

WETLAND ASSESSMENT

PES, EIS, REC




GREENGATE EXT 98

Proponent:
Hocom Properties Pty Ltd
Project Reference:
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DECLARATION OF INDEPENDENCE

Specialist Name	Mr. D. Botha
Declaration of Independence	<p>I declare, as a specialist appointed in terms of the National Environmental Management Act (Act No 108 of 1998) and the associated 2014 Environmental Impact Assessment (EIA) Regulations, that:</p> <ul style="list-style-type: none">• 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 48 and is punishable in terms of section 24F of the Act.
Signature	
Date	2020/09/15

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EXECUTIVE SUMMARY

Prism Environmental Management Services was requested by **Hocom Properties Pty Ltd** to undertake a wetland assessment to delineate the wetland and to determine the Present Ecological State (PES), the Ecological Importance and Sensitivity (EIS) and the Recommended Ecological Classification (REC) for the proposed development of Holdings 43 and 44 Culembeek AH to be known as **Greengate Ext 98**. This, specifically to inform the Environmental Impact Assessment (EIA) and Water Use License Application (WULA) for the said development.

The proposed development is located on Part of Portion 43 and 44 of Culembeek Agricultural Holdings, City of Johannesburg, Gauteng Province (here after referred to as the study site/s). The study sites measure approximately 1.75ha. The study site is located in quaternary catchment C22A in the Vaal Water Management Area (WMA 5). The study area falls within the Grassland Biome (Biome 06), the Highveld Level-1 Ecoregion (Ecoregion 11) (Kleynhans et al., 2005).

The field investigations concluded that one natural wetland system was identified in the study area.

The following Hydrogeomorphic wetland was identified during the site evaluation:

- GG98_UCVB – Unchanneled Valley Bottom Wetland - was found on the valley floor at the head of the catchment, draining towards the West

Study	Findings and Conclusions											
Wetland Assessment	The development site is not directly affected by the wetland, but the wetland buffer encroaches slightly onto the development site on the western boundary.											
	This area could be used to assist with storm water management and flow management at the transitional point leading from the development and infrastructure installations into the wetland and buffer area.											
	The infrastructure installations and connections to the external services will impact on the wetland.											
	Careful design and interdisciplinary consultation between the professional team would be required. Interflows and sheet flow must be managed at the contact points.											
	Wetland	Wetland HGM	Wetland		32m Buffer		PES		EIS		REC	
	GG98_UCVB	UCVB	On site	External linked to services	On site	External linked to services	Category	Trajectory of change	Category	Trajectory of change	Category	
			No	Yes	Yes	Yes	C - Moderate	↓	C - Moderate	↓	C - Moderately modified.	
	Recommended Monitoring Requirements		Wetland Assessment				Wetland Specialist		Monthly Visual Inspections			
			Environmental Control Officers				ECO		Bi-Weekly Visual Inspections			
			Closure Audit				Wetland Specialist		Closure Audit			

Concluded from the results presented in this document, the construction activities will in all likelihood impact slightly on the wetland system but can be mitigated to satisfactory standards if all mitigatory actions are

implemented with due care. It is key to preserve water quality and supply to the downstream aquatic resources.

The rehabilitation of the wetland is vital to recover some ecological function. The wetland drivers must be enhanced as part of the rehabilitation of the affected areas. In respect of the construction phase, it is important to ensure that the required erosion protection measures linked to the wetland intersection sections be carefully designed and installed.

The project can be supported, should all the mitigation measures be implemented and monitored against to ensure compliance and protection of the aquatic resource.

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1 INTRODUCTION

Prism Environmental Management Services was requested by **Hocom Properties Pty Ltd** to undertake a wetland assessment to delineate the wetland and to determine the Present Ecological State (PES), the Ecological Importance and Sensitivity (EIS) and the Recommended Ecological Classification (REC) for the proposed development of **Greengate Ext 98**. This, specifically to inform the Environmental Impact Assessment (EIA) and Water Use License Application (WULA) for the said development.

1.1 Project Description

Hocom Properties Pty Ltd is intending to develop a mixed-use township on Portion 260 (a Portion of Portion 114) of the Farm Rietfontein No. 189 I.Q. to be known as Greengate Ext 98. The development will be zoned for mixed-use. The site extends from North to South along the Provincial M5 Road (Beyers Naude Drive) and falls under jurisdiction of the City of Johannesburg (CoJ).

The proposed development involves the development of several Business 1 and Commercial erven of approximately 8.89 hectares in extent. In addition, the proposed development also involves the provision of all necessary services to the development including water, sanitation, stormwater and internal roads.

1.1.1 Study Site Location

The proposed development is located on Portion 260 (a Portion of Portion 114) of the Farm Rietfontein No. 189 I.Q., City of Johannesburg, Gauteng Province (*here after referred to as the study site/s*) (Figure 1.2) (Figure 1.3). The study site measures approximately 8.89ha. The study site is located in quaternary catchment A21E in the Limpopo Water Management Area (WMA 1), (Figure 1.4). The study area falls within the Grassland Biome (Biome 06), the Highveld Level-1 Ecoregion (Ecoregion 11) (Kleynhans *et al.*, 2005) (Figure 1.5).

1.2 Scope and Purpose

The aim of this study was to undertake a wetland assessment to delineate the wetland and to determine the Present Ecological State (PES), the Ecological Importance and Sensitivity (EIS) and the Recommended Ecological Classification (REC) for the proposed development. This, specifically to inform the Environmental Impact Assessment (EIA) and Water Use License Application (WULA) for the said development.

1.3 Overview of Specialist

Prism EMS has conducted the required wetland specialist assessment and delineation of the wetlands on site to inform the Environmental Impact Assessment (EIA) and Water Use License Application (WULA). The team under lead of Mr. D. Botha has conducted the assessment. The details of the team are tabularised in Table 1-1.

Table 1-1: Details of Specialist

Specialist	Mr. D. Botha – Wetland Specialist			
Company:	Prism EMS			
Qualifications:	M.A. Environmental Management B.A. Hons. Geography & Environmental Management, B.A. Humanities Post Higher Education Diploma Wetland and Wetland Delineation (<i>DWAF Accredited Short Course</i>) Soil Classification and Wetland Delineation – Short Course – <i>Terrasoil Science</i> Tools for Wetland Assessment – <i>Rhodes University</i> SASS5 Aquatic Biomonitoring Training – <i>Department of Water Affairs, Ground Truth</i> Wetland Plant Taxonomy – <i>Water Research Commission</i> Hydropedology and Wetland Functioning – <i>Water Business Academy / Terra Soil Science</i>			
Experience:	17 Years			
Affiliation/ Registration	South African Council for Natural Scientific Professions (SACNASP) registered Scientist Pr.Sci.Nat. (119979) Registered Member of Environmental Assessment Practitioners Association of South Africa (EAPASA)(2019/1209) Member of the International Association for Impact Assessors (IAIAsa) (1653) Member of the Gauteng Wetland Forum Member of the South African Wetland Society			
Address:	12A Beacon Road, Poortview, Johannesburg			
Tel:	087 985 0951			
Fax:	086 601 4800			
Email:	dewet@prismems.co.za			
Designation	Name	Qualification	Professional Registration	Role
Specialist Team				
Ecologist	A.E. van Wyk	B.Sc. Environmental and Biological Sciences B.Sc. Hons. Environmental and Biological Sciences (in progress) 5 Years' Experience	Cand.Sci.Nat (pending)	Field Assistant
Aquatic Specialist	Mr. P. Singh	MSc Aquatic Health (Cum Laude) BSc.Hons (Biodiversity & Conservation) BSc (Bot & Zoo) Rand Water Water Purification of Drinking Water – <i>Rand Water Vereeniging</i> Ecotoxicity Test Methods and Validation - <i>Golder Associates Research Laboratory</i> 7 Years' Experience	Pr. Sci. Nat. (116822)	Peer Review

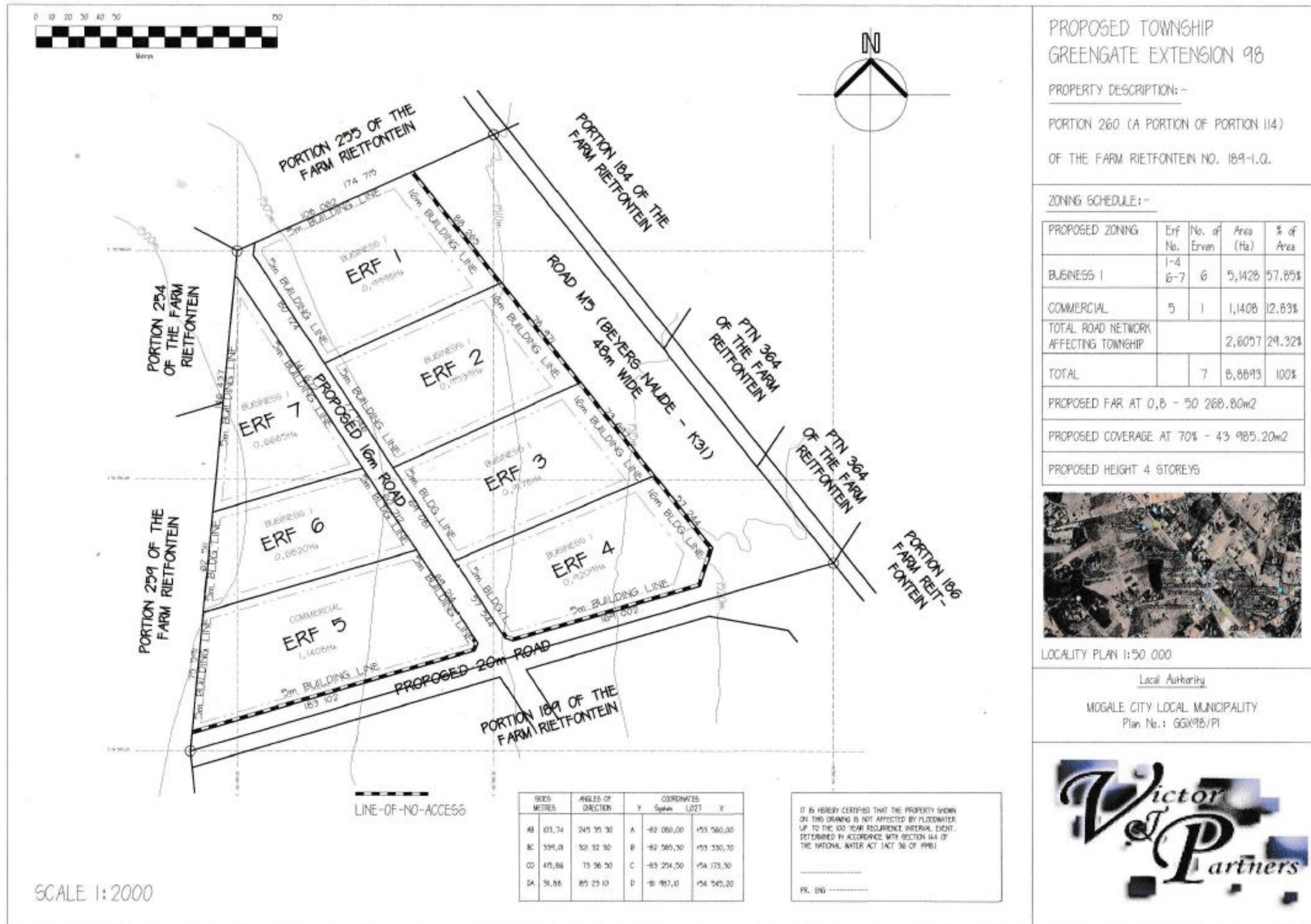
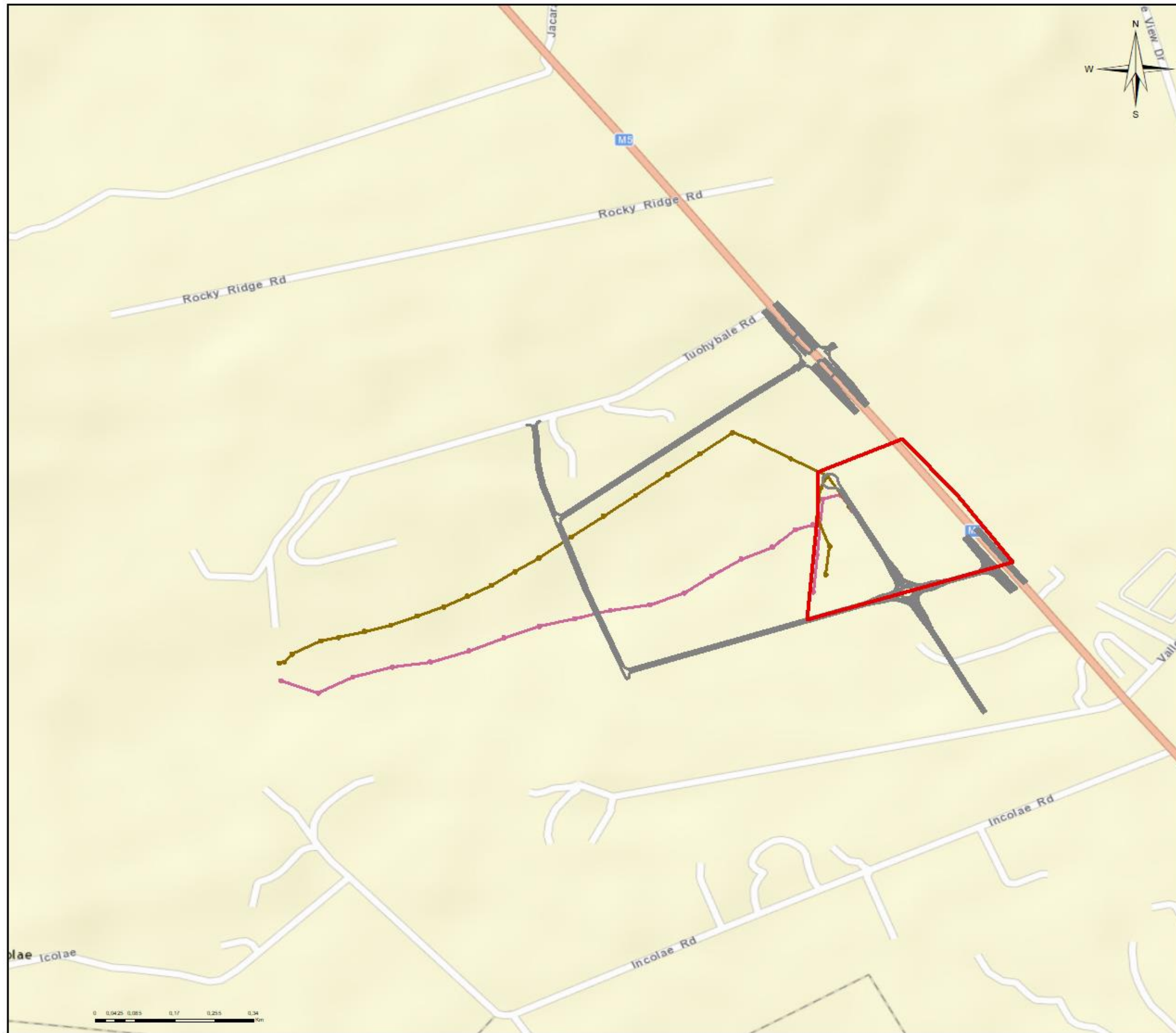


Figure 1.1: Proposed Layout.



PROJECT:
Portion 260 Rietfontein 189 IQ

WETLAND DELINEATION

GENERAL NOTES:
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

Locality Plan

Legend

- Ptn 260 Rietfontein
- New Roads and Upgrades
- New Sewer Line - Proposal
- New Sewer Line - Alternative

REVISIONS:
FINAL

CLIENT: Hocom Properties Pty Ltd	SCALE: 1:7 500
	DRAWING REF: 21949-Locality Plan v2
	DRAWING STATUS: FINAL

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Figure 1.2: Locality Plan.



PROJECT:
Portion 260 Rietfontein 189 IQ

**WETLAND
DELINEATION**

GENERAL NOTES:
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

Study Area

Legend

- Ptn 260 Rietfontein
- New Roads and Upgrades
- New Sewer Line - Proposal
- New Sewer Line -

REVISIONS:
FINAL

CLIENT: Hocom Properties Pty Ltd	SCALE: 1:7 500
DRAWING REF: 21949-Study Area v2	DRAWING STATUS: FINAL

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Figure 1.3: Map of the survey area.

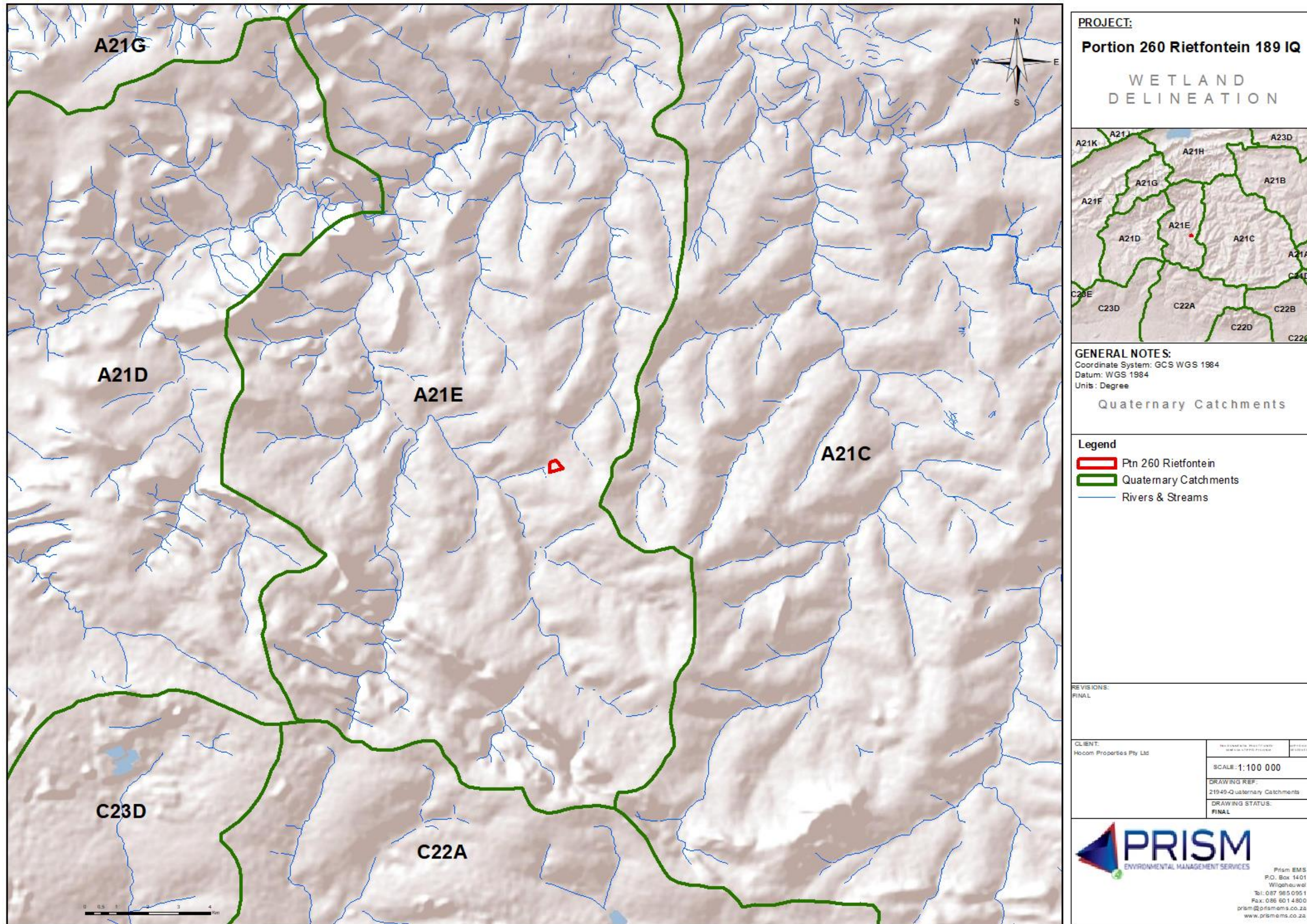


Figure 1.4: Map of the Catchment Areas.

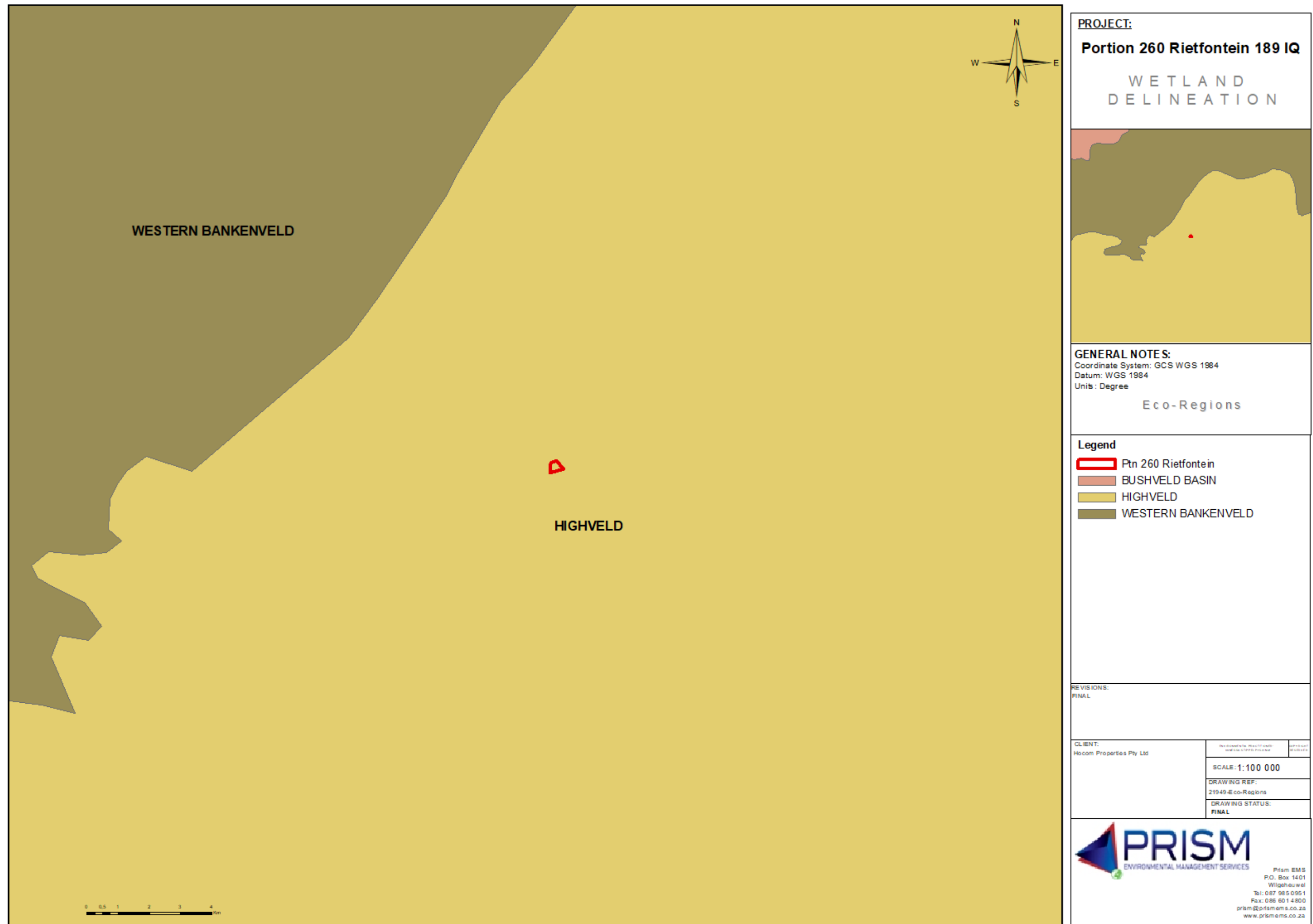


Figure 1.5: Map of the study sites Eco-Regions (DWAf; 2005).

2 REPORT OUTLINE

Appendix 6 of GN 982 of 4 December 2014 provides the requirements for specialist reports undertaken as part of the environmental authorisation process. In line with this, Table 2-1 provides an overview of Appendix 6 together with information on how these requirements have been met.

Table 2-1. Specialist Report Requirements.

Requirement from Appendix 6 of GN 982 of 4 December 2014	Chapter
(a) Details of - <ul style="list-style-type: none"> (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae 	Chapter 1.3
(b) Declaration that the specialist is independent in a form as may be specified by the competent authority	<i>Declaration of Independence</i>
(c) Indication of the scope of, and the purpose for which, the report was prepared	Chapter 1.2
(d) Date and season of the site investigation and the relevance of the season to the outcome of the assessment	Chapter 4.1
(e) Description of the methodology adopted in preparing the report or carrying out the specialised process	Chapter 4.
(f) Specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Chapter 6
(g) Identification of any areas to be avoided, including buffers	Chapter 6
(h) Map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Chapter 6
(l) Description of any assumptions made and any uncertainties or gaps in knowledge	Chapter 5
(j) Description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment	Chapter 6 Chapter 1
(k) Mitigation measures for inclusion in the EMPr	Chapter 8.1
(l) Conditions for inclusion in the environmental authorisation	Chapter 8.1
(m) Monitoring requirements for inclusion in the EMPr or environmental authorisation	Chapter 8.1
(n) Reasoned opinion - <ul style="list-style-type: none"> (i) as to whether the proposed activity or portions thereof should be authorised; and 	Chapter 8

Requirement from Appendix 6 of GN 982 of 4 December 2014	Chapter
(ii) if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMP, and where applicable, the closure plan	
(o) Description of any consultation process that was undertaken during the course of preparing the specialist report	Chapter 4.7
(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
(q) Any other information requested by the competent authority	N/A

3 LEGISLATION AND GUIDELINES

The generic term ‘wetland’ is used worldwide and includes specific ecosystems such as bogs, coastal lakes, estuaries, fens, floodplains, mangroves, marshes, mires, moors, pans, peatlands, seeps, sloughs, springs, swamps, vlei and wet meadows (Mays, 1996; DWAF, 2005). Regardless of the local name given to wetlands, the driving force of all wetlands is the interplay between land and water, and the consequent characteristics that reflect both (Cowan, 1999). Any part of the landscape where water accumulates for long enough and often enough to influence the plants, animals and soils occurring in that area, is referred to as a wetland (DWAF, 2005). Wetlands comprise approximately 6% (8.5 km² x 10³) of the world’s land surface and are found in every climate from the tropics to the frozen tundra (Mays, 1996).

Several definitions for wetland and wetland areas exist. Two of the most common wetland definitions used in South Africa is the National Water Act (NWA) (Act 36 of 1998) and the Ramsar definition are provided below:

National Water Act, Act No 36 of 1998:

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

South Africa, being a contracting party to Ramsar, also uses the definition accepted by the convention. Article 1.1 of the convention defines wetlands as (Cowan, 1999; Koester, 1989):

“Areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters.”

Wetlands are defined as those areas that have water on the surface or within the root zone for long enough periods throughout the year to allow for the development of anaerobic conditions. These conditions create unique soil conditions (hydric soils) and support vegetation adapted to these flood conditions.

Hydric soils develop a grey or sometimes greenish or blue-grey colour, as a result of the chemical reduction of iron (gleying). Hydric soils that are seasonally flooded are characterised by the formation of mottles, which are relatively insoluble, enabling them to remain in the soil long after it has been drained. Consequently, it is possible to identify wetland areas on the basis of soil colour, using a standard colour chart, as matrix hue and chroma decrease, while mottle hue and chroma initially increase and then decrease the more saturated the soils become Table 3-1.

Table 3-1: Relationship between degree of wetness (wetland zone), soil-physiochemistry and vegetation (Kotze *et al.*, 1994).

Degree of wetness			
	Temporary	Seasonal	Permanent / Semi-permanent
Soil Depth (0cm – 10cm)	Matrix chroma: 1-3 Few / no mottles Low / intermediate OM Non-sulphuric	Matrix chroma: 0-2 Many mottles Intermediate OM Seldom sulphuric	Matrix chroma: 0-1 Few / no mottles High OM Often sulphuric
Soil Depth (40cm – 50cm)	Few / many mottles Matrix chroma: 0-2	Many mottles Matrix chroma: 0-2	No / few mottles Matrix chroma: 0-1
Vegetation	Predominantly grass species	Predominantly sedges and grasses	Predominantly reeds and sedges

Vegetation distribution within wetlands is related to the flooding regime. Terrestrial plants are not tolerant of flooding within the root zone for periods long enough to cause anaerobic conditions, and are thus found on drier soil conditions. The distribution of wetland plants is related to their tolerance of different flooding conditions, and their distribution within a system can be used as an indication of the wetness of an area.

Typically, indicators of soil wetness based on soil morphology correspond closely with vegetation distribution, since hydrology affects soils and vegetation in systematic and predictable ways. However, in systems where the hydrological regime has been modified due to human activities, vegetation distribution will not vary systematically with soil morphology. The response of vegetation to alteration of

hydrological conditions is rapid (months / years), whereas the response of soil morphology to such alteration is slow (centuries). Therefore, lowering of the water table or reduction of surface flows, may lead to rapid establishment of terrestrial vegetation, whereas the soil morphology will retain indicators of wetness for a lengthy period. Soil morphology forms the basis of wetland delineation nationally, following international protocols, mainly because it provides a long-term indication of the “natural” hydrological regime. However, soil morphology cannot be considered to necessarily reflect the current hydrological conditions of the site where the hydrological regime has been altered, and in such circumstances vegetation provides the best indication of the distribution of wetlands as it best reflects current hydrological conditions (Figure 3.1).

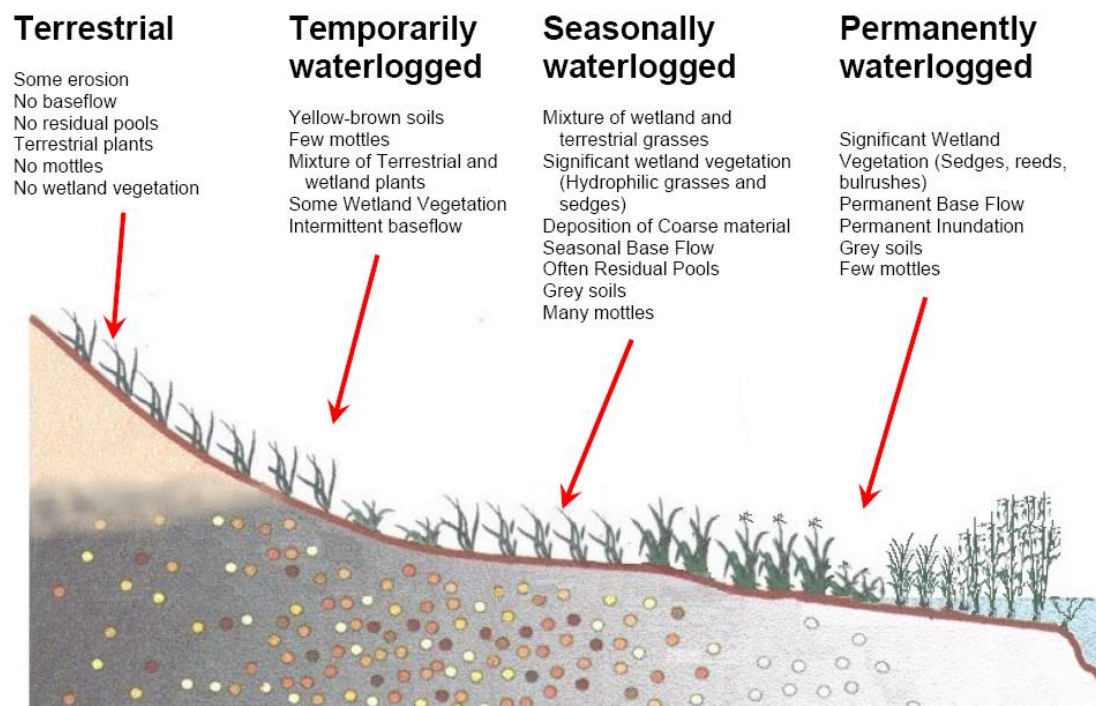


Figure 3.1: Cross section through a wetland, indicating how the soil wetness and vegetation indicators change along a gradient of decreasing wetness, from the middle to the edge of the wetland. (Reproduced by Sivest from Kotze (1996), DWAF Guidelines).

Wetland vegetation is adapted to shallow water table conditions. Due to water availability and rich alluvial soils, wetland areas are usually very productive. Tree growth rate is high and the vegetation under the trees is usually lush and includes a wide variety of shrubs, grasses and wildflowers.

3.2 EIA Applicable Legislation

3.2.1 National Environmental Management Act (Act No. 107 of 1998) (NEMA)

The proposed development triggers a number of activities in terms of NEMA. These are listed in Table 3-2.

Table 3-2: Listed Activities in terms of NEMA

Government Notice Number	Activity and Listing Number	Description
GN 983 of 4 December 2014	Activity 9 (i), Listing Notice 1	<p>The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water—</p> <ul style="list-style-type: none"> (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; <p>excluding where—</p> <ul style="list-style-type: none"> (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or where such development will occur within an urban area.
GN 983 of 4 December 2014	Activity 12 (ii) (a)(c) Listing Notice 1	<p>The development of—</p> <ul style="list-style-type: none"> (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— <ul style="list-style-type: none"> (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; — <ul style="list-style-type: none"> excluding— <ul style="list-style-type: none"> (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.

Government Notice Number	Activity and Listing Number	Description
GN 983 of 4 December 2014	Activity 19 (i), Listing Notice 1	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing, dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.
GN 983 of 4 December 2014	Activity 24 (ii), Listing Notice 1	The development of a road— (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road— (a) which is identified and included in activity 27 in Listing Notice 2 of 2014; (b) where the entire road falls within an urban area; or (c) which is 1 kilometre or shorter.
GN 983 of 4 December 2014	Activity 27, Listing Notice 1	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation.
GN 983 of 4 December 2014	Activity 28 (ii), Listing Notice 1	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.
GN 985 of 4 December 2014	Activity 4 (c)(iv)(v)(vi), Listing Notice 3	The development of a road wider than 4 metres with a reserve less than 13,5 metres.

Government Notice Number	Activity and Listing Number	Description
GN 985 of 4 December 2014	Activity 12 (c)(i)(ii), Listing Notice 3	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan
GN 985 of 4 December 2014	Activity 14 (c)(iv)(v)(vi), Listing Notice 3	<p>The development of-</p> <ul style="list-style-type: none"> (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more <p>where such development occurs-</p> <ul style="list-style-type: none"> a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; - <p>excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.</p>

3.3 WULA Applicable Legislation

3.3.1 National Water Act (Act No 36 of 1998) (NWA)

The NWA is the primary regulatory legislation; controlling and managing the use of water resources as well as the pollution thereof and is implemented and enforced by the Department of Water and Sanitation (DWS¹). Section 21 of the NWA lists water uses that must be licensed unless it is listed in the schedule (existing lawful use) and/or is permissible under a general authorisation, or if a responsible authority waives the need for a Water Use Licence.

The following listed water uses that require a Water Use License according to Section 21 of the NWA are triggered for the proposed project:

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

A Water Use Licence Application (WULA) will be undertaken.

¹ Previously referred to as the Department of Water Affairs

4 METHODOLOGY

4.1 Wetland Assessment

4.1.1 Desktop Assessment

A preliminary delineation of the Wetland boundary was undertaken using aerial photograph interpretation. Historical records and reports were consulted. The Department of Water and Sanitation (DWS) database was also consulted to obtain historical data for the study area. The National Wetland Map version 5 (NWM5) as presented by South African National Biodiversity Institute (SANBI) was also scrutinised (Van Deventer *et al*, 2019). Historical data and official approvals were also consulted during the assessment.

4.1.2 Field Investigation

The field investigation was undertaken during January 2020 to assess and corroborate the delineated Wetland zones present on the survey area.

The field procedure for the wetland delineation was conducted according to the Guidelines for delineating the boundaries of a wetland set out by the Department of Water Affairs and Forestry (DWAF 2005/8). Due to the transitional nature of wetland boundaries, the different wetland zones are often not clearly apparent. However, the wetland edge can be determined accurately. The delineations are based on scientifically defensible criteria and are aimed at providing a tool to facilitate the decision-making process regarding the assessment of the significance of impacts that may be associated with the proposed developments.

The wetlands were delineated by considering the following wetland indicators (DWAF 2005/8):

- Terrain unit indicator helps identifying those parts of the landscape where wetlands are most likely to occur. Wetlands occupy characteristic positions in the landscape and can occur on the following terrain units: crest, midslope, footslope, and valley bottom;
- 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 hydrophytic vegetation associated with frequently saturated soils.

The following procedure was followed during the delineation of the wetland boundaries and zones:

- A desktop delineation of the larger wetland area was undertaken using satellite imagery of the study site;
- Areas for verification were identified; and
- Identified areas were then assessed in the field with boundaries being recorded using a GPS.

4.1.3 Mapping

Mapping of the wetland boundaries was done by computerised processing utilising GPS tools, mobile applications and GIS modelling.

4.2 Wetland Classification

SANBI’s “Further development of a proposed National Classification System for South Africa” was used to verify the classification of the wetlands within the study area (SANBI, 2009). The wetlands were classified up to level four, which includes the system, regional setting, landscape unit and hydrogeomorphic unit.

Table 4-1: Wetland classification level 1 - 4.

Level 1: System	Level 2: Regional setting	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) unit				
Connectivity to open ocean	Ecoregion	Landscape setting	HGM type	Longitudinal zonation / landform	Drainage - outflow	Drainage - inflow	
			A	B	C	D	
INLAND	DWA Level 1 Ecoregions	SLOPE	Channel (river)	Mountain headwater stream	Not applicable	Not applicable	
				Mountain stream	Not applicable	Not applicable	
				Transitional river	Not applicable	Not applicable	
				Rejuvenated bedrock fall	Not applicable	Not applicable	
			Hillslope seep	Not applicable	With channel inflow	Not applicable	
					Without channel inflow	Not applicable	
			Depression	Not applicable	Exorheic	With channel inflow	Not applicable
						Without channel inflow	Not applicable
					Endorheic	With channel inflow	Not applicable
						Without channel inflow	Not applicable
		dammed			With channel inflow	Not applicable	
					Without channel inflow	Not applicable	
		VALLEY FLOOR	Channel (river)	Mountain stream	Not applicable	Not applicable	
				Transitional river	Not applicable	Not applicable	
				Rejuvenated bedrock fall	Not applicable	Not applicable	
				Upper foothill river	Not applicable	Not applicable	
				Lower foothill river	Not applicable	Not applicable	
				Lowland river	Not applicable	Not applicable	
				Rejuvenated foothill river	Not applicable	Not applicable	
				Upland floodplain river	Not applicable	Not applicable	
Valley-bottom depression	Not applicable			Not applicable			

Level 1: System	Level 2: Regional setting	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) unit				
			Channelled valley-bottom wetland	Valley-bottom flat	Not applicable	Not applicable	
			Unchannelled valley-bottom wetland	Valley-bottom depression	Not applicable	Not applicable	
				Valley-bottom flat	Not applicable	Not applicable	
			Floodplain wetland	Floodplain depression	Not applicable	Not applicable	
				Floodplain flat	Not applicable	Not applicable	
			Depression	Not applicable	Exorheic	With channel inflow	
						Without channel inflow	
					Endorheic	With channel inflow	
						Without channel inflow	
					dammed	With channel inflow	
		Without channel inflow					
		Valleyhead seep	Not applicable	Not applicable	Not applicable		
		PLAIN	Channel (river)	Lowland river	Not applicable	Not applicable	
				Upland floodplain river	Not applicable	Not applicable	
			Floodplain wetland	Floodplain depression	Not applicable	Not applicable	
				Floodplain flat	Not applicable	Not applicable	
			Unchannelled valley-bottom wetland	Valley-bottom depression	Not applicable	Not applicable	
				Valley-bottom flat	Not applicable	Not applicable	
			Depression	Not applicable	Exorheic	With channel inflow	
						Without channel inflow	
					Endorheic	With channel inflow	
						Without channel inflow	
		Flat	Not applicable	Not applicable	Not applicable		
		BENCH (Hilltop/saddle/shelf)	Depression	Exorheic	With channel inflow		
					Without channel inflow		
				Endorheic	With channel inflow		
					Without channel inflow		
		Flat	Not applicable	Not applicable	Not applicable		

The Hydrogeomorphic wetland units identified will be describe individually as per Marneweck and Batchelor (Marneweck & Batchelor; 2002).

4.3 Present Ecological Status (PES) assessment

WET-Health assists in assessing the health of wetlands using indicators based on geomorphology, hydrology and vegetation. WET-Health is tailored specifically for South African conditions and has wide

application, including assessing the Present Ecological State of a wetland for purposes of Ecological Reserve determination in terms of the National Water Act, and for environmental impact assessments WET-Health (Macfarlane *et al*, 2008). A level 1 wetland assessment was undertaken to determine the PES of the wetland system.

The PES assessment is concluded by following a 5 step process:

1. Divide the wetland into HGM units
2. Assess hydrological health of the wetland
3. Assess geomorphological health
4. Assess vegetation health of the wetland
5. Represent the health scores for the overall wetland

Table 4-2: Outline of steps involved in the Level 1 assessment (Macfarlane *et al*, 2008).

Step 1	Divide the wetland into HGM units
↓	
Step 2	Assess hydrological health of the wetland
	<ul style="list-style-type: none"> • Step 2A Evaluate changes to water input characteristics from the catchment • Step 2B Evaluate changes to water distribution and retention patterns with the wetland • Step 2C Determine the hydrological State of the wetland based on integrating scores from individual HGM Units • Step 2D Determine the overall Present Hydrological State of the wetland based on integrating scores from individual HGM Units • Step 2E Assess the anticipated trajectory of change of the wetland hydrology
↓	
Step 3	Assess geomorphological health
	<ul style="list-style-type: none"> • Step 3A Determine the Present Geomorphic State of the Individual HGM units • Step 3B Determine the overall Present Geomorphic State of the wetland based on integrating scores from individual HGM Units • Step 3C Assess the anticipated trajectory of change of the geomorphology of the overall wetland
↓	
Step 4	Assess vegetation health of the wetland
	<ul style="list-style-type: none"> • Step 4A Familiarisation with the general structure and composition of wetland vegetation in the area • Step 4B Identify and estimate the extent of disturbance classes • Step 4C Assess the changes to vegetation composition in each class, and integrate these for the overall HGM Unit • Step 4D Determine the overall Present Vegetation State based on integrating scores from individual HGM Units • Step 4E Assess the anticipated trajectory of change of wetland vegetation
↓	
Step 5	Represent the health scores for the overall wetland

The Present Ecological State (PES) categories are given in Table 4-3.

Table 4-3: PES categories (Macfarlane *et al*, 2008).

Description of Ecological Category	Combined impact score	PES Category
Unmodified / Natural	0-0.9	A
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	B
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	C
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	D
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	E
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	F

The determination of the probable Trajectory of Change of the wetland is also evaluated. This is rated and presented as indicated in Table 4-4.

Table 4-4: Trajectory of Change classes, scores and symbols used to represent anticipated changes to wetland integrity (Macfarlane *et al*, 2008).

Trajectory class	Description	Change score	Class Range	Symbol
Improve markedly	Condition is likely to improve substantially over the next five years	2	1.1 to 2.0	↑↑
Improve	Condition is likely to improve over the next 5 years	1	0.3 to 1.0	↑
Remain stable	Condition is likely to remain stable over the next 5 years	0	-0.2 to +0.2	→
Deterioration slight	Condition is likely to deteriorate slightly over the next 5 years	-1	-0.3 to -1.0	↓
Deterioration substantial	Condition is likely to deteriorate substantially over the next 5 years	-2	-1.1 to -2.0	↓↓

4.4 Wetland Ecological Importance and Sensitivity (EIS)

The ecological importance and sensitivity assessment were conducted according to the guidelines as discussed by DWAF (1999). DWAF defines “ecological importance” of a water resource as an expression of its importance to the maintenance of ecological diversity and function on local and wider scales. “Ecological sensitivity”, according to DWAF (1999), refers to the system’s ability to resist disturbance and its capability to recover from disturbance once it has occurred. The Ecological Importance and Sensitivity (EIS) analysis provides a guideline for the determination of the Ecological Management Class (EMC).

In the method outlined by DWAF (1999) a series of determinants for EIS are assessed for the wetlands on a scale of 0 to 4 (Table 4-5), where 0 indicates no importance and 4 indicates very high importance. The median of the determinants is used to determine the EIS and EMC of the wetland unit (Table 4-6).

Table 4-5: Score sheet for the determination of ecological importance and sensitivity (DWAF, 1999).

Determinant	Score	Confidence
Primary determinants		
Rare and endangered species		
Species / taxon richness		
Diversity of Habitat types or features		
Migration route / breeding and feeding site for wetland species		
Sensitivity to changes in the natural hydrological regime		
Sensitivity to water quality changes		
Flood storage, energy dissipation and particulate / element removal		
Modifying determinants		
Protected status		
Ecological integrity		

Score guideline: 4 = Very High; 3 = High; 2 = Moderate; 1 = Marginal / Low; 0 = None. Confidence rating: 4 = Very High Confidence; 3 = High Confidence; 2 = Moderate Confidence; 1 = Marginal / Low Confidence.

Table 4-6: Ecological Importance and Sensitivity (EIS) categories and the interpretation of median scores for biotic and habitat determinants (DWAF, 1999).

Range of Median	EIS Category	Category Description	Ecological Management Class
>3 and ≤4	Very High	Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	A
>2 and ≤3	High	Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water in major rivers.	B
>1 and ≤2	Moderate	Wetlands that are to be considered ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	C
>0 and ≤1	Low/ Marginal	Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	D

4.5 Recommended Ecological Category (REC)

“A high management class relates to the flow that will ensure a high degree of sustainability and a low risk of ecosystem failure. A low management class will ensure marginal maintenance of sustainability, but carries a higher risk of ecosystem failure.” (DWAF, 1999).

The Recommended Ecological Category (REC) is determined based on the results obtained from the Present Ecological State (PES), reference conditions and Ecological Importance and Sensitivity (EIS) of the aquatic resource. This is then followed by realistic recommendations, mitigation, and rehabilitation measures to achieve the desired REC.

A system may receive the same class for the PES, as the REC if the system is deemed to be in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be

assigned in order to prevent any further degradation as well as to enhance the PES of the riparian system (Table 4-7).

Table 4-7: Recommended Ecological Category (REC) classes.

Class (% of total)	Description
A	Unmodified, natural.
B	Largely natural with few modifications.
C	Moderately modified.
D	Largely modified.

4.6 Impact Assessment Methodology

As standardized impact assessment methodology was utilized to determine the impacts associated with the proposed installation. A summary of this methodology is provided below.

The **significance** of an impact is defined as the combination of the **consequence** of the impact occurring and the **probability** that the impact will occur. The nature and type of impact may be direct or indirect and may also be positive or negative, refer to Table 4-8: below for the specific definitions.

Table 4-8: Nature and type of impact.

Nature and Type of Impact:			
IMPACT	Direct	Impacts that are caused directly by the activity and generally occur at the same time and place as the activity	✓/✗
	Indirect	Indirect or induced changes that may occur as a result of the activity. These include all impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity	✓/✗
	Cumulative	Those impacts associated with the activity which add to, or interact synergistically with existing impacts of past or existing activities, and include direct or indirect impacts which accumulate over time and space	✓/✗
	Positive	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes will benefit significantly, and includes neutral impacts (those that are not considered to be negative)	✓
	Negative	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes will be comprised	✗

Table 4-9 presents the defined criteria used to determine the **consequence** of the impact occurring which incorporates the extent, duration and intensity (severity) of the impact.

Table 4-9: Consequence of the Impact occurring.

Extent of Impact:	
Site	Impact is limited to the site and immediate surroundings, within the study site boundary or property (immobile impacts)
Neighbouring	Impact extends across the site boundary to adjacent properties (mobile impacts)
Local	Impact occurs within a 5km radius of the site
Regional	Impact occurs within a provincial boundary
National	Impact occurs across one or more provincial boundaries
Duration of Impact:	
Incidental	The impact will cease almost immediately (within weeks) if the activity is stopped, or may occur during isolated or sporadic incidences
Short-term	The impact is limited to the construction phase, or the impact will cease within 1 - 2 years if the activity is stopped
Medium-term	The impact will cease within 5 years if the activity is stopped
Long-term	The impact will cease after the operational life of the activity, either by natural processes or by human intervention
Permanent	Where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient
Intensity or Severity of Impact:	
Low	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are not affected
Low-Medium	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are modified insignificantly
Medium	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are altered
Medium-High	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes are severely altered
High	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes will permanently cease

The probability of the impact occurring is the likelihood of the impacts actually occurring, and is determined based on the classification provided in Table 4-10.

Table 4-10: Probability and confidence of impact prediction.

Probability of Potential Impact Occurrence:	
Improbable	The possibility of the impact materialising is very low either because of design or historic experience
Possible	The possibility of the impact materialising is low either because of design or historic experience
Likely	There is a possibility that the impact will occur
Highly Likely	There is a distinct possibility that the impact will occur
Definite	The impact will occur regardless of any prevention measures

The significance of the impact is determined by considering the consequence and probability without taking into account any mitigation or management measures and is then ranked according to the ratings listed in Table 4-11.

Table 4-11: Significance rating of the impact.

Significance Ratings:		
SIGNIFICANCE	Low	Neither environmental nor social and cultural receptors will be adversely affected by the impact. Management measures are usually not provided for low impacts
	Low-Medium	Management measures are usually encouraged to ensure that the impacts remain of Low-Medium significance. Management measures may be proposed to ensure that the significance ranking remains low-medium
	Medium	Natural, cultural and/or social functions and processes are altered by the activities, and management measures must be provided to reduce the significance rating
	Medium-High	Natural, cultural and/or social functions and processes are altered significantly by the activities, although management measures may still be feasible
	High	Natural, cultural, and/or social functions and processes are adversely affected by the activities. The precautionary approach will be adopted for all high significant impacts and all possible measures must be taken to reduce the impact

The level of confidence associated with the impact prediction is also considered as low, medium or high (Table 4-12:).

Table 4-12: Level of confidence of the impact prediction.

Level of Confidence in the Impact Prediction:		
CONFIDENCE	Low	Less than 40% sure of impact prediction due to gaps in specialist knowledge and/or availability of information
	Medium	Between 40 and 70% sure of impact prediction due to limited specialist knowledge and/or availability of information
	High	Greater than 70% sure of impact prediction due to outcome of specialist knowledge and/or availability of information

Once significance rating has been determined for each impact, management and mitigation measures must be determined for all impacts that have a significance ranking of Medium and higher in order to attempt to reduce the level of significance that the impact may reflect.

The EIA Regulations, 2014 specifically require a description is provided of the degree to which these impacts:

- can be reversed;
- may cause irreplaceable loss of resources; and
- can be avoided, managed or mitigated.

Based on the proposed mitigation measures, the mitigation efficiency is also determined (Table 4-13) whereby the initial significance is re-evaluated and ranked again to effect a significance that incorporates the mitigation based on its effectiveness. The overall significance is then re-ranked and a final significance rating is determined.

Table 4-13: Mitigation efficiency.

Mitigation Efficiency		
MITIGATION EFFICIENCY	None	Not applicable
MITIGATION EFFICIENCY	Very Low	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact. Positive impacts will remain the same
MITIGATION EFFICIENCY	Low	Where the significance rating reduces by one level, after mitigation
MITIGATION EFFICIENCY	Medium	Where the significance rating reduces by two levels, after mitigation
MITIGATION EFFICIENCY	High	Where the significance rating reduces by three levels, after mitigation
MITIGATION EFFICIENCY	Very High	Where the significance rating reduces by more than three levels, after mitigation

The reversibility is directly proportional to the “Loss of Resource” where no loss of resource is experienced, the impact is completely reversible; where a substantial “Loss of resource” is experienced there is a medium degree of reversibility; and an irreversible impact relates to a complete loss of resources, i.e. irreplaceable (Table 4-14).

Table 4-14: Degree of reversibility and loss of resources.

Loss of Resources:		
DEGREE REVERSABILITY & LOSS OF RESOURCES	No Loss	No loss of social, cultural and/or ecological resource(s) are experienced. Positive impacts will not experience resource loss
DEGREE REVERSABILITY & LOSS OF RESOURCES	Partial	The activity results in an insignificant or partial loss of social, cultural and/or ecological resource(s)
DEGREE REVERSABILITY & LOSS OF RESOURCES	Substantial	The activity results in a significant loss of social, cultural and/or ecological resource(s)
DEGREE REVERSABILITY & LOSS OF RESOURCES	Irreplaceable	The activity results in the complete and irreplaceable social, cultural and/or ecological loss of resource(s)
Reversibility:		
DEGREE REVERSABILITY & LOSS OF RESOURCES	Irreversible	Impacts on natural, cultural and/or social functions and processes are irreversible to the pre-impacted state in such a way that the application of resources will not cause any degree of reversibility
DEGREE REVERSABILITY & LOSS OF RESOURCES	Medium Degree	Impacts on natural, cultural and/or social functions and processes are partially reversible to the pre-impacted state if less than 50% resources are applied
DEGREE REVERSABILITY & LOSS OF RESOURCES	High Degree	Impacts on natural, cultural and/or social functions and processes are partially reversible to the pre-impacted state if more than 50% resources are applied
DEGREE REVERSABILITY & LOSS OF RESOURCES	Reversible	Impacts on natural, cultural and/or social functions and processes are fully reversible to the pre-impacted state if adequate resources are applied

4.7 Consultation Process

Consultation as part of the overall environmental authorization process is being undertaken by Prism EMS (EAP). Prism EMS, wetland specialist consulted with:

- The EAP
- Department of Water and Sanitation (DWS)
- The Professional Team

5 ASSUMPTIONS, GAPS AND LIMITATIONS

The study was limited to a snapshot view during a few site visits. The field investigations were undertaken during January 2020 to assess and confirm the delineated Wetland zones present on the survey area. The wetland's northern bank was surveyed less intensely and mostly based on desktop level delineations as this area will not be impacted by the developed. The eastern section adjacent to the proposed development was surveyed in detail. Weather conditions during the survey were favourable for recordings. The delineations were recorded by hand held GPS.

It must be noted that, during the process of converting spatial data to final output drawings, several steps are followed that may affect the accuracy of areas delineated. Due care has been taken to preserve accuracy. Printing or other forms of reproduction may also distort the scale indicated in maps. It is therefore suggested that the wetland areas identified in this report be pegged in the field in collaboration with the surveyor for precise boundaries.

It is unlikely that more surveys would alter the outcome of this study radically.

6 RESULTS AND FINDINGS

6.1 Wetland Delineation

6.1.1 Desktop Assessment

During the desktop investigation, one (1) possible area where wetlands could occur was identified on or in close proximity to the study site that would be affected by the proposed development activities. The National Wetland Map version 5 (NWM5) as presented by SANBI was also scrutinised and one wetland area were identified (refer to Figure 6.3) on or in close proximity to the study site that could be affected by the proposed activities. The wetland as indicated by the NWM5 wetland layers were further investigated on site.

6.1.2 Field Assessment

The field investigations were undertaken during January 2020 to assess and confirm the delineated Wetland zones present on the survey area.

The field investigations concluded that one natural wetland unit could be recorded as per the DWAF, 2005 guidelines (Figure 6.6)

6.1.2.1 *Wetland Indicators*

6.1.2.1.1 *Terrain Unit Indicator*

Terrain unit indicator helps identify those parts of the landscape where wetlands are most likely to occur. Wetlands occupy characteristic positions in the landscape and can occur on the following terrain units:

- crest,

- midslope,
- footslope, and
- valley bottom.

The wetlands identified were also assessed in respect to its location in the landscape. The wetland found:

- GG98_UCVB was found on the valley floor at the head of the catchment, draining towards the West

Refer to Table 6-1 and section 4.2 Wetland Classification for the classification of the terrain unit.

Table 6-1: Wetland Classification

Level 1: System	Level 2: Regional setting	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) unit	
Connectivity to open ocean	Ecoregion	Landscape setting	HGM type	Longitudinal zonation / landform
			A	B
INLAND	DWAF Level 1 Ecoregions	VALLEY FLOOR	Unchanneled valley-bottom wetland	Valley-bottom flat

6.1.2.1.2 Soil Form and Soil Wetness Indicator

Soil erodibility in hydrologically transformed environments contributes to the difficulties to precisely determining wetland boundaries. This investigation focussed on the delineation of the wetland features based on soil hydro-morphology and landscape hydrology as observed in the catchment and on the site.

Soils were found to be of a low clay content in general. Mostly sandy soils were present especially in the top 150mm. The wetland seasonal and permanent zones reflected clayey soils. Typical wetland soils were observed (Figure 6.1).



Figure 6.1: Soil samples.

6.1.2.1.3 *Vegetation Indicator*

Upon the assessment of the area, the various wetland vegetation components were assessed and recorded. Dominant species were characterised as either wetland species or terrestrial species. Hydrophytic vegetation species were observed. Predominantly grass, rushes and sedge species were recorded. This unit was predominantly utilised to delineate the wetland.



Figure 6.2: Wetland vegetation.

Table 6-2: Wetland indicator species noted during the assessment.

Riparian / Wetland vegetation	
<i>Pycurus species</i>	<i>Fuirena Species</i>
<i>Paspalum species</i>	<i>Imperata cylindrica</i>
<i>Andropogan species</i>	<i>Cyperus species</i>
<i>Berkheya radula</i>	<i>Leersia hexandra</i>

*Not all species listed, only most common/dominant indicators

6.1.3 Mapping

Figure 6.3 indicates the National Wetland Map version 5 (NWM5) as presented by SANBI (Van Deventer *et al.*, 2019). NWM5 indicates one wetland to the west of the study site.

Figure 6.4 illustrates the Flow Accumulation Model that indicates the accumulation of water in the wetland system.

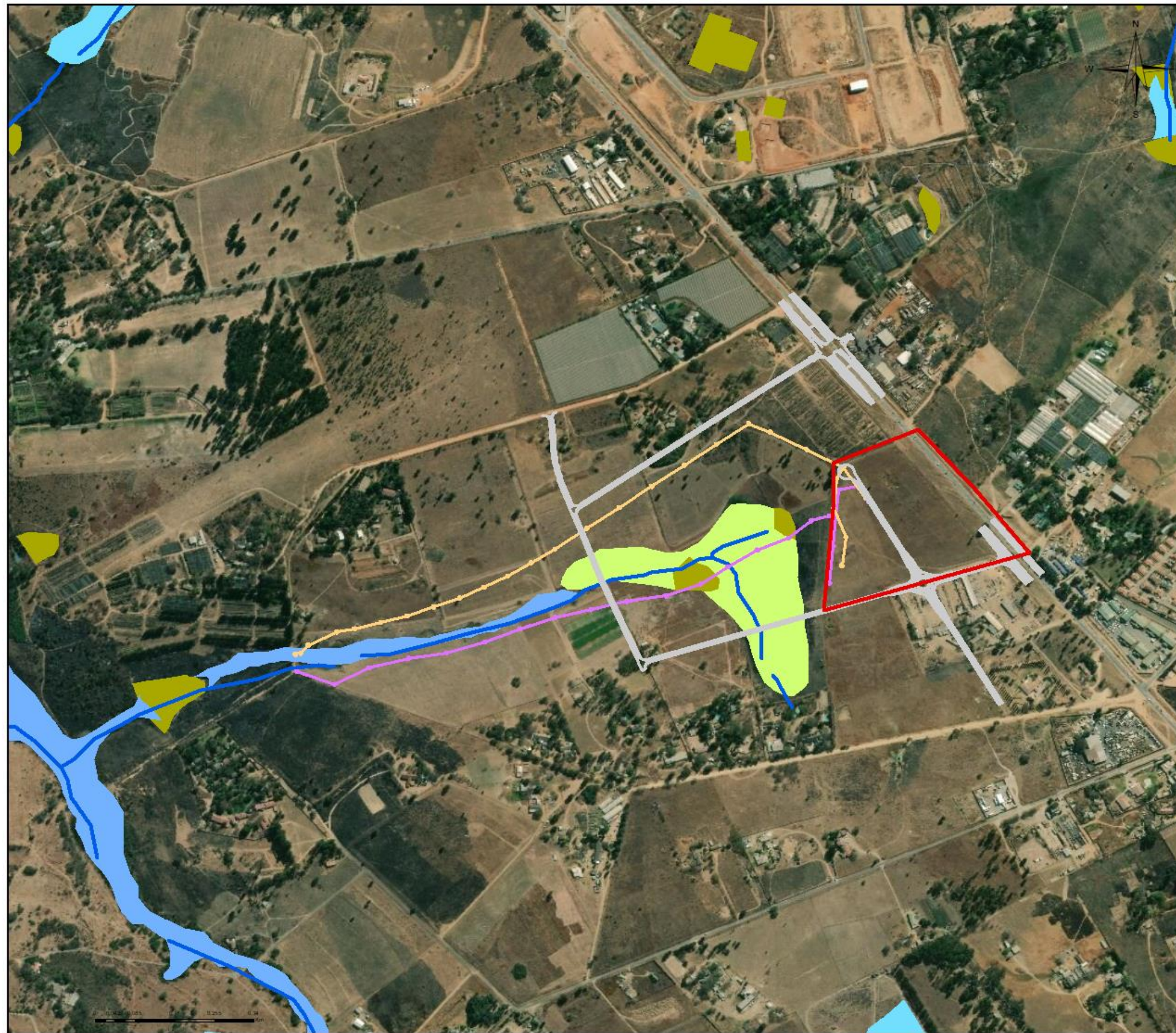
Figure 6.5 illustrates the Quantitative Flow Model that indicates the flow quantitatively through the wetland system.

Figure 6.6 serves to conceptually present the location of the wetland that could be affected by the proposed development activities on the site.

Figure 6.7 presents the conservation buffer zones that are applicable and should be considered during the development to ensure appropriate mitigation and management of the activities.

A 32m buffer was applied to the wetland that is in line with the National Environmental Management Act (NEMA) listed activities and Gauteng biodiversity and mapping requirements. This wetland is largely disturbed due to historical impacts and is of low ecological importance. Rehabilitation of the wetland and buffer areas will be required. This conservation buffer should be utilised as the control area and will be adequate to assist with management and mitigation during the construction and operation phase.

Also, refer to the associated digital files presenting the wetland boundaries to allow for further planning of the layout of the proposed activity.



PROJECT:
Portion 260 Rietfontein 189 IQ
**WETLAND
DELINEATION**



GENERAL NOTES:
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree
**National Wetland Map v5
(NWM5)**

- Legend**
- Ptn 260 Rietfontein
 - New Roads and Upgrades
 - New Sewer Line - Proposal
 - New Sewer Line - Alternative
 - Rivers & Streams
- National Wetland Map v5 (NWM5)**
- River
 - Floodplain wetland
 - Channelled valley-bottom wetland
 - Unchannelled valley-bottom wetland
 - Flat
 - Depression
 - Seepage wetland
 - Micro-Estuary
 - Estuary
 - Artificial wetlands (NBA2018)

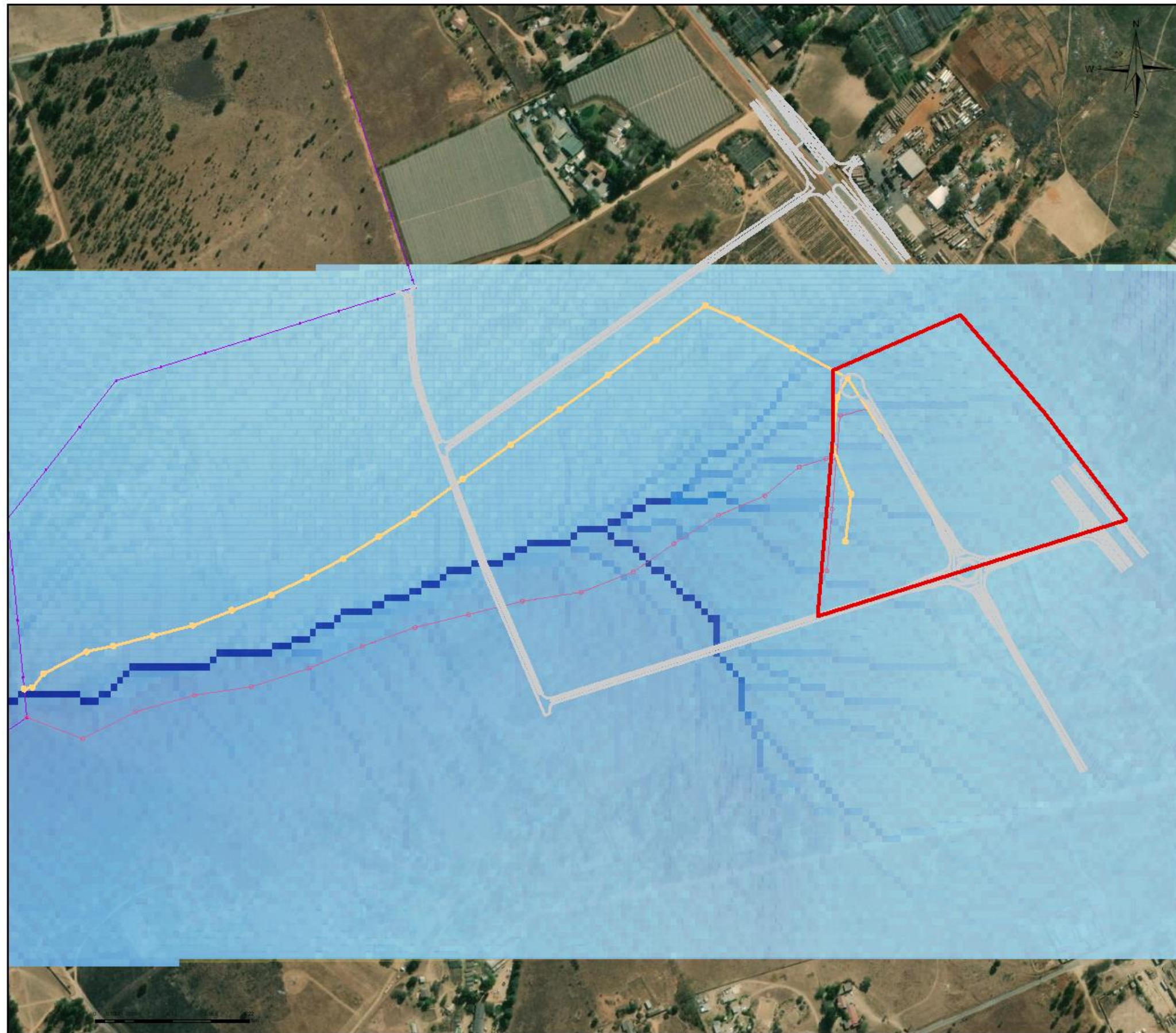
REVISIONS:
FINAL

CLIENT: Hocom Properties Pty Ltd	SCALE: 1:7 500
DRAWING REF: 21949-NWMS v2	DRAWING STATUS: FINAL

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Wilgeheuwel
Tel: 087 985 0951
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www.prismems.co.za

Figure 6.3: National Wetland Map version 5 (NWM5) (Van Deventer et al., 2019).



PROJECT:
Portion 260 Rietfontein 189 IQ
**WETLAND
DELINEATION**



GENERAL NOTES:
Coordinate System: WGS 1984 World Mercator
Projection: Mercator
Datum: WGS 1984

Flow Accumulation

- Legend**
- Ptn 260 Rietfontein
 - New Roads and Upgrades
 - New Sewer Line - Proposal
 - New Sewer Line - Alternative
 - Existing Sewer Line
- Flow Accumulation**
- High
 - Low

REVISIONS:
FINAL

CLIENT: Hocom Properties Pty Ltd	SCALE: 1:5 000
DRAWING REF: 21949-Flow Accumulation v2	DRAWING STATUS: FINAL

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Figure 6.4: Flow Accumulation Model.

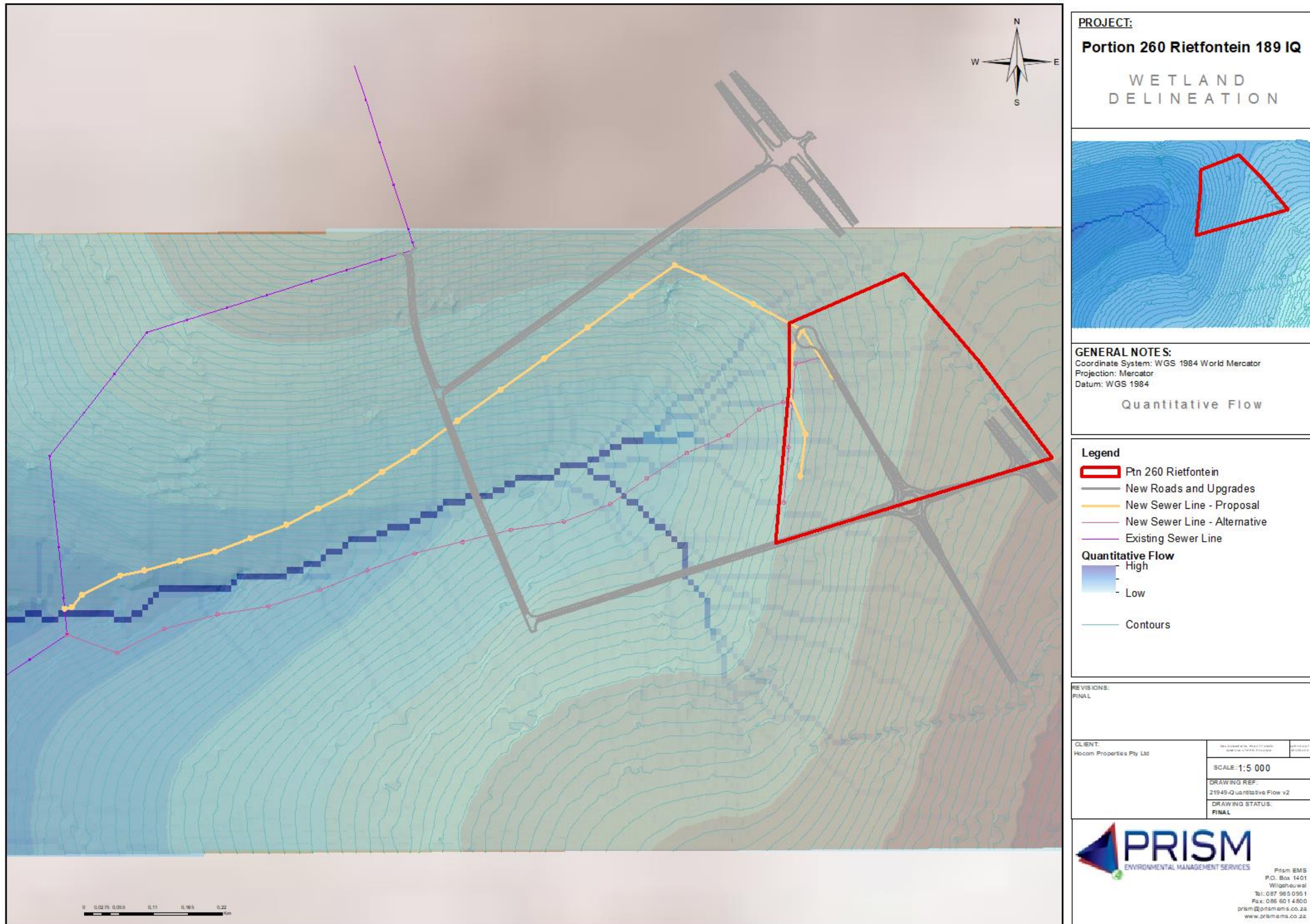


Figure 6.5: Quantitative Flow Model.

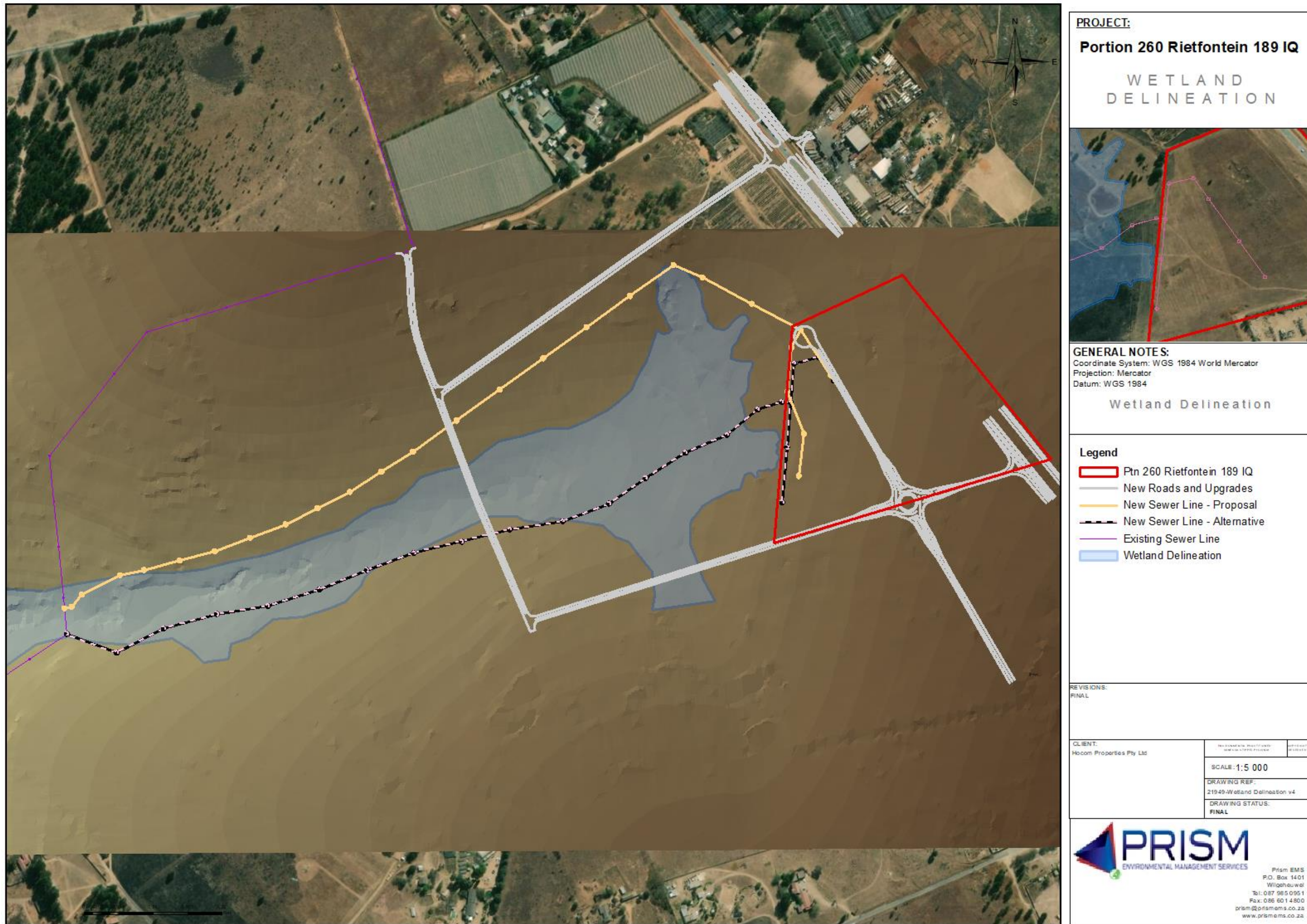


Figure 6.6: Wetland Delineation.

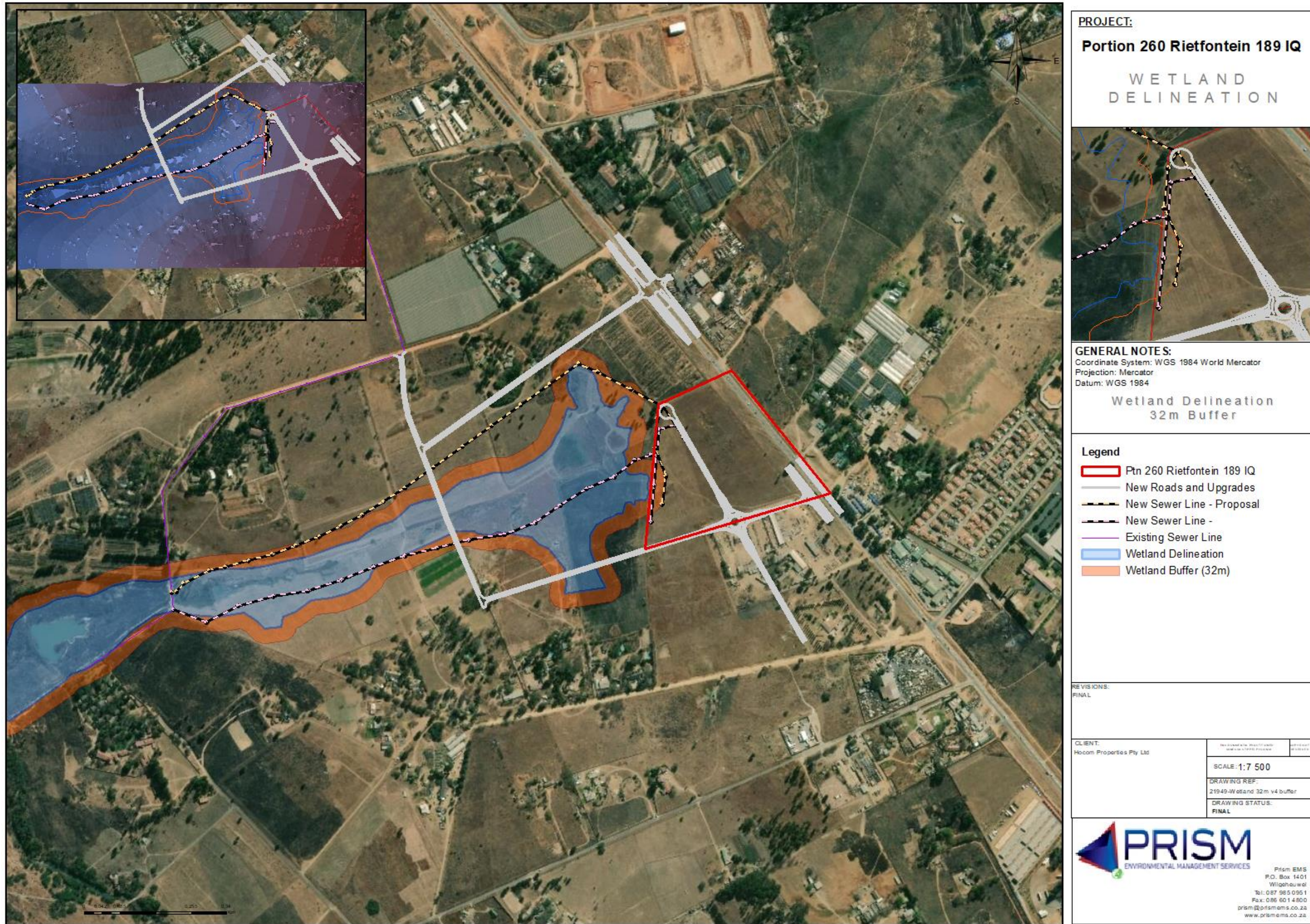


Figure 6.7: Wetland Buffer Zones.

6.2 Wetland Classification

SANBI's classification for wetlands was used to classify the wetland units within the study area (SANBI, 2009). The wetland units were classified up to level four, which includes the system, regional setting, landscape unit and Hydrogeomorphic (HGM) unit. Figure 6.8 conceptually present the HGM units (Marneweck and Batchelor, 2002).

One natural wetland entity was identified during the field investigation.

The following Hydrogeomorphic wetlands were identified during the site evaluation:

- GG98_UCVB – Unchanneled Valley Bottom Wetland

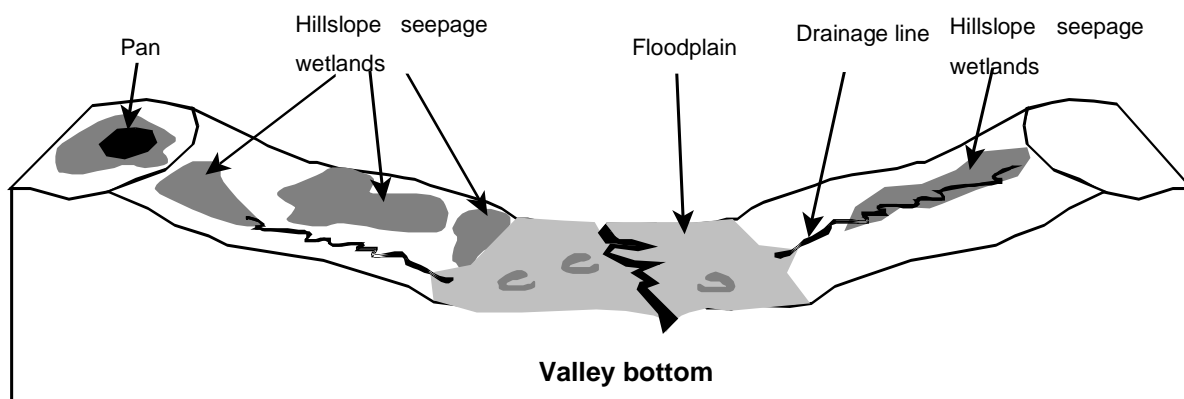


Figure 6.8: Wetland hydrogeomorphic (HGM) classification (Marneweck and Batchelor, 2002).

6.2.1 Unchanneled Valley Bottom Wetland

One Unchanneled Valley Bottom Wetland Unit at the head of the catchment was identified in the study area. Figure 6.9 diagrammatically illustrates the HGM unit.

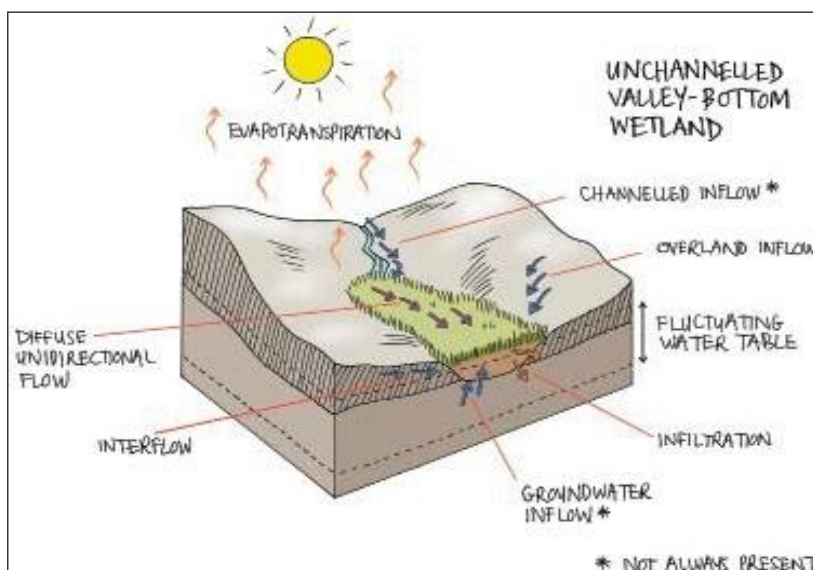


Figure 6.9: Unchanneled Valley Bottom Wetland (SANBI; 2013)

6.2.2 Wetland Unit classification

SANBI’s “Further development of a proposed National Classification System for South Africa” was used to verify the classification of the wetlands within the study area (SANBI, 2009). The wetlands were classified up to level four, which includes the system, regional setting, landscape unit and hydrogeomorphic unit (Table 4-1).

The wetland was classified as per Table 6-3.

Table 6-3: Wetland Units classification

Unit	System	Regional setting	Landscape unit	Hydrogeomorphic unit
GG98_UCVB	Inland	Highveld	Valley Floor	Unchanneled Valley Bottom Wetland

6.3 Present Ecological Status (PES)

A level 1 WET-health wetland assessment was undertaken to determine the PES of the wetland system.

6.3.1 GG98_UCVB – Unchanneled Valley Bottom Wetland

GG98_UCVB was found to be moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact (Table 6-4). This wetland system is impacted by historical activities both in the catchment as well as directly on the wetland system where the impacts are continues. It forms part of a larger wetland system. The trajectory of change for the wetland ecological status is predicted that conditions are likely to deteriorate slightly over the next 5 years without major intervention (Table 6-5).

Table 6-4: PES – GG98_UCVB

Description	Combined impact score	PES Category
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	3,3	C

Table 6-5: Trajectory of change of GG98_UCVB

Trajectory class	Description	Change score	Class Range	Symbol
Deterioration slightly	Condition is likely to deteriorate slightly over the next 5 years	-0,7	-0.3 to -1.0	↓

6.4 Ecological Importance and Sensitivity (EIS)

The ecological importance and sensitivity assessment were conducted according to the guidelines as discussed by DWAF (1999). DWAF defines “ecological importance” of a water resource as an expression of its importance to the maintenance of ecological diversity and function on local and wider scales. “Ecological sensitivity”, according to DWAF (1999), refers to the system’s ability to resist disturbance and its capability to recover from disturbance once it has occurred. The Ecological Importance and Sensitivity (EIS) analysis provides a guideline for the determination of the Ecological Management Class (EMC).

6.4.1 GG98_UCVB – Unchanneled Valley Bottom Wetland

The GG98_UCVB, Unchanneled Valley Bottom Wetland is considered ecologically important and sensitive on a local scale. The biodiversity of this wetland is generally not sensitive to flow and habitat modifications. It plays a small role in moderating the quantity and quality of water of major rivers. The system drains into further downstream wetland and streams before reaching major rivers. The Ecological Importance and Sensitivity (EIS) for this system is thus considered to be Moderate (Refer to Table 6-6).

Table 6-6: EIS - GG98_UCVB

Score	EIS Category	Category Description	Ecological Management Class
Score =1,67 Range (>1 and <=2)	Moderate	Wetlands that are to be considered ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	C

6.5 Recommended Ecological Category (REC)

The Recommended Ecological Category (REC) is determined based on the results obtained from the Present Ecological State (PES), reference conditions and Ecological Importance and Sensitivity (EIS) of the aquatic resource. This is then followed by realistic recommendations, mitigation, and rehabilitation measures to achieve the desired REC.

6.5.1 GG98_UCVB – REC

The wetland will be impacted to some extent by the proposed development activities. This impact will be localised and at the transitional point leading from the development and infrastructure installations into the wetland and buffer area. It will in all likelihood regress slightly in terms of its current Ecological Category if not managed in specific during the construction period. Stormwater management for the

site is required in specific the construction phase. This will mitigate the impact on the wetlands. Rehabilitation of the impacts and maintenance of the system will further mitigate the impacts and could improve the sustainability of the system. It is thus rated that the Recommended Ecological Category (REC) should fall into:

- Category C for GG98_UCVB (Table 6-7).

Table 6-7:: REC

Wetland Unit	Class (% of total)	Description
GG98_UCVB	C	Moderately modified.

7 IMPACT ASSESSMENT

IMPACTS		CONSEQUENCE				PROBABILITY	RANKING WITHOUT MITIGATION	CONFIDENCE	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE			
Type	Description	Nature	Extent (A)	Duration (B)	Intensity (C)	Probability (P)	Significance (A + B + C) X P	Confidence	Mitigation and/or Management Measures	Mitigation Effectiveness	Significance	Loss of Resources	Reversibility	
CONSTRUCTION PHASE														
Wetland	Direct	Water quality	Negative	Neighbouring	Incidental	Low-Medium	Likely	Low	High	Stock piling outside the wetland area, stormwater management, dry season construction, filtration.	High	Low	No Loss	Reversible
	Direct	Flow Regime	Negative	Local	Short-term	Low-Medium	Highly Likely	Low-Medium	High	Stock piling outside the wetland area, stormwater management, dry season construction, filtration.	High	Low	No Loss	Reversible
	Direct	Habitat	Negative	Site	Medium-term	Low-Medium	Likely	Low	High	Stock piling outside the wetland area, minimal ingress and egress.	High	Low	No Loss	Reversible
	Indirect	Biota	Negative	Neighbouring	Medium-term	Medium	Likely	Low	High	Stock piling outside the wetland area, minimal ingress and egress.	High	Low	No Loss	Reversible
	Direct	Geomorphology	Negative	Neighbouring	Medium-term	Low-Medium	Highly Likely	Low-Medium	High	Stormwater management design and erosion control measures.	High	Low	No Loss	Reversible
OPERATIONAL PHASE														
Wetland	Direct	Water quality	Negative	Neighbouring	Incidental	Low-Medium	Possible	Low	High	Rehabilitation of construction impacted area, continuous monitoring. Storm water management.	High	Low	No Loss	Reversible
	Direct	Flow Regime	Negative	Neighbouring	Incidental	Low-Medium	Possible	Low	Medium	Rehabilitation of construction impacted area, continuous monitoring and maintenance. Storm water management.	High	Low	No Loss	Reversible
	Direct	Habitat	Negative	Site	Incidental	Low-Medium	Improbable	Low	High	Rehabilitation of construction impacted area, continuous monitoring, storm water management.	High	Low	No Loss	Reversible
	Indirect	Biota	Negative	Neighbouring	Incidental	Low-Medium	Possible	Low	High	Rehabilitation of construction impacted area, continuous monitoring, storm water management.	High	Low	No Loss	Reversible
	Direct	Geomorphology	Negative	Site	Incidental	Low	Improbable	Low	High	Rehabilitation of construction impacted area.	High	Low	No Loss	Reversible

8 REASONED OPINION AND RECOMMENDATIONS

The Wetland identified is highly transformed and impacted by historical and ongoing anthropogenic activities. The Present Ecological Status (PES) for the wetland scored in the lower ranges for the Unchanneled Valley Bottom Wetland. The Ecological Importance and Sensitivity (EIS) falls in the low range and has little functionality in respect of bio-diversity conservation. The Recommended Ecological Category (REC) for the wetlands were categorised as moderate. It will thus require some rehabilitation to enhance the ecological function of the system. The wetland is not considered to be sensitive and of any major importance.

For this reason, it can be supported that the development may go-ahead if the required buffers are maintained and the resource drivers preserved. The rehabilitation of the wetland is vital to recover some ecological function. The wetland drivers must be enhanced as part of the rehabilitation of the affected areas. In respect of the construction phase, it is important to ensure that the required erosion protection measures linked to the crossing sections be carefully designed and installed. It is further important to carefully design the storm water outlet structures to assist with dispersed flow release into the wetland. This should be designed to mimic the natural sheet flow into the wetland and avoid concentrated flow patterns into the wetland area.

The project can be supported, should all the mitigation measures be implemented and monitored against to ensure compliance.

8.1 Mitigation and Monitoring Requirements

Monitoring programmes can measure the success of mitigation implementations, monitor unforeseen impacts, and can be used as a feedback system to adjust or correct management of the wetlands.

The following are recommended:

- It should be attempted to enhance the current wetland function.
 - Wetland drivers should be protected as far as possible.
 - Water quality preservation is key. Silt protection measure to be implemented in consultation with the wetland specialist (ECO).
- Mitigation measures for the proposed development activities should be implemented, managed and monitored according to:
 - The following wetland ecosystem impact assessment conclusions, based on the results of the baseline survey:
 - Runoff from the construction areas may result in contamination of wetland and downstream aquatic habitat;
 - On site storm water management must be implemented.
 - The following impacts may result in changes to the soil structure:
 - Heavy construction vehicles moving within the wetland areas;

- Ingress and Egress must be managed to minimise impacts in respect of compaction of the wetland soils.
- Single entry and exit points must be established.
- These areas must be scarified as part of the rehabilitation plan.
- Stock piling;
 - Stock piling must be located outside the delineated wetland and buffer boundaries.
- Spills from machinery;
 - To be managed as per the Environmental Management Programme (EMPr).
- The mixing of concrete;
 - To be managed as per the Environmental Management Programme (EMPr) outside of the demarcated buffer areas with no flow into the control area.
- The following aspects may result in reduction of ecosystem habitat integrity:
 - Dust and sediment runoff from construction activities;
 - Diesel and oil spill from equipment and machinery; and
 - Higher and faster water flow from the site that could cause soil erosion.
- The following aspects may result in sedimentation of the associated aquatic systems:
 - Sedimentation due to increase runoff and dispensed soil particles and runoff from the affected areas; and
 - Increase in the velocity of the runoff from the exposed soil, due to construction.
- The proposed activities must be initiated and constructed in such a way to prevent the reduction of natural water flow into the wetland and downstream which, in essence, is the driving factor in terms of water provision.
 - An approved stormwater management plan must be implemented.
 - Velocity dissipation structures and sheet flow structures (such as reno mattresses) must also be installed to prevent water flowing through culverts to gain velocity and be released uncontrolled.
 - Dispersed flow must be attained post formal structures.
 - Sheet flow must be promoted to mimic natural flow patterns.
- The wetland integrity should be improved during the rehabilitation phase. This may entail the following:
 - Removal of alien and invasive plant species during the construction and operational phases.
 - Stabilisation of gullies and drainage lines to prevent erosion.
 - Implementation of topsoil management (stockpiling, topography shaping) and erosion control (berms, geotextiling, silt fences, hay bales and gabion structures).
 - Re-vegetation with indigenous plant species.

9 CONCLUSION

The field investigations concluded that one natural wetland system was identified in the study area.

The following Hydrogeomorphic wetland was identified during the site evaluation:

- GG98_UCVB – Unchanneled Valley Bottom Wetland - was found on the valley floor at the head of the catchment, draining towards the West

The wetland recorded was assessed and the following results were attained:

- The wetland attained a moderate overall PES (Present Ecological State)
 - GG98_UCVB was found to be moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact. This wetland system is impacted by historical activities both in the catchment as well as directly on the wetland system where the impacts are continues. It forms part of a larger wetland system. The trajectory of change for the wetland ecological status is predicted that conditions are likely to deteriorate slightly over the next 5 years without major intervention.
- The wetland attained a Moderate Ecological Importance and Sensitivity (EIS) score.
 - The GG98_UCVB, Unchanneled Valley Bottom Wetland is considered ecologically important and sensitive on a local scale. The biodiversity of this wetland is generally not sensitive to flow and habitat modifications. It plays a small role in moderating the quantity and quality of water of major rivers. The system drains into further downstream wetland and streams before reaching major rivers. The Ecological Importance and Sensitivity (EIS) for this system is thus considered to be Moderate.
- The wetland Recommended Ecological Classification (REC) classification was rated as:
 - The wetland will be impacted to some extent by the proposed development activities. This impact will be localised and at the transitional point leading from the development and infrastructure installations into the wetland and buffer area. It will in all likelihood regress slightly in terms of its current Ecological Category if not managed in specific during the construction period. Stormwater management for the site is required in specific the construction phase. This will mitigate the impact on the wetlands. Rehabilitation of the impacts and maintenance of the system will further mitigate the impacts and could improve the sustainability of the system. It is thus rated that the Recommended Ecological Category (REC) should fall into:
 - Category C for GG98_UCVB

Table 9-1: Findings and Conclusion

Study	Findings and Conclusions										
Wetland Assessment	The development site is not directly affected by the wetland, but the wetland buffer encroaches slightly onto the development site on the western boundary.										
	This area could be used to assist with storm water management and flow management at the transitional point leading from the development and infrastructure installations into the wetland and buffer area.										
	The infrastructure installations and connections to the external services will impact on the wetland.										
	Careful design and interdisciplinary consultation between the professional team would be required. Interflows and sheet flow must be managed at the contact points.										
	Wetland	Wetland HGM	Wetland		32m Buffer		PES		EIS		REC
			On site	External linked to services	On site	External linked to services	Category	Trajectory of change	Category	Trajectory of change	Category
	GG98_UCVB	UCVB	No	Yes	Yes	Yes	C - Moderate	↓	C - Moderate	↓	C - Moderately modified.
	Recommended Monitoring Requirements		Wetland Assessment				Wetland Specialist		Monthly Visual Inspections		
			Environmental Control Officers				ECO		Bi-Weekly Visual Inspections		
			Closure Audit				Wetland Specialist		Closure Audit		

Concluded from the results presented in this document, the construction activities will in all likelihood impact slightly on the wetland system but can be mitigated to satisfactory standards if all mitigatory actions are implemented with due care. It is key to preserve water quality and supply to the downstream aquatic resources.

The rehabilitation of the wetland is vital to recover some ecological function. The wetland drivers must be enhanced as part of the rehabilitation of the affected areas. In respect of the construction phase, it is important to ensure that the required erosion protection measures linked to the wetland intersection sections be carefully designed and installed.

The project can be supported, should all the mitigation measures be implemented and monitored against to ensure compliance and protection of the aquatic resource.

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