Aquatic Biodiversity Impact Assessment

Erf 1486, Vermont, Western Cape Province

November 2023

Report Information

Document name	Aquatic Biodiversity Impact Assessment: Erf 1486, Vermont, Western Cape Province V2.0.		
Number of pages	48		
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
Reviewer	Joshua Gericke	SACNASP Reg. No.	117997

Citation

Van Zyl, K., Morton, R., & Gericke, J. 2023. Aquatic Biodiversity Impact Assessment Erf 1486 Vermont V2.0. Delta Ecology. RSA

Executive Summary

The owner of Erf 1486, Vermont, proposes subdivision of the property to create several erven for single residential use and one erf in the south for group housing. The site development plan is not final however and the proponent is open to amendments to accommodate environmental constraints.

Wetland conditions are known to exist within the erf and were previously delineated by Job and Ratcliff (Freshwater Consulting Group, 2006), commissioned by the Overstrand Municipality. In 2018, Joshua Gericke conducted a freshwater screening assessment of the erf, to inform feasibility and layout of the current proposed project (EnviroSwift, 2018). Subsequently, the owner has decided to proceed with the Environmental Authorisation (EA) application process for the proposed project, and Delta Ecology has been appointed to conduct an Aquatic Biodiversity Impact Assessment.

Following the aquatic biodiversity screening assessment of the proposed site by Joshua Gericke on the 17th of August 2018, a natural Unchanneled Valley-Bottom (UVB) wetland was confirmed and delineated onsite (EnviroSwift, 2018). The wetland was confirmed, and an updated delineation was undertaken during a site assessment by Gericke and van Zyl (Delta Ecology, 2023) on the 30th of May 2023.

The wetland is part of a 1.4 km long wetland system that originates within the study area and ends at the Vermont Pan to the southeast. A depression has been excavated towards the centre of the study area, with an overflow pipe that crosses beneath Lynx Road and flows into the wetland on the far side thereby creating a hydrological link between the wetlands within the study site and the greater wetland to the southeast. An additional stormwater outlet is found in the southeast corner of the study area, which discharges runoff from the neighbouring housing development into the wetland. The remainder of the 1.5 ha study area is extensively disturbed and characterised by a mixture of alien and indigenous vegetation.

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 i: Results of the wetland status quo assessment.

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

Although the condition of the UVB wetland was largely disturbed, the moderate to moderately high EIS and WES scores indicates that the wetland is moderately sensitive and important in terms of conservation planning or provision of ecosystem services.

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 GN509 of 2016.

The results of the assessment of wetland loss along with four more minor impacts during the construction and operational phases, given implementation of the listed mitigation measures, are summarised in **Table ii.**

Table ii: Summary of impact/risk assessment results (with mitigation).

	Rating	Risk Class	Applicable to	Mitigation Measures
Construction Phase				
Impact 1: Wetland Loss	Medium	Moderate	UVBW	The only mitigation applicable to wetland loss is reduction of the area of loss. It is recommended that the proposed residential areas / houses are positioned within the proposed new Erven so as to avoid the delineated wetland area. Should the proposed residential developments avoid the wetland area entirely, the impact of Wetland Loss, as assessed in this report, will not be applicable. It is however noted that this may not be possible for proposed new Erven 1 & 8. The proposed layout has gone through various iterations in order to ensure that the footprint within the delineated wetland area is minimal. Ordinarily, wetland loss would fall within the 'high' category, but the limited area of wetland loss (0,22 Ha) and the degraded nature of the wetland has reduced the impact significance.
Impact 2: Altered flow	Very Low	Low	UVBW	The significance of this impact can be largely mitigated by demarcating the UVBW wetland area as a No-Go area during construction, conducting rehabilitation within this wetland area; and by ensuring that SW generated onsite flows into the wetland through an appropriately designed broad, vegetated earth swale (to avoid erosion). If possible, conduct construction activities of dwellings, associated stormwater infrastructure and any rehabilitation activities during summer months (November to March). The alien invasive vegetation present within the wetland area must be removed and replanted with indigenous wetland vegetation. It is recommended that a suitably qualified aquatic specialist compiles detailed method statements once the final layout of the proposed project has been formalized. Additionally, a suitable Rehabilitation and

				Management Plan should be drafted for the wetland area onsite.
Impact 3: Water Quality Impairment	Very Low	Low	UVBW	The significance of this impact can be largely mitigated by demarcating the UVBW as No-Go area during construction. Bunded, impervious areas that are more than 15 m away from the UVBW must be designated by an Environmental Control Officer for temporary toilets, vehicle parking/servicing areas, and for pouring and mixing of concrete/cement, paint, and chemicals.
Operational Phase				
Impact 4: Altered flow	Very Low	Low	UVBW	The significance of this impact can be largely mitigated by ensuring that SW generated onsite flows into the wetland through an appropriately designed broad, vegetated earth swale (to avoid erosion). If possible, conduct any rehabilitation activities during summer months (November to March). It is recommended that a suitably qualified aquatic specialist compiles detailed method statements once the final layout of the proposed project has been formalized. Additionally, a suitable Rehabilitation and Management Plan should be drafted for the wetland area onsite.
Impact 5: Water quality impairment	Very Low	Low	UVBW	Repair all sewage leaks as soon as reasonably possible after detection. Inspection of all sewage pipes should be conducted by a plumber once every 10 years. The positive aspect of rehabilitation will likely compensate for any negative water quality impacts to the wetland area.
"No Go" Scenario: Gradual decrease in ecological condition in wetlands	Very Low	Not Assessed	UVBW	None

Four out of five of the post-mitigation scores fell within the within the "Low" to "Very Low" impact categories. Wetland loss received the highest impact significance score, which fell within the 'Medium' category.

The proposed layout has gone through various iterations in order to ensure that the layout overlapping with the delineated wetland area is minimal. Ordinarily, wetland loss would fall within the 'high' category, but the limited area of wetland loss (0,22 Ha) and the degraded nature of the wetland has reduced the impact significance.

Although it is unknown whether the development area would be further developed in future, it is assumed that the site would remain as is. 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.

The Moderate risk rating confirms that a Water Use Licence will be required for this project due to the encroachment into the onsite wetland. It is furthermore highlighted that a suitable wetland offset and associated Wetland Offset, Rehabilitation, and Management Plan will be required for the project in terms of the DHSWS 'no net loss' policy (Macfarlane *et al*, 2014).

It is the opinion of the specialist that rehabilitating the remnant UVBW onsite will be a feasible and acceptable offset for the proposed development.

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, as well as the implementation of a suitable Wetland Offset, Rehabilitation and Management Plan.

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 7 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.

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

Specialist Details | Joshua Gericke	
Company Name	Delta Ecology
Physical address	59 Exmouth Rd, Plumstead, Cape Town 7801
Email Address	joshua@deltaecologists.com
Telephone	074 295 9571
Highest Qualification	BSc Honours
SACNASP Reg. No.	117997
Area of Specialisation	Wetland Science

Joshua Gericke is an aquatic biodiversity specialist with over 12 years of experience. He has undertaken over 100 aquatic biodiversity screenings, assessments, and plans. In addition to his honours degree, he has completed several relevant short courses on a variety of topics including hydrophytic vegetation identification, wetland assessment methodologies, SASS5 river health assessments, and hydropedology. Prior to his consulting career, Joshua worked for the City of Cape Town's Biodiversity Management Branch for almost 9 years and received the Mayoral Outstanding Service Award for work in the field of urban wetland and estuary management. A full CV can be provided on request.

1. Introduction

The owner of Erf 1486, Vermont (**Figure 1-1**) proposes subdivision of the property to create several erven for single residential use and one erf in the south for group housing (**Figure 1-2**). The study area for this aquatic assessment is the extent of Erf 1486, located within Overstrand Local Municipality. The study area is bordered to the north by the R43 road reserve, to the west by the Hoek van der Berg Private Nature Reserve, to the south by a small residential housing estate and to the east by Lynx Road (**Figure 1-1**). The study area contains a gravel access road which enters the site from Lynx Road and terminates at the derelict buildings in the northwest corner of the study area (**Figure 1-3**).

Wetland conditions are known to exist within the erf and were previously delineated by Job and Ratcliff (Freshwater Consulting Group, 2006), commissioned by the Overstrand Municipality. In 2018, Joshua Gericke conducted a freshwater screening assessment of the erf, to inform feasibility and layout of the current proposed project (EnviroSwift, 2018). Subsequently, the owner has decided to proceed with the Environmental Authorisation (EA) application process for the proposed project. The site development plan has undergone various amendments to accommodate environmental constraints, ultimately resulting in the preferred Layout (Alternative 4) (**Figure 1-2**).

According to the national web-based environmental screening tool report generated for the proposed site, the Combined Aquatic Biodiversity Theme Sensitivity is classified as "Very High" (DFFE, 2023). The classification trigger is the location of the site within a Strategic Water Source Area (SWSA) for surface water (Boland).

Following the aquatic biodiversity screening assessment of the proposed site by Joshua Gericke on the 17th of August 2018, a natural Unchanneled Valley-Bottom (UVB) wetland was confirmed and delineated onsite (EnviroSwift, 2018). The wetland was confirmed, and an updated delineation was undertaken during a site assessment by Gericke and van Zyl (Delta Ecology, 2023) on the 30th of May 2023.

The wetland is part of a 1.4 km long wetland system that originates within the study area and ends at the Vermont Pan to the southeast. A depression has been excavated towards the centre of the study area, with an overflow pipe that crosses beneath Lynx Road and flows into the wetland on the far side thereby creating a hydrological link between the wetlands within the study site and the greater wetland to the southeast (refer to **Figure 1-3**). An additional stormwater outlet is found in the southeast corner of the study area, which discharges runoff from the neighbouring housing development into the wetland (**Figure 1-3**). The remainder of the 1.5 ha study area 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 site was determined to be of "Very High" aquatic sensitivity. If the specialist determines that the Aquatic Biodiversity sensitivity of the site 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 site, Erf 1486, Vermont.

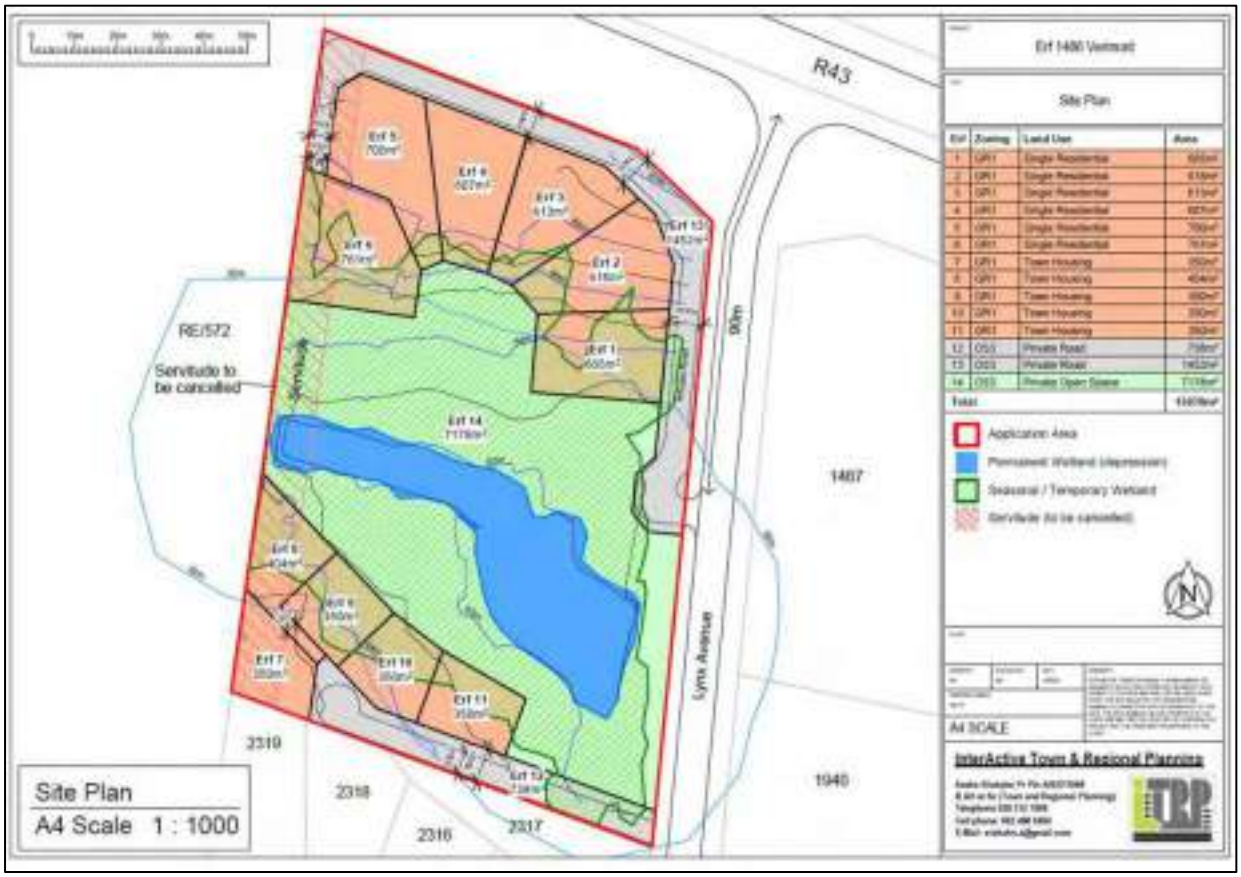

Figure 1-2: Preferred Layout (Alternative 4) for the site.

Figure 1-3: Location of infrastructure and landmarks within and adjacent to the study area.

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 site assessment to confirm aquatic biodiversity constraints.
- Delineation of watercourse (s) likely to be impacted by proposed development activities using a combination of site-based and desktop methodologies as appropriate.
- Verification of the aquatic site sensitivity as either "Very High" or "Low".
- Drafting of an aquatic biodiversity impact assessment report including the following:
    - General site description;
    - Site 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 site assessment was undertaken on the 30th of May 2023, during the winter season in the Western Cape Province. Therefore, this assessment does not cover complete seasonal variation in conditions at the site. This is however, in the opinion of the specialist, of no material consequence to outcome of this assessment.
- The duration of the site assessment was approximately 4 hours which was sufficient to adequately assess the watercourse and the aquatic biodiversity risk posed by the proposed project.
- The watercourse 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.

Notwithstanding the above limitations, the specialist is of the opinion that the aquatic biodiversity constraints for the site 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.

2. Site Sensitivity Verification

According to the national web-based environmental screening tool report generated for the site, the Combined Aquatic Biodiversity Theme Sensitivity is classified as "Very High" (DFFE, 2023). The classification trigger is the location of the site 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 site - as identified by the national web-based environmental screening tool - must be confirmed by undertaking an Initial Site 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.

Following the aquatic biodiversity screening assessment of the proposed site on the 17th of August 2018, a natural UVB wetland was confirmed and delineated onsite (EnviroSwift, 2018). The wetland was confirmed, and an updated delineation was undertaken during a site assessment by Gericke and van Zyl (Delta Ecology, 2023) on the 30th of May 2023.

The wetland has been disturbed and transformed through the construction of the buildings, dam / depression, and access road. Despite this, it is clear from hydromorphic soil and hydrophytic vegetation indicators that both natural wetland function and habitat exist within the study area and form part of the larger wetland system of the Vermont Salt Pan. The proposed development is likely to impact the hydrology, water quality and wetland vegetation present. Encroachment of the development into the onsite wetland will impact the geomorphology of the wetland.

Given the confirmed presence of an onsite wetland which is likely to be impacted by the proposed development, the site was determined to be of "Very High" aquatic sensitivity. According to GN R. 320 of 2020, if the specialist determines that the Aquatic Biodiversity sensitivity of the site is "Very High", then a full Aquatic Biodiversity Impact Assessment must be compiled as part of the Basic Assessment (BA) process.

3. Methodology

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

3.1. Desktop Assessment

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

- Topographical and watercourse information from the Department of Rural Development and Land Reform (DRDLR);
- The South African Atlas of Climatology and Agrohydrology;
- Geological information from the Council for Geoscience;

- The SANBI (2018) National Vegetation Map (NVM);
- The National Wetlands Map Version 5 (NWM5 – CSIR 2018);
- The National Freshwater Ecological Priority Areas (NFEPA – CSIR, 2011) wetland, wetland vegetation group classification, river, and FEPA datasets;
- The Chief Directorate: National Geo-spatial Information (DRDLR) Rivers dataset;
- The Western Cape Biodiversity Spatial Plan (WCBSP, 2017).

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 **soil form** – Wetlands are generally associated with certain soil types;
3. The presence of **aquatic vegetation communities**;
4. 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**).

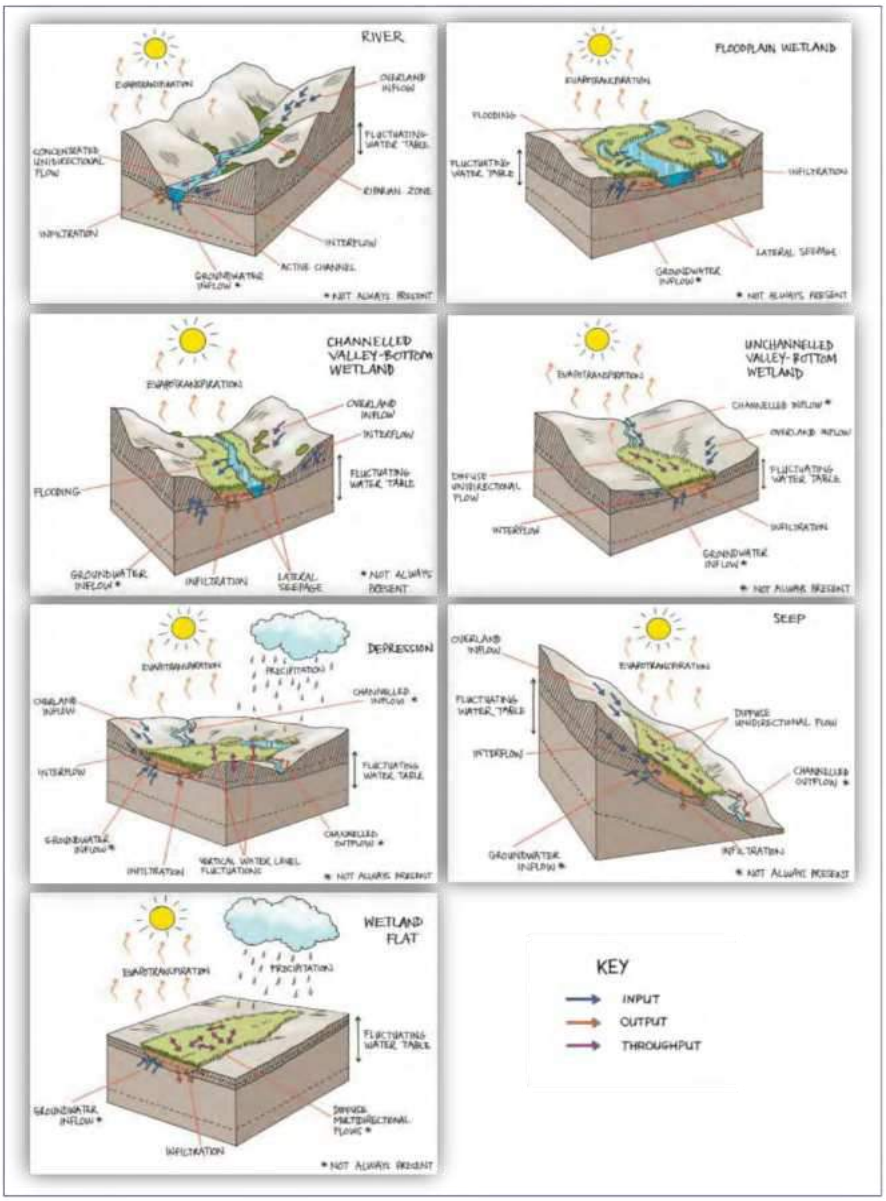

Figure 3-1: Wetland Hydrogeomorphic Types as defined in the Classification System for Wetlands and Other Aquatic Ecosystems in South Africa (Ollis *et al*., 2013).

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 risk matrix specified in GN. 509 of 2016 for the purpose.

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

According to the Council for Geoscience geological map (ENPAT), the soils in this region are dominated by grey regic sands and other soils. The geology onsite 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 vegetation in this area consists of Hangklip Sand Fynbos (**Figure 4-1**) 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 4-2**), which where CVB wetlands are present, is listed as Critically Endangered (CR) and Poorly Protected (PP).

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

Table 4-1: General characteristics of the proposed site.

Site 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-Gouritz	Water Management Areas (DWAF, 2011)
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)

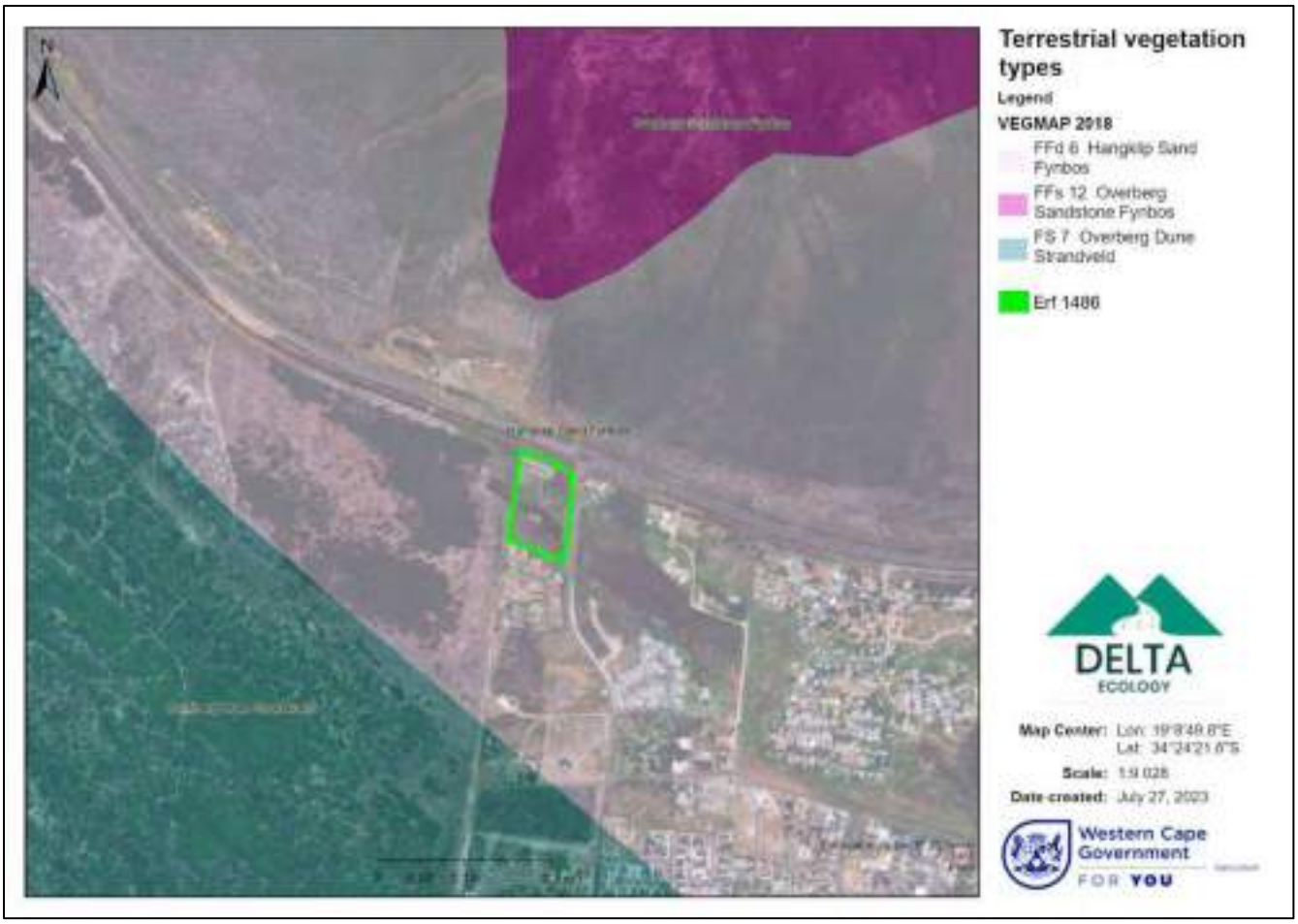

Figure 4-1: Terrestrial vegetation types (SANBI, 2018).

Figure 4-2: Wetland vegetation types (NFEPA, 2011).

4.2. Biodiversity Planning Context

The site under evaluation is located within the Breede-Gouritz Water Management Area, 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 site and the 500 m regulated area, the NFEPA wetland layer indicates the presence of a large unnatural Channelled Valley-Bottom (CVB) wetland system extending from the study area in a south-easterly direction and ultimately augmenting the Vermont Salt Pan (**Figure 4-3** and **Figure 4-4**). It was however the opinion of Job and Ratcliff (2006), EnviroSwift (2018) and this current assessment, that the wetland is a natural UVB wetland system. In addition, the National Geospatial Information Service (NGI) topo-cadastral map indicates two non- perennial drainage lines within 500 m of the study area which are likely associated with the identified wetland system (**Figure 4-4**).

Within the proposed site, the WCBSP identifies an aquatic ESA 2 (Restore) associated with the CVB wetland indicated by the NFEPA dataset (WCBSP, 2017) (**Figure 4-5**). The WCBSP identifies a range of aquatic and terrestrial Critical Biodiversity Areas 1 (CBAs) and Ecological Support Areas 2 (ESAs) within the 500 m regulated area, while located adjacent to the western boundary is the Hoek van de Berg Private Nature Reserve (**Figure 4-5**).

Figure 4-3: Watercourses within the proposed site (NFEPA, 2011).

Figure 4-4: Watercourses within 500m of the proposed site (CSIR, 2011).

Figure 4-5: CBAs, ESAs, and Protected Areas within the 500 m regulated area (WCBSP, 2017).

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 site is predicted to shift from the Csb Warm-summer Mediterranean climate zone to the BSh Arid, steppe, hot climate zone (**Figure 4-6**).

Figure 4-6: 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, however the soils present do contain high amounts of carbon. However, the wetland is small and degraded in nature. The wetland is therefore unlikely to contribute significantly towards climatic-change resilience and construction 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

The proposed site is located within Overstrand Local Municipality. The study area is bordered to the north by the R43 road reserve, to the west by the Hoek van der Berg Private Nature Reserve, to the south by a small residential housing estate and to the east by Lynx Road. The study area contains a gravel access road which enters the site from Lynx Road and terminates at the derelict buildings in the northwest corner of the study area.

The study site is situated on a gentle slope in a southerly direction at a gradient of between 1 % and 3 %. The gradient rises steadily from the northern study area boundary across the R43 trunk road to the Onrusberge mountains, where slopes in excess of 60 % are visible (**Figure 5-1**). **Figure 5-2** shows elevation (height above mean sea-level [AMSL] in metres) over distance via a straight line transect from the northern boundary to the southern boundary of the study area. The highest point of the study area is at the northern boundary approximately 34m AMSL, while the lowest point is towards the centre, and associated with the wetland at about 28,5m. The elevation rises slightly from this point to approximately 30 m AMSL at the southern boundary (**Figure 5-2**).

Vegetation within the study area was extensively disturbed, with a mixture of indigenous species such as *Senecio halimifolius* and the wetland obligate *Juncus kraussi* (**Figure 5-5**) alongside alien invasive species such as Kikuyu grass (*Cenchrus clandestinum*, refer to **Figure 5-6**) and pampas grass (Cortaderia selloana). While the latter species is not wetland obligate, it is commonly found in wetlands where it grows particularly densely (van Outshoorn, 2014). An additional wetland obligate species, *Typha capensis*, was also found in isolated patches during the site assessment (**Figure 5-8**).

Hydrology could be observed onsite, with runoff from the neighbouring housing estate's stormwater system into the depression clearly visible. Terrestrial soils within the study area are dark grey, sandy and appear to be well drained (**Figure 5-8A**). Soils that were sampled in wetter areas near the depression did not differ markedly from terrestrial soils, aside from appearing darker and with a higher organic content than the terrestrial baseline (**Figure 5-8B**). Mottling and gleying are not expected in this wetland. Mottling was however found in isolated patches on the southern periphery of the depression in brown soils that are likely the result of limited historical infilling (**Figure 5-9A**).

The wetland was delineated at the outer boundary of the temporary zone (**Figure 5-10**). The presence of saturated, high carbon soils (**Figure 5-9B**) and isolated instances of mottling within the upper 500 mm of the soil was used in conjunction with the presence of hydrophytic vegetation to delineate the wetland. The excavated depression represented the permanent zone (**Figure 5-10**).

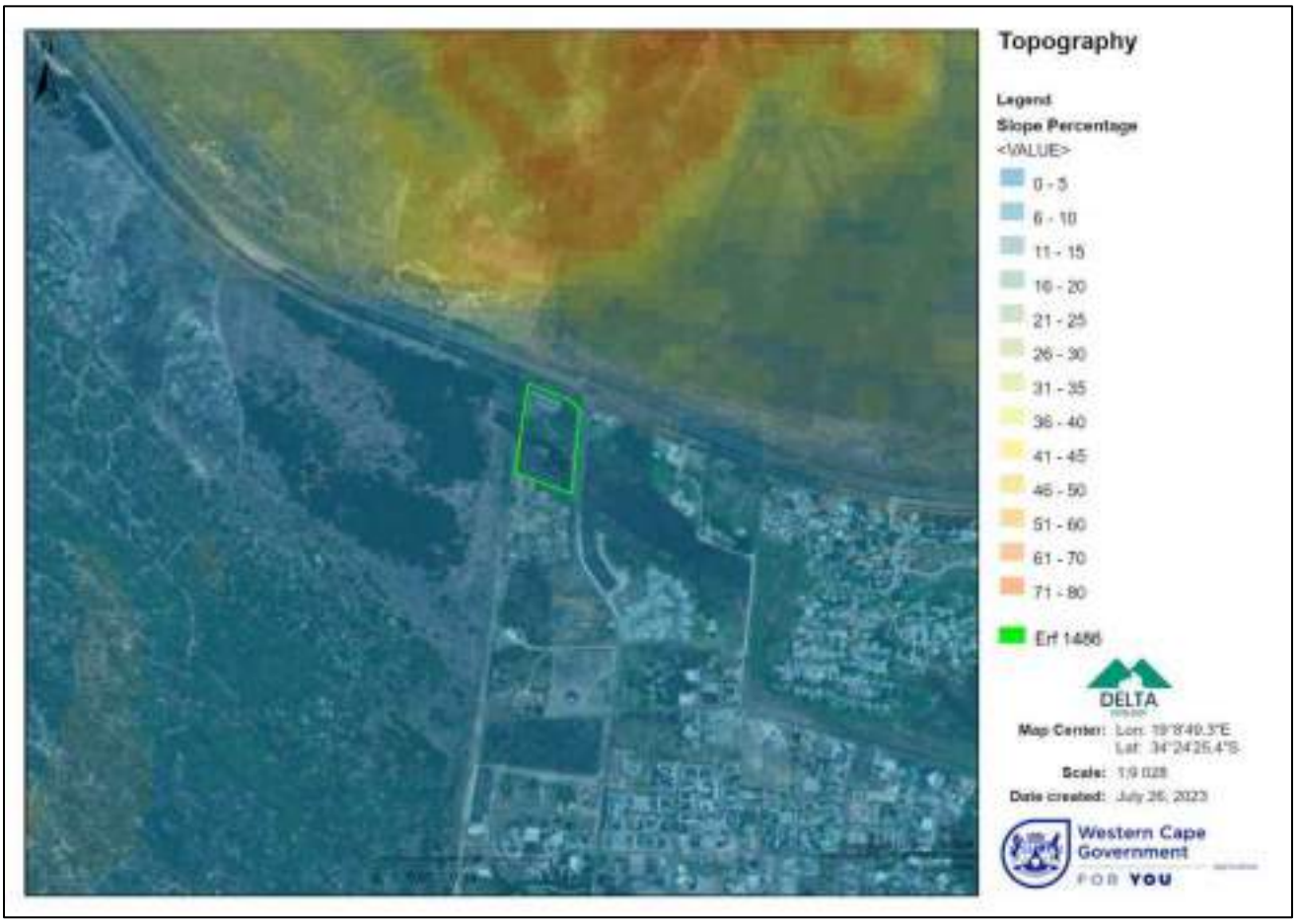

Figure 5-1: Topography of the study area and surrounds.

Figure 5-2: Elevation profile for the study area, showing height over distance from north to south.

Figure 5-3: Overview of the proposed site from the derelict buildings, facing south.

Figure 5-4: Derelict buildings located in the north of the proposed site.

Figure 5-5: Wetland obligate *Juncus kraussi* indicated by the arrow. This species, along with *Senecio halimifolius*, were used as primary indicators of the outer boundary of the wetland within the study area.

Figure 5-6: Dense clumps of alien invasive *Pennisetum clandestinum* along the edges of the depression within the study area, particularly where sediment dredged from the depression was dumped.

Figure 5-7: Additional wetland species *Typha capensis*, located in front of the derelict buildings onsite.

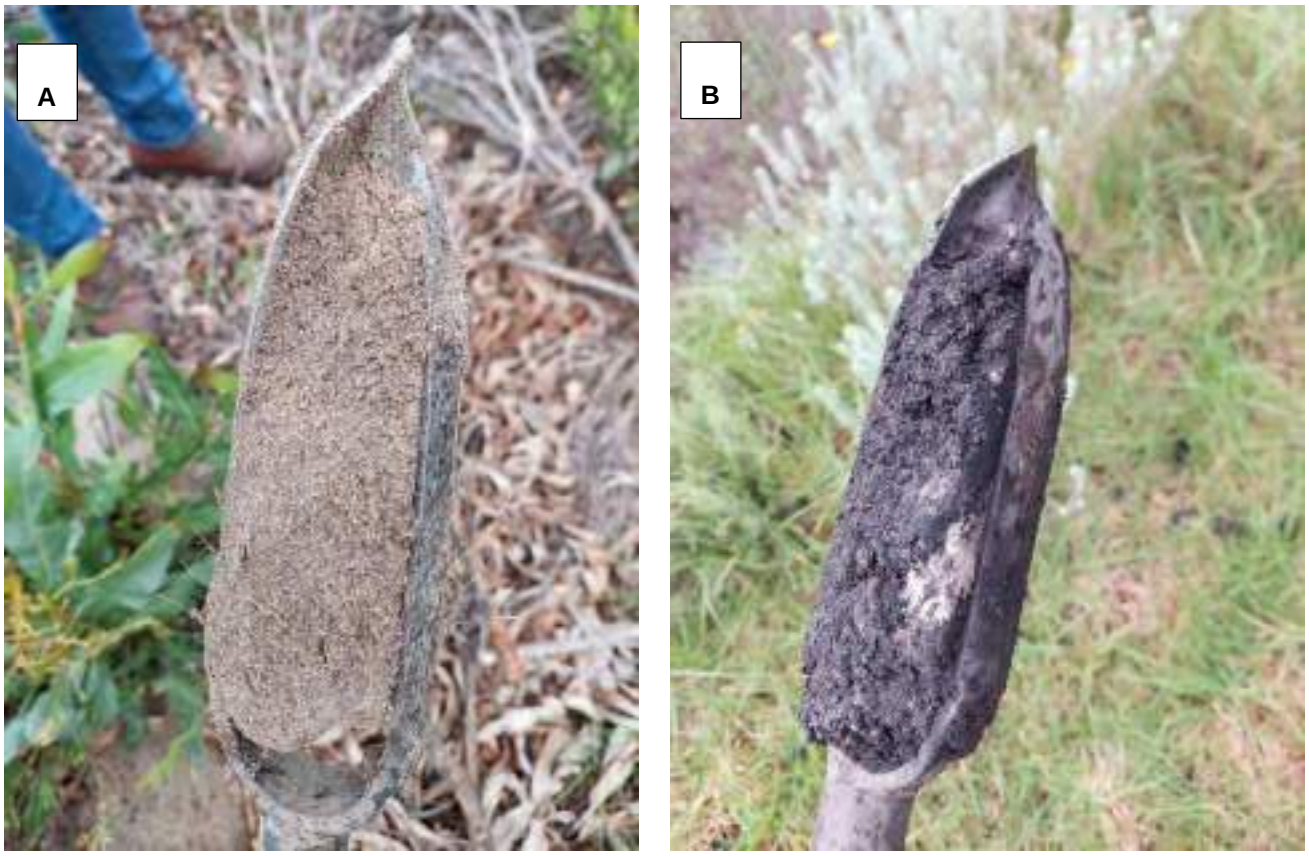

Figure 5-8: A) Near-surface soil sample, showing typical terrestrial soil conditions within the study area. Terrestrial soils within the study area are sandy, characterised by a uniform grey - brown colour, with no mottling, gleying or organic matter visible. B) Near-surface soil sample, taken within a wet area; darker chroma observed.

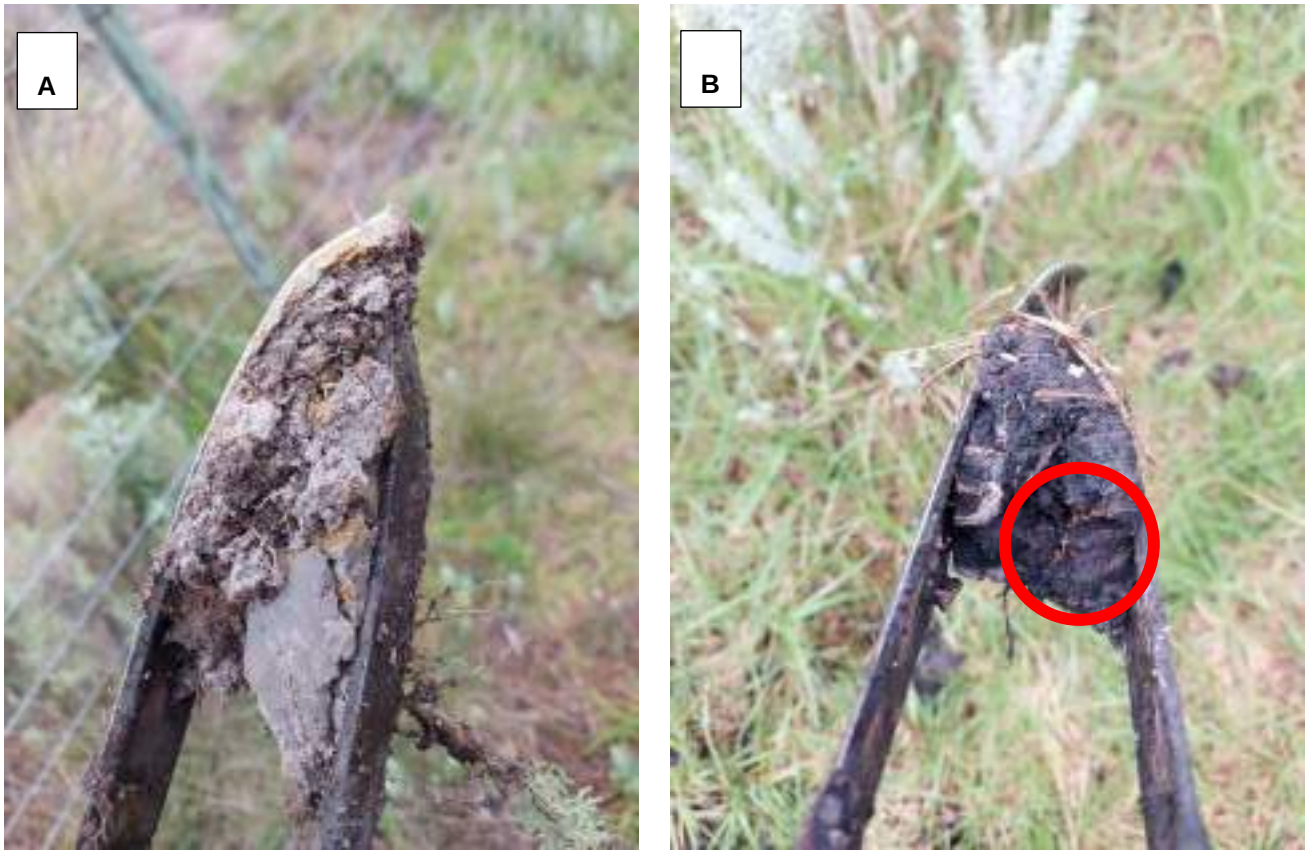

Figure 5-9: A) Soil taken from within a wet area. Rusty orange-coloured mottles are observed; alongside fill material and B) rusty orange mottle (red circle) observed in high carbon, dark soils from a wet area.

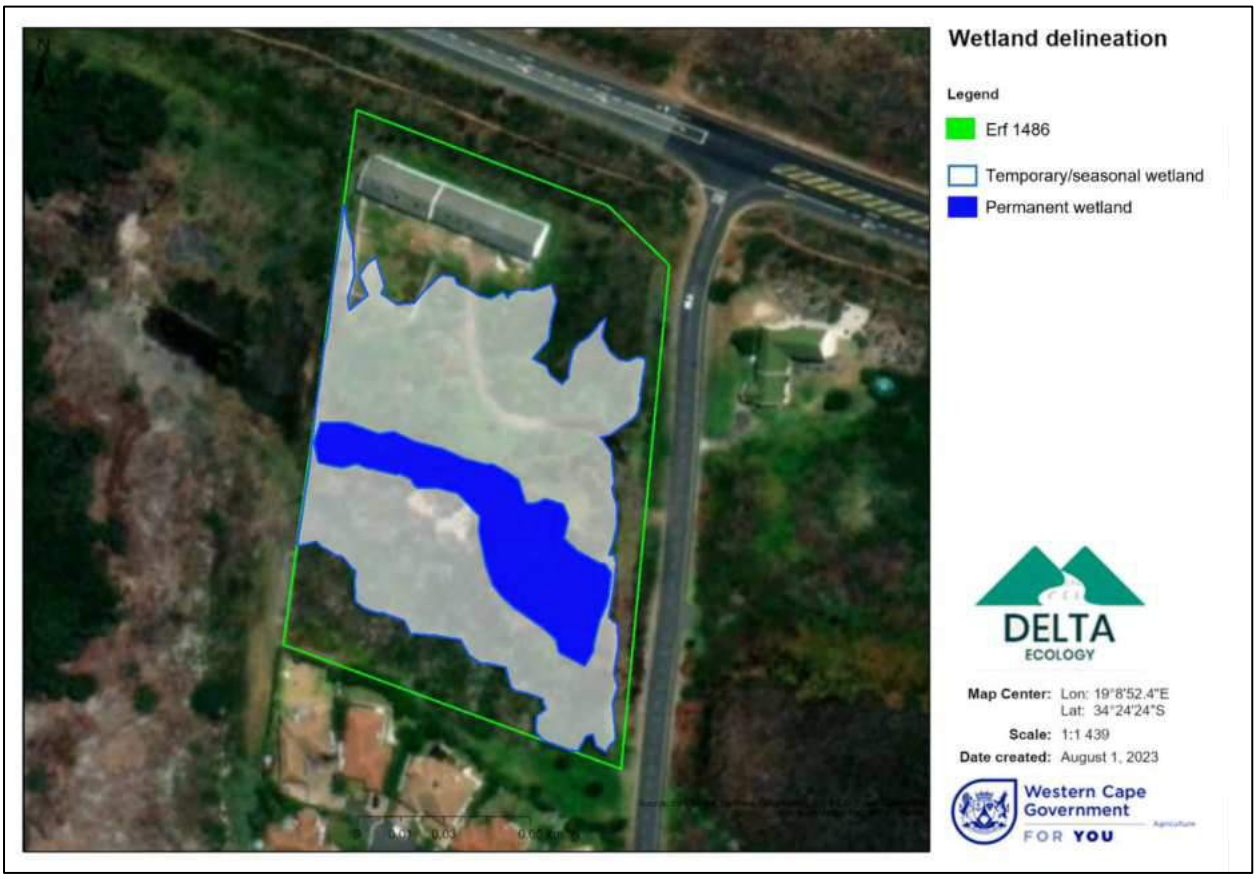

Figure 5-10: Delineated wetlands within Erf 1486.

Figure 5-11: Delineated wetland boundaries within Erf 1486, indicating the 32 m regulated area in orange.

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 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 Present Ecological State (PES) of the UVB wetland was assessed using the Macfarlane *et al*. (2020) WET-Health Version 2.0 method which includes four assessment units, namely hydrology, geomorphology, water quality, and vegetation.

The Macfarlane *et al*. (2020) WET-Health Version 2.0 assessment produced an overall Present Ecological State (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 assessment results for the wetland are presented in **Table 6-1** and the definitions of the ecological categories are presented in **Table 6-2**. The key factors that influenced the scoring are summarised below.

Hydrology

- The natural flow regime of the UVB Wetland (UVBW) has been altered as a result of onsite disturbances such as the excavation to create the centre depressional area, historical vegetation clearing and infilling, and catchment hardening associated with the dirt track and derelict houses onsite.
- Although there is an overflow pipe that crosses beneath Lynx Road and flows into the wetland on the far side, the construction of Lynx Road, and excavation within the centre of the site, has created a dam within the centre of the UVBW.
- The presence of nutrient rich laterite, in soils that are naturally nutrient poor, such as those on the proposed development area, are associated with the dominance of invasive species such as the dense clumps of Kikuyu grass (*Pennisetum clandestinum*) seen onsite, 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 in the wetland's immediate catchment area. Urban land use such as residential areas and tarred roads have resulted in flow diversion and catchment hardening which is associated with increased runoff and storm peak flows.
- Additionally, a stormwater outlet is located in the southeast corner of the study area, which discharges runoff from the neighbouring housing development into the wetland.

Vegetation

- While several communities of indigenous hydrophytic species were noted onsite, there was moderate vegetation disturbance within the wetland area as a result of:
    - The excavation of the dam onsite;
    - Large areas of the site were brushcut during 2004;
    - Construction activities associated with the derelict houses onsite;
    - Dumping of rubble within the wetland area.
- The vegetation present within the wetland is characterised by a mixture of alien and indigenous vegetation. Alien invasive species noted onsite include dense clumps of Kikuyu grass (*Cenchrus clandestinum*) and pampas grass (*Cortaderia selloana*).
- No species of conservation concern were noted. According to the Botanist appointed for the proposed project, at least one plant SoCC (*Disa hallackii*) may be present in low numbers (Nick Helme Botanical Surveys, 2023).

Geomorphology

- The geomorphology of the UVBW wetland was largely modified by the excavation of the depressional / dam area in the centre of the site.
- Additionally, historical vegetation clearing, infilling, and hardening across large areas of the site has resulted in extensive disturbance to the wetland's 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 along the east of the wetland area seriously altered this portion of the UVBW's geomorphology.

Water Quality

- The water quality within the UVB wetland has been disturbed because of the adjacent infilling and compaction of the southern portion of the Erf which has resulted in:
    - Leaching of toxicants and nutrients from the infilling materials such as hydroxyl ions from cement particles and nitrates from laterite.
- The water quality within the wetland is likely to be impacted by the residential nature of the catchment.
- It is likely that runoff entering the wetland through the stormwater outlet in the southeast corner is 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.

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

PES Assessment	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	5.6	4.4	3.0	3.0
PES Score (%)	44%	56%	70%	70%
Ecological Category	**D**	**D**	**C**	**C**
Combined Impact Score	4.2			
Combined PES Score (%)	58%			
Combined Ecological Category	**D**			
Hectare Equivalents	0.5 Ha			

Table 6-2: Descriptions and definitions of the impact scores.

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

6.2. Ecosystem Services

The UVB wetland's contribution to ecosystem services was assessed using the WET-EcoServices Version 2 methodology. The method includes the assessment of sixteen potential ecosystem services including both direct and indirect human benefits.

Importance scores were all within the 'Very Low' to 'Moderately Low' category for the wetland to ecosystem services, apart from sediment trapping, phosphate assimilation, toxicant assimilation, and carbon storage.

The assessment results are summarised in **Table 6-3**. The score categories and their descriptions are provided in **Table 6-2**. The reasoning behind the ecosystem services scores is summarised below:

- In terms of regulatory and supporting services, the CVBW wetland could supply a high amount of flood attenuation, stream flow regulation, erosion control and nitrate assimilation services. The demand for these services is limited by the largely natural land use within the upstream, broader catchment area and demand / requirements of downstream users (few people immediately downstream who would be affected by flooding). Therefore the significance is Low to Moderately Low.
- UVBWs provide a high level of sediment trapping, phosphate assimilation, and toxicant assimilation services due to their gentle gradient, ability to diffuse low and peak flows, and permanent wetness. There is demand for these services due to the residential/urban landuse within the immediate surrounding catchment area (residential development to the south, Storm Water outlet 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. In addition, the wetland is located within a vegetation type that is Critically Endangered (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 Very Low.
- Similar to other UVBW's, there is a moderate importance associated with carbon storage services which this wetland provides. There is a 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 carbon sequestration.
- The delineated UVBW could provide certain provisioning services, such as cultivated foods, however the demand for these ecosystem services is low as the Erf is currently not being used for agricultural or livestock farming besides a limited amount of Beekeeping / Honey Production. Thus, the importance score remains Very Low for these provisioning services.
- Similarly, the wetland could supply cultural or spiritual ecosystem services to an extent, likely due their aesthetic pleasing location, however the demand is low as the property is privately owned with limited access to the public and therefore the importance of these ecosystem services is Very Low.

Table 6-3: The outcome of the ecosystem services assessment for the delineated UVBW.

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	2.5	0.8	1.4	Moderately Low
	Stream flow regulation	2.7	0.3	1.3	Moderately Low
	Sediment trapping	3.0	1.0	2.0	Moderate
	Erosion control	2.4	0.5	1.2	Low
	Phosphate assimilation	2.0	3.0	2.0	Moderate
	Nitrate assimilation	2.7	1.0	1.7	Moderately Low
	Toxicant assimilation	3.0	2.0	2.5	Moderately High
	Carbon storage	2.3	2.7	2.1	Moderate
	Biodiversity maintenance	0.3	2.0	0.0	Very Low
PROVISIONING SERVICES	Water for human use	1.6	0.7	0.4	Very Low
	Harvestable resources	0.5	0.7	0.0	Very Low
	Food for livestock	1.5	0.0	0.0	Very Low
	Cultivated foods	2.1	0.0	0.6	Very Low
CULTURAL SERVICES	Tourism and Recreation	1.3	0.0	0.0	Very Low
	Education and Research	1.0	0.0	0.0	Very Low
	Cultural and Spiritual	2.0	0.0	0.5	Very Low

Table 6-4: Score categories and descriptions.

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.

6.3. Ecological Importance and Sensitivity

The EIS method used to assess the wetland was based on the Rountree *et al*. 2013 method. Hydro-functional importance and direct human benefits were assessed using the updated and more detailed 2020 WET-EcoServices method and these sections were therefore omitted from the EIS assessment.

The wetland achieved a median score of 2.0 which falls within the "Moderate" category. The results of the assessment and the reasoning behind the scores are presented in **Table 6-5**.

Table 6-5: Results of the EIS assessment.

Ecological Importance and Sensitivity	UVB Wetland	Reason
Biodiversity Support (Median)	**0.67**	
Presence and status of Red Data species:	1	None noted. At least two bird Species of Conservation Concern (SoCC) may use the site for foraging, and at least one plant SoCC (*Disa hallackii*) may be present in low numbers, but no plant or animal SoCC were recorded on site during the survey. The Cape Dwarf Chameleon (*Bradypodion pumilum)* is listed as Vulnerable, and may occur on site (Nick Helme Botanical Surveys, 2023).
Populations of unique species/uncommonly large populations of wetland species:	0	None noted.
Migration/breeding/feeding sites:	1	Possibility to be a breeding site for hardy amphibians.

Ecological Importance and Sensitivity	UVB Wetland	Reason
(Importance of the unit for migration, breeding sites and/or feeding):		
Landscape Scale (Median)	**0.60**	
Protection status of the wetland: (National (4), Provincial/Private (3), municipal (1 or 2), public area (0 or 1)	0	The wetland 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)	2	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)	0	PES – D for the UVBW.
Size and rarity of the wetland type/s present: (Identification and rarity assessment of wetland types)	0	CR status indicates slight rarity, but degraded status has left only common, tolerant elements of the ecosystem intact.
Diversity of habitat types: (Assessment of the variety of wetland types present within a site)	1	One wetland type present in a largely modified ecological condition; however representation of permanent and seasonal – temporary zones provide a limited 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 may be sensitive to flooding due to the stormwater outlet observed onsite; and the construction of Lynx Road downstream/along the eastern boundary of the wetland area. However, 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 site, creating a dam within the centre of the UVBW.
Sensitivity to changes in low flows/dry season: (Unchanneled VB's probably most sensitive)	2	Although UVBW's are naturally very sensitive to changes in low flows/dry season; the wetland is

Ecological Importance and Sensitivity	UVB Wetland	Reason
		augmented by SW flow from adjacent residential areas.
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 the 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.

7. Aquatic Impact Identification

The proposed project entails the proposed subdivision of Erf 1486, Vermont, to create several erven for single residential use and one erf in the south for group housing (**Figure 1-2**).

At present the proposed development area (as a whole) coincides with approximately 0.22 Ha i.e. 24 % of the seasonal/temporary zone of the UVBW (**Figure 7-1**). The remaining delineated wetland area will be set aside for Private Open Space.

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

Construction Phase

1. Areas of the onsite UVBW will potentially be lost (i.e. complete loss in flow regime, water quality, vegetation, and geomorphic structure) as a result of the private road construction, and residential housing.
2. Alteration of the flow regime of the UVBW during construction of the residential housing.
3. Water quality impairment due to increased sediment input, potential spillage, or release of potentially contaminated runoff into the UVBW during construction of the residential housing.

Operational Phase

4. Alteration of the flow regime of the UVBW once the housing development is complete, due to potential flow diversion / increase in storm flows.
5. Water quality impairment due to the release of potentially contaminated stormwater (hydrocarbons) into the UVBW.

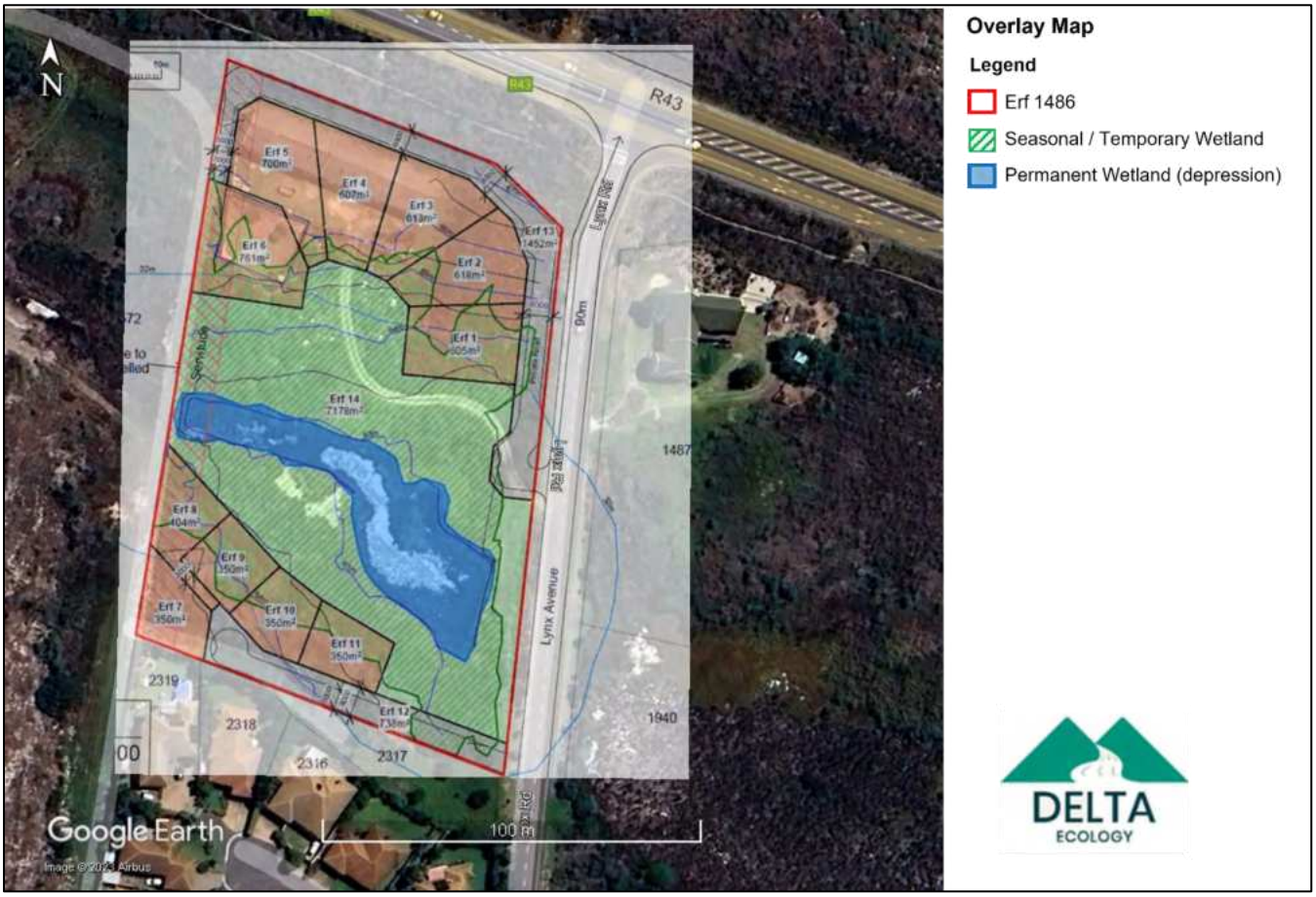

Figure 7-1: Preferred Layout (Alternative 4) for the site overlain with the delineated UVBW onsite. This preferred layout has minimal wetland encroachment.

8. Impact Assessment

The five potential aquatic impacts identified in Section 7 were assessed first without and then with application of mitigation measures. Four out of the five of the post-mitigation scores fell within the "Low" to "Very Low" impact categories. Wetland loss received the highest impact significance score, which fell within the 'Medium' category.

The proposed layout has gone through various iterations in order to ensure that the layout overlapping with the delineated wetland area is minimal. Ordinarily, wetland loss would fall within the 'high' category, but the limited area of wetland loss (0,22 Ha) and the degraded nature of the wetland has reduced the impact significance.

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.

8.1. Construction Phase

Table 8-1: Assessment results for Impact 1

Impact 1: Wetland Loss in the delineated UVBW				
Description		At present the proposed development area (as a whole) coincides with approximately 0.22 Ha i.e. 24 % of the seasonal/temporary zone of the UVBW. The remaining delineated wetland area will be set aside for Private Open Space. The UVBW has a PES score in the D category (Largely Modified), however still offers ecosystem services of moderately high importance and exhibits Moderate EIS. The wetland vegetation type is CR and although the fynbos onsite is considered senescent, there could potentially be SoCC. There is also hydrological connection to the Vermont Salt Pan downstream which is an NFEPA designated wetland area.		
Mitigation Measures		The only mitigation applicable to wetland loss is reduction of the area of loss. It is recommended that the proposed residential areas are positioned within the proposed new Erven so as to avoid the delineated wetland area. Should the proposed residential developments avoid the wetland area entirely, the impact of Wetland Loss, as assessed in this report, will not be applicable. It is however noted that this may not be possible for proposed new Erven 1 and 8.		
	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	4	High / Very 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	3	Medium	0	Not Applicable
Cumulative Impact	3	Medium	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	5	Definite	0	Not Applicable
Impact Significance				
Consequence	3,00	Medium	0,00	Not Applicable
Probability	5.00	Very High	0,00	Not Applicable
Impact Significance	**3,40**	**Medium**	**0,00**	**Not Applicable**

Table 8-2: Assessment results for Impact 2

Impact 2: Altered flow regime within the delineated UVBW				
Description		**Site clearance, infilling and compaction will result in alteration of the flow regime of the UVBW.**		
Mitigation Measures		**The significance of this impact can be largely mitigated by demarcating the UVBW wetland area as a No-Go area during construction, conducting rehabilitation within this wetland area; and by ensuring that SW generated onsite flows into the wetland through an appropriately designed broad, vegetated earth swale (to avoid erosion). If possible, conduct construction activities of dwellings, associated stormwater infrastructure and any rehabilitation activities during summer months (November to March). The alien invasive vegetation present within the wetland area must be removed and replanted with indigenous wetland vegetation. It is recommended that a suitably qualified aquatic specialist compiles detailed method statements once the final layout of the proposed project has been formalized. Additionally, a suitable Rehabilitation and Management Plan should be drafted for the wetland area onsite.**		
	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	3	Medium / Harmful	3	Medium / Harmful
Duration of Impact	5	Beyond 20 years / Permanent	1	Up to 1 month
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	2	Low-cost rehabilitation / Moderately high likelihood of success	1	Passive restoration / High likelihood of success
Loss of irreplaceable resources	1	None	1	None
Cumulative Impact	2	Low	1	None
Probability				
Frequency of the Activity	1	Once off activity / less than once in 20 years	1	Once off activity / less than once in 20 years
Likelihood of the Incident / Impact occurring	5	Definite	3	Possible
Impact Significance				
Consequence	2,27	Medium	1,72	Low

Probability	5.00	Very High	2,00	Low
Impact Significance	**2,56**	**Low – Medium**	**1,77**	**Low**

Table 8-3: Assessment results for Impact 3

Impact 3: Water Quality Impairment within the UVBW				
Description		**Accidentally spilled cement, construction chemicals, sewage from temporary toilets or petrochemicals from construction vehicles may find their way into the remnant wetland area.**		
Mitigation Measures		**The significance of this impact can be largely mitigated by demarcating the UVBW as No-Go area during construction. Bunded, impervious areas that are more than 15 m away from the UVBW must be designated by an Environmental Control Officer for temporary toilets, vehicle parking/servicing areas, and for pouring and mixing of concrete/cement, paint, and chemicals.**		
	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	3	Medium / Harmful	1	Very Low / Non-harmful
Duration of Impact	1	Up to 1 month	1	Up to 1 month
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	1	Passive restoration / High likelihood of success	1	Passive restoration / High likelihood of success
Loss of irreplaceable resources	1	None	1	None
Cumulative Impact	1	None	1	None
Probability				
Frequency of the Activity	1	Once off activity / less than once in 20 years	1	Once off activity / less than once in 20 years
Likelihood of the Incident / Impact occurring	3	Possible	2	Unlikely
Impact Significance				

Consequence	1,72	Low	1,00	Very Low
Probability	2,00	Low	1,50	Very Low
Impact Significance	**1,77**	**Low**	**1,10**	**Very Low**

8.2. Operational Phase

Table 8-4: Assessment results for Impact 4

Impact 4: Altered flow regime within the UVB wetland				
Description		**Site clearance, infilling and compaction will result in alteration of the flow regime for the onsite wetland.**		
Mitigation Measures		**The significance of this impact can be largely mitigated by ensuring that SW generated onsite flows into the wetland through an appropriately designed broad, vegetated earth swale (to avoid erosion). If possible, conduct any rehabilitation activities during summer months (November to March). It is recommended that a suitably qualified aquatic specialist compiles detailed method statements once the final layout of the proposed project has been formalized. Additionally, a suitable Rehabilitation and Management Plan should be drafted for the wetland area onsite.**		
	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	3	Medium / Harmful	3	Medium / Harmful
Duration of Impact	5	Beyond 20 years / Permanent	1	Up to 1 month
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	2	Low-cost rehabilitation / Moderately high likelihood of success	1	Passive restoration / High likelihood of success
Loss of irreplaceable resources	1	None	1	None
Cumulative Impact	2	Low	1	None
Probability				
Frequency of the Activity	1	Once off activity / less than once in 20 years	1	Once off activity / less than once in 20 years

Likelihood of the Incident / Impact occurring	5	Definite	3	Possible
Impact Significance				
Consequence	2,27	Medium	1,72	Low
Probability	5.00	Very High	2,00	Low
Impact Significance	**2,56**	**Low – Medium (Negative)**	**1,77**	**Low**

Table 8-5: Assessment results for Impact 5

Impact 5: Water quality impairment of the UVBW				
Description		**Pollutants may enter the onsite wetland via stormwater or sewage leaks (although highly unlikely).**		
Mitigation Measures		**Repair all sewage leaks as soon as reasonably possible after detection. Inspection of all sewage pipes should be conducted by a plumber once every 10 years. The positive aspect of rehabilitation will likely compensate for any negative water quality impacts to the wetland area.**		
	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	3	Medium / Harmful	1	Very Low / Non-harmful
Duration of Impact	1	Up to 1 month	1	Up to 1 month
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	1	Passive restoration / High likelihood of success	1	Passive restoration / High likelihood of success
Loss of irreplaceable resources	1	None	1	None
Cumulative Impact	1	None	1	None
Probability				

Frequency of the Activity	1	Once off activity / less than once in 20 years	1	Once off activity / less than once in 20 years
Likelihood of the Incident / Impact occurring	3	Possible	2	Unlikely
Impact Significance				
Consequence	1,72	Low	1,00	Very Low
Probability	2,00	Low	1,50	Very Low
Impact Significance	**1,77**	**Low**	**1,10**	**Very Low**

Table 8-6: 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	2	Low / Slightly 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	1	Passive restoration / High likelihood of success	0	Not Applicable
Loss of irreplaceable resources	1	None	0	Not Applicable
Cumulative Impact	1	Very 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	3	Possible	0	Not Applicable
Impact Significance				
Consequence	1,72	Very Low	0,00	Not Applicable
Probability	2	Very Low	0,00	Not Applicable
Impact Significance	**0,74**	**Very Low**	**0,00**	**Not Applicable**

9. Risk Assessment

The Risk Assessment Matrix prescribed by GN 509 of 2016 was applied to the proposed project with the following outcomes:

1. The risk associated with Impact 1 (wetland loss), was found to be within the Moderate - High Risk category.
    - The delineated UVBW has a PES score in the D category (Largely Modified), exhibits High EIS and offers Moderately High ecosystem services.
    - The historical wetland vegetation type is CR.
    - There is hydrological connection to downstream wetland areas of importance (Vermont Salt Pan).
2. The risks associated with Impacts 2-5 were all found to fall within the Low-Risk category. The key factors included:
    - The impacts pertain to the limited extent of a natural UVBW which has been impacted historically and is considered to be in a largely modified condition.
    - With the implementation of appropriate mitigation / management measures, the risk of the impacts can be largely reduced / minimized onsite.

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 site assessment on the 30th of May 2023, during the winter season. Although the site was found to be disturbed in nature, given the confirmed presence of a wetland which is likely to be impacted by the proposed development, the site 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 site 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	Moderately High	D-C

Although the condition of the UVB wetland was largely disturbed, the moderate to moderately high EIS and WES scores indicates that the wetland is moderately sensitive and important in terms of conservation planning or provision of ecosystem services.

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 GN509 of 2016.

The results of the assessment of wetland loss along with four more minor impacts during the construction and operational phases, given implementation of the listed mitigation measures, are summarised in **Table 10-2.**

Table 10-2: Summary of impact/risk assessment results (with mitigation).

	Rating	Risk Class	Applicable to	Mitigation Measures
Construction Phase				
Impact 1: Wetland Loss	Medium	Moderate	UVBW	The only mitigation applicable to wetland loss is reduction of the area of loss. It is recommended that the proposed residential areas / houses are positioned within the proposed new Erven so as to avoid the delineated wetland area. Should the proposed residential developments avoid the wetland area entirely, the impact of Wetland Loss, as assessed in this report, will not be applicable. It is however noted that this may not be possible for proposed new Erven 1 & 8. The proposed layout has gone through various iterations in order to ensure that the footprint within the delineated

				wetland area is minimal. Ordinarily, wetland loss would fall within the 'high' category, but the limited area of wetland loss (0,22 Ha) and the degraded nature of the wetland has reduced the impact significance.
Impact 2: Altered flow	Very Low	Low	UVBW	The significance of this impact can be largely mitigated by demarcating the UVBW wetland area as a No-Go area during construction, conducting rehabilitation within this wetland area; and by ensuring that SW generated onsite flows into the wetland through an appropriately designed broad, vegetated earth swale (to avoid erosion). If possible, conduct construction activities of dwellings, associated stormwater infrastructure and any rehabilitation activities during summer months (November to March). The alien invasive vegetation present within the wetland area must be removed and replanted with indigenous wetland vegetation. It is recommended that a suitably qualified aquatic specialist compiles detailed method statements once the final layout of the proposed project has been formalized. Additionally, a suitable Rehabilitation and Management Plan should be drafted for the wetland area onsite.
Impact 3: Water Quality Impairment	Very Low	Low	UVBW	The significance of this impact can be largely mitigated by demarcating the UVBW as No-Go area during construction. Bunded, impervious areas that are more than 15 m away from the UVBW must be designated by an Environmental Control Officer for temporary toilets, vehicle parking/servicing areas, and for pouring and mixing of concrete/cement, paint, and chemicals.
Operational Phase				
Impact 4: Altered flow	Very Low	Low	UVBW	The significance of this impact can be largely mitigated by ensuring that SW generated onsite flows into the wetland through an appropriately designed broad, vegetated earth swale (to avoid erosion). If possible, conduct any rehabilitation activities during summer months (November to March). It is recommended that a suitably qualified

				aquatic specialist compiles detailed method statements once the final layout of the proposed project has been formalized. Additionally, a suitable Rehabilitation and Management Plan should be drafted for the wetland area onsite.
Impact 5: Water quality impairment	Very Low	Low	UVBW	Repair all sewage leaks as soon as reasonably possible after detection. Inspection of all sewage pipes should be conducted by a plumber once every 10 years. The positive aspect of rehabilitation will likely compensate for any negative water quality impacts to the wetland area.
"No Go" Scenario: Gradual decrease in ecological condition in wetlands	Very Low	Not Assessed	UVBW	None

Four out of five of the post-mitigation scores fell within the within the "Low" to "Very Low" impact categories. Wetland loss received the highest impact significance score, which fell within the 'Medium' category.

The proposed layout has gone through various iterations in order to ensure that the layout overlapping with the delineated wetland area is minimal. Ordinarily, wetland loss would fall within the 'high' category, but the limited area of wetland loss (0,22 Ha) and the degraded nature of the wetland has reduced the impact significance.

Although it is unknown whether the development area would be further developed in future, it is assumed that the site would remain as is. 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.

The Moderate risk rating confirms that a Water Use Licence will be required for this project due to the encroachment into the onsite wetland. It is furthermore highlighted that a suitable wetland offset and associated Wetland Offset, Rehabilitation, and Management Plan will be required for the project in terms of the DHSWS 'no net loss' policy (Macfarlane *et al*, 2014).

It is the opinion of the specialist that rehabilitating the remnant UVBW onsite will be a feasible and acceptable offset for the proposed development.

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, as well as the implementation of a suitable Wetland Offset, Rehabilitation and Management Plan.

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.2.6.10.

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.2.6.10.

DEADP. 2014. Western Cape Climate Change Response Strategy.

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

Delta Ecology. 2023. Aquatic Biodiversity Impact Assessment Erf 1486 Vermont. Delta Ecology. RSA

DFFE. 2023. National Web based Environmental Screening Tool.

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

DWAF. 2011. Water Management Areas. CapeFarmMapper Ver.2.6.10.

ENPAT. 2021. Soils & Geology (ENPAT). Cape Farm Mapper ver 2.6.10.

ENVIROSWIFT. Freshwater Screening of Erf 1486, Vermont, Western Cape Province. RSA.

Nick Helme Botanical Surveys. 2023. Terrestrial biodiversity assessment of proposed subdivision of Erf 1486 Vermont, Western Cape.

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.