Aquatic Biodiversity Impact Assessment

Remainder of Erf 1489, Vermont, Western Cape Province

For: Lornay Environmental Consulting

July 2025

Report Information

Document name	Aquatic Biodiversity Impact Assessment: Erf 1489, Vermont, Western Cape Province V1.0.		
Number of pages	58		
Author 1	Kimberley van Zyl	SACNASP Reg. No.	117097
Author contact details	**Email:** kimberley@deltaecologists.com **| Phone:** +27 74 295 9571		
Author 2	Robyn Morton	SACNASP Reg. No.	Pending

Citation

Van Zyl, K., & Morton, R. 2025. Aquatic Biodiversity Impact Assessment Erf 1489 Vermont V1.0. Delta Ecology. RSA.

Executive Summary

The owner of the Remainder (RE) of Erf 1489, Vermont, located within Overstrand Local Municipality proposes a subdivision of the property to create several erven for single residential development. The proposed development would consist of 18 single residential units with a footprint of approximately 0.74 ha, 0,13 ha of open space and 0,38 ha of private road.

Additionally, the applicant proposes to subdivide the road access (Kolgans Close Road) portion off Erf 1490 and consolidate it with Erf 1489. This section of the road will be a public road, built to municipal standards, and transferred to the municipality. The road will not be widened, but rather the existing road surface will be replaced and improved by removing the old surface and underlaying layers before adding new materials (asphalt).

According to engineering designs for bulk services, it is proposed that the existing 110 mm diameter small bore sewer system from the proposed development to the existing 200 mm diameter outfall sewer in Malmok Street is upgraded to 160 mm diameter and 200 mm diameter outfall sewers, to accommodate the proposed development in the existing sewer system. In terms of water supply, it is proposed that the development area is accommodated within the existing Vermont reservoir zone. The connection to the existing system should be done via a 170 m x 110 mm Ø supply pipe from the south of Erf 1489, running along the access road (Erf 1490), connecting via a 20 m x 110 mm Ø inter-connection pipe.

According to the national Department of Forestry, Fisheries and the Environment (DFFE) web-based environmental screening tool report generated for the proposed study area, the Combined Aquatic Biodiversity Theme Sensitivity is classified as “Very High” (DFFE, 2024). The classification trigger is the location of the study area within a Strategic Water Source Area (SWSA) for surface water (Boland).

Following the aquatic biodiversity screening assessment of the proposed study area on the 10th of December 2024, a natural Unchanneled Valley-Bottom (UVB) wetland was confirmed and delineated directly south of Erf RE/1489, while Portion A overlays an area of relic UVB wetland.

The UVB wetland is part of a 1.4 km long wetland system that originates to the west of the study area and ends at the Vermont Pan to the southeast. The UVB wetland is disturbed and characterised by a mixture of alien and indigenous vegetation.

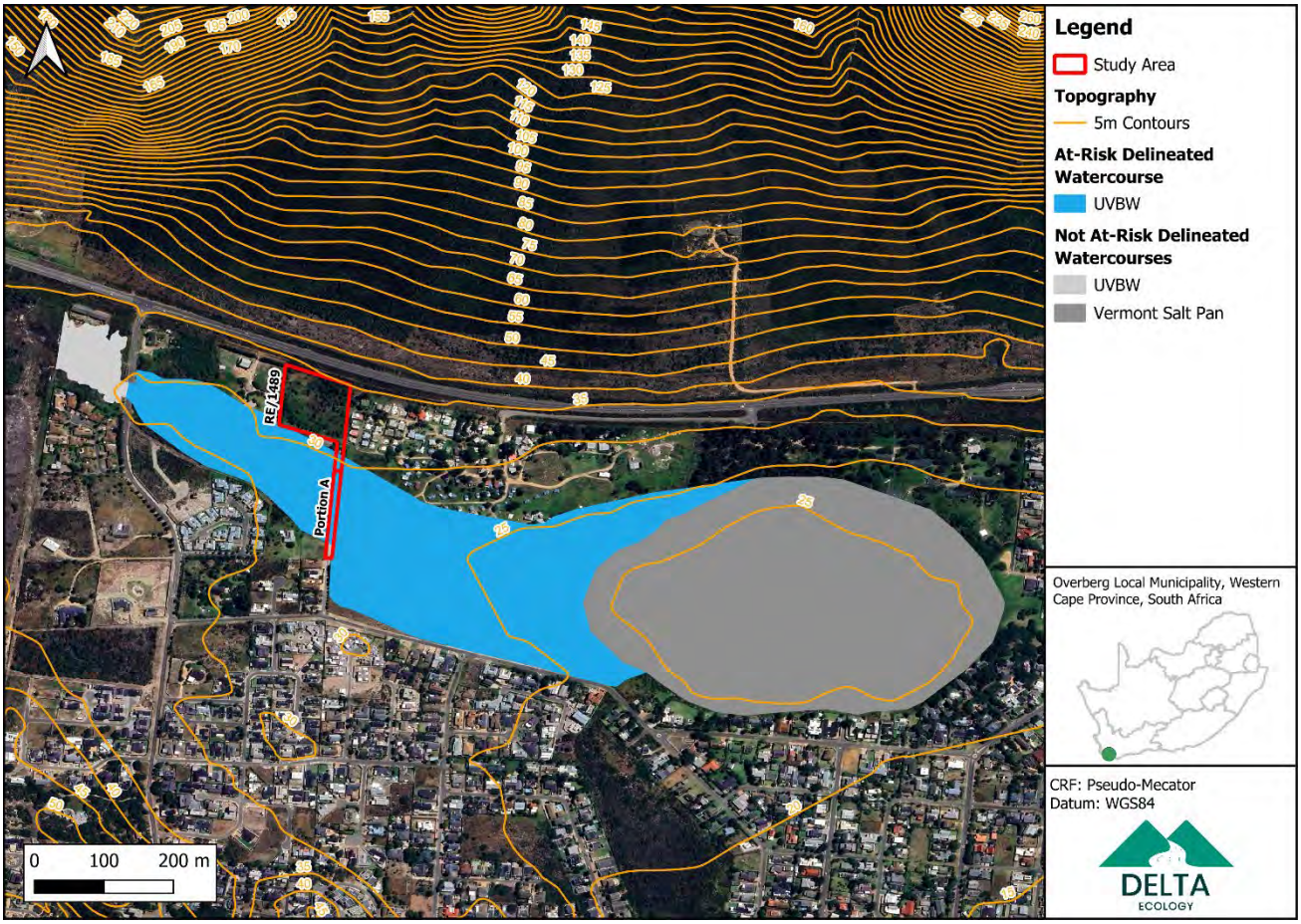


Figure i: Delineated "At risk" UVB wetland.

In this impact assessment, the delineated at-risk UVB wetland (**Figure i**) was assessed using current best practice assessment methodologies to determine the Present Ecological State (PES), Ecological Importance and Sensitivity (EIS), Wetland Ecosystem Services (WES), and Recommended Ecological Category (REC) metrics. The results of these assessments are as follows:

Table i: Results of the wetland status quo assessment.

	PES	EIS	WES (Highest)	REC
UVB Wetland	D	Moderate	Moderate	D-C

Aquatic biodiversity impacts associated with the development were identified and assessed using both an impact assessment methodology compliant with NEMA requirements and the Risk Assessment Matrix prescribed by GN4167 of 2023.

The potential aquatic impacts identified were assessed first without and then with application of mitigation measures. All the post-mitigation scores fell within the within the "Low" impact categories. The "no go" scenario was assessed and found to be of "Low" impact significance as this scenario would result in continuation of existing impacts to the wetland due to the within wetland disturbances and adjacent land uses. No indirect impacts were noted.

The result of the RAM was an overall "Low Risk" rating for the proposed development, assuming that all mitigation measures will be implemented. Therefore, the project should be registered under the GN4167 (2023) General Authorisation (GA).

It is therefore the opinion of the specialist that the proposed development should be approved subject to application of the mitigation measures listed in this report.

Table of Contents

List of Figures

List of Tables

Specialist Details

Specialist Details | Kimberley van Zyl	
Company Name	Delta Ecology
Physical address	59 Exmouth Rd, Plumstead, Cape Town 7801
Email Address	Kimberley@deltaecologists.com
Telephone	078 275 8815
Highest Qualification	MSc. Water Resource Management (University of Pretoria)
SACNASP Reg. No.	117097
Area of Specialisation	Freshwater Ecology

Kimberley van Zyl is an ecologist and environmental scientist with over 9 years' experience in the environmental management field. She holds a MSc. degree in Water Resource Management from the University of Pretoria and her professional affiliations include the South African Council for Natural Scientific Professions (SACNASP) and the Southern African Society of Aquatic Scientists (SASAqS). Kimberley's work experience has exposed her to a range of projects across various business sectors such as mining, agriculture, and construction, as well as the public sector.

Co-author's Details | Robyn Morton	
Company Name	Delta Ecology
Physical address	41 Dreyersdal Rd, Bergvliet, Cape Town 7945
Email Address	robyn@deltaecologists.com
Telephone	082 779 7618
Highest Qualification	MSc. Nature Conservation
SACNASP Reg. No.	Pending
Area of Specialisation	Ecology

Robyn Morton has a MSc. degree in Conservation Sciences from the Cape Peninsula University of Technology. Throughout her studies, internships, and consultancy experience, she has gained valuable and informed insight into the functioning of natural and socio-ecological systems, as well as many key research and monitoring skills. Prior to her consulting career, Robyn worked for Zandvlei Estuary Nature Reserve for 4 years and gained experience in the field of urban wetland and estuary management. Robyn specialises in aquatic ecology and is currently working for Delta Ecology as a junior associate under the guidance of Kimberley van Zyl.

A signed statement of independence will be provided as a separate document.

1. Introduction

The owner of the Remainder (RE) of Erf 1489, Vermont, located within Overstrand Local Municipality (**Figure 1-1**) proposes a subdivision of the property to create several erven for single residential development (**Figure 1-2**). The proposed development would consist of 18 single residential units with a footprint of approximately 0.74 ha, 0,13 ha of open space and 0,38 ha of private road (**Figure 1-3**).

Additionally, the applicant proposes to subdivide the road access (Kolgans Close Road) portion off Erf 1490 and consolidate it with Erf 1489 (**Figure 1-4**). This section of the road will be a public road, built to municipal standards, and transferred to the municipality (**Figure 1-4**). According to engineering designs for bulk services (**Annexure 4**), it is proposed that the existing 110 mm diameter small bore sewer system from the proposed development to the existing 200 mm diameter outfall sewer in Malmok Street is upgraded to 160 mm diameter and 200 mm diameter outfall sewers, in order to accommodate the proposed development in the existing sewer system. In terms of water supply, it is proposed that the development area is accommodated within the existing Vermont reservoir zone. The connection to the existing system should be done via a 170 m x 110 mm Ø supply pipe from the south of Erf 1489, running along the access road (Erf 1490), connecting via a 20 m x 110 mm Ø inter-connection pipe.

According to the national Department of Forestry, Fisheries and the Environment (DFFE) web-based environmental screening tool report generated for the proposed study area, the Combined Aquatic Biodiversity Theme Sensitivity is classified as "Very High" (DFFE, 2024). The classification trigger is the location of the study area within a Strategic Water Source Area (SWSA) for surface water (Boland).

Following the aquatic biodiversity screening assessment of the proposed study area on the 10th of December 2024, a natural Unchanneled Valley-Bottom (UVB) wetland was confirmed and delineated directly south of Erf RE/1489, while Portion A overlays an area of relic UVB wetland.

The UVB wetland is part of a 1.4 km long wetland system that originates to the west of the study area and ends at the Vermont Pan to the southeast. The UVB wetland is extensively disturbed and characterised by a mixture of alien and indigenous vegetation.

Given the confirmed presence of an onsite wetland which is likely to be impacted by the proposed development, the study area was determined to be of "Very High" aquatic sensitivity. If the specialist determines that the Aquatic Biodiversity sensitivity of the study area is "Very High", the GN320 of 2020 requires that a full aquatic biodiversity impact assessment must be submitted 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).

The aim of this aquatic biodiversity impact assessment is to (1) determine the Present Ecological State (PES) and ecological importance of the wetland system present, (2) to assess the potential impact of the proposed development on the mapped and confirmed wetland, and (3) to provide recommendations for impact mitigation.

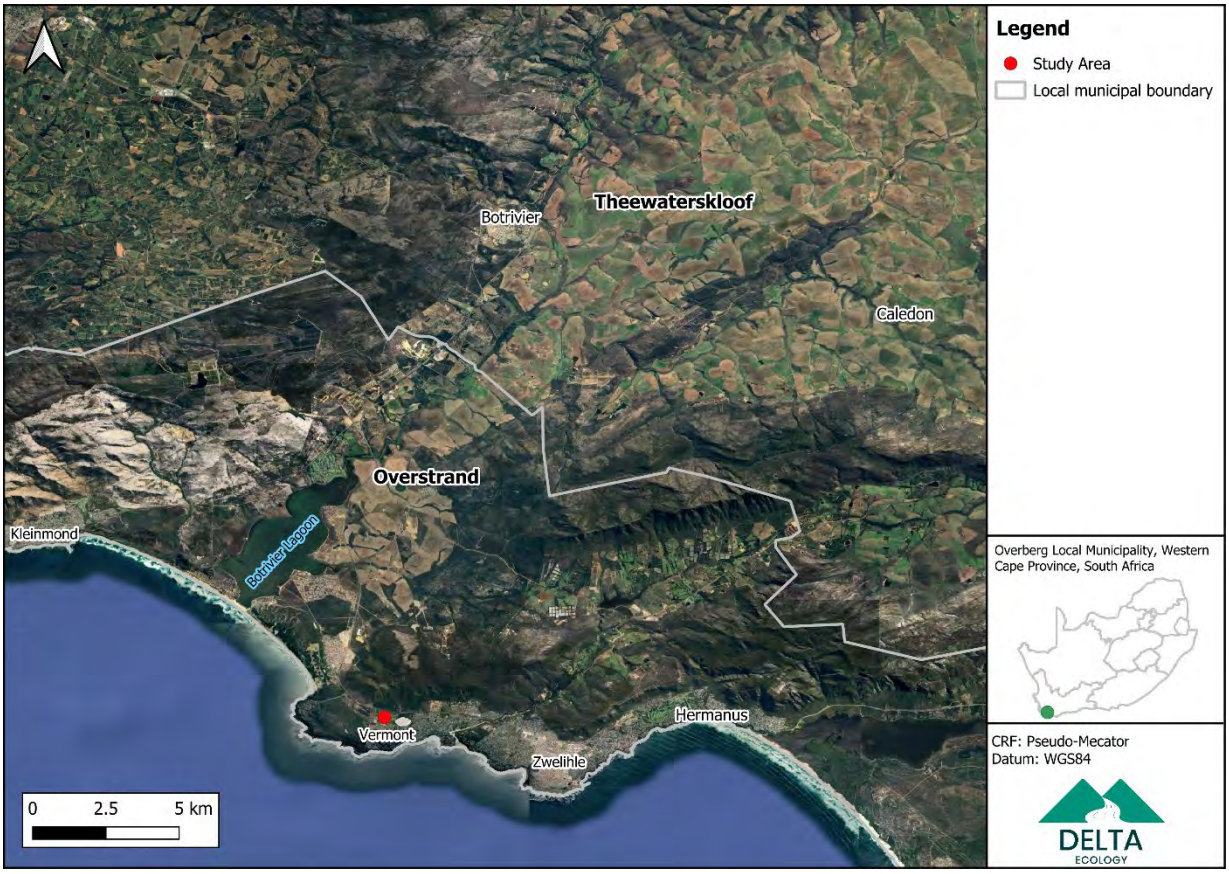


Figure 1-1: Location of the proposed study area, Erf 1489, Vermont.

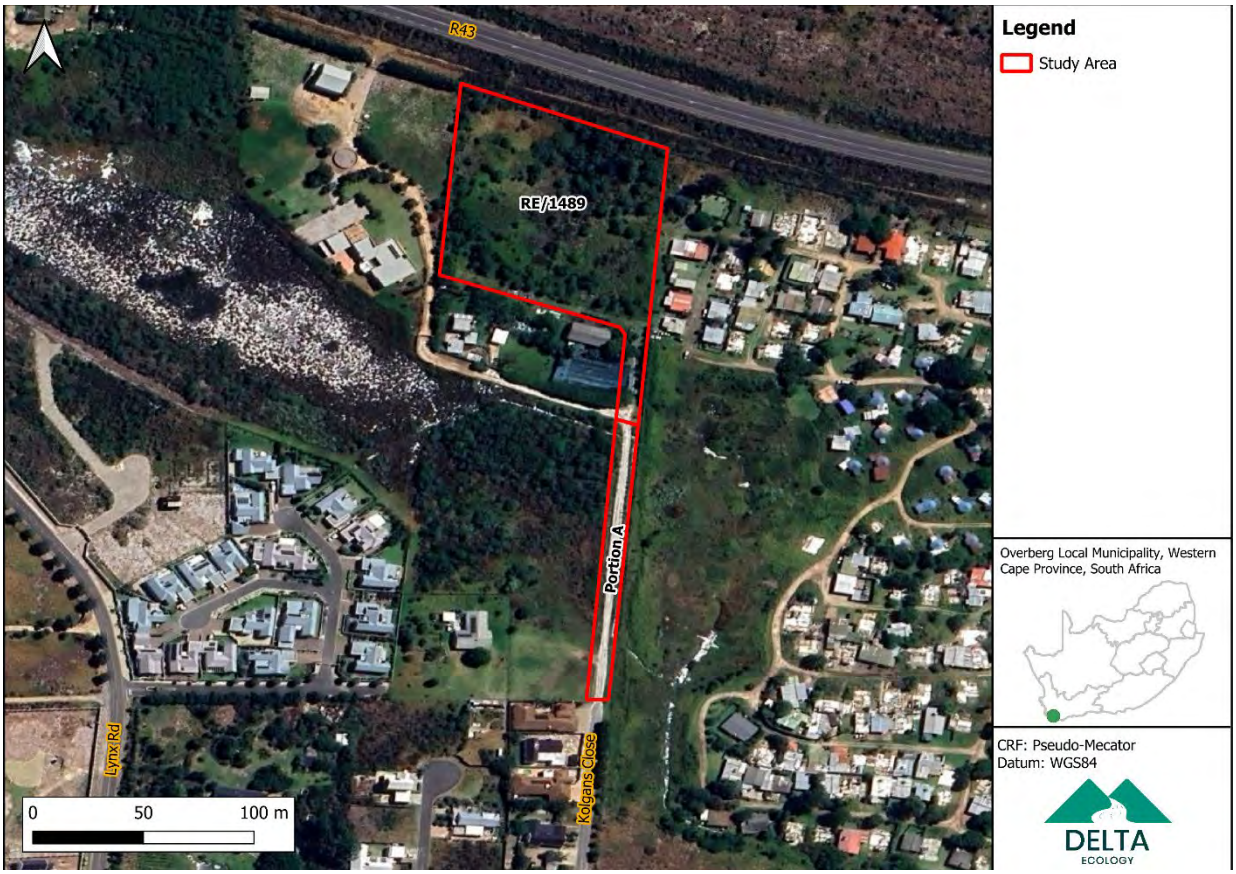


Figure 1-2: Study area, including Portion A and Erf RE/1489 Vermont.

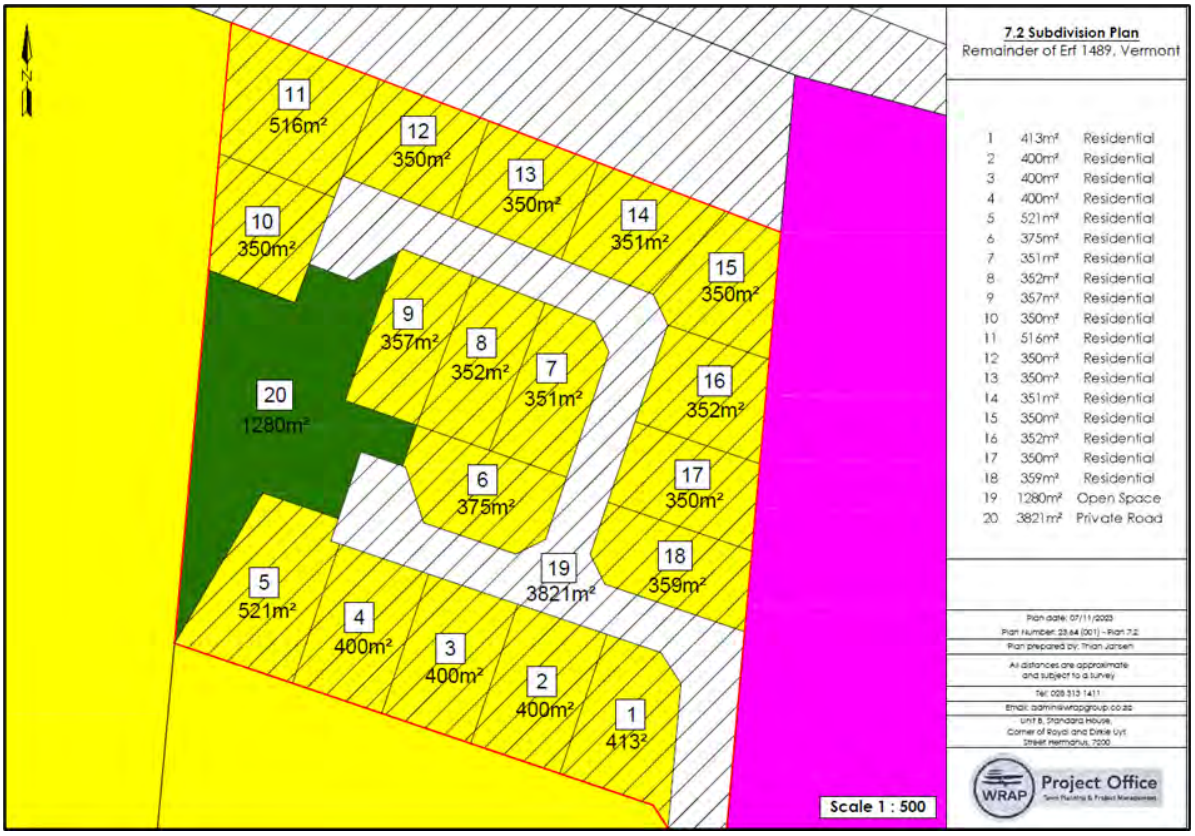


Figure 1-3: Proposed subdivision plan.

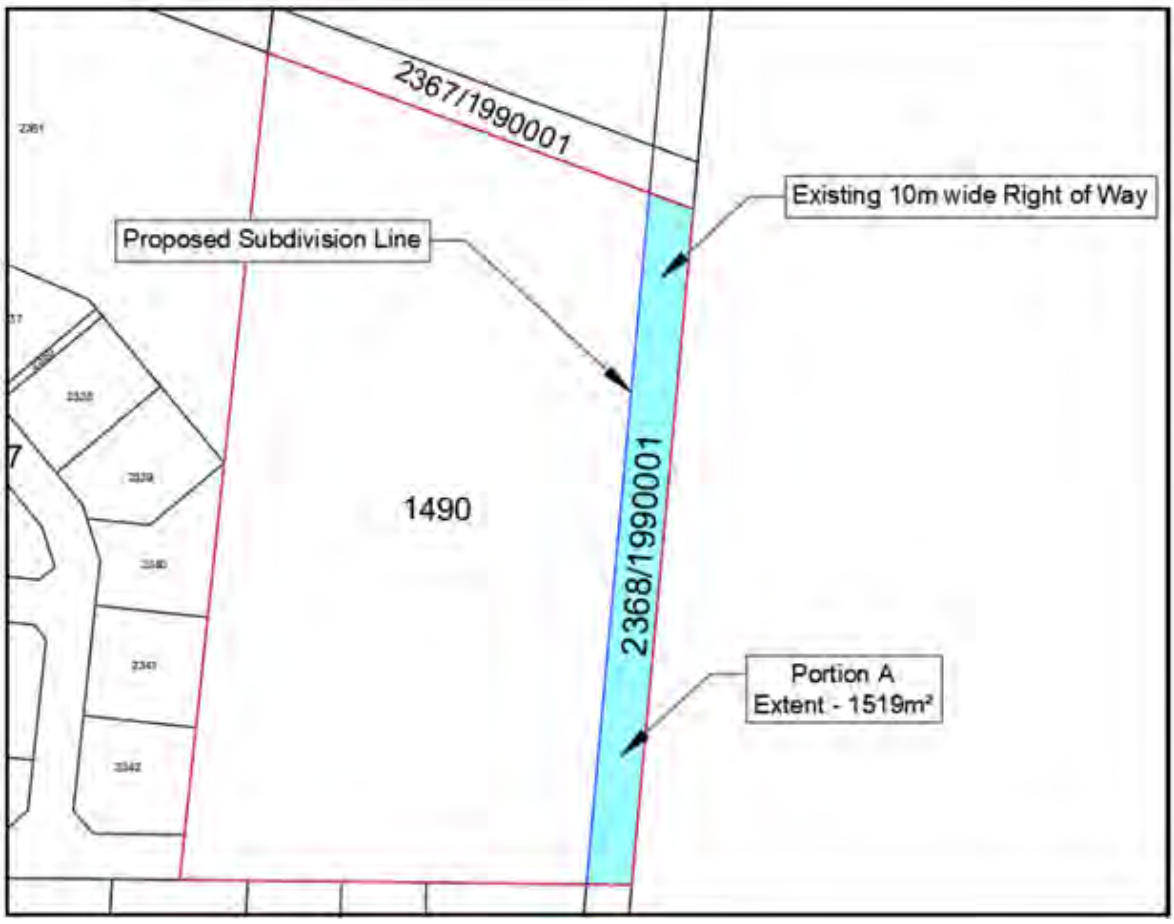


Figure 1-4: Proposed subdivision plan for Erf 1490.

1.1. Terms of Reference

The terms of reference agreed upon for this aquatic biodiversity assessment include:

- A desktop background assessment to identify potential aquatic biodiversity constraints within the Erf and within the 500 m regulated proximity thereof.
- A study area assessment to confirm aquatic biodiversity constraints.
- Delineation of watercourse (s) likely to be impacted by proposed development activities using a combination of study area-based and desktop methodologies as appropriate.
- Verification of the aquatic study area sensitivity as either "Very High" or "Low".
- Drafting of an aquatic biodiversity impact assessment report including the following:
    - General study area description;
    - Study area sensitivity verification;
    - Determination of the Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) and the contribution to Wetland Ecosystem Services (WES);
    - Assessment of potential aquatic biodiversity impacts of the proposed development on the watercourse present onsite;
    - Application of the Risk Assessment matrix stipulated by GN509 of 2016 promulgated in terms of the National Water Act (Act 36 of 1998) to determine the risk of the proposed development activities on the delineated watercourse onsite;
    - Provision of mitigation measures to reduce aquatic biodiversity impact as far as possible.

1.2. Limitations and Assumptions

The following limitations and assumptions apply to this assessment:

- The study area assessment was undertaken on the 10th of December 2024, during the spring season in the Western Cape Province. Therefore, this assessment does not cover complete seasonal variation in conditions at the study area. This is however, in the opinion of the specialist, of no material consequence to outcome of this assessment.
- The southern portion of the study area currently consists of residential dwellings, roads, and associated lawn / vegetable garden, and therefore was highly disturbed, infilled, and compacted. This combination of factors caused difficulty when delineating the boundary of the natural wetland. Additionally, wetland soil indicators and vegetation communities may form artificially, as may be the case with the vegetable patch and one individual of *Cyperus textilis* observed along the south of the study area.
- The "At-Risk" watercourses were delineated in the field, using methodology presented in **Section 3.2.**, while the watercourses deemed not to be "At-Risk" were delineated via desktop, such as the Google Earth, NWM5 (SANBI, 2018) wetland layer, and the Department of Rural Development and Land Reform (DRDLR) National Geo-spatial Information (NGI) river line vector data. This was deemed sufficient as these watercourses will not be impacted upon by the proposed development.
- The watercourse edge was delineated using a Garmin handheld GPSMAP 66i with an expected accuracy of 3 m or less at the 95% confidence interval. In the opinion of the specialist, this limitation is of no material significance to the assessment and all aquatic biodiversity constraints have been adequately identified.

- The information provided by the client forms the basis of the planning and layouts discussed. *Upon receipt of the detailed engineer design for the road, the report may need to be updated.*
- Formal vegetation sampling was not done by the specialist, however general observations pertaining to vegetation were recorded based on onsite visual observations. Furthermore, only dominant, and noteworthy plant species were recorded. Thus, the vegetation information provided has limitations for true botanical applications.
- Deriving a 100% factual report based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions, species' seasonality, and migrations. Since environmental impact studies deal with dynamic natural systems, additional information may come to light at a later stage.
- Description of the depth of the regional water table, geohydrological, hydrology, and hydro pedological processes falls outside the scope of the current assessment.
- Flood line calculations fall outside the scope of the current assessment.
- A Species of Conservation Concern (SCC) scan, fauna and flora assessments were not included in the current study.
- Watercourse delineation plotted digitally may be offset by at least five meters to either side. Furthermore, it is important to note that, during converting spatial data to final drawings, several steps in the process may affect the accuracy of areas delineated in the current report. It is therefore suggested that the no-go areas identified in the current report be pegged in the field in collaboration with the surveyor for precise boundaries. The scale at which maps and drawings are presented in the current report may become distorted should they be reproduced by, for example, photocopying and printing.
- The delineation does not consider climate change or future changes to watercourses resulting from increasing catchment transformation. The reason for this is because the accepted best practice method for delineating watercourses in South Africa, required by GN 509[1], uses key indicators obtained in the field to determine the wetland's **current** edge. The applicant should be cognisant of the risk that the extent, ecological state, and function of the onsite watercourse may change over time, due to altered land use in the catchment.
- Notwithstanding the above limitations, the specialist is of the opinion that the aquatic biodiversity constraints for the project have been adequately identified for the purposes of this aquatic biodiversity assessment.

Notwithstanding the above limitations, the specialist is of the opinion that the aquatic biodiversity constraints for the study area have been adequately identified for the purposes of this aquatic biodiversity assessment.

1.3. Use of this report

This report reflects the professional judgement of its author and, as such, the full and unedited contents of this should be presented in any application to relevant authorities. Any summary of the findings should only be produced with the approval of the author.

[1] Also refer to Section 3.2. for a detailed description of this methodology.

2. Site Sensitivity Verification

According to the national web-based environmental screening tool report generated for the study area, the Combined Aquatic Biodiversity Theme Sensitivity is classified as "Very High" (DFFE, 2024). The classification trigger is the location of the study area within a Strategic Water Source Area (SWSA) for surface water (Boland).

As per the National Environmental Management Act (NEMA) (Act No. 107 of 1998) Regulations of 2020 (as amended) (GN R. 320 of 2020), prior to initiation of specialist assessments, the current land use, and the potential environmental sensitivity of the study area - as identified by the national web-based environmental screening tool - must be confirmed by undertaking an Initial Study area Sensitivity Verification. This Initial Site Sensitivity Verification aims to confirm or dispute the current use of the land and environmental sensitivity as identified by the national web based environmental screening tool.

Extending across much of the proposed development area and the southern 500 m regulated area, the NFEPA wetland layer indicates the presence of a large unnatural Channelled Valley-Bottom (CVB) wetland system which ultimately augments the Vermont Salt Pan. It is however the opinion of current assessment, that the wetland is a natural UVB wetland system located along the southern boundary of the proposed study area.

In addition, the National Geospatial Information Service (NGI) topo-cadastral map indicates a non-perennial drainage line within the proposed development area, and three non-perennial drainage line within the 500 m regulated area. The Western Cape Biodiversity Spatial Plan (WCBSP) identifies an aquatic Ecological Support Area 2 (ESA) associated with the non-perennial river flowing though the study area (WCBSP, 2017).

Following the aquatic biodiversity screening assessment of the proposed development area on the 10th of December 2024, most of the study area was terrestrial, with no indication of the mapped NGI non-perennial drainage line present. A natural UVB wetland, which drains into the Vermont Salt Pan located approximately 420 m downstream, was confirmed and delineated directly south of Erf RE/1489, while Portion A overlays an area of relic UVB wetland.

Given the confirmed presence of a wetland along the south of the proposed development area, which may be impacted upon, the study area was determined to be of "Very High" aquatic sensitivity as per the screening tool. If the specialist determines that the Aquatic Biodiversity sensitivity of the study area is "Very High", the GN320 of 2020 requires that a full Aquatic Biodiversity Impact Assessment must be submitted 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).

<u>Note on Strategic Water Source Areas:</u>

Strategic Water Source Areas (SWSAs) are described in the Water Research Commission Report No. TT754/1/18 (Le Maitre *et al*. 2018). These are divided into surface water (sw) and groundwater (gw) sources. Strategic Water Source Areas (SWSA) for surface water are defined as areas of land that supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important.

The application area has been mapped as falling within a Strategic Water Source Area for surface water (SWSA-sw) i.e. the Boland SWSA-sw and this is reflected in the DFFE Screening Tool

Report. The Boland SWSA-sw covers a very large area of 6 083 square kilometres and this mainly includes the important mountain catchment areas of the Boland Mountains (i.e. Hottentots Holland, Jonkershoek, Du Toits Kloof and Bains Kloof Mountains). This SWSA-sw supplies about 79% of the water for the dams that provide most of the water supplied to various towns in the area.

The proposed development is in the lowlands and is not located in a mountain catchment area (**Figure 4-1**), therefore it is not likely that the proposed development will impact the SWSA.

3. Methodology

The methodology used in this aquatic biodiversity impact assessment report, including a desktop background assessment, one study area visit, and the delineation, and classification of the wetland associated with the proposed study area, is outlined in the subsections below.

3.1. Desktop Assessment

A review of desktop resources was undertaken to determine the nature of the proposed study area, the presence of watercourses in the vicinity, and the significance of the study area in terms of biodiversity planning. The following desktop resources were consulted:

- Topographical information from the National Geographical Information Service (NGI);
- The South African Atlas of Climatology and Agrohydrology (1997, 2007 and 2009);
- The South African National Biodiversity Institute (SANBI) (2018) National Vegetation Map (NVM);
- The SANBI NWM5 (2018);
- The National Freshwater Ecosystem Priority Area (NFEPA) (CSIR, 2011) wetland, wetland vegetation group classification, river and FEPA datasets;
- The Natural Agricultural Resource Atlas of South Africa: Version 1.2 (NAR, 2022).
- The Western Cape Biodiversity Spatial Plan (WCBSP, 2023).

3.2. Wetland Identification & Delineation

Watercourses were identified and delineated using the method described in the Manual for the Identification and Delineation of Wetlands and Riparian Areas for field-based delineation (DWAF, 2008). This method is the accepted best practice method for delineating watercourses in South Africa and its use is required by GN 509. For wetlands, the method makes use of four key field indicators to guide the delineation process (refer to **Box 1**):

Box 1. Four indicators of wetland presence as described in DWAF (2008):

1. The **position in the landscape** – Identifies parts of the landscape where wetlands are more likely to occur;
2. The presence of **aquatic vegetation communities**;
3. The presence of **hydromorphic soil features**, which are morphological signatures that appear in soils with prolonged periods of saturation (associated with anaerobic conditions). Key hydromorphic features include:
    a. Mottling – Formation of clumps of iron oxide within the soil matrix in the form of orange, yellow, black, or reddish-brown speckling. Mottling occurs in most soils and reaches maximum density in the centre of the seasonal zone with sparse mottling in the temporary zone and no mottling in the permanent zone.
    b. Gleying – Shift in soil colour from the terrestrial baseline towards a blue, green, or grey colour and an overall reduction in soil chroma. This phenomenon is normally difficult to identify in the temporary zone, noticeable in the seasonal zone and most significant in the permanent zone.
    c. Organic Surface Layers – surface layers with very high organic content that typically occur in the wetland seasonal and permanent zones.
    d. Organic Streaking – Streaks of organic matter within the soil column which may be present in all zones, but particularly the temporary and seasonal zones.

Soil samples were taken for inspection by hand augering to determine soil form, presence of redoximorphic and other hydromorphic soil features. Aquatic vegetation communities were identified using the (DWAF, 2008) classification of wetland plant species, along with auxiliary information from (Van Ginkel *et al*., 2011). Wetland plant species classification categories include:

- Obligate species (occurring in wetlands >99% of the time – usually in the permanent or seasonal zone);
- Facultative Positive species (67 to 99% of the population occurs within wetlands – typically in the seasonal and temporary zones with the remaining 1 to 33% in the adjacent area on the wetland periphery);
- Facultative Species (33 – 67% of the population occurs within wetlands – usually in seasonal or temporary zones with the remaining 67 – 33% in the adjacent area on the wetland periphery);
- Facultative Negative Species (1 – 33% of the population occurs within wetlands – usually in the temporary zone with the remaining 99 to 67% in the adjacent area on the wetland periphery);
- Wetland Cosmopolitan Species (No specific affinity for wetlands and colonise wetland and terrestrial areas).

3.3. Wetland Classification

The Ollis *et al* (2013) Classification System for Wetlands and Other Aquatic Ecosystems in South Africa, as used in this assessment, is a tiered structured classification system that provides a uniform description of wetland types based on their hydrogeomorphic characteristics (**Figure 3-1**).

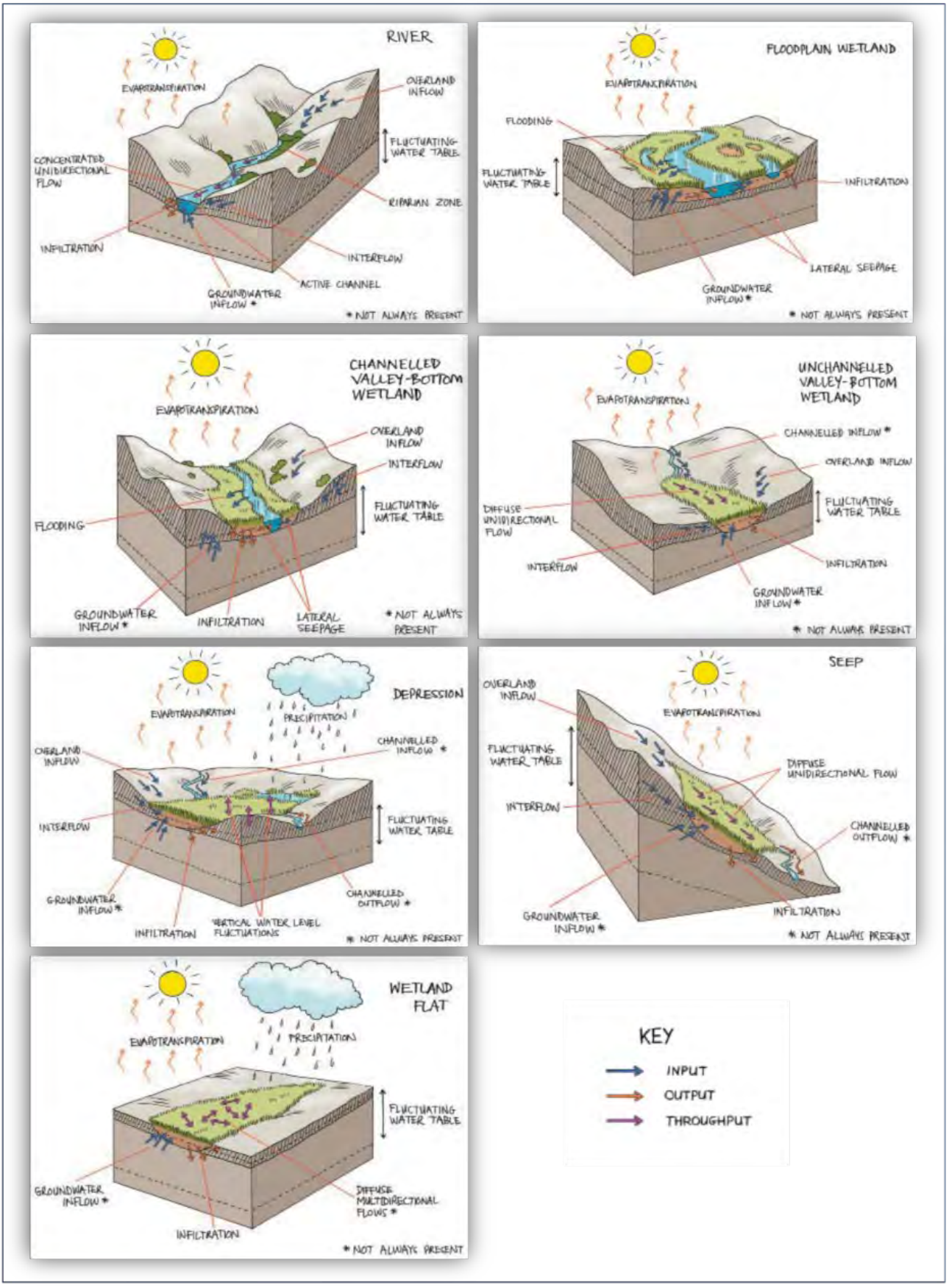


Figure 3-1: Wetland Hydrogeomorphic Types as defined in the Classification System for Wetlands and Other Aquatic Ecosystems in South Africa (Ollis *et al.*, 2013).

3.4. Present Ecological State Assessment

WET-Health Version 2 (Macfarlane *et al*. 2020) is a modular tool designed to evaluate and assess the Present Ecological State (PES) of wetland hydrogeomorphic units based on the degree to which the wetland has deviated from its natural reference condition. The tool accounts for four inter-related components that influence wetland health. These consist of three core drivers of wetland change namely hydrology, geomorphology and water quality, along with vegetation as a responding variable. A separate PES score is derived for each of these components, which are then combined into a single PES score for the wetland hydrogeomorphic unit. The scores for each component and the overall score fall into one of six Ecological Categories defined in **Table 3-1** below.

The tool offers three levels of assessment:

1. Level 1A, a low-resolution desktop-based assessment;
2. Level 1B, a high-resolution desktop-based assessment; and
3. Level 2, a detailed rapid field-based assessment.

Level 1A is applied to provincial and national scale assessments of many wetlands, while Level 1B is applied to catchment scale assessments or to rapid individual assessments. The Level 2 assessment incorporates information from a direct onsite assessment of the wetland and its catchment and adds detail by separately assessing the various disturbance units within the wetland. The level 2 PES assessment was applied in this case.

Table 3-1: PES Categories Scores as defined WET-Health Version 2 (Macfarlane *et al*., 2020).

Ecological Category	Description	Impact Score	PES Score (%)
A	Unmodified, natural.	0-0.9	90-00
B	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9	80-89
C	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2-3.9	60-79
D	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	40-59
E	Seriously modified. The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	20-39
F	Critically modified. Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8-10	0-19

3.5. Ecosystem Service Assessment

WET-EcoServices Version 2 (Kotze *et al*. 2020) is a structured and rapid field-based evaluation tool designed to assess the wetlands ecosystem services based on its Hydrogeomorphic (HGM) unit. The tool accounts for 16 ecosystem services which are derived from regulating (e.g., flood attenuation), provisioning (e.g., water supply), supporting (e.g., biodiversity maintenance), and cultural (e.g., tourism and recreation) services (refer to **Annexure 1**). The tool evaluates the scale of ecosystem services supplied (in terms of a score out of 4 per service) relative to other wetlands and furthermore compares the scale of service supply to the demand for each service. The scores are divided into seven categories as per **Table 3-2**.

The tool offers two levels of assessment, namely Level 1 (a rapid desktop assessment) and Level 2 (a detailed field-based indicator assessment). Level 1 is designed for conducting rapid desktop assessments of many wetlands across provincial and national scales. Ratings are assigned based on the Hydrogeomorphic unit of the wetland. Level 2 is designed for conducting robust in-field assessments of ecosystem services for respective wetland types. The level 2 Ecosystem Service assessment was applied in this case.

Table 3-2: Ecosystem Services Importance Categories Scores as defined in WET-EcoServices Version 2 (Kotze *et al*. 2020).

Importance Category		Description
Very Low	0-0.79	The importance of services supplied is very low relative to that supplied by other wetlands.
Low	0.8 – 1.29	The importance of services supplied is low relative to that supplied by other wetlands.
Moderately-Low	1.3 – 1.69	The importance of services supplied is moderately-low relative to that supplied by other wetlands.
Moderate	1.7 – 2.29	The importance of services supplied is moderate relative to that supplied by other wetlands.
Moderately-High	2.3 – 2.69	The importance of services supplied is moderately-high relative to that supplied by other wetlands.
High	2.7 – 3.19	The importance of services supplied is high relative to that supplied by other wetlands.
Very High	3.2 - 4.0	The importance of services supplied is very high relative to that supplied by other wetlands.

3.6. Ecological Importance and Sensitivity Assessment

The Ecological Importance and Sensitivity (EIS) method (Rountree *et al.* 2013) is a rapid scoring system designed to identify the ecological importance and sensitivity of wetlands to disturbances across multiple scales (i.e., catchment to international scales). The full EIS method integrates three important components, namely, ecological importance and sensitivity, hydro-functional importance, and basic socio-economic importance. The hydro-functional and socio-cultural benefits were however assessed using the updated WET-EcoServices assessment methodology and these two components were therefore omitted from this EIS assessment. The EIS score ranges from 0-4, and it provides an index for prioritisation and management of water resources. The EIS categories are presented in **Table 3-3**.

Table 3-3: Ecological Importance and Sensitivity Categories (DWAF, 1999).

EIS Category	Description	Range of Median
Very high	Ecologically important and sensitive on a national or even international level. These river systems and their biota are usually very sensitive to flow and habitat modifications and provide only a small capacity for use.	>3 and <=4
High	Ecologically important and sensitive on a regional or national scale. These river systems may be sensitive to flow and habitat modifications.	>2 and <=3
Moderate	Watercourses that are considered to be ecologically important and sensitive on a provincial or local scale. The biota of these watercourses is not usually sensitive to flow and habitat modifications.	>1 and <=2
Low/marginal	Watercourses that are not ecologically important and sensitive at any scale. The biota within these watercourses is not sensitive to flow and habitat modifications.	>0 and <=1

3.7. Recommended Ecological Category

The method for determining the Recommended Ecological Category (REC) for water resources is described in Rountree *et al.* (2013). The objective of the REC is to define the management objective for wetlands and does so in accordance with the following rules:

- A wetland within PES Category A (unmodified) cannot be rehabilitated. The management objective will therefore always be to maintain the existing PES Category.
- A wetland within PES Category B, C or D with a "Low-marginal" or "Moderate" EIS score must also be maintained in the pre-development PES category.
- A wetland within PES Category B, C or D with a "High" or "Very High" EIS score must, where practically possible, be rehabilitated to a PES category that is one higher than the pre-development category. E.g. a wetland with a pre-development PES score of C and a "High" EIS score must be rehabilitated to a PES category B. Where this is not practically possible, maintenance of the pre-development PES category will be the management objective.
- PES Categories E or F are considered unsuitable and always require rehabilitation to a PES Category D.

3.8. Impact and Risk Assessment

The impact assessment utilised the Delta Ecology impact assessment methodology as specified in **Annexure 2.** The risk assessment utilised the methodology and RAM stipulated by GN 4167 of 2023 promulgated in terms of the National Water Act (Act 36 of 1998).

4. Desktop Assessment

A review of desktop resources was undertaken. A summary of key desktop information relevant to this assessment is provided below.

4.1. Biophysical Context

The study area slopes gently in a southerly direction, with a gradient of <3% across much of the area. The highest point of the area is along the northern boundary, at approximately 34 m above mean sea-level (AMSL), while the lowest point is the southern boundary and proposed access road, at about 29 m AMSL. The mean annual rainfall received in the area is 587 mm, mostly during the winter months with the highest mean rainfall occurring in May-August and the lowest mean rainfall occurring in November-February (Schultz, 2009) (**Table 4-1**).

The soils in this area are dominated by grey, regic sands amongst others. The geology consists of recent coastal sand and dunes, with slight occurrence along the coast of shale of the Bokkeveld Group and sandstone of the Peninsula Formation, Table Mountain Group. The soil types and descriptions map developed by the Department of Agriculture, Forestry and Fisheries (DAFF) indicates that this region is characterised by greyish, sandy soils which are excessively drained. Soils tend to be poor in clay (<15%).

According to the SANBI Vegetation Map (SANBI, 2018), the natural terrestrial vegetation in this area consists of Hangklip Sand Fynbos which is listed as Critically Endangered (CR) and Moderately Protected (MP) (**Table 4-1**). According to the NFEPA (CSIR, 2011) spatial dataset, this area corresponds to the wetland vegetation type Southwest Sand Fynbos (**Figure 4-1**), which where UVB wetlands are present, is listed as Critically Endangered (CR) and Poorly Protected (PP).

The general biophysical characteristics of the proposed study area is summarised in **Table 4-1**.

Table 4-1: General characteristics of the proposed study area.

Study area attribute	Description	Data source
Eco-region	Southern Coastal Belt	Department of Water Affairs Level 1 Ecoregions (DWS, 2011)
Terrestrial Vegetation Type	Hangklip Sand Fynbos (CR-MP)	National Vegetation Map of South Africa, 2018 (SANBI, 2018)
Dominant Geology and Soils	Recent coastal sand and dunes with slight occurrence along the coast of shale of the Bokkeveld Group and sandstone of the Peninsula Formation, Table Mountain Group.	Cape Farm Mapper (ENPAT, 2021)
Soil Erodibility Factor (K)	0.64 (High)	SA Atlas of Climatology and Agrohydrology (Schulze, 2009)

Soil Depth & Clay Percentage (%)	>= 750 mm & <15%	Soil types and descriptions for the Western Cape, Department of Agriculture, Forestry and Fisheries (DAFF, 2021)
Mean Annual Precipitation (mm)	587 mm	SA Atlas of Climatology and Agrohydrology (Schulze, 2009)
Rainfall seasonality	Winter rainfall	
Mean Annual Temperature (°C)	16.10 °C	
Water Management Area	Breede- Olifants	Water Management Areas (DWs, 2023)
Quaternary Catchment	G40G	South African Quaternary Catchments Database (Schulze *et al*. 2007)
Wetland Vegetation Group (for wetlands within the applicable terrestrial vegetation type)	Southwest Sand Fynbos (CR-PP)	NFEPA Wetland Vegetation Types (CSIR, 2011)

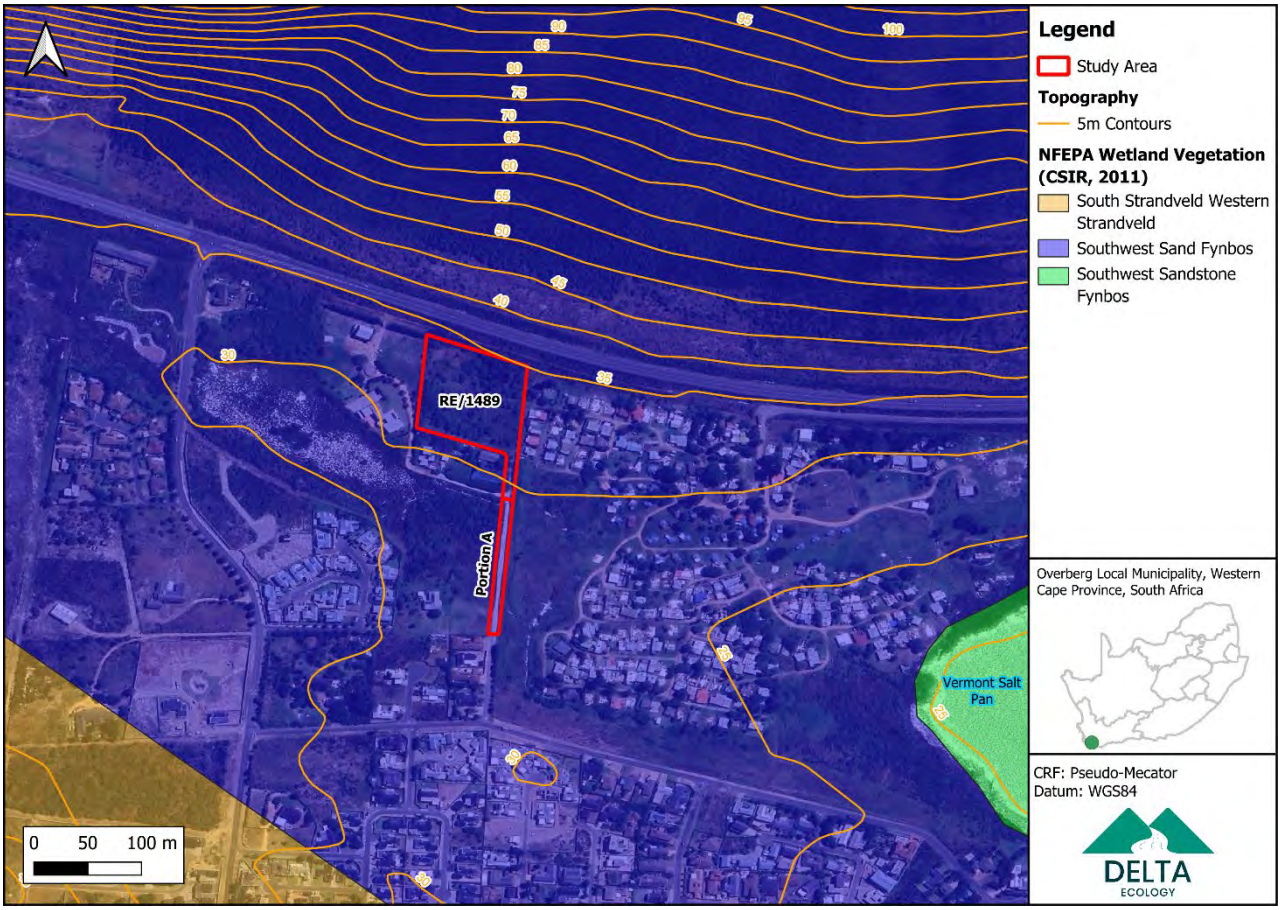


Figure 4-1: Wetland vegetation types (NFEPA, 2011).

4.2. Biodiversity Planning Context

The study area under evaluation is located within the Breede - Olifants Water Management Area (WMA), quaternary catchment G40G. The applicable sub-quaternary catchment is demarcated as a Fish Support Area and Fish Sanctuary (CSIR, 2011). The regional setting, in terms of the Level 1 DWA (now Department of Water and Sanitation) Ecoregions, is within the Southern Coastal Belt (**Table 4-1**).

Extending across much of the proposed study area and the southern 500 m regulated area, the NFEPA wetland layer indicates the presence of a large unnatural CVB wetland system which ultimately augments the Vermont Salt Pan downstream (**Figure 4-2** and **Figure 4-3**). It was however the opinion of this current assessment, that the wetland is a natural UVB wetland system. Additionally, after the site visit, the wetland was delineated along the southern boundary of the proposed residential development, with much of the area exhibiting terrestrial conditions. The existing road to be upgraded, along with the proposed upgrade to services, run through the wetland (albeit historical extent) (**Figure 4-2** and **Figure 4-3**).

The NGI topo-cadastral map indicates a non-perennial drainage line within the proposed residential area (**Figure 4-2** and **Figure 4-3**), which, after the site visit, was determined to be absent. The WCBSP identifies a terrestrial CBA within Erf RE/1489, aquatic ESAs or CBAs are absent within the study area (WCBSP, 2023) (**Figure 4-4)**.

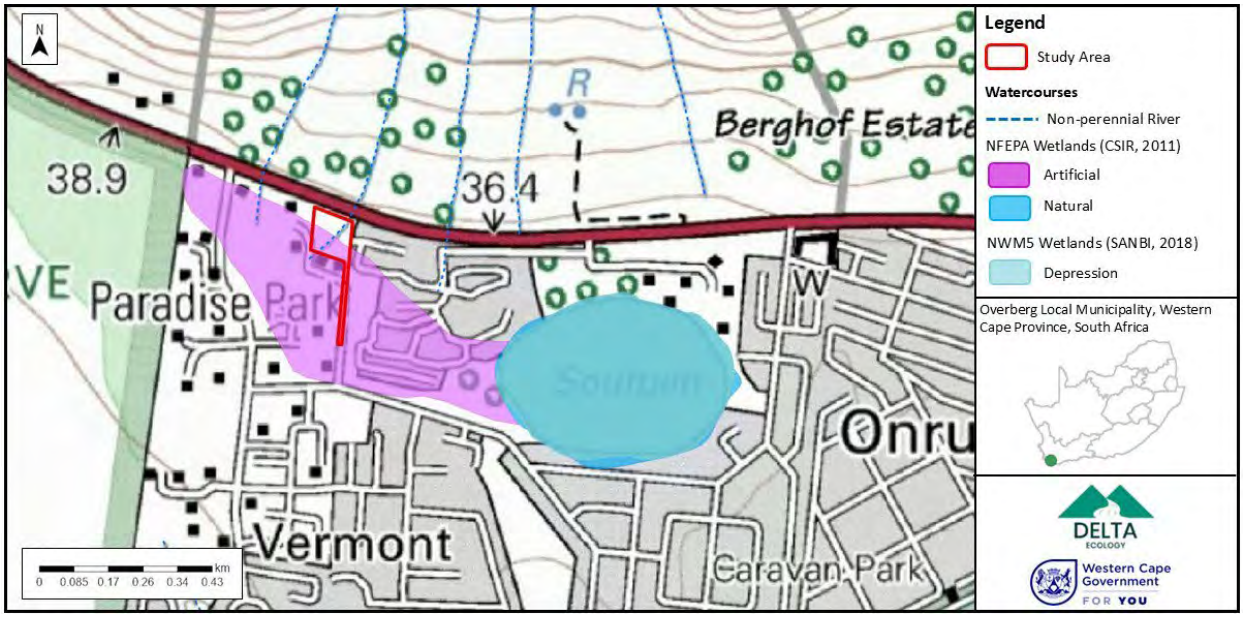


Figure 4-2: Regional Drainage Map (NGI Rivers, NWM5 Wetlands and NFEPA Wetlands).

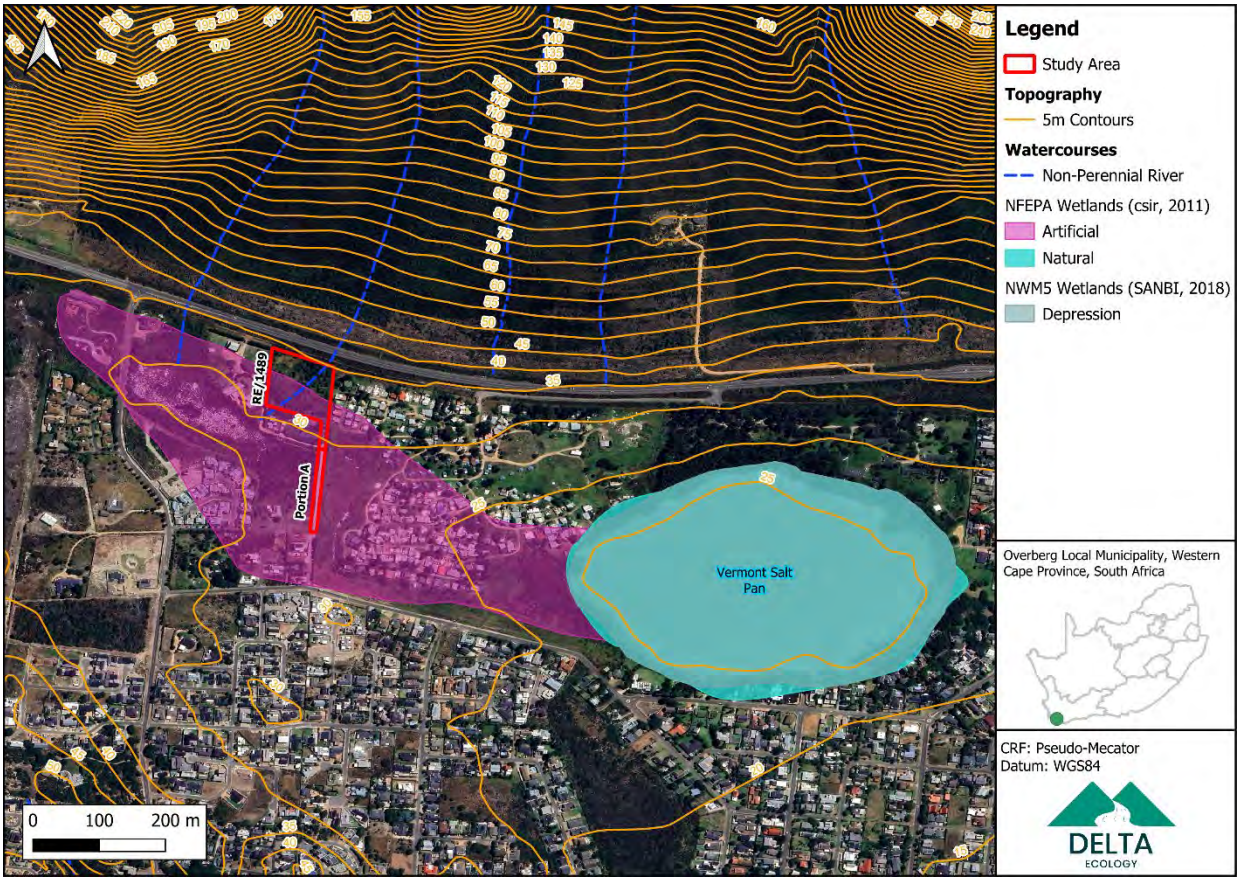


Figure 4-3: Watercourses within the proposed study area (NGI, 2017 and NFEPA, 2011).

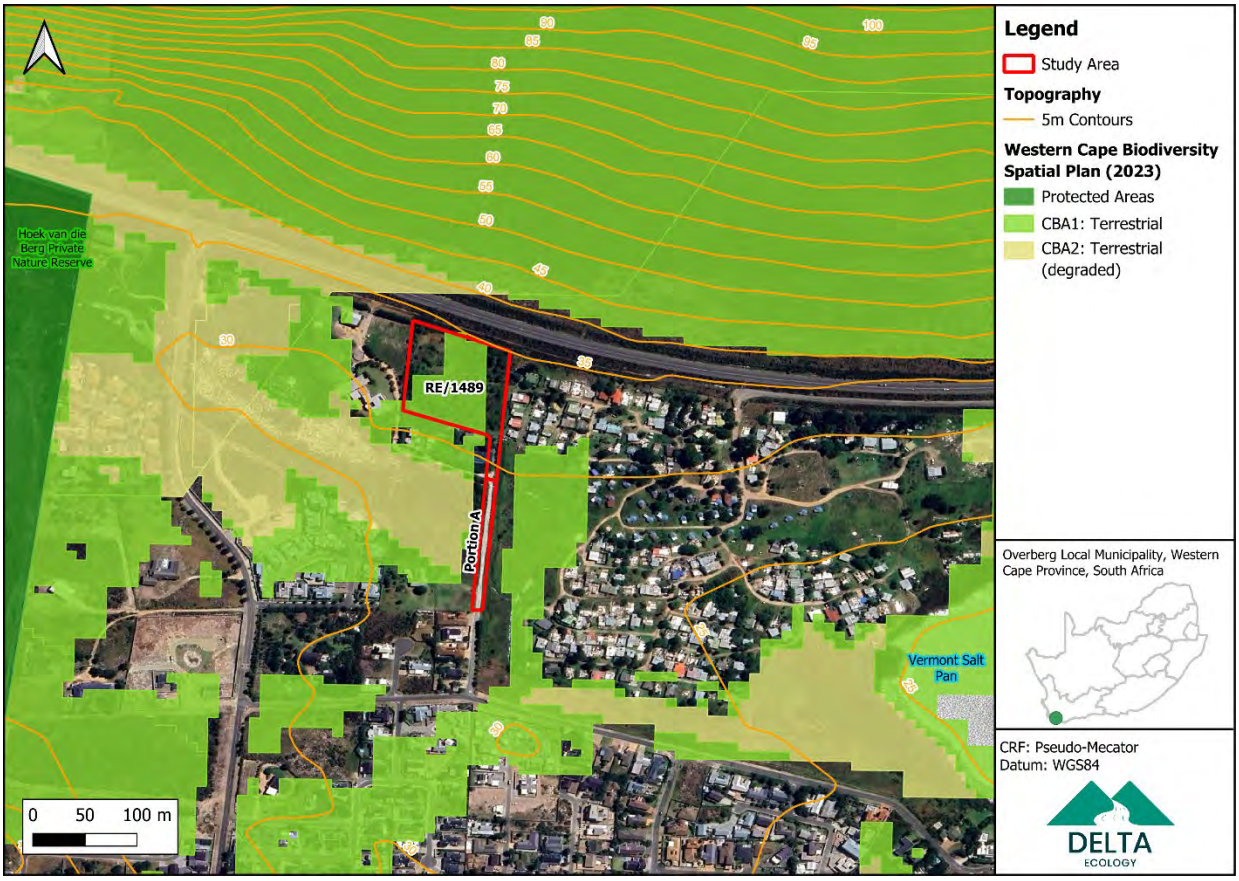


Figure 4-4: CBAs and ESAs (WCBSP, 2023).

4.3. Climate Change Perspective

The Beck *et al.* (2018) 1 km² climate model which utilises the Köppen-Geiger climate classifications to represent measured present and predicted future climate scenarios was consulted to determine the expected climatic shift by the end of the present century at the project location. The project study area is predicted to shift from the Csb Warm-summer Mediterranean climate zone to the BSh Arid, steppe, hot climate zone (**Figure 4-5**).

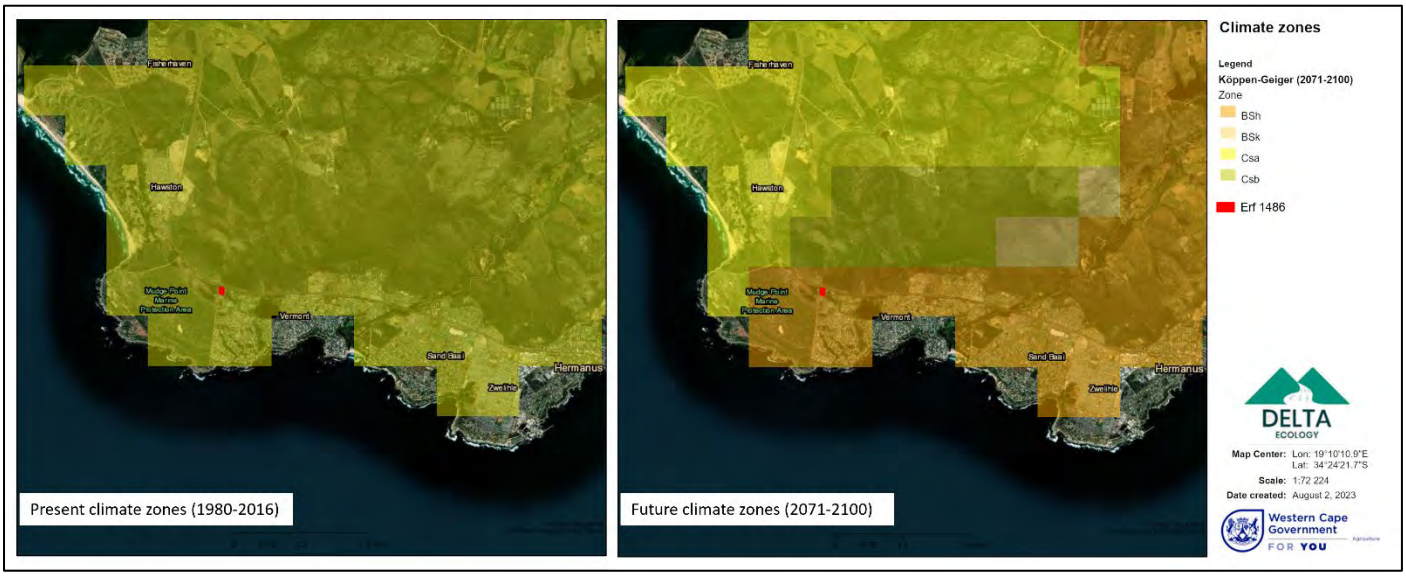


Figure 4-5: Beck *et al.* (2018) Köppen-Geiger climate zones for present day and for the close of the century.

The Western Cape Climate Response Strategy (DEADP, 2014) acts as a provincial level strategy modelled on the NCCRP. The strategy sets out the priorities for the Western Cape with regards to climate change adaptation and mitigation. The overarching intention of the strategy is to reduce climate vulnerability and increase adaptive capacity within the Western Cape in a manner that contributes to the attainment of the province's socio-economic and environmental goals.

Wetlands are a key factor in determining climate resilience due to the nature of ecosystem services offered. Streamflow regulation is important for maintaining baseflow of perennial rivers during climate-change induced droughts. During increased intensity rainfall events, attenuation and sediment trapping services reduce the risk of flooding downslope/stream. Furthermore, peat wetlands trap substantial carbon, reducing the impact anthropogenic carbon emissions. Conversely, peat removal or disturbance can release substantial volumes of carbon thereby increasing climate change impacts.

The wetland in question does not contain peat. Soils in the wetland – especially the seasonal to permanent zone - were indicative of moderate/moderately high level of carbon sequestration. The wetland is therefore unlikely to contribute *significantly* towards climatic-change resilience and the potential minimal disturbance within the wetland is unlikely to lead to a significant release of carbon into the atmosphere. No further assessment of potential climate impact is necessary.

5. Site Description

A site assessment was conducted on the 10th of December 2024. The study area is bordered to the north by the R43 road reserve, to the west and south by low density residential housing, and to the east by Paradise Park holiday resort. The proposed residential area has no formal infrastructure within it; however a short dirt / gravel access road lined with crushed sea shells is present from the southern boundary (**Figure 5-2**) which is proposed to be upgraded.

Much of the study area was terrestrial, with no indication of the mapped NGI non-perennial drainage line present. Vegetation within the study area was extensively disturbed, with a mixture of terrestrial indigenous species such as *Carpobrotus edulis* (Sour Fig), and *Pelargonium graveolens* (Rose-scented Pelargonium), along with alien invasives such as *Acacia mearnsii* (Black Wattle), *Pennisetum clandestinum* (Kikuyu), and *Acacia saligna* (Port Jackson) (**Figure 5-3**-**Figure 5-6**). Terrestrial soils were greyish brown, sandy, and appear to be well drained (**Figure 5-10**).

An UVB wetland, which drains into the Vermont Salt Pan approximately 420 m south east, was delineated along the southern boundary of the proposed residential area (**Figure 5-1**). The wetland area coinciding with the study area (majority of Portion A) is considered to be relic or historical. Although there was sparse wetland vegetation present (such as *Cyperus textilis*), it is the specialist's opinion that this area has lost all wetland functionality and there is no rehabilitation potential due to the level of disturbance. There is an artificial channel, along with infill (foreign soils), roads, residential dwellings, excavation, and culverts within this relic wetland area, which has altered natural flow regime, vegetation, water quality and geomorphology (**Figure 5-7** and **Figure 5-8**).

The vegetation within the functional UVB wetland downslope / adjacent to the access road, consists of wetland obligate species *Juncus krausii*, *Cyperus textilis*, with wetland facultative *Senecio halimifolius* and *Zantedeschia Aethiopica* along the outer boundary of the functional wetland area.

Soils that were sampled in the functional UVB wetland did not differ markedly from terrestrial soils, aside from appearing darker and with a higher organic content than the terrestrial baseline (**Figure 5-11**).

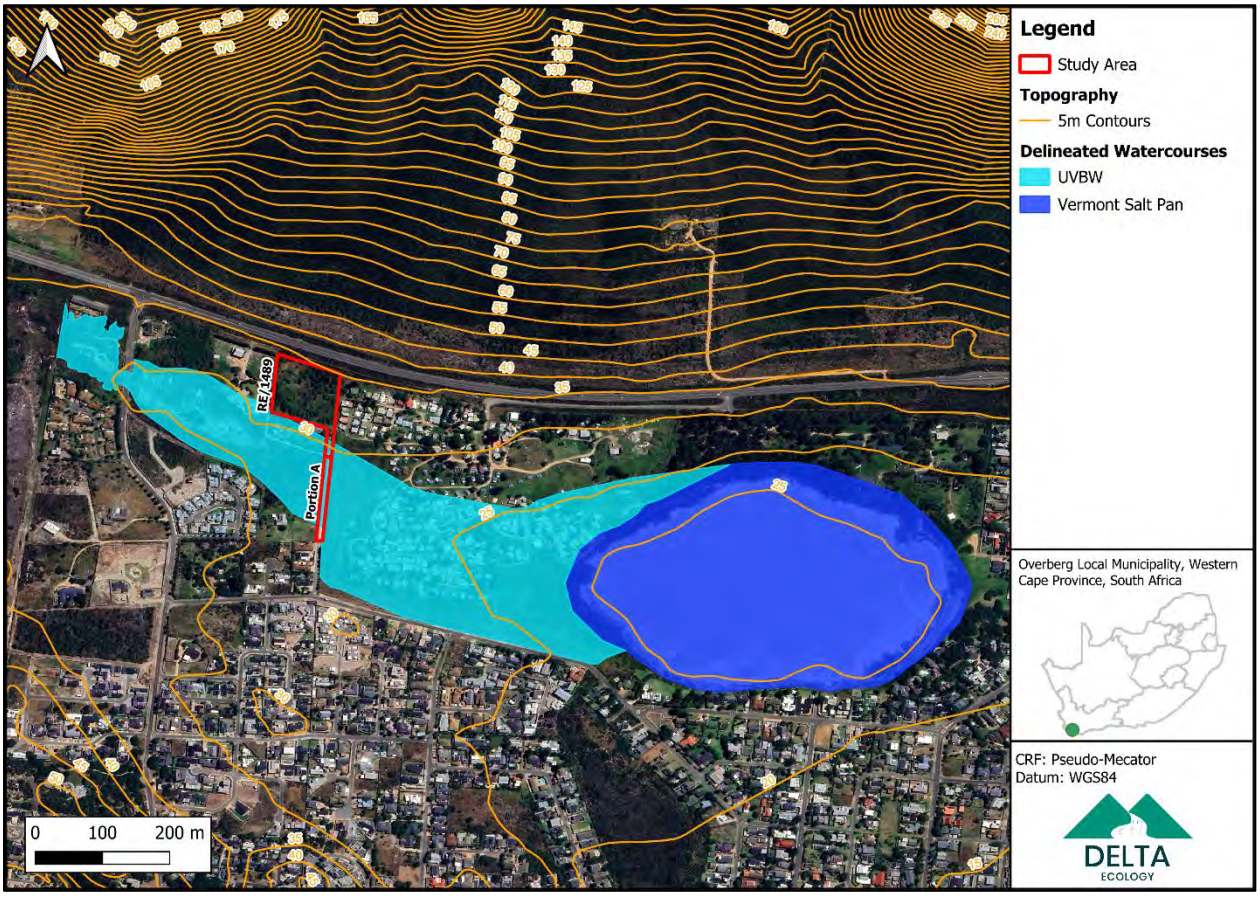


Figure 5-1: Delineation Map.

Figure 5-2: Existing access road within Erf RE/1489.

Figure 5-3: Overview of Erf RE/1489, facing east.

Figure 5-4: Numerous mole hills present within Erf RE/1489, exposing the deep sandy soils.

Figure 5-5: Mixture of common indigenous terrestrial vegetation and alien invasive vegetation on Erf RE/1489.

Figure 5-6: Alien invasives within Erf RE/1489.

Figure 5-7: Channel within the UVB wetland, adjacent to the entrance / access road.

Figure 5-8: Stormwater channel along the access road which will be upgraded, within the UVB wetland.

Figure 5-9: *Zantedeschia Aethiopica* in the UVB wetland along the access road to be upgraded.

Figure 5-10: Majority of the soils sampled within the study area consisted of greyish brown, deep, sandy terrestrial soils.

Figure 5-11: Soil sample from the functional UVB wetland.

Table 5-1: Classification of the wetland.

Factor	Wetland
System	Inland
Ecoregion	Southern Coastal Belt
Landscape Setting	Valley-Floor
Hydrogeomorphic type	Unchanneled valley bottom
Drainage	Rainfall and Interflow
Seasonality	Permanent – Seasonal/temporary
Anthropogenic influence	Excavation, vegetation clearing, alien invasive vegetation, and infilling
Vegetation	Southwest Sand Fynbos
Geology	Recent coastal sand and dunes with slight occurrence along the coast of shale of the Bokkeveld Group and sandstone of the Peninsula Formation, Table Mountain Group
Substrate	Sandy Loam with areas that have been infilled
Salinity	Fresh

6. Wetland Status Quo Assessment

In this study, the wetland present within the proposed development area (at risk of the development) was assessed to determine its Present Ecological State (PES), Ecological Importance and Sensitivity (EIS), and contribution to Wetland Ecosystem Services (WES). These metrics were used to determine the management objective expressed in terms of the Recommended Ecological Category (REC).

6.1. Present Ecological State

The Macfarlane *et al*. (2020) WET-Health Version 2.0 assessment produced an overall PES score within category D (**Table 6-1**). This indicates that the wetland was in a largely modified condition at the time of the assessment. The key factors that influenced the scoring are summarised below.

Hydrology

- The natural flow regime of the UVB Wetland (UVBW) has been altered because of disturbances such as the excavation, vegetation clearing, infilling (roads, dirt tracks, residential areas), and associated catchment hardening.
- The presence of nutrient rich laterite, in soils that are naturally nutrient poor, such as those often associated with development, are associated with the dominance of invasive species such as the dense clumps of Kikuyu grass (*Pennisetum clandestinum*) *Acacia mearnsii* (Black Wattle), and *Acacia saligna* (Port Jackson), which leads to altered surface roughness and therefore altered flow regimes in the wetland.
- The hydrology of the UVBW has been impacted by the presence of urban residential land use within the wetland itself, and in the wetland's immediate catchment area. Urban land use such as residential areas and tarred roads has resulted in flow diversion and catchment hardening which is associated with increased runoff and storm peak flows.
- The wetland has been canalized in various locations, leading to concentration of flow, and likely the drying out of the wetland.

Vegetation

- The vegetation present within the wetland is characterised by a mixture of alien and indigenous vegetation. Alien invasive species (AIS) noted onsite include Kikuyu grass (*Pennisetum clandestinum*) *Acacia mearnsii* (Black Wattle), and *Acacia saligna* (Port Jackson) amongst others.
- No wetland specific species of conservation concern were noted.
- Vegetation clearing and disturbance within the wetland is due to residential development, spread of AIS, canalization and dumping.

Geomorphology

- The geomorphology of the UVBW wetland was largely modified by the excavation of depressional areas, infilling associated with roads, residential areas (notably Paradise Park), and hardening across large areas of the wetland has resulted in extensive disturbance to its natural geomorphic state.
- The wetland system extends from the study area in a south-easterly direction and ultimately augments the Vermont Salt Pan. The construction of Lynx Road, Kolgans Close Road, and numerous other roads, has altered portions of the UVBW's geomorphology.

Water Quality

- The water quality within the UVB wetland has been disturbed because of the infilling and compaction associated with roads, and houses; which has resulted in:
    - Leaching of toxicants and nutrients from the infilling materials such as hydroxyl ions from cement particles and nitrates from laterite.
    - It is likely that runoff entering the wetland through the stormwater outlets is likely polluted by the surrounding catchment area for example, runoff from roads is likely to contain contaminants such as laterite, oil, fuel, rubber from car tires and other pollutants.
- The water quality within the wetland is likely to be impacted by the residential nature of the catchment area.

Table 6-1: Outcome of the WET-Health Assessment for the delineated UVBW.

PES Assessment	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	6.3	5.9	4.1	4.3
PES Score (%)	37%	41%	59%	57%
Ecological Category	**E**	**D**	**D**	**D**
Trajectory of change	↓	↓	↓	↓
Confidence (revised results)	Not rated	Not rated	Not rated	Not rated
Combined Impact Score	5.5			
Combined PES Score (%)	45%			
Combined Ecological Category	**D**			
Hectare Equivalents	4.7 Ha			

6.2. Ecosystem Services

Importance scores were all within the 'Very Low' to 'Moderately Low' category for the wetland to ecosystem services, apart from *moderately important sediment trapping, biodiversity maintenance, phosphate, nitrate, and toxicant assimilation, and carbon storage ecosystem services*, which were of moderate importance.

UVBWs generally provide a high level of sediment trapping, phosphate, nitrate , and toxicant assimilation services due to their gentle gradient, ability to diffuse low and peak flows, and generally permanent wetness. There is demand for these services due to the residential/urban landuse within the wetland itself and its immediate surrounding catchment area (residential development to the south, Storm Water outlets discharging into the wetland area, and tarred roads to the north and east).

The demand for Biodiversity Maintanence is moderate, due to the UVBW being connected to the NFEPA designated Vermont Pan downstream. In addition, the wetland is located within a vegetation type that is CR. However, the UVBW's condition and location within an urban context depresses the provision of this service. Thus, the importance of this ecosystem service supplied by the UVB relative to that supplied by other wetlands is Moderate.

The moderate importance associated with carbon storage services is as a result of the global demand for storage of carbon, thereby reducing total atmoshperic greenhouse gas concentrations. Soils in the

wetland – especially the seasonal to permanent zone - were indicative of moderate/moderately high level of carbon sequestration.

Table 6-2: The outcome of the ecosystem services assessment for the delineated UVBW.

ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	2.0	1.3	1.2	Low
	Stream flow regulation	2.0	0.3	0.7	Very Low
	Sediment trapping	2.3	2.0	1.8	Moderate
	Erosion control	1.8	1.6	1.1	Low
	Phosphate assimilation	1.8	3.0	1.8	Moderate
	Nitrate assimilation	2.0	3.0	2.0	Moderate
	Toxicant assimilation	2.3	3.0	2.3	Moderate
	Carbon storage	2.4	2.7	2.2	Moderate
	Biodiversity maintenance	2.6	2.0	2.1	Moderate
PROVISIONING SERVICES	Water for human use	1.6	1.3	0.8	Very Low
	Harvestable resources	1.5	0.7	0.3	Very Low
	Food for livestock	1.5	0.3	0.2	Very Low
	Cultivated foods	2.1	0.3	0.8	Very Low
CULTURAL SERVICES	Tourism and Recreation	1.5	0.0	0.0	Very Low
	Education and Research	1.0	0.0	0.0	Very Low
	Cultural and Spiritual	3.0	0.0	1.5	Moderately Low

6.3. Ecological Importance and Sensitivity

The wetland achieved a median score of 2.0 which falls within the "Moderate" category, indicative that the wetland is ecologically important and sensitive on a provincial or local scale. The biota of the wetland is not particularly sensitive to flow and habitat modifications. The results of the assessment and the reasoning behind the scores are presented in **Table 6-3.**

Table 6-3: Results of the EIS assessment.

Ecological Importance and Sensitivity	UVB Wetland	Reason
Biodiversity Support (Median)	**1.67**	
Presence and status of Red Data species:	2	The Cape Dwarf Chameleon (*Bradypodion pumilum)* is listed as Vulnerable and was noted during the site visit on Erf RE 1489, although this is not a wetland dependant spp. Lesser Flamingo (*Phoeniconaias minor)* has been sited within the Vermont Salt Pan which is Near Threatened according to BirdLife International, 2023. The Vermont Salt Pan is located approximately 420 m downstream.
Populations of unique species/uncommonly large populations of wetland species:	0	None noted.
Migration/breeding/feeding sites: (Importance of the unit for migration, breeding sites and/or feeding):	4	Possibility to be a breeding site for hardy amphibians; considered to be an important corridor to downstream Vermont Salt Pan.
Landscape Scale (Median)	**1.80**	
Protection status of the wetland: (National (4), Provincial/Private (3), municipal (1 or 2), public area (0 or 1)	0	The at risk wetland area is located within a privately owned property and is not protected.
Protection status of the vegetation type: (SANBI guidance on the protection status of the surrounding vegetation)	4	Southwest Sand Fynbos (CR-PP) NFEPA (2011) WetVeg type, however vegetation within the wetland at present is disturbed.
Regional context of the ecological integrity: (Assessment of the PES (habitat integrity), especially in light of regional utilisation)	1	PES – D for the UVBW.
Size and rarity of the wetland type/s present: (Identification and rarity assessment of wetland types)	3	CR status indicates slight rarity, but degraded status has left only common, tolerant elements of the ecosystem intact. The size of the UVBW is relatively large and unique in this respect.
Diversity of habitat types:	1	One wetland type present in a largely modified ecological

Ecological Importance and Sensitivity	UVB Wetland	Reason
(Assessment of the variety of wetland types present within a site)		condition; representation of permanent and seasonal – temporary zones provide some diversity of habitat types.
Sensitivity of the Wetland (Median)	**2.00**	
Sensitivity to changes in floods: (Floodplains at 4; valley bottoms 2 or 3; pans and seeps 0 or 1)	2	The wetland is augmented by SW flow from adjacent residential areas, and there is an overflow pipe that crosses beneath Lynx Road and flows into the wetland on the far side, and excavation within the centre of the wetland area, creating a dam within the centre of the UVBW.
Sensitivity to changes in low flows/dry season: (Unchanneled VB's probably most sensitive)	2	UVBW's are naturally very sensitive to changes in low flows/dry season; current impacts in the catchment affecting the wetlands natural flow regime render the wetland less sensitive.
Sensitivity to changes in water quality: (Especially natural low nutrient waters – lower nutrients likely to be more sensitive)	2	The wetland's immediate surrounding land use is residential which has likely impacted its water quality over the years; however, it is still expected that the water quality within the wetland is sensitive to changes in water quality.
Ecological Importance and Sensitivity Score	**2.0**	
Ecological Importance and Sensitivity Category	**Moderate**	

6.4. Recommended Ecological Category

According to the Rountree *et al.* (2013) method for determining REC, the management objective for any wetland within the PES Category B, C or D with a "Low marginal" or "Moderate" EIS score must also be maintained in the pre-development PES category. In this case, the UVBW has a PES of D so the management objective should be to maintain the wetland in the pre-development PES category of D, or to improve the condition of the wetland to a category C if feasible. Any planned rehabilitation should therefore target this category, which is deemed to be achievable with a Maintenance and Management Plan (MMP) in place, and considering the approved plan to remove the residential dwellings associated with Paradise Park (although not part of the current application).

7. Aquatic Impact Identification

The proposed project entails the proposed subdivision of RE/1489, Vermont, to create several erven for single residential development. The proposed development would consist of 18 single residential units with a footprint of approximately 0.74 ha, 0,13 ha of open space and 0,38 ha of private road. Additionally, the applicant proposes to subdivide the road access (Kolgans Close Road) portion off Erf 1490 and consolidate it with Erf 1489. This section of the road will be a public road, built to municipal standards, and transferred to the municipality. The road will not be widened, but rather the existing road surface will be replaced and improved by removing the old surface and underlaying layers before adding new materials (asphalt).

According to engineering designs for bulk services, it is proposed that the existing 110 mm diameter small bore sewer system from the proposed development to the existing 200 mm diameter outfall sewer in Malmok Street is upgraded to 160 mm diameter and 200 mm diameter outfall sewers, to accommodate the proposed development in the existing sewer system. In terms of water supply, it is proposed that the development area is accommodated within the existing Vermont reservoir zone. The connection to the existing system should be done via a 170 m x 110 mm Ø supply pipe from the south of Erf 1489, running along the access road (Erf 1490), connecting via a 20 m x 110 mm Ø inter-connection pipe.

The UVB wetland is deemed to be "At-Risk" of the proposed development (**Figure 7-1**). Given the distance and implementation of mitigation measures recommended, the Vermont Salt Pan is not deemed to be "At-Risk" of the proposed development (**Figure 7-1**).

The majority of the study area is terrestrial and therefore has no Aquatic Sensitivity (**Figure 7-2**). A natural UVB wetland was delineated along the southern boundary of Erf RE/1489. The wetland area directly adjacent to Erf RE/1489 and coinciding with the Portion A, is considered to be relic or historical and currently consists of residential areas, associated gardens / lawns, and a gravel/shell lined access road (Kolgans Close Road). Although there was sparse wetland vegetation present (such as *Cyperus textilis*), it is the specialist's opinion that this area has lost all wetland functionality and there is no rehabilitation potential due to the level of disturbance. Given the above, this area was determined to be of "Low Aquatic Sensitivity" (**Figure 7-2**).

The vegetation within the functional UVB wetland downslope / along the edge of the access road, consists of wetland obligate species *Juncus krausii*, *Cyperus textilis*, with wetland facultative *Senecio halimifolius* and *Zantedeschia Aethiopica* along the outer boundary of the functional wetland area. This area was deemed to be of "High" Aquatic Sensitivity (**Figure 7-2**).

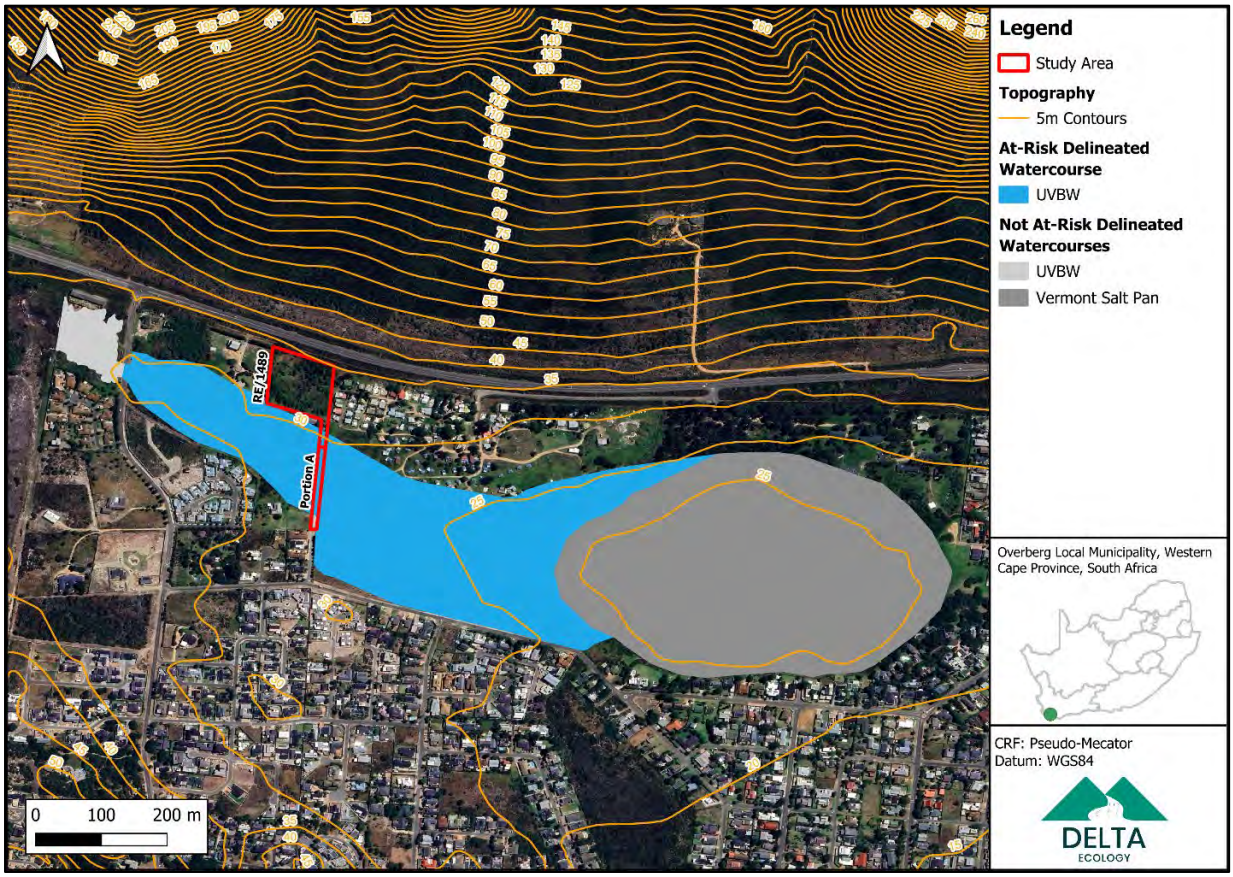


Figure 7-1: The watercourse extent deemed to be "At Risk" of the proposed development.

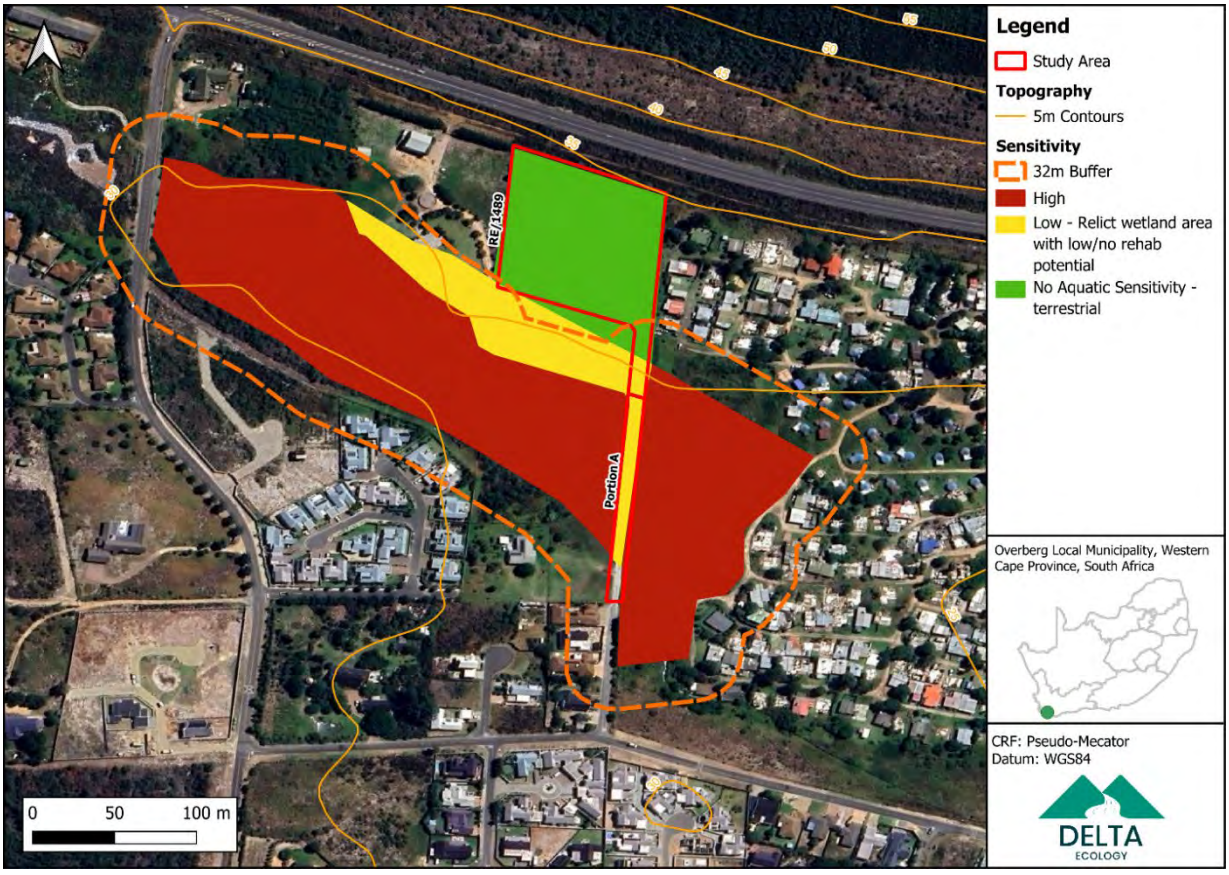


Figure 7-2: Aquatic sensitivity.

The potential impacts to the UVB wetland as a result of the proposed development are listed below:

1. Potential wetland habitat disturbance as a result of the road upgrade, installation of services for the proposed residential development, and maintenance activities.
2. Alteration of the flow regime of the UVB wetland during construction and operation of the residential development / upgrade of the road/services installation, and associated erosion within the watercourse. Flow alteration may occur due to potential flow diversion / impediment / increase in storm flows.
3. Water quality impairment due to increased sediment input, potential spillage, or release of potentially contaminated runoff into the UVB wetland during construction of the residential housing and upgrade of the road/services installation. Additionally, during operation, water quality impairment may occur due to the release of potentially contaminated stormwater (potentially polluted with hydrocarbons) or leakage from sewage pipes into the UVB wetland.

8. Impact Assessment

The three potential aquatic impacts identified in Section 7 were assessed first without and then with application of mitigation measures. All the post-mitigation scores fell within the "Low" impact categories. The "no go" scenario was assessed and found to be of "Low" impact significance as this scenario would result in continuation of existing impacts to the wetland due to the onsite disturbance (alien invasive vegetation) and adjacent land uses. No indirect impacts were noted.

Table 8-1: Assessment results for Impact 1

Impact 1: Disturbance of Wetland Habitat	
Description	**Disturbance of wetland habitat within the UVBW may occur due to the proximity of the proposed residential development, as well as the upgrade of the existing access road and installation of sewer / water supply pipelines, including but not limited to vegetation clearing, infilling, and construction of the road and housing. The disturbance of aquatic habitat will also provide an opportunity for alien invasive species (AIS) to proliferate. During the operational phase, foot traffic, along with littering and dumping in the wetland area may result in disturbance of wetland habitat.**
Mitigation Measures	**The extent of works within the UVBW should be limited as far as possible (both in terms of extent and duration and should be within the road reserve area).** **Designate the high sensitivity / functional UVB wetland area as a No Go for construction activities (for both the residential development and the replacement / upgrade of the sewer pipeline) as far as possible. Clearly demarcate the construction footprint (including construction camp, access roads, stockpile areas and working servitudes) with orange hazard tape, fencing or similar prior to the commencement of any activity, and strictly prohibit the movement of construction vehicles and personnel outside of the demarcated areas (as applicable).** **Locate site camps, laydown areas, stockpile areas, construction material, equipment storage areas, vehicle parking areas, bunded vehicle servicing areas and re-fuelling areas in designated areas of already hardened surface or disturbed areas located outside of the No Go area. These areas should preferably be located on level ground in a previously disturbed area of vegetation approved by the Environmental Control Officer (ECO). Cut and fill must be avoided where possible during the set-up of the construction site camp.**

	Demarcation of the construction footprint/working servitude must be signed off by an ECO (or similar). Demarcation should not be removed until construction is complete, and rehabilitation (if applicable) has taken place. **Prohibit the dumping of excavated material, building materials or removed vegetation within the No Go area. Building material must be stored at the designated storage area located outside of the no-go area. Spoil material must be appropriately disposed of at a registered waste disposal facility.** **Undisturbed topsoil and subsoils removed from the construction footprint must be stored separately at the designated stockpile area for future rehabilitation.** **Vegetation clearance should be restricted to the relevant development components and indigenous vegetation cover should be maintained as far as practically possible.** **Vegetation which is considered suitable for rehabilitation activities after construction (such as indigenous grasses and other herbaceous species) should be carefully removed from the construction footprint and stored at an appropriate facility for use in later rehabilitation activities (as applicable).** **Clear and remove any rubble or litter that may have been accidentally deposited into the no-go area because of construction activities and dispose of at an appropriate registered facility.** **An ECO must inspect the construction footprint of the road upgrade on a weekly basis and must take immediate measures to address unforeseen disturbances to the wetland. Any disturbed / compacted areas falling outside of the demarcated construction footprint must be immediately rehabilitated. Depending on the extent of damage the method of rehabilitation may require input from an aquatic specialist / suitably qualified contractor.** **Once construction has been completed, orange hazard fences as well as all construction waste, rubble, and equipment must be removed from the construction footprint.** **In line with the NEMBA, all AIPS listed under the amended AIPS Lists (DEFF: GN1003, 2020) must either be removed or controlled on land under the management of the proponent.** **Vegetation which needs to be re-planted (if applicable) within each Erf should be planted with indigenous vegetation.** **A Rehabilitation, Maintenance and Management Plan must be drafted by a suitably qualified specialist.**

	Impact Without Mitigation		**Impact With Mitigation**	
Factor		-		-
Consequence				
Intensity of Impact	3	Medium / Harmful	2	Low / Slightly Harmful
Duration of Impact	3	One year to 5 years	2	One month to one year
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	2	Low cost / Moderately high likelihood of success	2	Low cost / Moderately high likelihood of success
Loss of irreplaceable resources	2	Low	2	Low

Cumulative Impact	3	Medium	2	Low
Probability				
Frequency of the Activity	4	Monthly to annually	4	Monthly to annually
Likelihood of the Incident / Impact occurring	4	Likely	3	Possible
Impact Significance				
Consequence	2.27	Low	1,72	Low
Probability	4	High	3,5	Medium
Impact Significance	**2,61**	**Medium**	**2,08**	**Low**

Table 8-2: Assessment results for Impact 2

Impact 2: Altered flow regime		
Description		**Site clearance, infilling, and compaction will result in alteration of the flow regime of wetland area on the site. The hardened catchment area would result in increased stormwater runoff, velocity and increased flood peaks within the wetland and would also likely result in sedimentation and erosion.** **Given that the wetland's hydrological status quo is seriously modified, should multiple culverts, etc. be constructed during the road upgrade, there will more likely be positive impacts associated with the road upgrade in this respect (increased hydrological connectivity).**
Mitigation Measures		**Designate the high sensitivity / functional UVB wetland area as a No Go for construction activities (for both the residential development and the replacement / upgrade of the sewer pipeline) as far as possible. Clearly demarcate the construction footprint (including construction camp, access roads, stockpile areas and working servitudes) with orange hazard tape, fencing or similar prior to the commencement of any activity, and strictly prohibit the movement of construction vehicles and personnel outside of the demarcated areas (as applicable).** **Should flow need to be impeded or diverted temporarily within the watercourse while works are being undertaken, it is recommended that the diversion be undertaken during the dry season and that the flow be piped past the works and discharged into the watercourse immediately downstream of the works. The diversion should be kept to a minimum period and should be mitigated to ensure that no sedimentation or erosion is resulting downstream.** **Natural water flow within the UVBW must be maintained. Multiple culverts or open-bottom structures to maintain sheet flow is recommended as well as permeable shoulders or subgrades to allow natural infiltration of water into wetland soils where and as applicable.** **The works within the UVBW should (where possible) take place during the drier months of the year (October to May) when there would be minimised impact in terms of flow and water quality. Where construction during the wet period cannot be avoided, it is recommended that the proposed method statement be compiled for undertaking the works during higher flows that specifically address limiting contamination and sediment at the site from impacting downstream aquatic habitat.**

		Ensure that effective stormwater management measures are implemented during construction, particularly associated with runoff from the road. Stormwater management must ensure that no runoff, which will impair the water quality and lead to increased sedimentation, may enter the downstream wetland area. Additionally, clean SW which does enter the downstream wetland system should do so in a manner that ensures no erosion occurs specifically during storm events, such as through vegetated swales. **Stormwater systems will require ongoing maintenance. Any build-up of silt or debris within stormwater drains or swales will need to be cleared to ensure the continued functioning of the systems.** **Any damage to stormwater infrastructure, and any flaws identified in the functionality of stormwater infrastructure, must be rectified immediately.** **Silt fencing and/or sediment basins should be installed prior to construction activities, in areas prone to sedimentation/erosion, to trap sediments and prevent runoff into wetlands.** **Implement erosion control measures where required. Examples of erosion control measures include:** • **Covering steep/unstable/erosion prone areas with geotextiles.** • **Covering areas prone to erosion with brush packing, straw bales, mulch.** • **Stabilizing cleared/disturbed areas susceptible to erosion with sandbags.** • **Constructing silt fences / traps in areas prone to erosion, to retain sediment-laden runoff. Silt fences must be adequately maintained. Furthermore, the ECO / site manager must monitor sediment fences / traps after every heavy rainfall event and any sediment that has accumulated must be removed by hand.** **Rainwater harvesting schemes (for the residential development) may reduce runoff intensity and thereby mitigate the impact of catchment hardening.** **The alien invasive vegetation present within the wetland area must be removed and replanted with indigenous wetland vegetation.** **A Rehabilitation, Maintenance and Management Plan must be drafted by a suitably qualified specialist.**

	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	3	Medium / Harmful	3	Medium / Harmful
Duration of Impact	3	One year to 5 years	3	One year to 5 years
Extent / spatial scale of impact	2	Limited to local catchment	1	Limited to project area
Reversibility	3	Moderate cost / Moderate likelihood of success	3	Moderate cost / Moderate likelihood of success
Loss of irreplaceable resources	2	Low	2	Low

Cumulative Impact	3	Medium	2	Low
Probability				
Frequency of the Activity	4	Monthly to annually	4	Monthly to annually
Likelihood of the Incident / Impact occurring	4	Likely	3	Possible
Impact Significance				
Consequence	2,63	Medium	2.27	Low
Probability	4	High	3,5	Medium
Impact Significance	**2,90**	**Medium**	**2,51**	**Low**

Table 8-3: Assessment results for Impact 3

Impact 3: Water Quality Impairment		
Description		**Accidentally spilled cement, construction chemicals, sewage during the upgrade/installation of pipelines, or petrochemicals from construction vehicles may find their way into the wetland area. Additionally, litter and dumping may occur due to the proximity of the proposed development to the wetland area.** **The removal of vegetation and stripping of soils from the construction footprint will result in the exposure of soils to erosive elements. An increase in stormwater runoff and velocities from exposed and compacted areas, particularly during peak rainfall periods, may result in the formation of erosion gullies and rills in the downslope wetland. In addition, destabilisation of soils during the removal of vegetation and excavation activities, as well as the stockpiling of soils may result in an increase in the runoff of sediment laden stormwater into the downslope wetland from the construction footprint, particularly during the rainy season.** **During operation, pollutants may enter the wetland via stormwater or sewage leaks (although highly unlikely). However, with the inclusion of stormwater design measures which allow for the infiltration and treatment of stormwater this impact can be greatly reduced.**
Mitigation Measures		**The extent of works within the UVBW should be limited as far as possible (both in terms of extent and duration and should be within the road reserve area).** **Designate the high sensitivity / functional UVB wetland area as a No Go for construction activities (for both the residential development and the replacement / upgrade of the sewer pipeline) as far as possible. Clearly demarcate the construction footprint (including construction camp, access roads, stockpile areas and working servitudes) with orange hazard tape, fencing or similar prior to the commencement of any activity, and strictly prohibit the movement of construction vehicles and personnel outside of the demarcated areas (as applicable).**

		The works within the UVBW should (where possible) take place during the drier months of the year (October to May) when there would be minimised impact in terms of flow and water quality. Where construction during the wet period cannot be avoided, it is recommended that the proposed method statement be compiled for undertaking the works during higher flows that specifically address limiting contamination and sediment at the site from impacting downstream aquatic habitat. **Ensure that effective stormwater management measures are implemented during construction, particularly associated with runoff from the road. Stormwater management must ensure that no runoff, which will impair the water quality and lead to increased sedimentation, may enter the downstream wetland area. Additionally, clean SW which does enter the downstream wetland system should do so in a manner that ensures no erosion occurs specifically during storm events, such as through vegetated swales.** **Silt fencing and/or sediment basins should be installed prior to construction activities, in areas prone to sedimentation/erosion, to trap sediments and prevent runoff into wetlands.** **The site manager / ECO must check the No Go area for pollution/spills, erosion damage and sedimentation weekly and after every heavy rainfall event. Should pollution, erosion or sedimentation be noted, immediate corrective measures must be undertaken.** **Fuel, chemicals, and other hazardous substances should preferably be stored offsite, or as far away as possible from the no-go area. These substances must be stored in suitable secure weather-proof containers with impermeable and bunded floors to limit pilferage, spillage into the environment, flooding, or storm damage.** **Inspect all storage facilities, vehicles, and machinery daily for the early detection of deterioration or leaks and strictly prohibit the use of any vehicles or machinery from which leakage has been detected.** **Mixing and transferring of chemicals or hazardous substances must take place outside of the No Go area, and must take place on drip trays, shutter boards or other impermeable surfaces.** **Drip trays must be utilised at all fuel dispensing areas; and during the maintenance of existing sewer flow as possible.** **Vehicles and machinery should preferably be cleaned off site. Should cleaning be required on site it must only take place within designated areas outside of the No Go area and should only occur on bunded areas with a water/oil/grease separator.** **Dispose of used oils, wash water from cement and other pollutants at an appropriate licensed landfill site.** **Avoid the use of infill material or construction material with pollution / leaching potential. Where possible, in situ earthen materials must be used during construction to reduce the risk of leachate from imported materials contaminating the wetland area.** **Concrete should preferably be imported as "ready-mix" concrete from a local supplier. Should onsite concrete mixing be required it must not be done on exposed soils. Concrete must be mixed on an impermeable surface in an area of low environmental sensitivity identified by the ECO outside of the no-go area. Surplus or waste concrete must be sent back to the supplier who will dispose of it.** **Construct temporary bunds around areas where cement is to be cast in situ.**

		Dispose of concrete and cement-related mortars in an environmental sensitive manner (can be toxic to aquatic life). Disposal of any of these waste materials into the No Go area is strictly prohibited. Washout must not be discharged into the no-go area. A washout area should be designated, and wash water should be treated on-site. Clean up any spillages immediately with the use of a chemical spill kit and dispose of contaminated material at an appropriately registered facility. Provide portable toilets where work is being undertaken (1 toilet per 10 workers). These toilets must be located within an area designated by the ECO outside of the no-go area and should preferably be located on level ground. Portable toilets must be regularly serviced and maintained. Provide an adequate number of bins on site and encourage construction personnel to dispose of their waste responsibly. Waste generated by construction personnel must be removed from the site and disposed of at a registered waste disposal facility on a weekly basis. Design a SWMP which will allow for the infiltration and treatment of stormwater. All stormwaters must receive basic filtering and treatment prior to its release. Incorporate measures into the stormwater design to trap solid waste, debris and sediment carried by stormwater. Measures may include the use of curb inlet drain grates and debris baskets/bags. Stormwater generated from areas with a higher risk of contamination such as parking areas and roads (as applicable) must receive basic filtering and treatment prior to its release into surrounding areas. Stormwater systems must be monitored and maintained into perpetuity and collections of debris and solid waste removed from grates and baskets. Operational phase mitigation implemented during the design/construction phase: • Construct sewage pipelines in accordance with the relevant SANS / SABS specifications. • Design the pipelines to accommodate the operating and surge pressures. • Provide surge protection e.g. air valves. • Allow for scour valves along pipelines to ensure sewage pipelines can be emptied in a controlled manner if required. • Allow for surcharge containment and emergency storage of 2 hours of peak flow at manholes located within areas upslope of the wetland. Containment/emergency storage may include a concrete box or earthen bund surrounding the manholes. The backup storage capacity of manholes may also be improved by raising the manholes by one meter. The sewage system must be monitored and maintained into perpetuity. The developer must confirm who will be responsible for this monitoring and maintenance as well as their roles. These measures should be addressed, implemented and monitored in terms of the Environmental Management Plan for the construction phase.
	Impact Without Mitigation	**Impact With Mitigation**
Consequence		

Intensity of Impact	3	Medium / Harmful	3	Medium / Harmful
Duration of Impact	2	1 month to 1 year	2	One month to one year
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	3	Moderate cost / Moderate likelihood of success	2	Low cost / Moderately high likelihood of success
Loss of irreplaceable resources	2	Low	2	Low
Cumulative Impact	3	Medium	2	Low
Probability				
Frequency of the Activity	4	Monthly to annually	3	1 to 5 years
Likelihood of the Incident / Impact occurring	4	Likely	3	Possible
Impact Significance				
Consequence	2,27	Low	2.09	Low
Probability	4	High	3	Medium
Impact Significance	**2,62**	**Medium**	**2.27**	**Low**

Table 8-4: Assessment results for the "No Go" Scenario

"No Go" Scenario			
Description		**Although it is unknown whether the development area would be further developed in future, it is assumed that the site would remain as is, which is in a disturbed condition consisting of unused, degraded land. The No-Go option would result in the continuation of impact to the wetland due to adjacent land uses – and would therefore still result in negative impact to the wetland onsite.**	
Mitigation Measures		**None**	
	Impact Without Mitigation		**Impact With Mitigation**

Consequence				
Intensity of Impact	3	Medium / Harmful	0	Not Applicable
Duration of Impact	5	Beyond 20 years / Permanent	0	Not Applicable
Extent / spatial scale of impact	1	Limited to project site	0	Not Applicable
Reversibility	3	Moderate cost / Moderate likelihood of success	0	Not Applicable
Loss of irreplaceable resources	2	Low	0	Not Applicable
Cumulative Impact	2	Low	0	Not Applicable
Probability				
Frequency of the Activity	1	Once off activity / less than once in 20 years	0	Not Applicable
Likelihood of the Incident / Impact occurring	4	Likely	0	Not Applicable
Impact Significance				
Consequence	2,45	Low	0,00	Not Applicable
Probability	2,5	Low	0,00	Not Applicable
Impact Significance	**2,46**	**Low**	**0,00**	**Not Applicable**

9. Risk Assessment

The Risk Assessment Matrix prescribed by GN4167 of 2023 was applied to the proposed project. The risks associated with all impacts were all found to fall within the *Low-Risk category*.

The completed risk assessment matrix is attached as **Annexure 3**.

10. Conclusion and Recommendation

The UVB wetland associated with the proposed study area was classified and delineated during a study area assessment on the 10th of December 2024. Although the UVB wetland was found to be disturbed in nature, due to the confirmed presence of a wetland which is likely to be impacted by the proposed development, the study area as a whole was determined to be of "Very High" aquatic sensitivity.

As the initial screening of the area confirmed that the Aquatic Biodiversity sensitivity of the study area is "Very High", the GN320 of 2020 requires that a full aquatic biodiversity impact assessment must be submitted 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). Delta Ecology was appointed to undertake an aquatic biodiversity impact assessment of the proposed development.

In this impact assessment, the delineated UVB wetland was assessed using current best practice assessment methodologies to determine the PES, EIS, WES, and REC metrics. The results of these assessments are as follows:

Table 10-1: Results of the wetland status quo assessment.

	PES	EIS	WES (Highest)	REC
UVB Wetland	D	Moderate	Moderate	D-C

Aquatic biodiversity impacts associated with the development were identified and assessed using both an impact assessment methodology compliant with NEMA requirements and the Risk Assessment Matrix prescribed by GN4167 of 2023.

The potential aquatic impacts identified were assessed first without and then with application of mitigation measures. All the post-mitigation scores fell within the within the "Low" impact categories. The "no go" scenario was assessed and found to be of "Low" impact significance as this scenario would result in continuation of existing impacts to the wetland due to the within wetland disturbances and adjacent land uses. No indirect impacts were noted.

The result of the RAM was an overall "Low Risk" rating for the proposed development, assuming that all mitigation measures will be implemented. Therefore, the project should be registered under the GN4167 (2023) General Authorisation (GA).

It is therefore the opinion of the specialist that the proposed development should be approved subject to application of the mitigation measures listed in this report.

11. References

Beck HE, Zimmermann NE, McVicar TR, Vergopolan N, Berg A, Wood EF. 2018. Data Descriptor: Present and future Koppen-Geiger climate classification maps at 1-km resolution. Scientific Data.

CapeNature. 2017. Protected Areas. CapeFarmMapper ver.3.3.

City of Cape Town. City of Cape Town Wetlands 2017 [vector geospatial dataset] 2017. Available from the Biodiversity GIS website, downloaded on 06 June 2023.

CSIR. 2011. Freshwater Priority Areas.

DAFF. 2021. Soil Clay & Depth. CapeFarmMapper Ver. 3.3.

DEADP. 2014. Western Cape Climate Change Response Strategy.

Department of Water and Sanitation. 2011. Ecoregions (Level 1) for South Africa [Data set].

DFFE. 2024. National Web based Environmental Screening Tool.

DWAF. 2008. Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas.

DWS. 2023. Water Management Areas. CapeFarmMapper Ver. 3.3.

ENPAT. 2021. Soils & Geology (ENPAT). Cape Farm Mapper ver. 3.3.

ENVIROSWIFT. Freshwater Screening of Erf 1489, Vermont, Western Cape Province. RSA.

Job, N., Ratcliffe, G. 2006. Freshwater Consulting Group: Vermont Pan and Wetlands – Wetland Delineation Study. Overstrand Municipality, Hermanus.

Kotze D, Macfarlane D, Mander M, Collins N, Texeira-Leite A, Lagesse J, Pringle C, Marneweck G, Batchelor A, Lindley D. 2020. WET-EcoServices (Version 2) A technique for rapidly assessing ecosystem services supplied by wetlands and riparian areas.

Macfarlane D, Ollis D, Kotze D. 2020. WET-Health (Version 2.0) A Refined Suite of Tools for Assessing the Present Ecological State of Wetland Ecosystems.

Macfarlane DM, Bredin IP. 2016. Buffer Zone Guidelines for Wetlands, Rivers, and Estuaries. Part 1: Technical Manual. Pretoria. Available from https://www.researchgate.net/publication/326009512.

Macfarlane D, Holness S, von Hase A, Brownlie S, Dini J, & Kilian V. 2016. Wetland offsets: A best practice guideline for South Africa.

NFEPA. 2011. National Freshwater Priority Area. CSIR.

NWM5. 2018. National Wetlands Map 5.

Rountree MW, Malan HL, Weston BC. 2013. Manual for the Rapid Ecological Reserve Determination of Inland Wetlands (Version 2.0). Available from www.wrc.org.za.

SANBI. 2011. NFEPA Wetland Vegetation. Available from https://bgis.sanbi.org.

SANBI. 2018. VegMap. Available from https://gis.elsenburg.com/apps/cfm/.

Schulze R. 2009. South African Atlas of Agrohydrology and Climatology. Water Research Commission, WRC (TT82-96).

Schulze R, Hallowes L, Horan M, Lumsden T, Pike A, Thornton-Dibb S, Warburton M. 2007. South African Quaternary Catchments Database. WRC Report 1489/1/06, Section 2.3. Pretoria.

Van Ginkel CE, Glen RP, Gordon-Gray KD, Cilliers CJ, Muasya M, van Deventer PP. 2011. Easy identification of some South African wetland plants. Water Research Commission.

Van Oudtshoorn, F. 2014. Third Revised Edition, Second Print. Guide to Grasses of South Africa. Briza Publications, Pretoria, RSA.

Annexure 1: Ecosystem Services

Table A1: Ecosystem Services included in the WET-EcoServices v.2 (Extracted from Kotze *et al.*, (2020)).

Services contributing to indirect benefits	Regulating and supporting services	Flood attenuation		The spreading out and slowing down of floodwaters in the wetland/riparian area, thereby reducing the severity of floods downstream (Adamus et al. 1987; MEA 2005)
		Streamflow regulation		Sustaining streamflow during low flow periods (McInnes and Everard 2017)
		Water quality enhancement services	Sediment trapping	The trapping and retention in the wetland/riparian area of sediment carried by runoff water (Adamus et al. 1987)
			Phosphate assimilation	Removal by the wetland/riparian area of phosphates carried by runoff water, thereby enhancing water quality (O'Geen et al. 2010)
			Nitrate assimilation	Removal by the wetland/riparian area of nitrates carried by runoff water, thereby enhancing water quality (O'Geen et al. 2010)
			Toxicant assimilation	Removal by the wetland/riparian area of toxicants (e.g. metals, biocides and salts) carried by runoff water, thereby enhancing water quality (O'Geen et al. 2010)
			Erosion control	Controlling of erosion at the wetland/riparian area, principally through the protection provided by vegetation (MEA 2005).
		Carbon storage		The trapping of carbon by the wetland/riparian area, principally as soil organic matter (Kumar et al. 2017)
	Biodiversity maintenance[1]			Through the provision of habitat and maintenance of natural process by the wetland/riparian area, a contribution is made to maintaining biodiversity (Liquete et al. 2016)
Services contributing to direct benefits	Provisioning services	Provision of water for human use		The provision of water which is taken directly from the wetland/riparian area for domestic, agriculture or other purposes (Kumar et al. 2017)
		Provision of harvestable resources		The provision of natural resources from the wetland/riparian area - including craft plants, fish, wood, etc. (McInnes and Everard 2017)
		Food for livestock		The provision of grazing for livestock (McInnes and Everard 2017)
		Provision of cultivated foods		The provision of cultivated foods from within the wetland/riparian area (McInnes and Everard 2017)
	Cultural (non-material) services	Cultural and spiritual experience		Places of special cultural significance in the wetland/riparian area - e.g. for baptisms or gathering of culturally significant plants (McInnes and Everard 2017)
		Tourism and recreation		Study areas of value for tourism and recreation in the wetland/riparian area, often associated with scenic beauty and abundant birdlife (McInnes and Everard 2017)[2]
		Education and research		Study areas of value in the wetland/riparian area for education or research (McInnes and Everard 2017)

[1]It is recognized that biodiversity maintenance is not an ecosystem service in the strict sense (Liquete *et al.* 2016) and is framed in less anthropocentric terms than all the other services, but it underpins many other services and is widely acknowledged as having high value to society broadly, even in the absence of any local or downstream beneficiaries.

[2]WET-EcoServices focuses on recreational services which are specifically nature-based, e.g., bird watching. It does not account specifically for recreational services from wetland/riparian areas that have been converted into sports grounds, children's playgrounds, or other built infrastructure.

Annexure 2: Impact Assessment Methodology

Impact assessment methodologies are based on qualitative ratings of the various factors and represent a standardised method for presenting a substantiated specialist opinion regarding the significance of a particular class of impact. Delta Ecology has developed a rapid numerical impact assessment methodology, applied in this report, that incorporates a range of factors commonly assessed to which numerical values from 1 to 5 are assigned to each rating category. Six primary factors are used to determine Consequence, and two primary factors are used to determine Probability. These two secondary factors are used to determine Impact Significance for each identified impact. Consequence, Probability and Impact Significance are determined by a set of formulae which incorporate weightings for each primary and secondary factor.

The weightings for each factor were determined by application of the formulae to over 50 pre-existing ecological impact assessments. These assessments employed other methodologies and were accepted by the relevant environmental authorities. These assessments were primarily from reports drafted by Delta Ecology staff during previous employment but also included unrelated ecological impact assessments freely available on the internet. The weighting system has therefore been derived as a means of real-world formula calibration rather than by logic alone. The final methodology achieves impact significance ratings that are consistently in line with industry standards.

Key elements of the approach include a detailed description of the nature of the impact and of the proposed mitigation measures, assessment of each factor for both the "with mitigation" and "without mitigation" scenarios and includes the provision of a rationale for each rating where appropriate. The resulting impact significance ratings may be adjusted, if necessary, in accordance with specialist opinion, given adequate motivation for the deviation from the standard methodology.

The various factors, formulae and weightings are provided in the table below:

Scoring of impacts			
Factor	**Weighting**	**Score**	**Description/Rating**
Consequence	**8**		
Intensity	4	1	Very Low / Non-harmful
		2	Low / Slightly Harmful
		3	Medium / Harmful
		4	High / Very Harmful
		5	Very High / Disastrous
Duration	1	1	Up to 1 month
		2	1 month to 1 year
		3	One year to 5 years
		4	5 to 20 years
		5	Beyond 20 years / Permanent
Spatial scale/extent	3	1	Limited to project study area
		2	Limited to local catchment
		3	Multiple local catchments
		4	Limited to quaternary catchment
		5	Regional, National, International
Reversibility	1	1	Passive restoration / High likelihood of success

		2	Low-cost rehabilitation / Moderately high likelihood of success
		3	Moderate cost / Moderate likelihood of success
		4	High cost / Low likelihood of success
		5	Very high cost / Very low likelihood of success
Loss of irreplaceable resources	1	1	None
		2	Low
		3	Medium
		4	High
		5	Very High
Cumulative Impact	1	1	Very Low
		2	Low
		3	Medium
		4	High
		5	Very High
Probability	**2**		
Frequency of the activity	1	1	Once off activity / less than once in 20 years
		2	5 to 20 years
		3	1 to 5 years
		4	Monthly to annually
		5	Weekly to Monthly
Likelihood of the Incident / Impact occurring	1	1	Highly unlikely
		2	Unlikely
		3	Possible
		4	Likely
		5	Definite
Consequence = (Intensity x 4) + Duration + (Extent x 3) + Reversibility + Loss of Irreplaceable Resources + Cumulative Impact) / 11			
Probability = (Frequency + Probability) / 2 OR = 5 where likelihood is definite			
Impact Significance = (Consequence x 8) + (Likelihood x 2) / 10			
Impact Significance Categories			
0 - 1.5			Very Low
1.6 - 2.5			Low
2.6 - 3.5			Medium
3.6 - 4.5			High
4.5 and above			Very High

Annexure 3: DWS RAM

PROJECT: Vermont Erf 1489 Residential Development

RISK ASSESSMENT MATRIX for Section 21 (c) and (i) Water Use activities - Version 2.1.1

Name of Assessor: Kimberley van Zyl **Signature:**

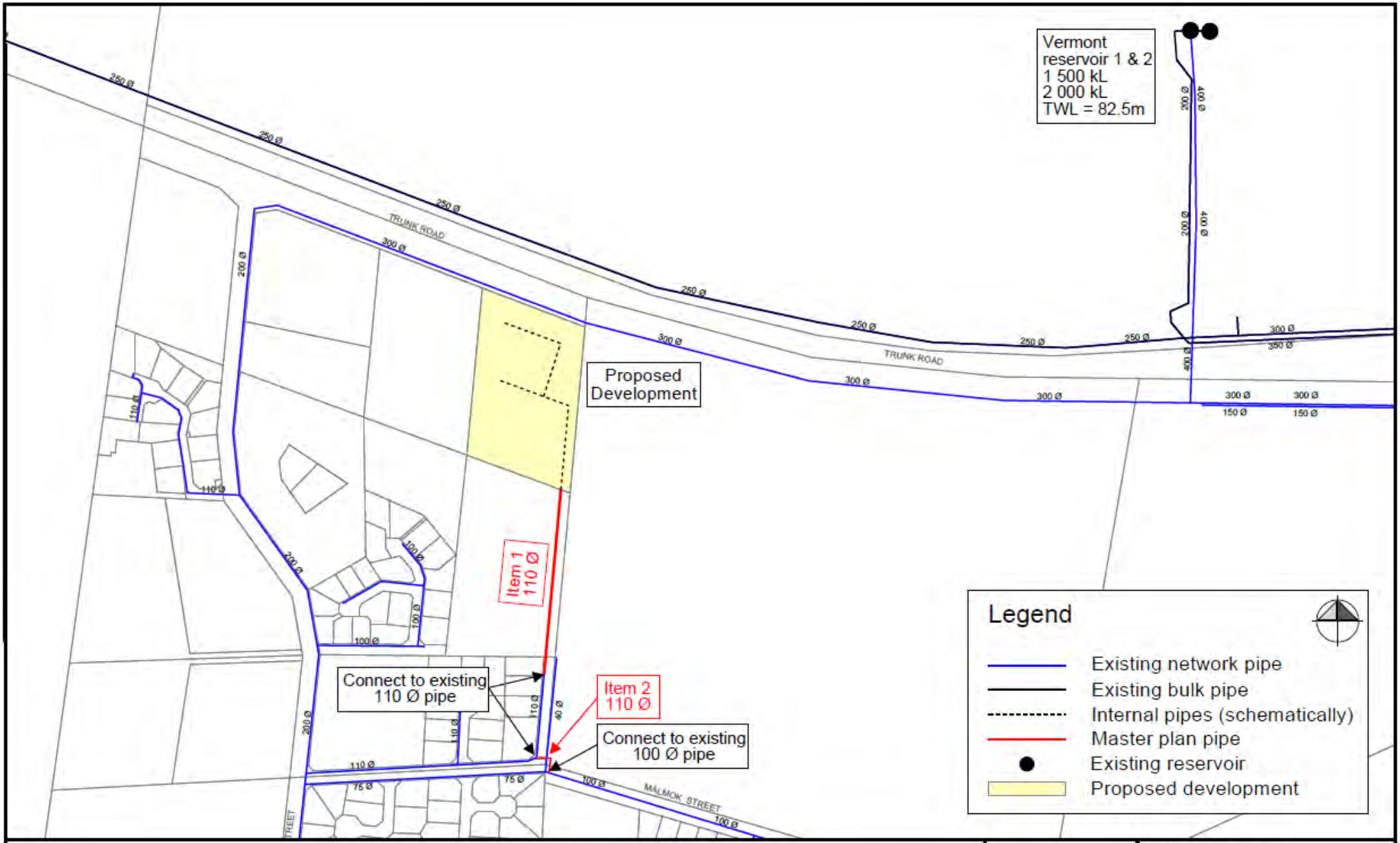
SACNASP Registration Number: Pr. Nat. Sci. Reg. No.117097 (Ecological Science)

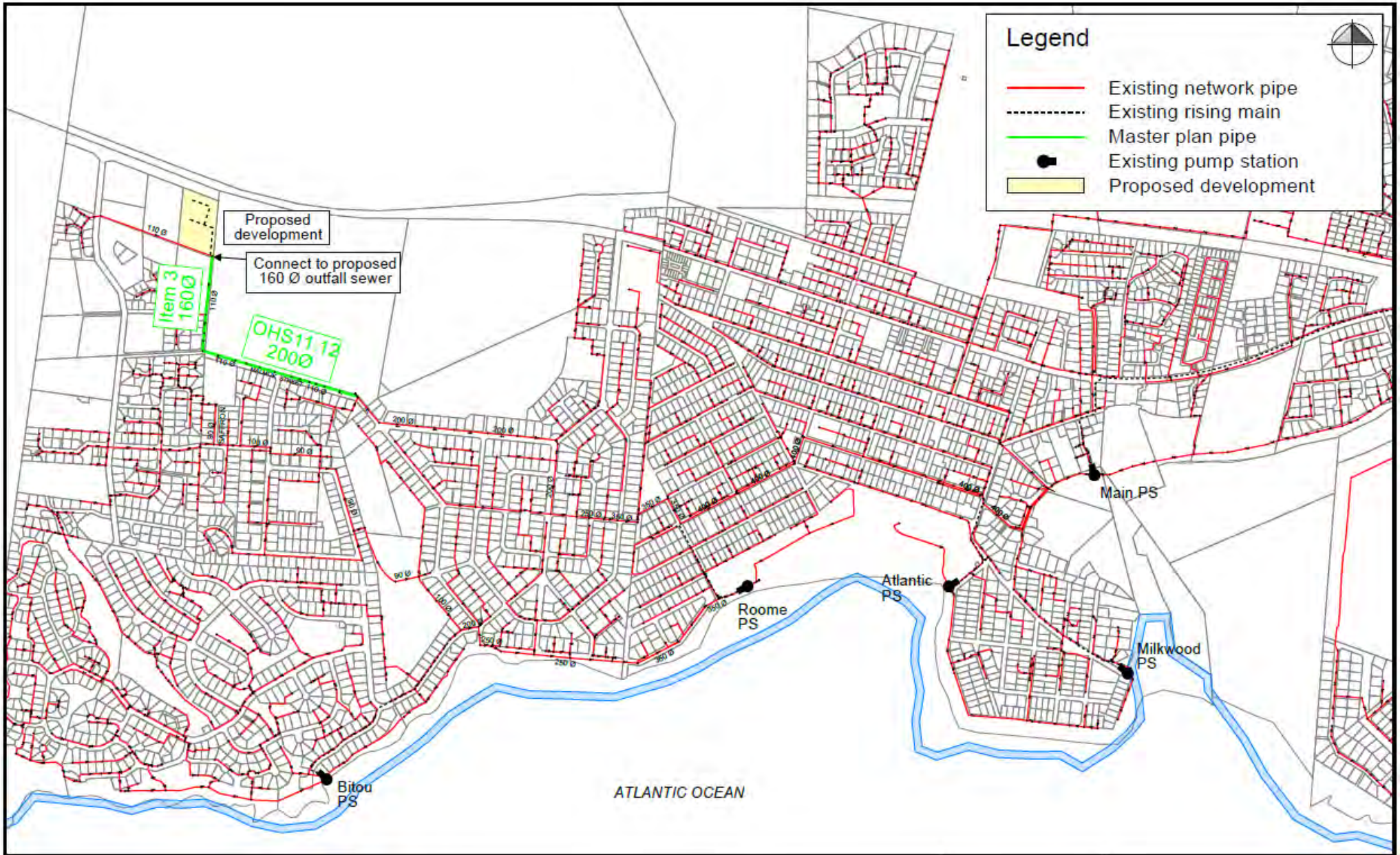
Date of assessment: 9-Jun-25

Risk to be scored for all relevant phases of the project (factoring in specified control measures). MUST BE COMPLETED BY SACNASP PROFESSIONAL MEMBER REGISTERED IN AN APPROPRIATE FIELD OF EXPERTISE.

Phase	Activity	Impact	Potentially affected watercourses			Overall intensity (max = 10)	Spatial scale (max = 5)	Duration (max = 5)	Severity (max = 20)	Importance rating (max = 5)	Consequence (max = 100)	Likelihood (Probability) of impact	Significance (max = 100)	Risk Rating	Confidence level
			Name/s	PES	Overall Watercourse importance										
	<1> Preparation of site for the construction of the residential development and upgrade of the existing road i.e. clearing, preparation, and infill of foreign material (soil & concrete), within proximity of the UVBW; Construction of the residential dwellings within proximity of the UVBW; upgrade of the road, installation / upgrade of sewer and water suply pipelines within the relic UVBW.	<1a>Wetland Habitat disturbance	UVBW	D	Moderate	4	1	2	7	3	21	60%	12.6	L	High
		<1b>Alteration of flow	UVBW	D	Moderate	6	2	2	10	3	30	60%	18	L	Medium
		<1c>Water quality impairement	UVBW	D	Moderate	6	1	2	9	3	27	60%	16.2	L	High
OPERATIONAL	<2>Operation of the residential development and maintenance on the road / sewer / water supply pipelines.	<2a>Wetland Habitat disturbance	UVBW	D	Moderate	4	1	2	7	3	21	60%	12.6	L	High
		<2b>Alteration of flow	UVBW	D	Moderate	4	2	2	8	3	24	60%	19.2	L	Medium
		<2c>Water quality impairement	UVBW	D	Moderate	6	1	2	9	3	27	60%	16.2	L	High

Annexure 4: Bulk Services


Vermont
reservoir 1 & 2
1 500 kL
2 000 kL
TWL = 82.5m
Proposed
Development
Item 1
110 Ø
Item 2
110 Ø
Connect to existing
110 Ø pipe
Connect to existing
100 Ø pipe
TRUNK ROAD
TRUNK ROAD
MALMOK STREET
Legend
Existing network pipe
Existing bulk pipe
Internal pipes (schematically)
Master plan pipe
Existing reservoir
Proposed development
OVERSTRAND
July 2023
Development of Erf 1489 - Vermont
GLS
infrastructureplanning
Figure 1
Proposed Development
Vermont - Erf 1489
Existing Water System


Legend
Existing network pipe
Existing rising main
Master plan pipe
Existing pump station
Proposed development
Proposed development
Connect to proposed 160 Ø outfall sewer
Item 3 160Ø
OHS11 12 200Ø
Main PS
Atlantic PS
Roome PS
Milkwood PS
Bitou PS
ATLANTIC OCEAN
July 2023
Development of Erf 1489 - Vermont
GLS
Figure 2
Proposed Development
Vermont - Erf 1489
Sewer Master Plan