeter of the proposed dwelling (Huis 3 is at the lowest elevation).

7.1 Construction Phase Impacts

Impact 1: Transformation of habitat within the Estuarine Functional Zone of the Goukou River estuary.

Construction of the residential dwelling will occur within a transformed section of the Goukou EFZ which offers limited habitat options for estuarine biota. No part of the development will occur within the river and no aquatic estuarine biota are expected to be adversely impacted. It is therefore unlikely that this development will significantly affect the ecological or functional attributes of the broader estuarine system.

	Alternative A		Alternative B		No-Go
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**	
Intensity	Negligible	Negligible	Negligible	Negligible	Negligible
Duration	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing
Extent	Very limited	Very limited	Very limited	Very limited	Very limited
Probability	Unlikely	Highly unlikely	Unlikely	Highly unlikely	Highly unlikely
Significance	**-24: Negligible**	**-8: Negligible**	**-24: Negligible**	**-8: Negligible**	**-8: Negligible**
Reversibility	High	High	High	High	High
Irreplaceability	Low	Low	Low	Low	Low
Confidence	High	High	High	High	High

Mitigation:

- Working areas must be clearly demarcated. Estuarine habitat outside of the working area must be designated as No-Go and no disturbance (i.e. trampling, smothering etc.) of estuarine habitat

in this area is permitted. A 10 m buffer (measured from the edge of the bankfull channel) must be implemented and be clearly demarcated as a No-Go area (see Figure 12).

- No excavated material must be dumped or stockpiled in the No-Go area.
- A comprehensive method statement must be drawn up which provides a clear step by step plan of the sequence of construction activities that will be undertaken. The method statement must aim to minimise the length of time that cleared areas remain exposed and vulnerable to erosion.

Figure 12: Map indicating No-Go area and recommended access route (green arrow) to the development area in Portion 257 of Farm 480.

Impact 2: Erosion and sedimentation caused by clearance of vegetation during construction

Clearing of vegetation will expose soil which may be vulnerable to erosion resulting in sediment input into the estuary and smothering and die-back of estuarine vegetation.

	Alternative A		Alternative B		No-Go
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**	
Intensity	Very low	Negligible	Moderate	Low	No Impact
Duration	Brief	Brief	Brief	Brief	
Extent	Very limited	Very limited	Very limited	Very limited	
Probability	Probably	Unlikely	Likely	Probably	
Significance	**-20: Negligible**	**-12: Negligible**	**-35: Negligible**	**-24: Negligible**	
Reversibility	High	High	High	High	
Irreplaceability	Low	Low	Low	Low	

Confidence	High	High	High	High	

Mitigation:

- Working areas must be clearly demarcated to avoid unnecessary clearing of vegetation. Estuarine habitat outside of the working area must be designated as No-Go and no disturbance (i.e. trampling, smothering etc.) of estuarine habitat in this area is permitted.
- For Alternative A, vegetation clearance must be limited to the proposed location of supporting piles
- Construction of the dwelling must be planned for the dry season (May to July).
- A comprehensive method statement must be drawn up which provides a clear step by step plan of the sequence of construction activities that will be undertaken. The method statement must aim to minimise the length of time that cleared areas remain exposed and vulnerable to erosion.
- Silt fencing must be placed along the lower southern boundary of the development footprint to prevent sediment input in the event of a rainfall event.
- Any disturbed, exposed areas outside of the development footprint must be reprofiled to natural contours and re-vegetated.

Impact 3: Disturbance of estuarine and coastal habitat caused by general construction activities.

The proposed location of the dwelling is located immediately adjacent to sensitive estuarine and habitat. Failure to adequately manage activities on the construction site (e.g. access to construction areas, location and management of laydown and stockpile areas, waste management etc.) could lead to physical disturbance, solid waste pollution (e.g. general litter, building rubble, construction materials, cement etc.) and chemical pollution (e.g. hydrocarbons from vehicles and machinery and wastewater from cement mixing and temporary ablution facilities) of estuarine habitat.

	Alternative A		**Alternative B**		**No-Go**
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**	
Intensity	Low	Negligible	Low	Negligible	No Impact
Duration	Brief	Brief	Brief	Brief	
Extent	Very limited	Very limited	Very limited	Very limited	
Probability	Likely	Unlikely	Likely	Unlikely	
Significance	**-30: Negligible**	**-12: Negligible**	**-30: Negligible**	**-12: Negligible**	
Reversibility	High	High	High	High	
Irreplaceability	Low	Low	Low	Low	
Confidence	High	High	High	High	

Mitigation:

- Access to the construction area through the No-Go area is not permitted. Access must be restricted to the strip of transformed EFZ immediately south of the main residential dwelling on Portion 132 of Farm 480.
- No construction materials may be stored or stockpiled outside of the area delineated by the rock revetment or in any part of the undeveloped areas of the EFZ.
- Rubble and waste materials must be managed on site and must not be dumped or stockpiled within the No-Go area.
- Chemical toilets should be provided on-site at 1 toilet per 10 persons.

- Waste from chemical toilets must be disposed of regularly (at least once a week) in a responsible manner by a registered waste contractor.

7.2 Operational Phase Impacts

Impact 4: Impedance and diversion of flood flows.

Alternative B will be susceptible to flood damage and present an obstruction to flood events which could result in localised diversion/impedance of flood flows which could cause scouring and erosion of the bank. Alternative A will allow flood water to pass beneath the building and will minimise the risk of flood damage, scouring and erosion.

	Alternative A		Alternative B		No-Go
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**	
Intensity	Low	Low	Moderate	Moderate	No Impact
Duration	Ongoing	Ongoing	Ongoing	Ongoing	
Extent	Limited	Limited	Limited	Limited	
Probability	Unlikely	Unlikely	Likely	Likely	
Significance	**-33: Negligible**	**-33: Negligible**	**-55: Minor**	**-55: Minor**	
Reversibility	High	High	High	High	
Irreplaceability	Low	Low	Low	Low	
Confidence	High	High	High	High	

Mitigation:

- No additional mitigation is applicable. Alternative A represents a lower impact due to the design.

8. WATER USE AUTHORISATION

According to the definition provided in Section 1.2, an estuary is not considered a watercourse. Section 21 (c) and (i) water uses are therefore not applicable to the proposed development and a water use authorisation is therefore not required.

9. CONCLUSION

While the proposed development does occur within the EFZ of the Goukou Estuary and is therefore contrary to management objectives aligned to the WCBSP and the Goukou EMP, the development footprint has been historically transformed and, assuming the implementation of recommended mitigation measures, its construction will not result in any modification to functional estuarine habitat. The dwelling is located in the 1:100-year floodline and there is a risk of flooding and scouring of the banks during the operational phase. For this reason, the authorisation of this development should only be considered subject to the implementation of the recommendations made by the floodline assessment conducted by WML Coast (2023). The SDP associated with Alternative A is considered acceptable from an aquatic biodiversity perspective.

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