



**WETLAND BASELINE AND IMPACT ASSESSMENT
FOR THE PROPOSED HOUSING DEVELOPMENT,
FARM 1388, KUILS RIVER**

**City of Cape Town Municipality, Western Cape
Province, South Africa**

10/3/2025

Prepared by:

The Biodiversity Company

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

Report Name	WETLAND BASELINE AND IMPACT ASSESSMENT FOR THE PROPOSED HOUSING DEVELOPMENT, FARM 1388, KUILS RIVER	
Specialist Theme	Aquatic Biodiversity Theme	
Project Reference	Proposed Housing Development	
Report Version	10/3/2025	Draft 1
Environmental Assessment Practitioner		
Fieldwork, Delineations & Assessments	Rowan Buhrmann (Pr Sci Nat 136853)	
Report Writer	Andrew Husted (Pr. Sci. Nat. 400213/11)	
Reviewer	Namitha Singh (Pr. Sci. Nat. 157927)	
Declaration	<p>The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.</p>	

Table of Contents

1	Introduction.....	6
1.1	Background	6
1.2	Scope of Work.....	7
1.3	Project Description and Technical Information.....	8
1.4	Assumptions and Limitations	8
1.5	Key Legislative Requirements.....	9
1.6	National Water Act (NWA, 1998)	9
2	Results & Discussion	10
2.1	Hydrological Characteristics.....	10
2.2	Ecologically Important Landscape Features	10
2.3	Sub-Quaternary Reaches.....	14
2.4	Wetland Field Survey	14
2.4.1	Delineation	14
2.4.2	Risk Screening.....	15
2.4.3	Classification and Description	16
2.5	Functional and Ecological Assessment.....	17
2.5.1	General Functional Description	17
2.5.2	Ecosystem Services	17
2.5.3	Present Ecological State.....	18
2.5.4	Ecological Importance and Sensitivity	18
2.5.5	Recommended Ecological Category and Recommended Management Objective	18
2.5.6	Screening Tool Comparison	18
2.6	Buffer Requirements	19
2.6.1	Regulation Zones.....	20
3	Risk Assessment.....	21
3.1	Mitigation Measures	24
3.1.1	General Measures	24
3.1.2	Construction Phase	25
3.1.3	Operational Phase	25
3.2	Recommendations	26
4	Conclusion.....	27
4.1	Risk and Impact Statement	27

4.2	Specialist Opinion.....	27
5	References.....	28
6	Appendix Items.....	30
6.1	Appendix A – Methodology	30
6.1.1	Ecologically Important Landscape Features.....	30
6.1.2	City of Cape Town Wetlands Dataset.....	30
6.1.3	Wetland Field Survey.....	31
6.1.4	Wetland Functional and Ecological Assessment.....	32
6.1.5	Buffer Requirements.....	33
6.2	Appendix B – Risk and Impact Assessment	33
6.2.1	Risk Assessment	33
6.3	Appendix C – Specialist Declaration of Independence	34
6.4	Appendix D – Specialist CVs	35

List of Tables

Table 1-1	A list of key legislative requirements	9
Table 2-1	Summary of relevance of the proposed project to ecologically important landscape features 10	
Table 2-2	Summary of the Present Ecological State of the SQRs associated with the project area (DWS, 2014) 14	
Table 2-3	Summary of wetland area within the project area of influence	14
Table 2-4	Risk status of the delineated wetlands.....	16
Table 2-5	Wetland classification as per SANBI guideline (Ollis et al., 2013).....	16
Table 2-6	Summary of the functional and ecological assessment.....	17
Table 2-7	Summary of the screening tool vs specialist assigned sensitivities.....	18
Table 2-8	Buffer requirements for the relevant wetland features	20
Table 2-9	Legislated zones of regulation	20
Table 3-1	Summative results of the Risk Assessment conducted for the proposed activities.....	23
Table 6-1	Classes for determining the likely extent to which a benefit is being supplied	32
Table 6-2	The Present Ecological Status categories (Macfarlane et al., 2009)	32
Table 6-3	Description of Ecological Importance and Sensitivity categories.....	33
Table 6-4	Recommended Ecological Category and Recommended Management Objectives for water resources based on Present Ecological State and Ecological Importance and Sensitivity scores 33	
Table 6-5	Significance ratings matrix	33

List of Figures

Figure 1-1	Map depicting the regional context of the Project Area of Influence (PAOI).	6
Figure 1-2	Map depicting the local context of the Project Area of Influence (PAOI).	7
Figure 2-1	Site Quaternary Catchment Setting	10
Figure 2-2	Strategic Water Source Areas that overlap with the project area of influence	11
Figure 2-3	South African Inventory of Inland Aquatic Ecosystems that overlap with the project area of influence	12
Figure 2-4	Wetland and river features identified within the project area of influence.....	13
Figure 2-5	Wetland features identified within the project area of influence according	13
Figure 2-6	Delineation of the water resources within the project area and project area of influence	15
Figure 2-7	Representative photographs of the Kuils River floodplain system.....	15
Figure 2-8	Amalgamated diagram of a typical floodplain, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al., 2013).....	16
Figure 2-9	The aquatic biodiversity theme sensitivity for the project area	19
Figure 3-1	The mitigation hierarchy as described by the DEA (2013)	22
Figure 3-2	The Site Development Plan for the project	22
Figure 6-1	Cross section of a wetland, indicating how the soil wetness and vegetation indicators respond to changes in topography (Ollis et al. 2013)	31

1 Introduction

1.1 Background

The Biodiversity Company was commissioned to conduct a wetland baseline and impact assessment for a proposed housing development, located on Farm 1388, Kuils River, Western Cape Province.

A map illustrating the regional locality of the PAOI is depicted in Figure 1-1, and a site locality illustrated in Figure 1-2. A field survey for the general area was undertaken on the 18th of August 2025 (wet season survey) for the identification and delineation of wetlands.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations, 2014 (No. 326, 7 April 2017) of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998). The approach has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020 as well as the Government Notice 1150 in terms of NEMA dated 30 October 2020: "Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation".

The National Web-based Environmental Screening Tool has characterised the theme sensitivities of the PAOI as:

- Aquatic Biodiversity Theme sensitivity is Very High and Low.

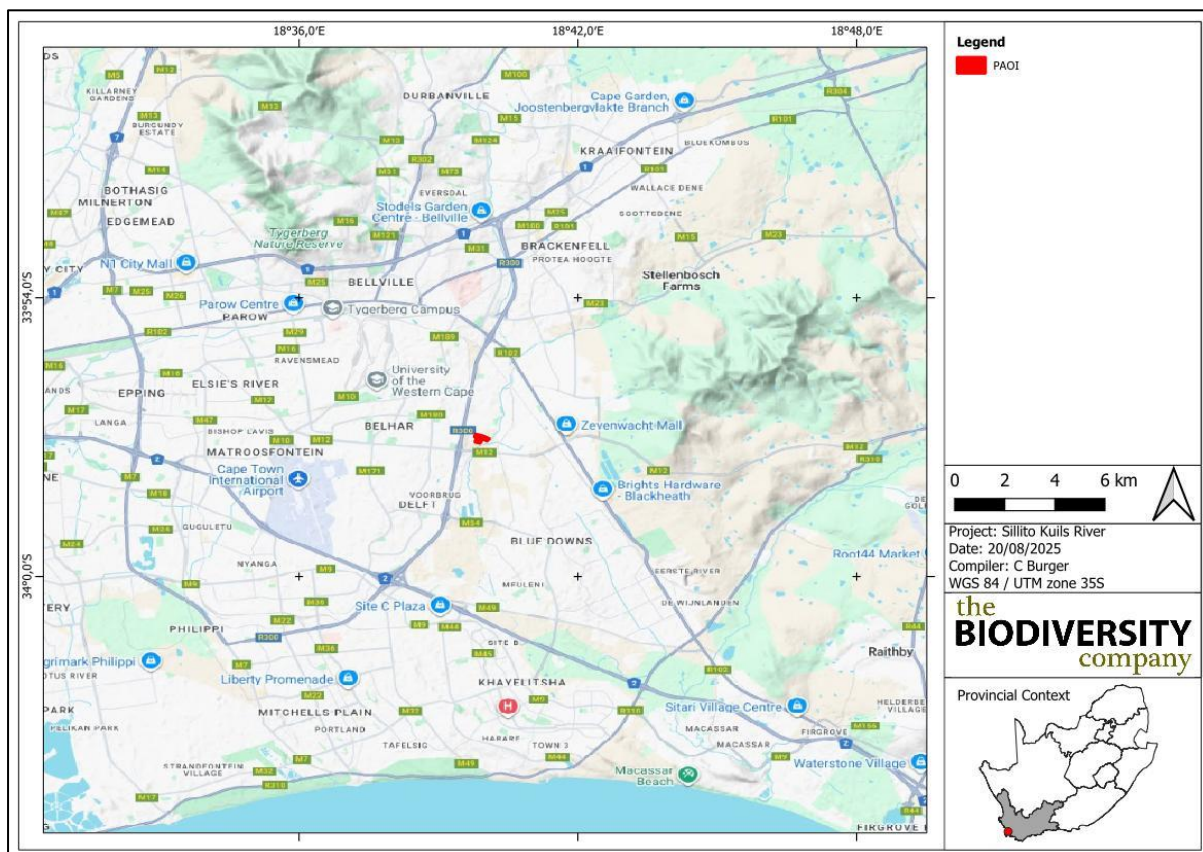


Figure 1-1 Map depicting the regional context of the Project Area of Influence (PAOI).

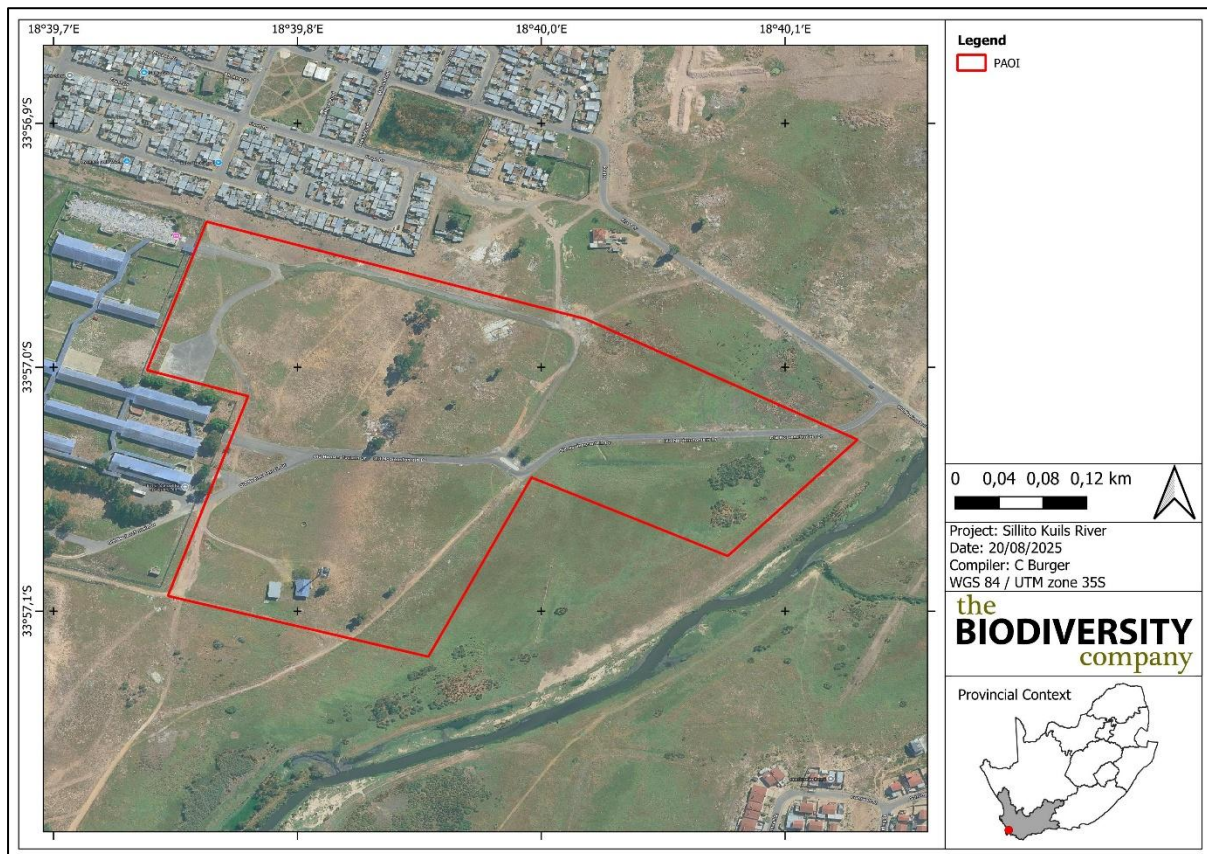


Figure 1-2 Map depicting the local context of the Project Area of Influence (PAOI).

This assessment has also been completed in accordance with the requirements of the published Government Notice (GN) 4167 by the Department of Water and Sanitation (DWS) (previously GN 509 of 2016 and GN 3139 of 2023). The said notice was published in the Government Gazette (no. 49833) under Section 39 of the National Water Act (Act no. 36 of 1998) in December 2023, for a Water Use Licence (WUL) in terms of Section 21(c) & (i) water uses. The GN 4167 process provides an allowance to apply for a WUL for Section 21(c) & (i) under a General Authorisation (GA), as opposed to a full Water Use Licence Application (WULA). A water use (or potential) qualifies for a GA under GN 4167 when the proposed water use/activity is subjected to analysis using the DWS Risk Assessment Matrix (RAM), provided the identified risks are all considered a low risk, and the applicant is listed under Appendix D1 or Appendix D2 of the same notice. This assessment will implement the RAM and provide a specialist opinion on the appropriate water use authorisation.

This report, after taking into consideration the findings and recommendation provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making with regards to the ecological viability of the proposed development and related activities.

1.2 Scope of Work

The following tasks were completed in fulfilment of the terms of reference for this assessment:

- A desktop assessment of available and related datasets to provide context of the freshwater biodiversity of the project area and to indicate potential wetland areas;
- The delineation, classification and assessment of wetlands within 500 m of the project area;
- An assessment of the related impacts through the use of the Risk Assessment (DWS, 2023);

- The provision of recommendations relevant to associated impacts; and
- Report compilation detailing the baseline findings.

1.3 Project Description and Technical Information

The following information is as provided by Sillito (2025):

The proposed residential development on Farm 1388 is strategically positioned along the western bank of the Kuils River, north of Wesbank and east of Belhar in Cape Town, Western Cape. The project aims to create a well-integrated residential community, offering 436 Single Residential (SR1) erven, two General Residential sites spanning 0.63 hectares (with an estimated yield of 50 units), and a 0.58-hectare General Business site to support local commercial needs. The development will feature a thoughtfully designed layout that ensures efficient service delivery, incorporating roads, stormwater drainage, water supply, and sanitation systems to meet the needs of future residents.

Located within a growing urban corridor, the development aligns with regional planning objectives by expanding housing availability while integrating sustainable infrastructure solutions. The site benefits from proximity to existing municipal services; however, upgrades and extensions will be necessary to accommodate the proposed density. Primary access to the development will be established through a south-westward extension of Reuter Street, with Old Nooiensfontein Road serving as a secondary entry point.

Farm 1388 is bordered by an existing residential area to the north and the Kuils River to the east, with the Betel Primary School centrally located within the site, effectively dividing it into two sections. Of the total site area, 12.15 hectares are allocated for housing development. The terrain is relatively flat, with a gentle west-to-east slope toward the river. Currently, the site is largely

undeveloped, featuring grass, scattered trees, and small wetland/marshy areas in the lower-lying eastern portion. Basic municipal infrastructure exists to support the Betel Primary School, including temporary roads, sewer, water, and stormwater services.

Sanitation infrastructure includes a 200 mm sewer line running along the northeastern boundary, flowing southeast toward the Nooiensfontein Pump Station. A temporary 160 mm sewer line serves the school, connecting to a 200 mm collector at Old Nooiensfontein Drive. Wastewater from the development will fall within the Bellville Wastewater Treatment Works (WWTW) catchment, which has sufficient treatment capacity. Regarding water supply, limited-service information is available, with a 160 mm reticulation line at Dorothy Street and a 110 mm line at Bhokwe Road, both northwest of the site. Larger distribution mains, including a 700mm and 800 mm main along Stellenbosch Arterial and a 450 mm main along the R300 highway, are located farther away. The existing stormwater network consists of a 525 mm pipeline along the northeastern section, discharging into a 600 mm pipeline that flows into the Kuils River, supplemented by a 375 mm pipe network servicing the school.

Access to the site is currently restricted to Old Nooiensfontein Road, which connects to Betel Primary School Road via a low bridge crossing over the Kuils River. However, this segment of Old Nooiensfontein Road requires realignment to fall within the designated road reserve. Additionally, Betel Primary School Road, currently serving as temporary access, will be demolished, and a new access route for the school will be incorporated into the proposed road network. As per the Traffic Impact Assessment (TIA), the primary access point for the development will be via Reuter Street's south-westward extension, with Old Nooiensfontein Road acting as a secondary access route

1.4 Assumptions and Limitations

The following aspects were considered as limitations:

- It has been assumed that the spatial files provided to the specialist is accurate;

- Only the boundary of the project area was provided during the time of the survey and reporting;
- Representative sampling within the assessment area was conducted and by its nature would result in some areas of the assessment area not being covered on foot. However, the results derived were sufficient to derive a meaningful baseline of the study area in the context of freshwater ecosystems;
- Delineations for areas within a 500 m distance from the site were undertaken from a desktop perspective due to constraints with access; and
- The GPS used for water resource delineations is accurate to within five metres. Therefore, the wetland delineation plotted digitally may be offset by a maximum of five metres to either side.

1.5 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-1 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-1 A list of key legislative requirements

Region	Legislation / Guideline	Comment
National	National Water Act (Act No. 36 of 1998) (NWA)	To provide for the regulation of water uses.
	NWA: Government Notice (GN) 4167 (previously GN 509 of 2016 and GN 3139 of 2023)	Water Use Licence (WUL) in terms of Section 21(c) & (i) water uses and the provision to apply for a General Authorisation subject to usage and outcome of the Risk Assessment Matrix.
Provincial	Draft Western Cape Biodiversity Bill, 2019	To provide for the framework and institutions for nature conservation and the protection, management and sustainable use of biodiversity and ecosystems in the Province; and for matters incidental thereto.
	Western Cape Biodiversity Sector Plan (WCBSP) (DEADP, 2017)	The spatial designation of conservation areas and targets within the province.

1.6 National Water Act (NWA, 1998)

The DWS is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers. The National Water Act (Act No. 36 of 1998) (NWA) allows for the protection of water resources, which includes:

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- The prevention of the degradation of the water resource; and
- The rehabilitation of the water resource.

A watercourse means:

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and

- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

The NWA recognises that the entire ecosystem and not just the water itself, and any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the DWS. Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) and (i).

2 Results & Discussion

2.1 Hydrological Characteristics

The site falls within the Quaternary Catchment G22E within the Breede - Olifants Water Management Area (WMA) Figure 2-1.

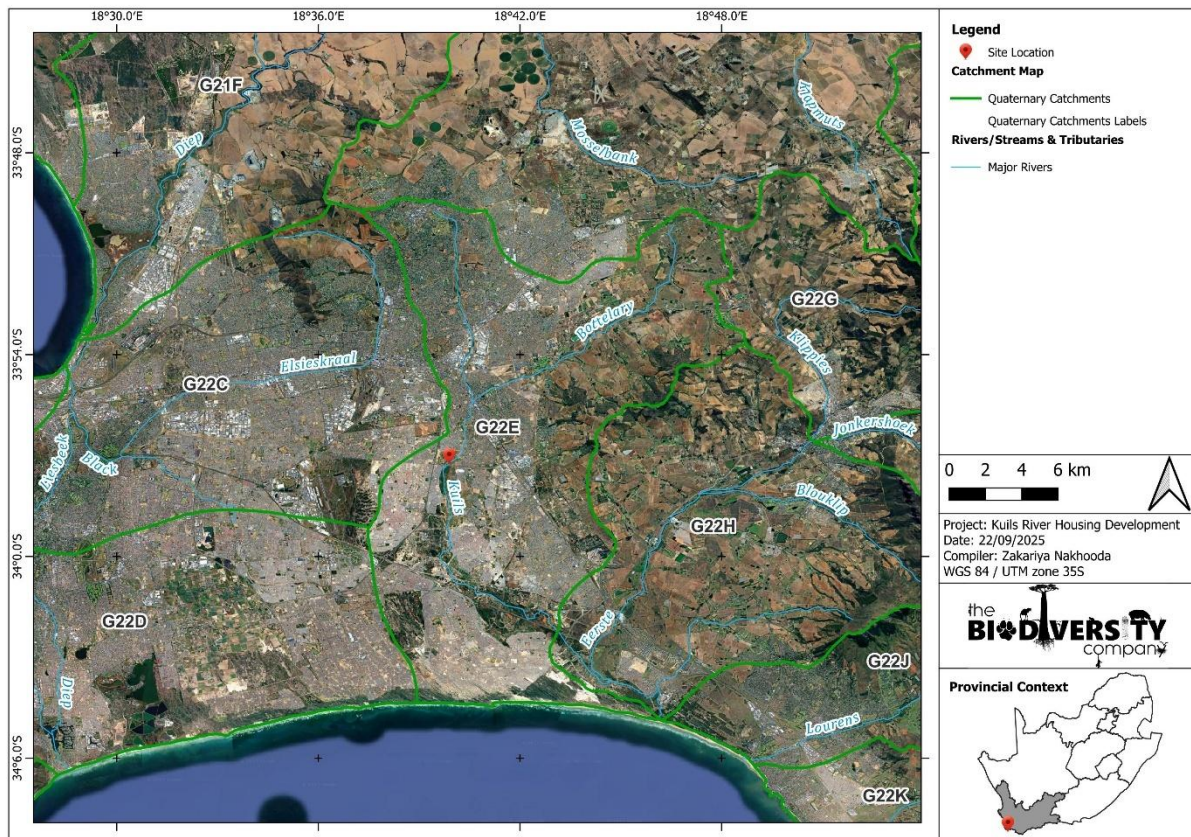


Figure 2-1 Site Quaternary Catchment Setting

2.2 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed project to ecologically important landscape features is summarised in Table 2-1. Only features that were identified to be relevant to the proposed project have been illustrated.

Table 2-1 Summary of relevance of the proposed project to ecologically important landscape features

Desktop Information Considered	Relevant/Irrelevant	Figure
Strategic Water Source Areas (SWSA) (2021)	Relevant: The project area overlaps with the Cape Peninsula and Cape Flats Groundwater Strategic Water Source Areas.	2.2

South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (2018)	Relevant: The project area overlaps with Endangered (EN) and Vulnerable (VU) wetlands and the Critically Endangered (CR) Kuils River is located directly east of the PAOI.	2.3
National Freshwater Priority Areas (NFEPA) (2011)	Relevant: The project area overlaps with a non-priority wetland and the Class D: Largely Modified Kuils River is located directly east of the PAOI.	2.4
The Wetlands of the City of Cape Town	Relevant: The project area overlaps with natural / semi-natural wetland systems associated with the Kuils River floodplain.	2.5

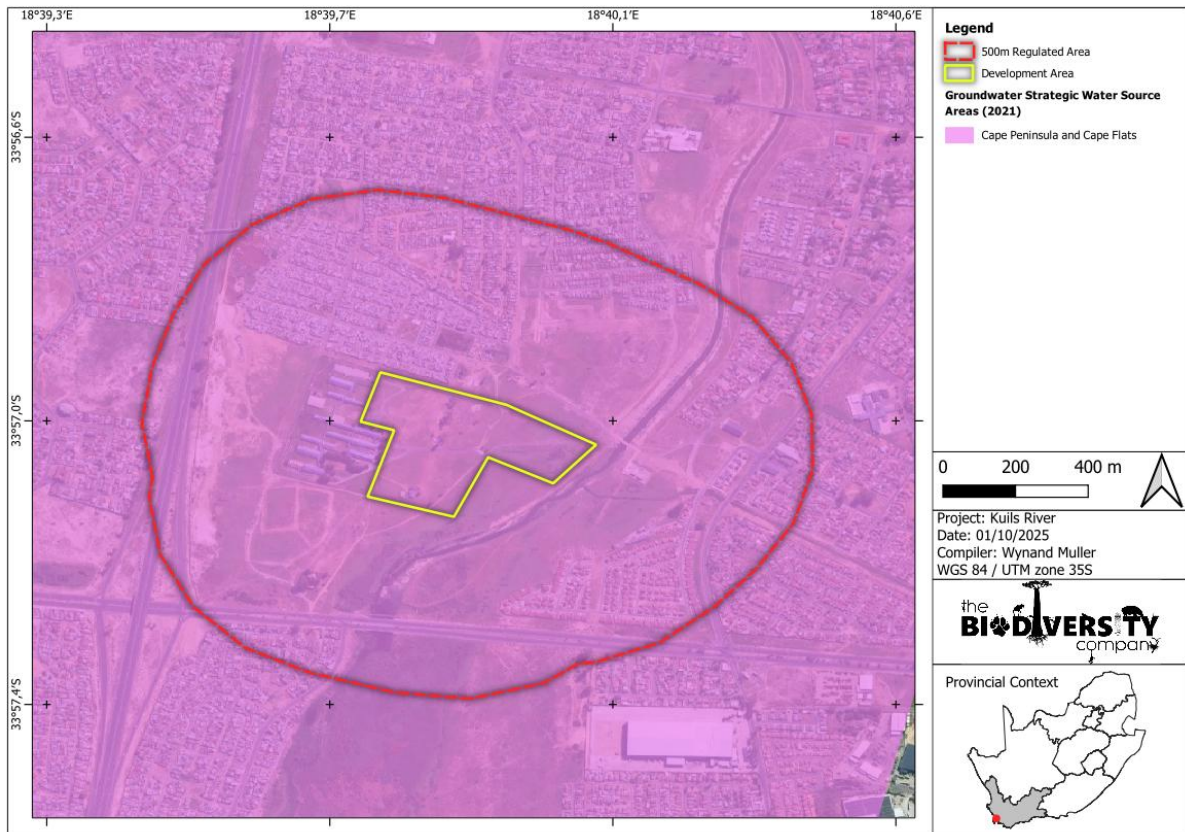


Figure 2-2 Strategic Water Source Areas that overlap with the project area of influence

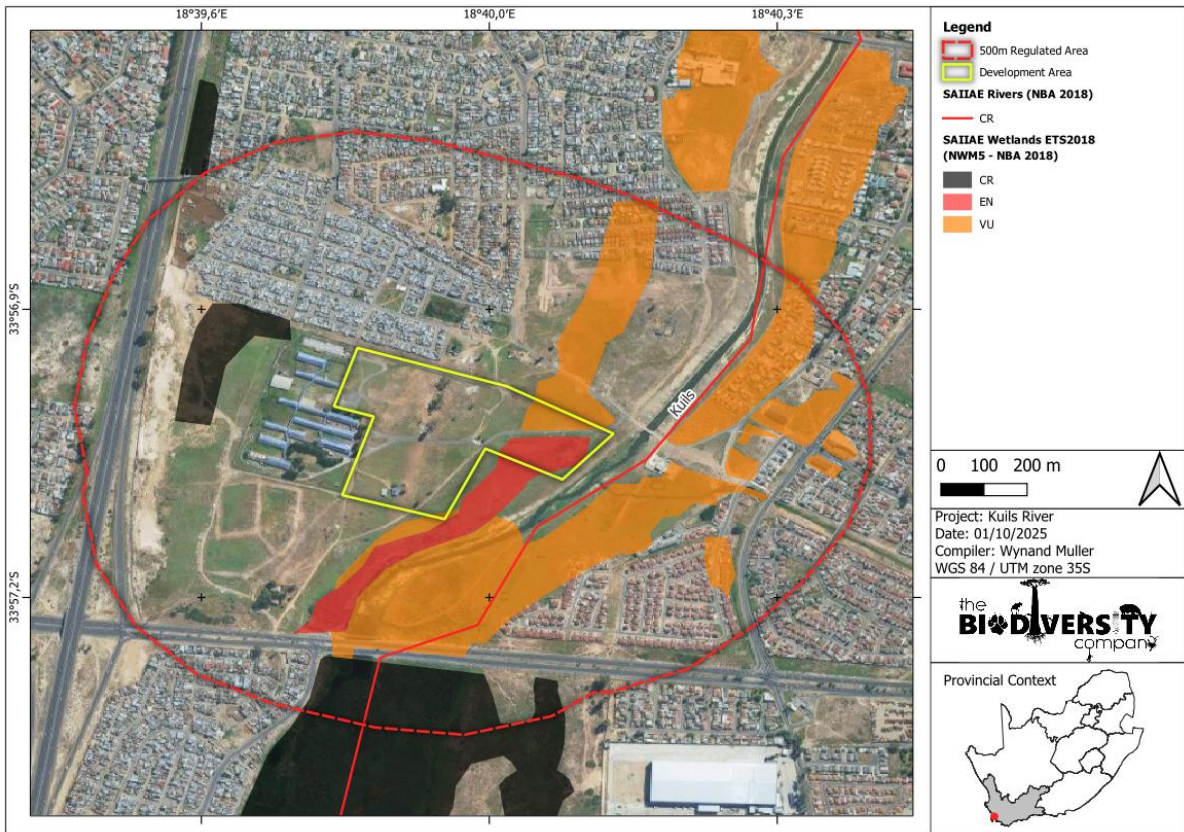


Figure 2-3 South African Inventory of Inland Aquatic Ecosystems that overlap with the project area of influence

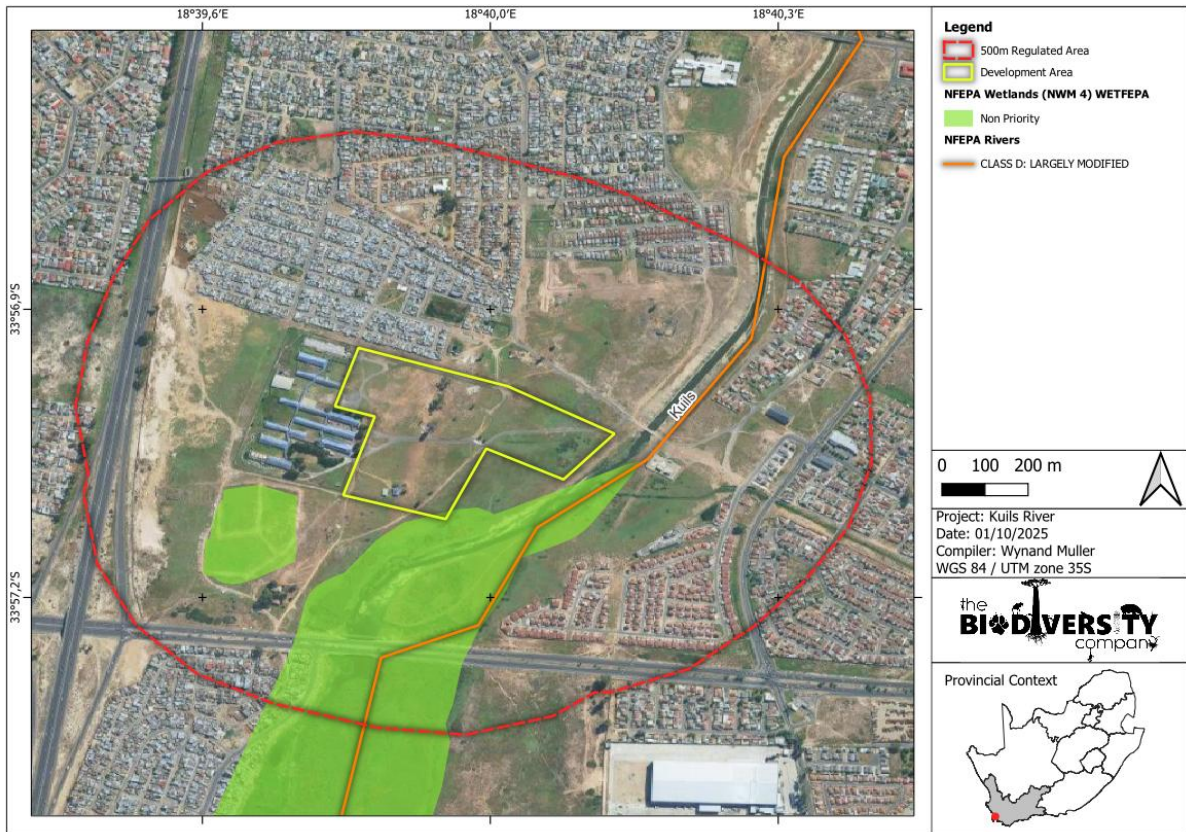


Figure 2-4 Wetland and river features identified within the project area of influence



Figure 2-5 Wetland features identified within the project area of influence according

2.3 Sub-Quaternary Reaches

The project area falls within the Breede - Olifants Water Management Area (WMA) (DWS, 2023), within the G22E quaternary catchment. Desktop information for the Sub-Quaternary Reaches (SQRs) was obtained from DWS (2014) and represented in Table 2-2. The land use within a catchment influences the ecological integrity of the associated downslope watercourses. According to the DWS database (2014) the present ecological state (PES) of the G22E-09207 (Kuil's River) SQR is in a 'Seriously Modified' state (Class E), with a 'Moderate' Ecological Importance (EI) and a 'High' Ecological Sensitivity (ES). The Default Ecological Category for the system is a Class B, largely natural.

Table 2-2 Summary of the Present Ecological State of the SQRs associated with the project area (DWS, 2014)

Component/Catchment	G22E-09207
SQR Name	Kuil's River
Reach Length (km)	21.88
Present Ecological Status (PES)	E (Seriously Modified)
Ecological Importance Class	Moderate
Ecological Sensitivity	High

2.4 Wetland Field Survey

2.4.1 Delineation

Two Hydrogeomorphic (HGM) units were identified within the PAOI (Figure 2-6), consisting of the Kuil's River floodplain system and hillslope seepage areas (Figure 2-7).

The wetland system is dominated by floodplain wetlands (40.53 ha; 80% of area; 24.7% PAOI), supported by seep wetlands (7.09 ha; 14%; 4.3% PAOI). A minor tributary of the Kuil's River (0.35 ha; 0.7%; 0.2% PAOI) is also present. The remaining ~5% of the area, with a combined PAOI contribution of under 2%, consists of artificial or modified features such as unlined dams, artificial depressions, and seeps.

A summary of the wetland area and percentage area of wetlands in relation to the total wetland area within the PAOI is provided in Table 2-3.

Table 2-3 Summary of wetland area within the project area of influence

Name	Area (ha)	Area (%)	PAOI (%)
Floodplain	40.53	80.0%	24.7%
Seep	7.09	14.0%	4.3%
Kuil's River Tributary	0.35	0.7%	0.2%
Unlined Dams	2.12	4.2%	1.3%
Artificial Depression	0.37	0.7%	0.2%
Infrastructure holding water	<0.01	0.0%	0.0%
Artificial Seep	0.21	0.4%	0.1%

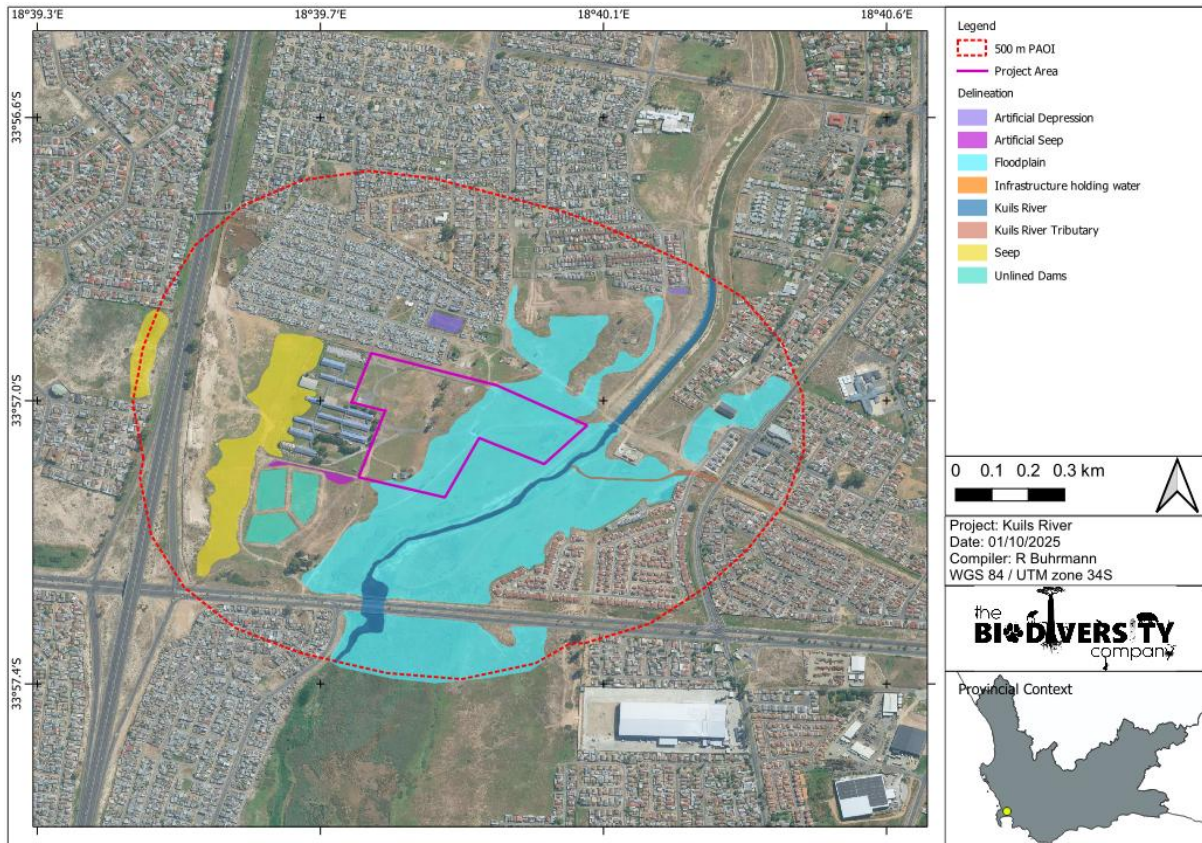


Figure 2-6 Delineation of the water resources within the project area and project area of influence



Figure 2-7 Representative photographs of the Kuils River floodplain system

2.4.2 Risk Screening

Table 2-4 provides the results of risk screening for the delineated systems and provides motivation for each of the determined categories. The Kuils River floodplain is perceived to be “At Risk” from the

proposed activities, whereas the remaining natural and also artificial systems are perceived to be “Not at risk”.

Table 2-4 Risk status of the delineated wetlands

HGM unit	Risk Status	Rationale
Kuils River Floodplain System	At Risk	These natural features were located either within proximity of the proposed activities or downslope of the activities and, have therefore been determined as “At Risk”. It is anticipated that direct and / or indirect impacts to the wetland system are potential.
HGM 3-5	Not at Risk	These HGM units, although located within 500 m of the proposed activities, were not located in a position of the landscape where the activities are expected to result in impact and have therefore been determined as “Not at Risk”. It is anticipated that no direct and / or indirect impacts to the wetland systems are potential from the existing and proposed surface infrastructure.
Dams Artificial Systems Infrastructure	Not Applicable	These are not natural systems. Instead, they are artificial or engineered water management structures. As such, the risk assessment framework used for natural HGM units does not apply to these features, and therefore, no risk status regarding potential impacts from the proposed activities is deemed necessary.

2.4.3 Classification and Description

The wetland classification as per SANBI guidelines (Ollis et al., 2013) is presented below. One wetland type was identified to be at risk within the PAOI, namely the Kuils River floodplain system.

Table 2-5 Wetland classification as per SANBI guideline (Ollis et al., 2013)

Wetland Unit	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
Kuils River	Inland	South Western Coastal Belt	Indian Ocean Coastal Belt Group 2	Plain	Floodplain	Floodplain Flat	N/A

Floodplain wetlands are located on valley floors and are characterised by a well-defined stream channel with typical floodplain features, including levees, scroll bars and oxbows. The water inputs of this wetland are mainly from overspills from the stream channel’s banks during flooding events. Figure 2-8 presents a diagram of a floodplain, showing the dominant movement of water into, through and out of the system.

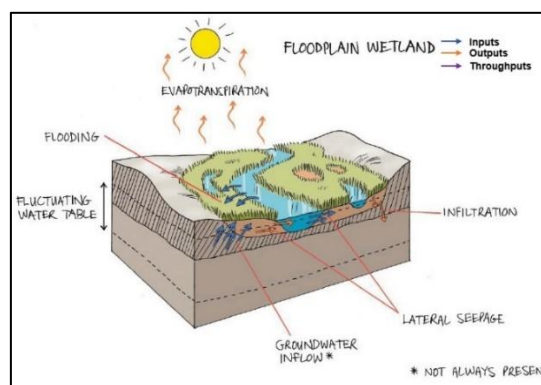


Figure 2-8 Amalgamated diagram of a typical floodplain, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al., 2013)

2.5 Functional and Ecological Assessment

The functional and ecological assessments were only undertaken for wetlands that were identified to be “At Risk”. Engineered or constructed features do not qualify for the functional and ecological assessments.

The assessment indicates that the Kuils River floodplain is the only unit presenting a notable risk, with a seriously modified PES, moderately high ecosystem services, and a moderate ecological importance and sensitivity (EIS) over an area of 40.53 ha. The other units, including seeps, the Kuils River tributary, and artificial features such as unlined dams and depressions, do not present significant ecological risks and therefore were not assigned PES, EcoServices, or EIS ratings.

Table 2-6 Summary of the functional and ecological assessment

Unit	Risk Level	PES	EcoServices	EIS	Area (ha)
Floodplain	Yes	Seriously Modified	Moderately High	Moderate	40.53
Seep	No	N/A	N/A	N/A	7.09
Kuils River Tributary	No	NA	N/A	N/A	0.35
Unlined Dams	N/A	N/A	N/A	N/A	2.12
Artificial Depression	N/A	N/A	N/A	N/A	0.37
Infrastructure holding water	N/A	N/A	N/A	N/A	0.00
Artificial Seep	N/A	N/A	N/A	N/A	0.21

2.5.1 General Functional Description

Floodplains generally are formed during high flow events which subsequently cause water to overflow its banks. Due to the topographic setting of floodplains, flood attenuation for these systems is very high, especially during seasons where the soil within the wetland is not yet saturated and before the oxbows are filled. Seeing that floodplains usually are characterised by clayey soils which retain water for long periods and are susceptible to vast amounts of evapotranspiration, very little streamflow regulation is expected for floodplains. In hindsight, floodplains with coarse soil types are ideal in regulating streamflow. Floodplains are excellent in assimilating phosphates due to the decrease in velocity during the overflow of banks. During this process, lateral deposition of sediment is prone to happen. Phosphorus tends to bind strongly to mineral particles which ensures that the phosphorus is retained on the floodplain after the deposition of these particles. Denitrification does occur to a lesser extent due to little exposure of large amounts of water seeing that these water masses are dependent on floods. Additionally, sub-surface flows are rare for floodplains which further decreases the possibility of denitrification.

It should be noted that these characteristics are representative of ideal river or wetland features and may not necessarily represent the characteristics of all rivers or wetlands. The functionality of the features and the provision of benefits is largely dependent on the river or wetland size and influence from abiotic drivers.

2.5.2 Ecosystem Services

The Kuils River floodplain provides a suite of ecosystem services that are considered moderately high in value, largely due to its wide extent, low gradient, and the way it engages with the hydrological regime during higher flows. The system plays an important role in flood attenuation, as the broad floodplain surface slows and disperses peak discharges, reducing downstream flood risk. The downstream bridge and associated wetland create a backwater effect during moderate to high flows, which raises upstream water levels and enhances storage across the floodplain. In addition, the transition from the channelised and straightened upstream reach to the more natural floodplain setting results in a marked decrease in velocity and energy, encouraging overbank inundation, sediment deposition, and nutrient retention.

These processes allow the floodplain to act as a filter that improves water quality by settling suspended solids and facilitating nutrient uptake by vegetation. The mosaic of habitats, ranging from shallow inundated zones to seasonal wet meadows, further enhances biodiversity support, while the system also contributes to local groundwater recharge in depressional areas. Although these functions remain robust, they are constrained by adjacent land-use pressures, altered hydrology, and compromised water quality, which together limit the services to a moderately high rather than a very high rating.

2.5.3 Present Ecological State

The present ecological state (PES) of the floodplain is best described as seriously modified. The channel straightening that occurs upstream has increased channel slope, conveying flows more rapidly and producing a flashy hydrological regime that delivers higher peak discharges over shorter durations. This disrupts the natural hydroperiod of the floodplain, resulting in inundation that is more energetic and short-lived, with reduced opportunities for slow recharge and stable aquatic habitats. The floodplain itself shows signs of aggradation, where fine sediments transported from upstream are deposited across the channel margins and floodplain surface. Water quality is degraded by stormwater inputs and runoff from surrounding urban and other anthropogenic land uses, which contribute elevated sediment loads, nutrients, and other pollutants. Vegetation within the floodplain reflects this disturbance, with patches of indigenous wetland species fragmented by alien plant encroachment and edge disturbances from adjacent development. While the system retains important structural and hydrological features, the cumulative impact of these stressors places it firmly within a Category E state.

2.5.4 Ecological Importance and Sensitivity

The ecological importance and sensitivity (EIS) of the floodplain is moderate. Despite its degraded condition, the floodplain still fulfills important functional roles within the catchment. It acts as a significant attenuation zone and sediment sink within a heavily modified river system, while also supporting patches of habitat for wetland-associated species and providing corridor connectivity along the valley floor. The system is moderately sensitive to further alteration of its hydrology and water quality. It has some capacity to recover or sustain functionality where hydroperiods and vegetation are managed, but remains vulnerable to additional development pressures, channel hardening, or increased pollutant loads.

2.5.5 Recommended Ecological Category and Recommended Management Objective

The REC and RMO for the wetland areas was determined from the results of the PES and EIS assessments. Considering these factors, the REC/RMO for the system is Category E, with a management objective to maintain its current level of functioning and prevent further decline. This acknowledges the realistic constraints of the urban and peri-urban context, while recognising the need to safeguard and incrementally restore key floodplain processes.

2.5.6 Screening Tool Comparison

The allocated sensitivity for the relevant theme is either disputed or confirmed in Table 2-7 below. A summative explanation for each result is provided as relevant. The specialist-assigned sensitivity ratings are based largely on the classification process assigned by the screening tool.

Table 2-7 Summary of the screening tool vs specialist assigned sensitivities

Screening Tool Theme	Screening Tool	Habitat	Specialist	Tool Validated or Disputed by Specialist - Reasoning
Aquatic Biodiversity Theme	Low	Dryland & Artificial Systems	Low	Confirmed – These areas do not represent natural water resources.
	Very High	Water Resources	Very High	Confirmed – Even though disturbed, the ecological integrity, importance and functioning of the system plays a role as a water resource system locally and regionally, and a habitat for common fauna and flora.

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Figure 2-9 The aquatic biodiversity theme sensitivity for the project area

2.6 Buffer Requirements

The buffer requirements for the wetlands were calculated using the Site-Based Tool: Determination of buffer zone requirements for wetland ecosystems (Macfarlane *et al.*, 2014). The recommended buffer zones are presented in Table 2-8. The post-mitigation buffers for the wetland features in relation to the proposed development area were calculated to be 36 m for the system.

The Draft Floodplain Management Policy for the City of Cape Town recognises the importance of establishing buffer zones along aquatic systems but does not prescribe a rigid methodology. Instead, it proposes that buffer widths should be determined using the National Wetland Classification System (SANBI, 2009) in combination with an assessment of the Ecological Importance and Sensitivity (EIS) of the wetland or watercourse. For river systems, the width of the active channel is also taken into account, with buffers measured from the top of bank or the delineated wetland edge. Within the metropolitan area, buffers of 30–75 m have been adopted for wetlands and 10–40 m for watercourses, while a minimum of 10 m is applied to hardened or concrete channels. Where no pre-determined buffer exists, developers are required to obtain the services of a freshwater ecologist to recommend an appropriate buffer width in line with national best practice (City of Cape Town Draft Floodplain Policy).

The national literature review on buffer determination by Macfarlane *et al.* (2009) further supports this approach, noting that buffer zones play multiple roles: they trap sediment and associated pollutants,

remove nutrients through plant uptake and denitrification, stabilise channels, and attenuate floods. Effectiveness is strongly linked to width, slope, vegetation density, and soil properties. For floodplain systems such as the Kuils River, the wide depositional environment and fine-textured alluvium make buffers particularly important for nutrient and sediment interception and for maintaining lateral habitat connectivity. Macfarlane et al. recommend buffer widths of 30–50 m as a starting point for nutrient and sediment removal, with larger widths (up to 75 m or more) needed where sensitive habitats, high pollutant loads, or intensive adjacent land uses occur

In the case of the Kuils River floodplain, the combination of a wide functional floodplain, high surrounding development pressures, and the system’s moderate EIS suggests that buffer widths should be set at the upper end of the City’s 30–75 m range for wetlands, with adjustments made for local slope, habitat presence, and adjacent land-use intensity. This would ensure adequate protection of flood attenuation, water quality improvement, and biodiversity support functions, while also aligning with both the City of Cape Town’s Draft Policy and national buffer zone research.

Table 2-8 Buffer requirements for the relevant wetland features

Unit	Recommended Buffer
Floodplain	36 m

2.6.1 Regulation Zones

The table below presents the legislated zones of regulation that would be applicable to the wetland areas.

In accordance with Government Notice (GN) 4167 of 2023 and GN 509 of 2016, as it relates to the NWA (1998), the regulated area of a watercourse for Section 21 (c) and 21 (i) of the NWA (1998) must be considered if the proposed development and associated infrastructure fall within the applicable zones of regulation as defined in the Act.

Listed activities in terms of the NEMA (1998), (Act 107 of 1998) EIA Regulations as amended in April 2017 must be taken into consideration if any infrastructure is to be placed within the applicable zone of regulation.

Both types of authorisations may be applicable to the proposed project given that floodplain wetland is located directly within the project site.

Table 2-9 Legislated zones of regulation

Regulatory authorisation required	Zone of applicability
Water Use License Application in terms of the National Water Act, 1998 (Act No. 36 of 1998). GN 4167 as published in the Government Gazette 49833 of 2023. GN 509 as published in the Government Gazette 40229 of 2016.	In accordance with GN 4167 of 2023 and GN 509 of 2016, as it relates to the National Water Act, 1998 (Act 36 of 1998), a regulated area of a watercourse in terms of water uses as listed in Section 21c and 21i is defined as: <ul style="list-style-type: none"> the outer edge of the 1 in 100 year floodline and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; in the absence of a determined 1 in 100 year floodline or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or a 500 m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation.
Environmental Authorisation in terms of the Listed activities of the National Environmental Management Act, 1998 (Act No. 107 of 1998). EIA Regulations (2014), as amended.	Activity 12 of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) states that: The development of: (xii) Infrastructure or structures with a physical footprint of 100 square meters or more; Where such development occurs— <ul style="list-style-type: none"> Within a watercourse;

- In front of a development setback; or
- If no development setback has been adopted, within 32 meters of a watercourse, measured from the edge of a watercourse.

Activity 19 of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA regulations, 2014 (as amended) states that:

“The infilling or depositing of any material of more than 10 cubic meters into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse.”

3 Risk Assessment

The Risk Assessment Matrix (RAM) considered the risks posed by the project to the Kuils River floodplain. The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) will be considered for this component of the assessment (Figure 3-1). In accordance with the mitigation hierarchy, the preferred mitigatory measure is to avoid impacts by considering options in project location, siting, scale, layout, technology and phasing to avoid impacts. It is apparent from the Site Development Plan (SDP) that avoidance of the floodplain is not feasible (Figure 3-2), and direct impacts to the flooding extent are the primary concern.

A risk assessment was conducted for the proposed activities (Table 3-1) under the assumption that the floodplain and the respective buffers will not be avoided. Direct and indirect risks are therefore both considered. The focus for mitigation was thus placed on minimising potential impacts.

The extension of the proposed development into the Kuils River floodplain poses several significant risks to the integrity and functioning of the system. The reduction in floodplain width and roughness will compromise its ability to attenuate floods, a concern amplified by the channel straightening upstream, which has increased flow velocities and reduced lag times. Encroachment into this zone will diminish the natural capacity of the floodplain to store and dissipate floodwaters, thereby raising the risk of localised flooding within the development footprint and downstream.

The infilling and hardening of floodplain areas will also constrain the system’s role in sediment deposition and nutrient interception, processes that currently moderate water quality impacts within this catchment. The loss of vegetated margins and overbank inundation areas will reduce the ability of the system to trap pollutants carried in urban runoff, leading to an increased risk of downstream water quality deterioration.

Additionally, the presence of the downstream bridge and associated wetland already creates a backwater effect that elevates water levels upstream during moderate and high flows. Development within this floodplain storage area will restrict available inundation space, which is likely to exacerbate flooding risks both within the site and for properties immediately upstream. The introduction of infrastructure into the floodplain further increases the risk of erosion and scour at stormwater outfalls, altering sediment dynamics and potentially destabilising channel margins.

Ecologically, the reduction of open and connected floodplain space will fragment residual wetland and riparian habitats, limiting refugia for aquatic and semi-aquatic species. The alteration of hydrological and sediment regimes, together with increased disturbance from development edges, will encourage alien vegetation colonisation and contribute to the long-term decline in habitat quality and ecological functioning.

In combination, these risks highlight that development extending into the active floodplain will directly undermine the hydrological, geomorphological, and ecological processes that sustain the system, while simultaneously exposing the development itself to elevated flood and water quality risks.

Only the construction and operational phases of the development were focused on for this assessment as the development is considered to have an extensive longevity and will unlikely be decommissioned within the next 30 years.

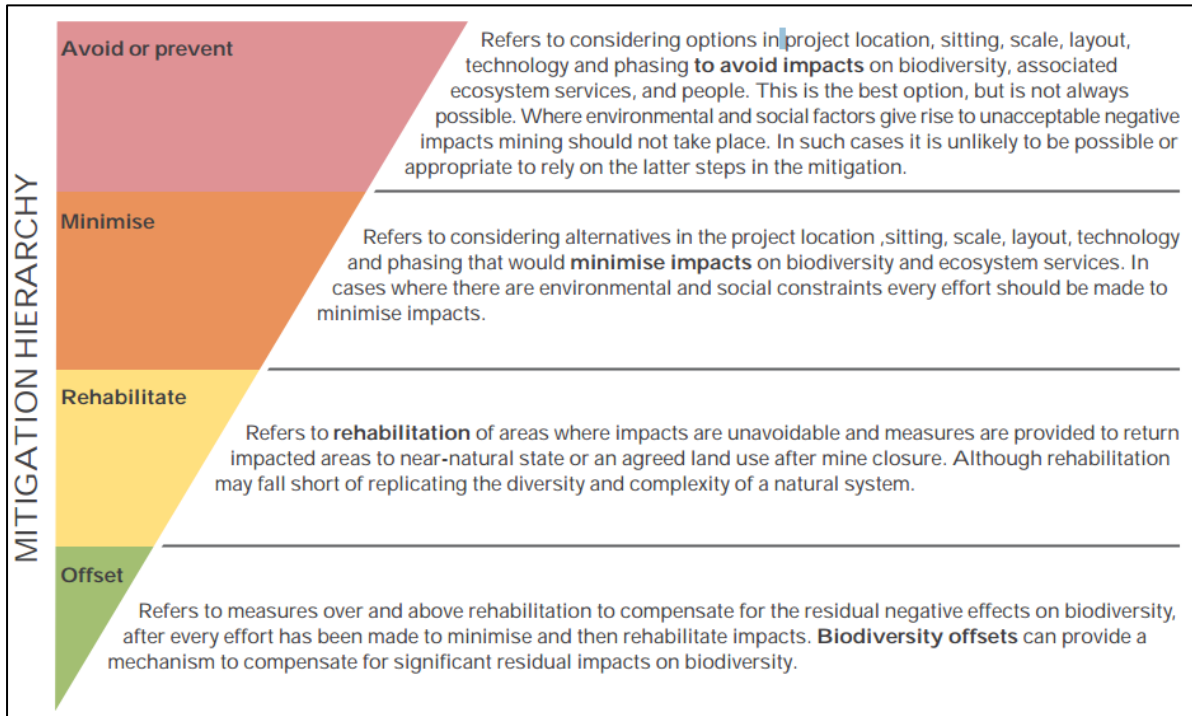


Figure 3-1 The mitigation hierarchy as described by the DEA (2013)

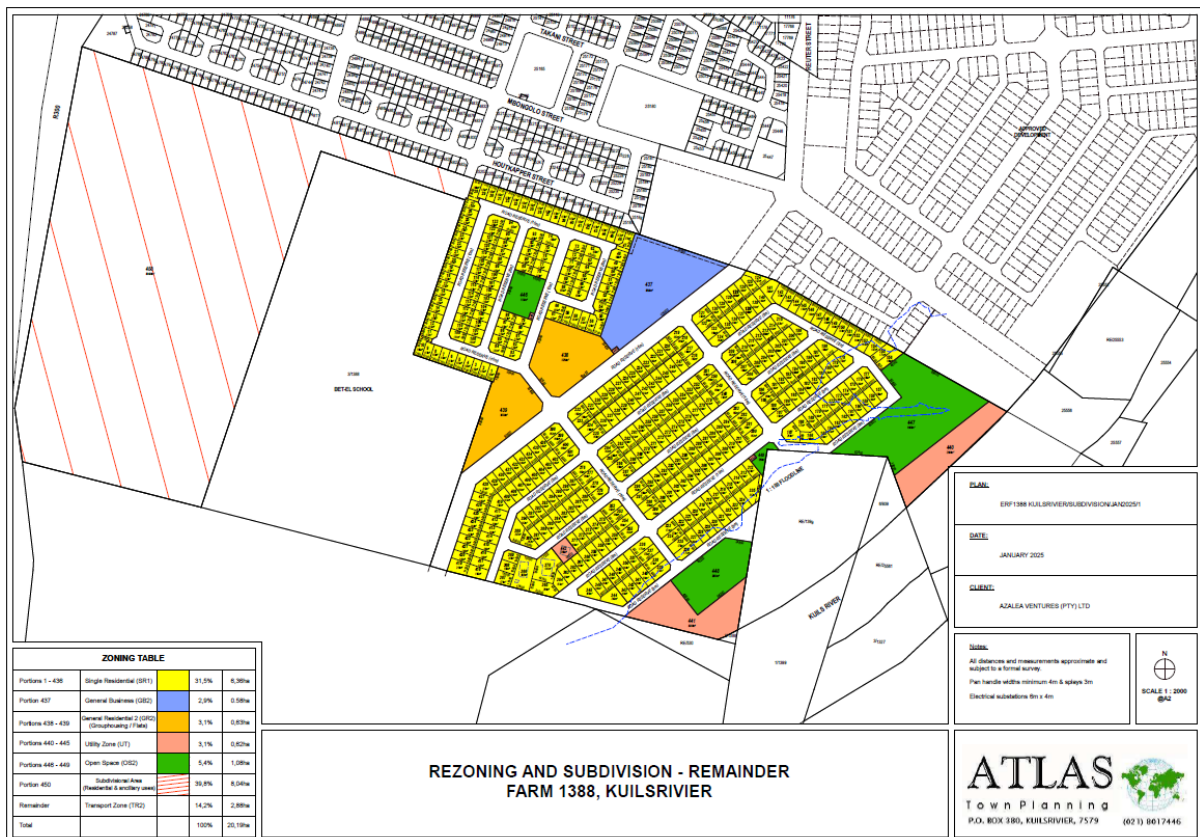


Figure 3-2 The Site Development Plan for the project

It is anticipated that the project will pose “Low” and “Moderate” post-mitigation risks, provided that the suggested mitigations are implemented.

During the construction phase, notable risks include increased sedimentation and erosion from earthworks, the potential for pollutant and hydrocarbon runoff from machinery, and short-term disturbance to hydrology through compaction and infilling of floodplain soils. Even with mitigation, these activities may reduce local infiltration capacity, alter flow paths, and promote colonisation by alien vegetation.

In the operational phase, the presence of permanent infrastructure within the floodplain poses ongoing risks of reduced flood attenuation capacity, leading to higher flood peaks and localised inundation. Stormwater discharges will continue to introduce nutrient- and sediment-rich runoff, increasing the risk of water quality deterioration downstream. Hardening of surfaces and loss of vegetated buffers will limit the system’s ability to trap sediments and nutrients, while altered hydrology and disturbance edges will sustain pressure from erosion, scour, and alien plant encroachment.

Table 3-1 Summative results of the Risk Assessment conducted for the proposed activities

Phase	Activity	Impact	Significance (max = 100)	Risk Rating	Confidence level
Construction	Site clearance & vegetation removal	Loss of wetland vegetation	14.4	L	High
		Increased erosion	14.4	L	High
		Soil disturbance	6	L	Medium
	Earthworks, excavation & filling	Sediment release	24	L	High
		Compaction of soils	18	L	High
		Reduction of floodplain storage	33.6	M	High
		Altered flow pathways	33.6	M	High
	Stockpiling of materials	Dust generation	4.8	L	Low
		Localised runoff contamination	12.6	L	Medium
		Edge habitat disturbance	14.4	L	Medium
	Platform filling & compaction	Reduced infiltration	33.6	M	High
		Permanent loss of wetland function	33.6	M	High
		Altered hydrology	33.6	M	High
	Stormwater network installation	Sediment pulses	14.4	L	Medium
		Hydrocarbon/cement contamination	12.6	L	Medium
		Short-term water quality deterioration	12.6	L	Medium
	Road & access construction	Fragmentation of habitats	18	L	High
		Increased runoff rates	18	L	High
		Edge effects from disturbance	16.2	L	Medium
		Loss of riparian connectivity	21.6	L	High
Construction vehicle movement	Soil compaction	14.4	L	Medium	
	Risk of fuel/oil spills	12.6	L	Medium	
	Noise and dust impacts on fauna	12.6	L	Medium	
Bridge/culvert tie-ins (if any)	Localised scour/erosion	16.2	L	High	
	Disruption to channel flow	19.8	L	High	
	Habitat modification	18	L	Medium	
Waste & spoil management	Risk of illegal dumping	10.8	L	Medium	

Operation		Leachate contamination	12	L	Medium	
		Attraction of invasive species	18	L	Medium	
	Permanent hard surfaces (erven, roads, rooftops)		Increased impervious runoff	33.6	M	High
			Reduced infiltration	33.6	M	High
			Elevated flood peaks.	33.6	M	High
	Stormwater discharge to river		Nutrient enrichment	31.2	M	High
			Erosion at outfalls	28.8	L	High
			Sediment deposition downstream	31.2	M	Medium
	Landscaping & edge maintenance		Alien plant invasion	21.6	L	High
			Reduction in indigenous cover	21.6	L	High
			Loss of ecological integrity	21.6	L	Medium
	Residential occupation & use		Litter and waste input	24	L	Medium
			Light/noise disturbance	18	L	Medium
			Increased human-wildlife conflict	18	L	Medium
	Ongoing road use & maintenance		Hydrocarbon runoff	24	L	High
			Dust and particulate transport	16.2	L	Medium
			Disturbance of riparian edges	18	L	Medium
	Solid waste & greywater mismanagement (informal practices)		Pollution of floodplain habitats	23.4	L	Medium
			Attraction of nuisance species	18	L	Medium
			Degraded water quality	23.4	L	High
Expansion or upgrading of infrastructure (long-term)		Additional habitat loss	16.8	L	Medium	
		Incremental floodplain encroachment	16.8	L	Medium	
		Long-term hydrological alteration	16.8	L	Medium	

3.1 Mitigation Measures

3.1.1 General Measures

The following measures apply to all the activities/risks for the two project phases:

- Construction and operational footprints must be clearly demarcated with visible fencing and no works allowed outside demarcated areas.
- Indigenous vegetation rehabilitation must be undertaken in all disturbed areas within 30 days of completion of works.
- Alien invasive plants must be removed by hand or mechanically, this is species dependent, or approved herbicide application at least twice yearly.
- Spill kits must be available at all work areas, with staff trained in their use.
- All waste (domestic, hazardous, construction) must be collected daily and disposed of at a licensed facility — no burying or burning permitted.
- Weekly ECO (Environmental Control Officer) inspections must be conducted and recorded for the construction phase only.
- Stormwater control measures (silt fences, berms, traps) must be installed before earthworks commence and maintained throughout construction.

- All mitigation actions must be recorded in a compliance checklist signed off monthly by the ECO.

3.1.2 Construction Phase

3.1.2.1 Site Clearance & Earthworks

- No vegetation clearance outside demarcated footprint.
- Topsoil must be stripped to 150 mm depth, stockpiled separately, covered, and reused for rehabilitation.
- Erosion protection (silt fences or hessian) must be installed downslope before clearance begins.

3.1.2.2 Stockpiling of Materials

- Stockpiles must be located >36 m from floodplain edge.
- Stockpiles must be covered and bunded to prevent runoff contamination.

3.1.2.3 Platform Filling & Compaction

- Fill must only be sourced from approved borrow pits (with permits).
- Compaction must not extend beyond the marked platform area.

3.1.2.4 Stormwater Network Installation

- Concrete works must be undertaken on plastic sheeting with drip trays for mixers.
- No cement wash water may be discharged to soil or wetlands.

3.1.2.5 Road & Access Construction

- Only approved access routes may be used; no off-road driving allowed.
- Culverts/bridges must be fitted with energy dissipation structures at outlets.

3.1.2.6 Construction Vehicle Movement

- Vehicles must park on designated hardened surfaces only.
- Refuelling may only occur in bunded areas with impermeable lining.

3.1.2.7 Waste & Spoil Management

- Waste skips must be covered and labelled (hazardous/non-hazardous).
- Spoil material must be removed weekly, no onsite burial.

3.1.3 Operational Phase

Permanent Hard Surfaces & Stormwater

- A stormwater management system with detention ponds and silt traps must be operational at all times.
- Stormwater outlets must be inspected and maintained monthly to remove sediment and repair erosion.

Landscaping & Edge Maintenance

- Landscaping must use locally indigenous species only; no alien ornamental plants allowed.
- A biannual alien plant clearing programme must be in place along the floodplain edge.

Residential Occupation & Use

- Waste bins must be provided at every 50 m along streets and emptied at least twice weekly.
- Street lighting must be shielded downwards to minimise light spill into wetlands.

Ongoing Road Use & Maintenance

- Roads must be swept monthly to remove hydrocarbon/oil residues.
- Road runoff must be directed through oil/water separators before discharge.

Solid Waste & Greywater

- Greywater discharge to soil/floodplain is prohibited; all flows must connect to formal sewerage systems.
- Recycling stations must be provided and serviced weekly.

Expansion or Upgrading of Infrastructure

- Any future expansion must trigger a fresh wetland risk assessment and approval before works begin.
- No infrastructure may be sited within 36 m of the floodplain edge without authorisation.

3.2 Recommendations

The following actions are recommended:

- It is recommended that a detailed floodline delineation and flood risk assessment be undertaken for the Kuils River floodplain, comparing pre- and post-development scenarios. This assessment should quantify changes in runoff, flood extent, depth, and hazard under various return periods, incorporating the influence of upstream channel straightening and downstream hydraulic controls. The outcomes will inform appropriate platform levels, buffer zones, and stormwater management requirements, ensuring that development does not exacerbate flood risk on-site or downstream;
- It is recommended that the development incorporate Sustainable Drainage Systems (SuDS) into its stormwater management design. Measures such as detention ponds, vegetated swales, bio-retention areas, permeable paving, and energy-dissipating outlet structures should be considered to reduce peak flows, improve water quality, and enhance groundwater recharge.

These systems will contribute to maintaining the floodplain's residual ecosystem services while reducing the risk of erosion, sedimentation, and downstream flooding. The integration of SuDS should form part of the engineering design and be aligned with the City of Cape Town's stormwater management objectives; and

- A wetland compensation strategy must be developed in consultation with the Department of Water and Sanitation (DWS) to address the anticipated loss of floodplain area. In line with the national Wetland Offset Guidelines, this strategy should include an appropriate combination of on-site rehabilitation measures and/or contributions to wetland conservation initiatives within the broader catchment, ensuring that residual impacts are adequately offset and no net loss of wetland ecosystem function is achieved.

4 Conclusion

The proposed development extends into the Kuils River floodplain, an area of ecological and hydrological significance that is already in a seriously modified state. Despite its degradation, the floodplain continues to provide valuable ecosystem services, particularly in terms of flood attenuation, sediment deposition, and nutrient retention. The assessment indicates that while the project poses notable risks to wetland functioning and floodplain integrity, these risks are primarily low to moderate in significance after mitigation. With strict adherence to the recommended mitigation measures, the ecological functioning of the system can be maintained at its current level, and further decline prevented.

4.1 Risk and Impact Statement

The project is expected to result in both direct and indirect impacts on the Kuils River floodplain, with residual risks relating to altered hydrology, reduced infiltration, flood attenuation loss, and long-term water quality deterioration. Post-mitigation risks are considered to fall within the low to moderate range, requiring ongoing management and monitoring to ensure compliance. Given the extent of encroachment into a regulated watercourse, a full Water Use Licence (WUL) in terms of Section 21(c) and (i) of the National Water Act (1998) is considered necessary to authorise these activities.

4.2 Specialist Opinion

From a wetland perspective, the proposed development within the delineated Kuils River floodplain is considered acceptable, provided that the mitigation and compensation measures outlined in this report are fully implemented. However, the hydrological and flood risk aspects remain critical and require dedicated assessment through a detailed floodline delineation and flood risk study. Development within areas identified as high-risk in terms of flood attenuation or conveyance should be strictly avoided. Subject to these conditions, the development can be authorised without resulting in unacceptable impacts on wetland ecological functioning.

Final platform levels, road levels, stormwater design, and the no-build line are contingent on the approved detailed floodline delineation and flood risk assessment

5 References

- City of Cape Town. Draft Floodplain Management Policy (unpublished).
- Department of Water Affairs and Forestry (DWAF). 2005a. A Practical Field Procedure for Identification and Delineation of Wetlands and Riparian Areas.
- Department of Water and Sanitation (DWS). 2016. General Authorisation in Terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for water uses as defined in Section 21(c) or section 21(i). Government Gazette Notice: 509 in Government Gazette 40229 of 26 August 2016.
- Department of Water and Sanitation (DWS). 2023. General Authorisation in Terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for water uses as defined in Section 21(c) or section 21(i). Government Gazette Notice: 4167 in Government Gazette 49833 of 08 December 2023.
- Kotze, D.C., Marneweck, G.C., Batchelor, A.L., Lindley, D.C., and Collins, N.B. 2009. A Technique for rapidly assessing ecosystem services supplied by wetlands, Mondi Wetland Project.
- Land Type Survey Staff. 1972 - 2006. Land Types of South Africa: Digital Map (1:250 000 Scale) and Soil Inventory Databases. Pretoria: ARC-Institute for Soil, Climate, and Water.
- Lotter, M.C., Le Maitre, D. 2021. Fine-scale delineation of Strategic Water Source Areas for surface water in South Africa using Empirical Bayesian Kriging Regression Prediction: Technical report. Prepared for the South African National Biodiversity Institute (SANBI), Pretoria. 33p.
- Macfarlane, D.M., Dickens, J. & Von Hase, F. (2009). *Development of a methodology to determine the appropriate buffer zone width and type for developments associated with wetlands, watercourses and estuaries*. Deliverable 1: Literature Review. INR Report No. 400/09. Water Research Commission
- Macfarlane, D.M., Bredin, I.P., Adams, J.B., Zungu, M.M., Bate, G.C. and Dickens, C.W.S. 2014. Preliminary guideline for the determination of buffer zones for rivers, wetlands and estuaries. Final Consolidated Report. WRC Report No TT 610/14, Water Research Commission, Pretoria.
- Macfarlane, D.M., Kotze, D.C., Ellery, W.N., Walters, D., Koopman, V., Goodman, P. and Goge, C. 2009. A technique for rapidly assessing wetland health: WET-Health. WRC Report TT 340/08.
- Mucina, L., and Rutherford, M.C., 2010. The vegetation of South Africa, Lesotho and Swaziland. *Strelizia* 19. South African National Biodiversity Institute, Pretoria South African.
- Nel, J. L., Driver, A., Strydom, W. F., Maherry, A. M., Petersen, C. P., Hill, L., Roux, D. J., Nienaber, S., van Deventer, H., Swartz, E. R. & Smith-Adao, L. B. (2011). Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources, WRC Report No. TT 500/11. Water Research Commission, Pretoria.
- Nel JL, Murray KM, Maherry AM, Petersen CP, Roux DJ, Driver A, Hill L, Van Deventer H, Funke N, Swartz ER, Smith-Adao LB, Mbona N, Downsborough L and Nienaber S. 2011. Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.
- Ollis DJ, Snaddon CD, Job NM, and Mbona N. 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African Biodiversity Institute, Pretoria.
- Rountree, M. & Kotze, D. 2013. Ecological Importance and Sensitivity Assessment. In: Rountree, M., Malan, H. & Weston. ed., Manual for the Rapid Ecological Reserve Determination of Inland Wetlands. Report to the Water Research Commission and Department of Water Affairs. WRC Report No. 1788/1/12. Pretoria. p. 42-46.

Soil Classification Working Group. 2018. Soil Classification A Taxonomic system for South Africa. Pretoria: The Department of Agricultural Development.

Van Deventer, H.; Smith-Adao, L.; Mbona, N.; Petersen, C.; Skowno, A.; Collins, N.B.; Grenfell, M.; Job, N.; Lötter, M.; Ollis, D.; Scherman, P.; Sieben, E.; Snaddon, K. 2018. South African Inventory of Inland Aquatic Ecosystems. South African National Biodiversity Institute, Pretoria. Report Number: CSIR report number CSIR/NRE/ECOS/IR/2018/0001/A; SANBI report number <http://hdl.handle.net/20.500.12143/5847>.

6 Appendix Items

6.1 Appendix A – Methodology

6.1.1 Ecologically Important Landscape Features

The datasets listed below were incorporated to establish the relation between the project and ecologically important or sensitive freshwater entities. Emphasis was placed around the following spatial datasets:

- South African Inventory of Inland Aquatic Ecosystems (SAIIAE), NBA 2018 Rivers and Wetlands (Van Deventer *et al.*, 2019);
- National Freshwater Priority Areas, Rivers and Wetlands, 2011 (Nel *et al.*, 2011);
- Strategic Water Source Areas, 2021 (Lötter & Le Maitre, 2021); and
- The Wetlands of the City of Cape Town.

6.1.1.1 The South African Inventory of Inland Aquatic Ecosystems

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the 2018 NBA, the SAIIAE is a collection of spatial data layers that represent the extent of river and inland wetland ecosystem types as well as the pressures on these systems. The same two headline indicators, and their associated categorisations, are applied as with the terrestrial ecosystem NBA, namely Ecosystem Threat Status and Ecosystem Protection Level. The Ecosystem Threat Status of river and wetland ecosystem types are based on the extent to which each ecosystem type had been altered from its natural condition.

6.1.1.2 National Freshwater Ecosystem Priority Areas, Rivers and Wetlands

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its inland aquatic systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs). The FEPAs are intended to be conservation support tools and it is envisioned that they will guide the effective implementation of measures to achieve the National Environment Management: Biodiversity Act's biodiversity conservation goals (Nel *et al.*, 2011).

6.1.1.3 Strategic Water Source Areas

SWSAs are defined as areas of land that supply a disproportionate quantity of mean annual surface water runoff in relation to their size, and therefore contribute considerably to the overall water supply of the country, as well as national aquatic and terrestrial biodiversity resources. These are considered key ecological infrastructure assets and the effective protection of SWSAs is vital for national security because a lack of water security will compromise national security and human wellbeing on all levels.

6.1.2 City of Cape Town Wetlands Dataset

The *City of Cape Town Wetlands Dataset* is a continuously updated GIS layer digitised at a 1:2000 scale for prioritising wetlands in the municipal area. It was developed through desktop GIS analysis (2009), ground-truthing, and aerial photography, using the National Wetland Classification System (2009). The dataset categorises wetlands by system, sub-system, functional units, structure, vegetation, and critical biodiversity area (CBA) status. Attributes include wetland type, dominant and alien vegetation, transformation status, hydroperiod, present ecological status (PES), and ecological importance and sensitivity (EIS). This resource supports conservation planning, environmental management, and reporting within the City of Cape Town.

6.1.3 Wetland Field Survey

6.1.3.1 Identification and Mapping

The wetland areas were delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 6-1. The outer edges of the wetland areas were identified by considering the following four specific indicators:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
- The soil forms (types of soil) found in the landscape were identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification Working Group, 1991);
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

Vegetation is used as the primary wetland indicator. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

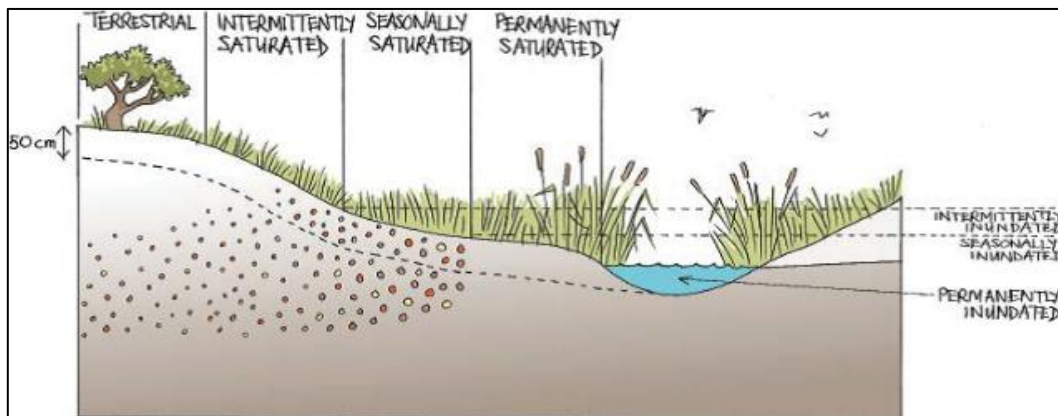


Figure 6-1 Cross section of a wetland, indicating how the soil wetness and vegetation indicators respond to changes in topography (Ollis et al. 2013)

6.1.3.2 Delineation

The wetland indicators described above are used to determine the boundaries of the wetlands within the project area. These delineations are then illustrated by means of maps accompanied by descriptions.

6.1.3.3 Classification and Description

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this study. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and then also includes structural features at the lower levels of classification (Ollis et al., 2013).

6.1.4 Wetland Functional and Ecological Assessment

6.1.4.1 Functional Assessment

Wetland Functionality refers to the ability of wetlands to provide healthy conditions for the wide variety of organisms found in wetlands as well as humans. Eco Services serve as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze *et al.*, 2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 6-1).

Table 6-1 Classes for determining the likely extent to which a benefit is being supplied

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

6.1.4.2 Present Ecological Status

The overall approach as described by Macfarlane *et al.*, 2009, is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological Status (PES) score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The Present State categories are provided in Table 6-2.

Table 6-2 The Present Ecological Status categories (Macfarlane *et al.*, 2009)

Impact Category	Description	Impact Score Range	PES Score (%)	PES
None	Unmodified, natural	0 to 0.9	90-100	A
Small	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.	1.0 to 1.9	80-89	B
Moderate	Moderately Modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	60-79	C
Large	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	40-59	D
Serious	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.	6.0 to 7.9	20-39	E
Critical	Critically Modified. The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	0-19	F

6.1.4.3 Ecological Importance and Sensitivity

The importance and sensitivity of water resources is determined in order to establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly

sensitive to impacts. The mean of the determinants as described by Rountree *et al.*, 2013, is used to assign the Ecological Importance and Sensitivity (EIS) category as listed in Table 6-3.

Table 6-3 Description of Ecological Importance and Sensitivity categories

EIS Category	Range of Mean	Recommended Ecological Management Class
Very High	3.1 to 4.0	A
High	2.1 to 3.0	B
Moderate	1.1 to 2.0	C
Low Marginal	< 1.0	D

6.1.4.4 Recommended Ecological Category and Recommended Management Objective

The Recommended Ecological Category (REC) and Recommended Management Objective (RMO) (Table 6-4) was determined based on the results obtained from the PES and EIS of the assessed wetlands, with the objective of recommending how a water resource should be managed. This is achieved by either maintaining or improving the ecological integrity of the wetland in order to ensure continued ecological functionality (DWA, 1999).

Table 6-4 Recommended Ecological Category and Recommended Management Objectives for water resources based on Present Ecological State and Ecological Importance and Sensitivity scores

		Ecological Importance and Sensitivity			
		Very High	High	Moderate	Low
PES	A (Pristine)	A Maintain	A Maintain	A Maintain	A Maintain
	B (Natural)	A Improve	A/B Improve	B Maintain	B Maintain
	C (Good)	A Improve	B/C Improve	C Maintain	C Maintain
	D (Fair)	C Improve	C/D Improve	D Maintain	D Maintain
	E/F (Poor)	D Improve	E/F Improve	E/F Maintain	E/F Maintain

6.1.5 Buffer Requirements

The “Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries” (Macfarlane *et al.*, 2014) was used to determine the appropriate buffer zone for the proposed activity.

6.2 Appendix B – Risk and Impact Assessment

6.2.1 Risk Assessment

The Department of Water and Sanitation (DWS) risk matrix assesses impacts in terms of consequence and likelihood. The significance of the impact is rated according to the classes presented in Table 6-5.

Table 6-5 Significance ratings matrix

Rating	Class	Management Description
1 – 29	(L) Low Risk	Acceptable as is or with proposed mitigation measures. Impact to watercourses and resource quality small and easily mitigated, or positive.
30 – 60	(M) Moderate Risk	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
61 – 100	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

6.3 Appendix C – Specialist Declaration of Independence

Declaration

I, Andrew Husted, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.



Andrew Husted

Freshwater Ecologist

The Biodiversity Company

October 2025

6.4 Appendix D – Specialist CVs

Andrew Husted

M.Sc Aquatic Health (*Pr Sci Nat*)

Cell: +27 81 319 1225

Email: andrew@thebiodiversitycompany.com

Identity Number: 7904195054081

Date of birth: 19 April 1979



Profile Summary

Working experience throughout South Africa, West and Central Africa and also Armenia & Serbia.

Specialist experience in exploration, mining, engineering, hydropower, private sector and renewable energy.

Experience with project management for national and international multi-disciplinary projects.

Specialist guidance, support and facilitation for the compliance with legislative processes, for in-country requirements, and international lenders.

Specialist expertise include Instream Flow and Ecological Water Requirements, Freshwater Ecology, Terrestrial Ecology and also Ecosystem Services.

Areas of Interest

Sustainability and Conservation.

Instream Flow and Ecological Water Requirements.

Publication of scientific journals and articles.

Key Experience

- World Bank, Equator Principles and the International Finance Corporation requirements
- Environmental, Social and Health Impact Assessments (ESHIA)
- Environmental Management Programmes (EMP)
- Ecological Water Requirement determination experience
- Wetland delineations and ecological assessments
- Rehabilitation Plans and Monitoring
- Fish population structure assessments
- The use of macroinvertebrates to determine water quality.
- Aquatic Ecological Assessments
- Aquaculture

Country Experience

Angola, Botswana, Cameroon
Democratic Republic of Congo
Ghana, Ivory Coast, Lesotho
Liberia, Mali, Mauritius, Mozambique
Nigeria, Republic of Armenia,
Senegal, Serbia, Sierra Leone, South Africa
Tanzania

Nationality

South African

Languages

English – Proficient
Afrikaans – Conversational
German - Basic

Qualifications

- MSc (University of Johannesburg) – Aquatic Health.
- BSc Honours (Rand Afrikaans University) – Aquatic Health
- BSc Natural Science
- Pr Sci Nat (400213/11)
- Certificate of Competence: Mondri Wetland Assessments
- Certificate of Competence: Wetland WET-Management
- SASS 5 (Expired) – Department of Water Affairs and Forestry for the River Health Programme
- EcoStatus application for rivers and streams