PROPOSED MIXED-USE RESIDENTIAL DEVELOPMENT ON ERF 266 AND A PORTION OF THE REMAINDER OF ERF 21 IN RIVERSDALE, HESSEQUA MUNICIPALITY, WESTERN CAPE PROVINCE

AQUATIC BIODIVERSITY IMPACT ASSESSMENT & DWS SECTION 21 (C) & (I) RISK ASSESSMENT

PREPARED FOR:

KAPP ENVIRONMENTAL CONSULTANTS

TEL: +27 (0) 44 693 0478

FAX: + 27 (0) 86 572 4159

CELL: +27 82 675 5233

PREPARED BY:

Dietmar de Klerk (Pr. Sci. Nat)

For: DDK Consulting

E-Mail: dietmar@ddkconsulting.co.za

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GLOSSARY OF TERMS

Alien Vegetation	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally. Vegetation species that originate from outside of the borders of the biome – usually international in origin.
Biodiversity	The number and variety of living organisms on earth, the millions of plants, animals and micro-organisms, the genes they contain, the evolutionary history and potential they encompass and the ecosystems, ecological processes and landscape of which they are integral parts.
Buffer	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted, in order to reduce the impact of adjacent land uses on the wetland or riparian area.
Catchment	The area where water is collected by the natural landscape, where all rain and run-off water ultimately flow into a river, wetland, lake and/or ocean or contributes to groundwater.
Delineation (wetland)	The process of determining the boundary of a wetland based on soil, vegetation and/or hydrological indicators.
Ecoregion	An Ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise the region".
Facultative species	Species usually found in wetlands (76% - 99%) but occasionally also found in non-wetland areas.
Gleying	A soil process resulting from prolonged soil saturation which is manifested by the presence of natural grey, bluish or greenish colours in the soil matrix.
Hydromorphic soil	A soil that in its undrained condition is saturated or flooded long enough to develop anaerobic conditions favouring the growth and regeneration of hydrophytic vegetation (vegetation adapted to living in anaerobic soil).
Groundwater	Subsurface water in the saturated zone below the water table.
Hydromorphic soil	A soil that in its undrained condition is saturated or flooded long enough to develop anaerobic conditions favouring the growth and regeneration of hydrophytic vegetation (vegetation adapted to survival in anaerobic soils).
Hydrology	The study of the occurrence, distribution and movement of water over, on and under the land surface.
Hydromorphy	A process of gleying and mottling resulting from the intermittent or permanent presence of excess water in the soil profile.
Indigenous vegetation	Vegetation occurring naturally within a specific area.
Mottles	Soils with variegated colour patterns are described as being mottled, with the "background colour" referred to as the matrix and the spots or blotches of colour referred to as mottles.
Obligate species	Species almost always found in wetlands (>99% of occurrences).
Watercourse	In terms of the definition contained within the National Water Act, 1998 (Act 36 of 1998) a watercourse means: • A river or spring; • A natural channel in which water flows regularly or intermittently; • A wetland, dam or lake 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.
Wetland	"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."
Wetland Vegetation	Broad groupings of wetland vegetation, reflecting differences in regional context, such as geology, climate, and soils, which may, in turn, have an influence on the ecological characteristics and functioning of wetlands.

1. INTRODUCTION

1.1 BACKGROUND INFORMATION

DDK Consulting was appointed by Kapp Environmental Consultants on behalf of Belladonna (Pty) Ltd, to undertake an Aquatic Biodiversity Impact Assessment & DWS Risk Assessment Matrices for the proposed mixed-use residential development on Erf 266 and the remainder of Erf 21 in Riversdale, Western Cape Province.

The proponent, Belladonna (Pty) Ltd, proposed to develop the concerned properties as a larger mixed-use residential development comprising of several different residential offerings. Additionally, the Hessequa Municipality has recently issued a decision to include the concerned properties within the municipal urban edge due to increased demand for residential opportunities within the town of Riversdale.

The proposed mixed-use residential development will take place on Erf 266 and a portion of the remainder of Erf 21 which is located immediately north of the N2 before the town of Riversdale. The remaining portion of Erf 21 to the south of the N2 will not be currently developed and will remain under Agricultural zoning.

The current preferred Spatial Development Plan (SDP) includes the following:

- Twenty-seven (27) Agricultural Zone II smallholdings comprising approximately 28.5 hectares with a total coverage of 50.5% of the total development area.
- One hundred and fifty-five (155) Single Residential erven comprising approximately 10.5 hectares with a total coverage of 18.6% of the total development area.
- Three (3) pockets of General Residential Zone II offerings comprising approximately 11.2 hectares with a total coverage of 19.9% of the total development area.
- One (1) Business Zone of approximately 0.5 hectares in extent with a total coverage of 0.9% of the total development area.
- One (1) Open Space Zone I of approximately 0.2 hectares in extent with a total coverage of 0.3% of the total development area.

Additionally, several ancillary land uses including internal and access roads comprising 3.2 hectares (Transport Zone II) with 5.7% coverage and 2.1 hectares of Transport Zone III covering 3.7% of the total development area. One (1) Utility Zone of 0.2 hectares is also planned to cover 0.4% of the total development area.

The entire proposed mixed-use residential development will cover an area of 56.4 hectares.

All civil engineering services are readily available towards the north and eastern boundaries of the development site.

Please refer to Figure 1 (Locality Map) and Figure 2 (Spatial Development Plan) below for reference to the location and layout of the proposed mixed-use residential development.

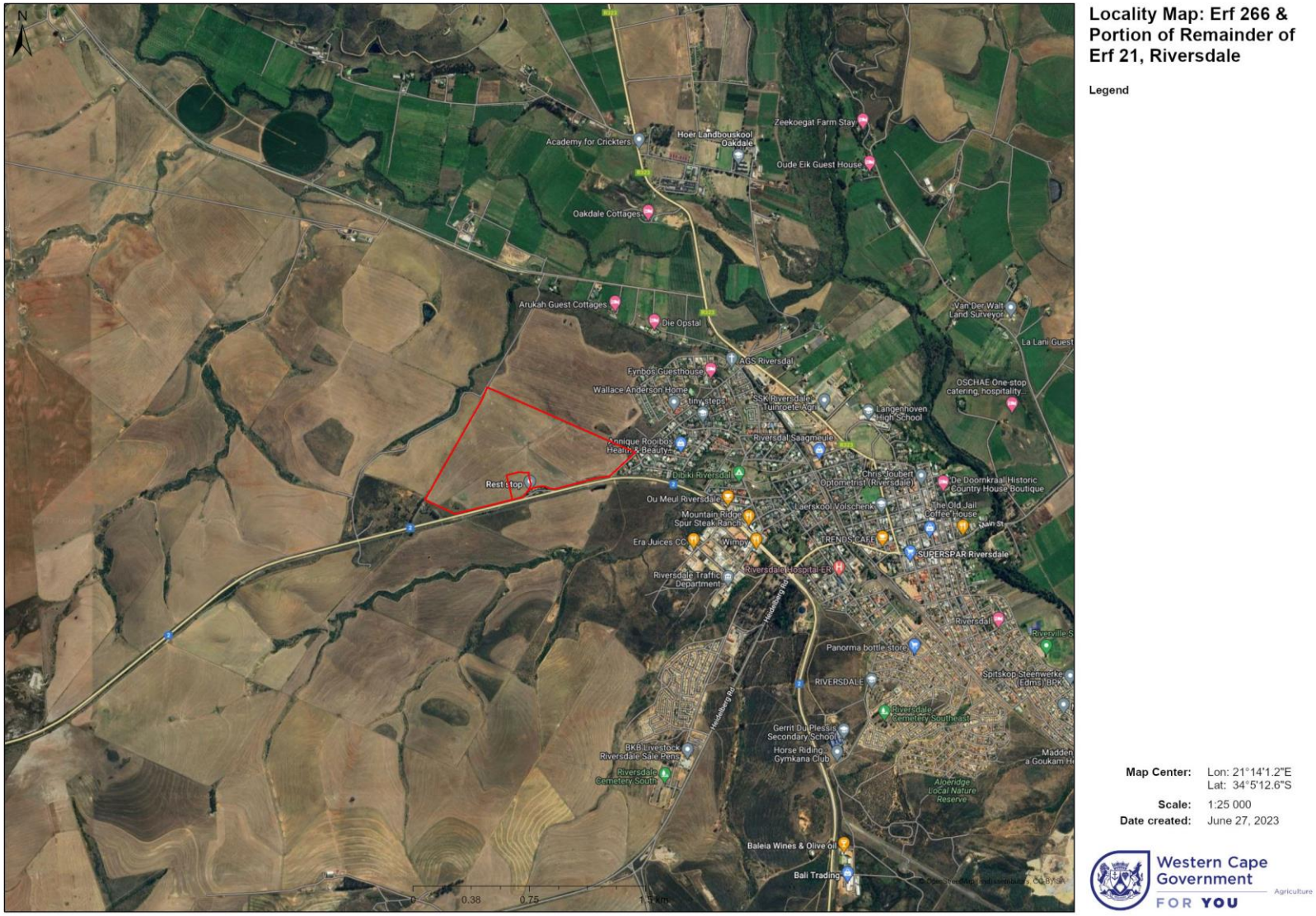

Figure 1: Locality Map – Erf 266 & Portion of Remainder of Erf 21, Riversdale

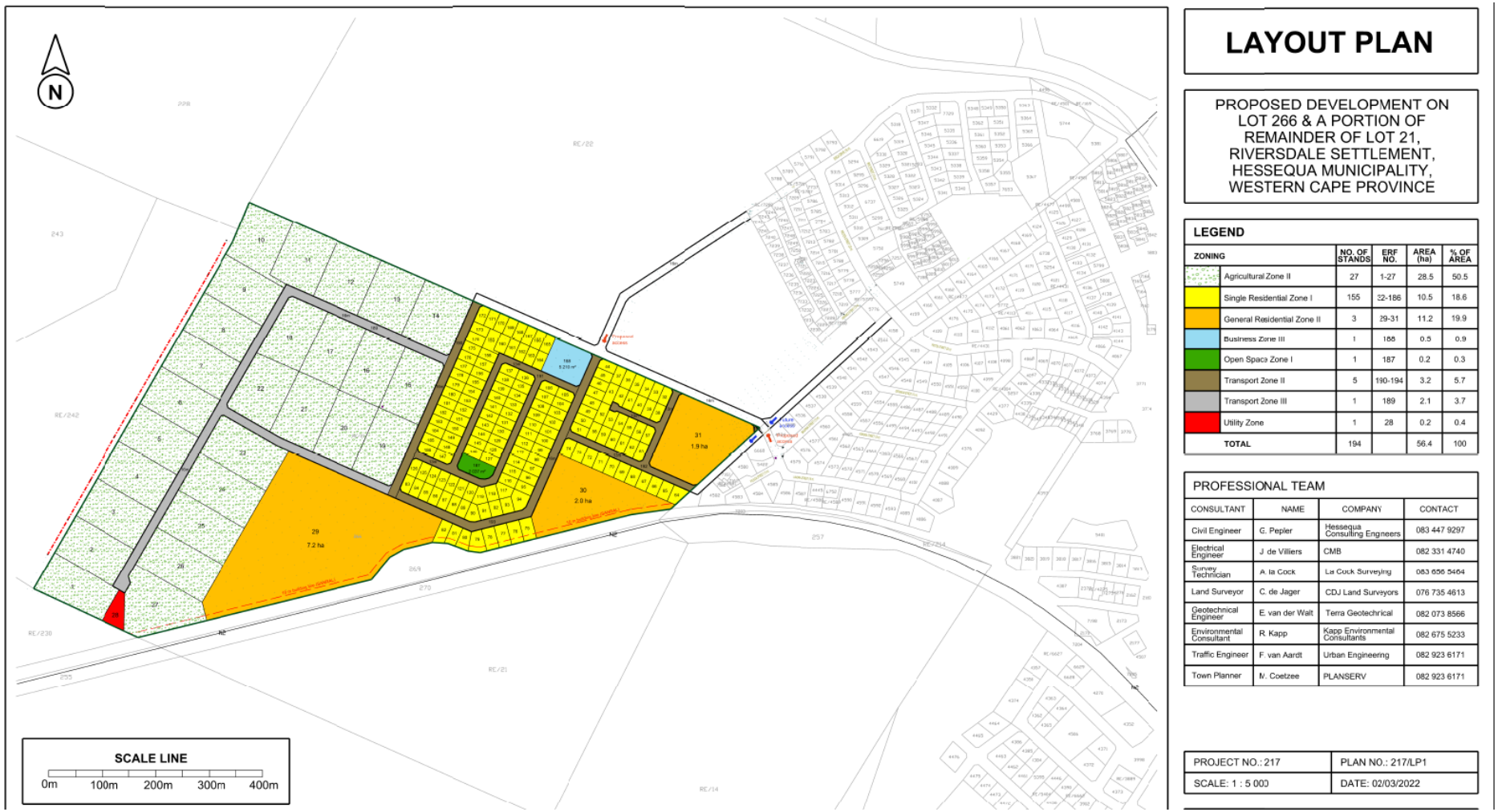

Figure 2: Spatial Development Plan (SDP) – Erf 266 & Portion of Remainder of Erf 21, Riversdale. Courtesy: PLANSERV (Pty) Ltd – Plan No. 217/LP1

The location of the proposed mixed-use residential development on Erf 266 and a portion of the remainder of Erf 21 in Riversdale will be located within the H90C Quaternary Catchment. The H90C catchment is classified as covering a total area of approximately 22342.13 Hectares, having a MAR of 25.70 mm and MAP of 466.68 mm. Several Sub-Quaternary Reaches are located within the H90C Catchment, with the primary sub-quaternary reaches to potentially be affected by the proposed mixed-use residential development, being the **H90C – 09211 (Naroo River)** and the **H90C - 09220 (Vet River)**. These systems are described in more detail in Section 4 of this report.

The Resource Quality Information System (RQIS) of the Department of Water and Sanitation (DWS) has assessed these systems with the **H90C – 09211 (Naroo River)** being classified as having a **Present Ecological State (PES) Category** of **D** (Largely Modified), an **Ecological Importance (EI)** of **Moderate** and **Ecological Sensitivity (ES)** of **Very High**. The H90C – 09211 (Naroo River) is approximately 23.2 kilometres in length.

Additionally, the **H90C - 09220 (Vet River)** is classified as having a **Present Ecological State (PES) Category** of **E** (Seriously Modified), an **Ecological Importance (EI)** of **Low** and **Ecological Sensitivity (ES)** of **Very High**. The H90C – 09220 (Vet River) is approximately 5.3 kilometres in length.

These primary sub-quaternary watercourses have been assessed relating to the potential impacts of the proposed mixed-use development on these watercourses in Section 4 of this report.

Please refer to Figure 3 below for reference to the location of these primary sub-quaternary watercourses in relation to the proposed development site.

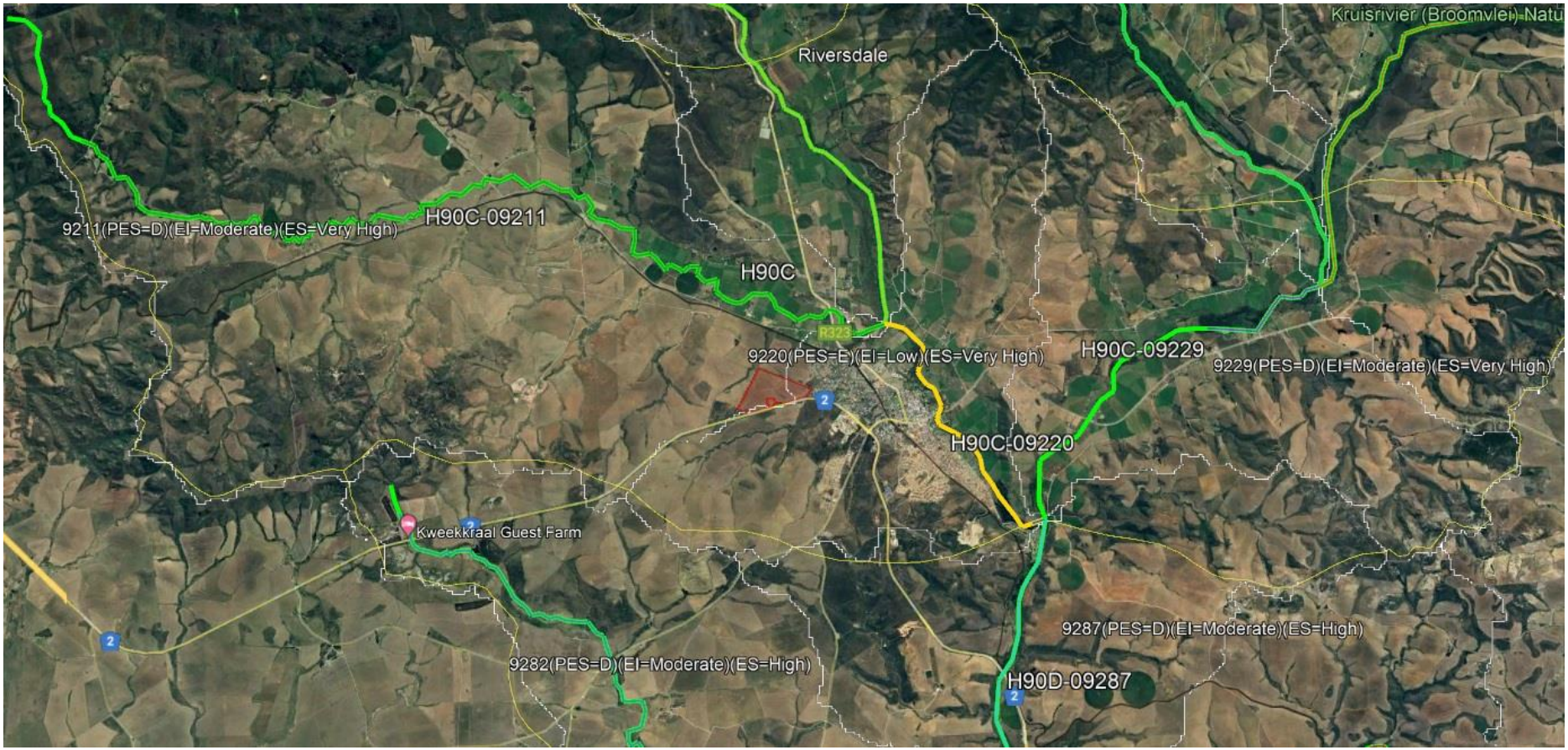

Figure 3: DWS RQIS location of **H90C – 09211 (Naroo River)** and **H90C - 09220 (Vet River)** in relation to the proposed development site (Red Polygon).

This Aquatic Biodiversity Impact Assessment and Section 21(c) & (i) Risk Assessment Report aims to guide the development process on the concerned properties (Erf 266 & Portion of the Remainder of Erf 21 in Riversdale) concerning potential impacts on natural water resources, to ensure that Ecological Functioning of the freshwater ecosystems, such that the provision of Ecoservices associated with these water resources are supported and maintained, whilst still considering the Need & Desirability of the proposed mixed-use residential development. This report aims to guide through a Reasoned Opinion, Recommendations, and associated Mitigation Measures from a Water Resource Management perspective.

1.2 TERMS OF REFERENCE

The specific Terms of Reference related to the required specialist input by DDK Consulting:

- Review of available information & documentation and Ecological Mapping Databases.
- Undertake a Site Investigation of the proposed development area.
- Determine the Present Ecological State (PES) and/or Ecological Importance & Sensitivity (EIS) of the identified natural water resources that will be impacted by the proposed activity.
- Describe and assess the potential impacts of the proposed activity on identified natural water resources.
- Compile a Section 21(c) & (i) Risk Assessment pertaining to these potential impacts on natural water resources.
- Provide a summary of the findings in the form of this Aquatic Biodiversity Impact Assessment Report.

1.3 ASSUMPTIONS AND LIMITATIONS

The following Assumptions and Limitations apply to this Aquatic Biodiversity Impact & Section 21(c) & (I) Risk Assessment Report:

- The Ground-Truthing and Delineation of Water Resource boundaries and the assessment thereof were confined to a single site visit undertaken during June 2023 of the concerned development area.
- The Water Resources identified were Delineated in fulfilment of GN 509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) using various Desktop Methods including the use of Topographic Maps, Historical and/or current Digital Satellite Imagery and/or Aerial Photographs. Where possible (based on accessibility) the water resource was Ground-Truthed and Delineations were undertaken utilizing Global Positioning System (GPS) technology.
- A concerned effort was made to access all concerned areas in question. In instances where access was a constraint, the findings from the areas that could be assessed were used to infer information as they present similar onsite conditions.
- Global Positioning System (GPS) technology is inherently somewhat inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur, however, the delineations as provided in this report are deemed accurate enough to fulfil the requirements as well as the implementation of the proposed Mitigation Measures.
- Water Resources and Terrestrial Zones create transitional areas where an Ecotone is formed as vegetation assemblages change from Terrestrial to Obligate/Facultative Wetland Species. Within this Transition Zone, some variation of opinion on the Water Resource boundaries may occur. However, if the DWAF (2008) method is followed, all assessors are expected to obtain largely similar results.
- With Ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. However, it is expected that the concerned areas have been accurately assessed and considered, based on the site assessment and the consideration of existing studies and monitoring data in terms of Riparian and Wetland Ecology.

1.4 LEGAL REQUIREMENTS

The following Legislative Requirements were considered during the site assessment process:

- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)
- The National Water Act, 1998 (Act No.36 of 1998) (NWA) and
- Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998).

According to Macfarlane *et al.* (2015), the definition of a Buffer Zone is variable and dependent on the purpose of the Buffer Zone, however, it is considered to be "*a strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another*".

Buffer zones are considered to be important to provide protection of basic ecosystem services (in this case, the protection of aquatic and wetland ecological services), and reducing impacts on water resources arising from upstream activities (e.g., by removal and/or filtering of sediments and pollutants), provision of habitat for aquatic and wetland species as well as for certain terrestrial species, and a range of ancillary societal benefits (Macfarlane *et. al,* 2015).

Buffer Zones are not considered to be effective mitigation against impacts such as hydrological altering arising from Streamflow Reduction, Impoundments, or water abstraction, nor are they considered to be effective in the management of Point-Source Discharges or contamination of groundwater, both of which require site-specific Mitigation Measures (Macfarlane *et. al,* 2015).

The definition and motivation for a Regulated Zone of Activity for the protection of Water Resources are summarised as follows:

Regulatory Authorisation	Zone of Applicability
Water Use License Application in terms of the National Water Act, 1998 (Act No. 36 of 1998). **Department of Water and Sanitation (DWS)**	In accordance with General Notice 509 of 2016, a Regulated Area of a watercourse for Section 21(c) and 21(i) water uses of the National Water Act, 1998 (Act 36 of 1998) is defined as • *the outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;* • *in the absence of a determined 1 in 100-year flood line 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 **500m radius** from the delineated boundary (extent) of any wetland or pan.*
Listed Activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998). **Provincial Department of Environmental Affairs and Development Planning (DEADP)**	The EIA Regulations (2014), as amended in April 2017, must be taken into consideration if any activities are to take place within the applicable Zone of Regulation. The following Listed Activities were considered as part of this Freshwater Constraints Analysis: **Activity 12** of Listing Notice 1 (GN 327) of the NEMA EIA regulations, 2014 (as amended) states that: *The development of:* *(xii) infrastructure or structures with a physical footprint of 100 square metres or more;* *Where such development occurs—* *a) Within a watercourse;* *b) In front of a development setback; or* *c) 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 NEMA EIA regulations, 2014 (as amended) states: "*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse".*

Table 1: Regulatory Authorisation and Zones of Applicability

The following Zones of Regulation were applied to the concerned Water Resources:

- A **32-metre Zone of Regulation** in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) was assigned to the identified *water resources*.
- A **100-metre Zone of Regulation** in accordance with General Notice 509 of 2016 as it relates to the National Water Act, 1998 (Act No.36 of 1998) pertaining to Section 21(c) & (i) Water Use Activities was assigned to the identified *water resources*.
- A **500-metre Zone of Regulation** in accordance with General Notice 509 of 2016 as it relates to the National Water Act, 1998 (Act No.36 of 1998) pertaining to Section 21(c) & (i) Water Use Activities was assigned to the identified *wetlands.*

Please note that the *Artificial Aquatic Features* identified as part of the site assessment were not considered Legislative Water Resources and as such, no Zones of Regulation apply to these feature(s). The Zones of Regulation were only applied to the Water Resources, deemed to be natural by the Author as outlined in Section 4 (below).

2. WATER RESOURCE ASSESSMENT APPROACH

2.1 FIELD ASSESSMENT

For this assessment, the definition of a Watercourse, Wetland and Riparian Habitat was taken as defined in the National Water Act, 1998 (Act No. 36 of 1998). The definitions are as follows:

A **Watercourse** means:
(a) a river or spring
(b) a natural channel in which water flows regularly or intermittently
(c) a wetland, lake, or dam into which, or from which, water flows; and
(d) 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.

Wetland habitat is "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."

Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterized by alluvial soil, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent areas.

A Site Assessment was undertaken in June 2023 of the concerned development area (Erf 266 & Portion of the Remainder of Erf 21 in Riversdale), during which the presence of any natural water resource characteristics as defined by DWAF (2008) or a wetland and riparian habitat as defined by the National Water Act, 1998 (Act No. 36 of 1998) were noted (please refer to Section 4 and 5 of this report). The Water Resource delineations took place according to the method presented in the "*Updated manual for the identification and delineation of wetland and riparian resources*" (DWAF, 2008). The foundation of the method is based on the fact that watercourses have several distinguishing factors including the following:

- *Landscape Position*
- *The presence of water at or near the ground surface*
- *Distinctive Hydromorphic Soil*
- *Vegetation adapted to saturated soil, and*
- *The presence of Alluvial Soil in stream systems*

2.2 SECTION 21 (C) & (I) RISK ASSESSMENT, RECOMMENDATIONS & MITIGATION MEASURES

Section 21(c) & (I) DWS Risk Assessment Matrices were compiled (please refer to **Addendum B** for the method of approach) and Recommendations were provided to address and mitigate potential impacts associated with the proposed mixed-use residential development on the identified water resources. These Recommendations also include general management measures, which apply to all construction-related activities. Practical and feasible mitigation measures were provided to manage and/or mitigate the impacts of the proposed mixed-use residential development on the identified natural water resources. The mitigation measures proposed are outlined below in Section 6 of this report.

3. DESKTOP ANALYSIS - RESULTS

3.1 ANALYSES OF RELEVANT ECOLOGICAL DATABASES

This section of the report contains data accessed as part of the Desktop Assessment.

It is important to note that although all data sources used provides useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics associated with Erf 266 & Portion of the Remainder of Erf 21 in Riversdale (the development area) at the scale required to inform legislative processes.

Given these limitations, this information is considered useful as background information to the report, is important in legislative contextualisation of the risks and impacts and was thus used as a guideline to inform the assessment and to focus on areas and aspects of increased ecological importance during the site assessment. It must, however, be noted that verification of the ecological conditions of the specific area in question may potentially contradict the information contained in the relevant databases, in which case the site-verified information must carry more weight in the decision-making processes.

Figure 4 depicts the proposed development area (red polygon) in relation to the 20-metre interval contour/relief lines for the Western Cape – Source: Department of Rural Development and Land Reform, Chief Directorate: National Geo-Spatial Information.

Figure 5 depicts the proposed development area (red polygon) in relation to the Land Cover 73-class (DEA, 2018) Database – Source: Department of Environmental Affairs. According to this database, the concerned development area is mapped as commercial annual crops (cultivated land).

Figure 6 depicts the proposed development area (red polygon) in relation to the Slope Percentage Classification Grid derived from the 20m SUDEM – Source: Stellenbosch University, WCDOA. The majority of the development area is classified as having a slope of >5%.

Figure 7 depicts the proposed development area (red polygon) in relation to Soil Types – Source: Department of Agriculture, Forestry and Fisheries. The majority of the concerned development area contains soils, according to this database, with a strong texture contrast, marked clay accumulation, strongly structured and a non-reddish colour. In addition, one or more vertic, melanic and plinthic soils may also be present. The southwestern section of the development area (area marked in yellow) contains soils with limited pedological development, usually shallow on hard weathering rock with or without intermittent diverse soils, with lime generally present in part or most of the landscape.

Figure 8 depicts the proposed development area (red polygon) in relation to Soil Erodibility – Source: SA Atlas of Climatology and Agrohydrology (R.E. Schulze, 2009). The entire development area is mapped as having moderate soil erodibility.

Figure 9 depicts the proposed development area (red polygon) in relation to Soil Clay & Depth – Source: Department of Agriculture, Forestry and Fisheries. The entire development area is mapped as having >15% clay with a depth of >450 mm.

Figure 10 depicts the proposed development area (red polygon) in relation to The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina L., Rutherford, M.C. and Powrie, L.W. Version 2018 – Source: South African National Biodiversity Institute (SANBI). The entire development site is mapped as containing Eastern Ruens Shale Renosterveld. This predominantly relates to the historical state as currently the entire proposed development area contains commercial crops.

Figure 11 depicts the proposed development area (red polygon) in relation to the NGI [River Line vector data of the 1: 50000 Topo maps for the Western Cape – Source: Chief Directorate: National Geo-spatial Information (DRDLR)] and the Department of Water and Sanitation (DWS) Rivers Database.

Figure 12 depicts the proposed development area (red polygon) in relation to the National Freshwater Ecological Priority Areas (NFEPA) Database for Wetlands – Source: Council for Scientific and Industrial Research (CSIR). Only a small area located in the middle of the concerned development area is mapped as a wetland area according to this database.

Figure 13 depicts the proposed development area (red polygon) in relation to the National Wetland Map 5 (NWM5) Database – Source: Please refer to references. Only a small area located in the middle of the concerned development area (which overlaps with the NFEPA Database) is mapped as a depression wetland located on a plain area according to the NWM 5 Database. The rest of the concerned properties is not mapped as containing natural wetland areas.

Figure 14 depicts the proposed development area (red polygon) in relation to the Surface Water Flow Direction derived from the 20m SUDEM – Source: Stellenbosch University, WCDOA. The majority of the concerned development area drains surface water in a north and northeastern direction towards a tributary of the H90C – 09211 (Naroo River) with only the southern portions of the development area (adjacent to the N2) draining in a predominantly eastern direction.

Figure 15 depicts the proposed development area (red polygon) in relation to Aquifer Type and Yield. Source: Department of Water and Sanitation (DWS). The entire development area is mapped as fractured with 0.0 – 0.1 l/s yield.

Figure 16 depicts the proposed development area (red polygon) in relation to Aquifer Classification. Source: Department of Water and Sanitation (DWS). The entire development area is mapped as Poor aquifer classification.

Figure 17 depicts the proposed development area (red polygon) in relation to Aquifer Susceptibility. Source: Department of Water and Sanitation (DWS). The entire development area is mapped as Low aquifer susceptibility.

Figure 18 depicts the proposed development area (red polygon) in relation to Aquifer Vulnerability. Source: Department of Water and Sanitation (DWS). The entire development area is mapped as the Least Aquifer Vulnerability.

Figure 19 depicts the proposed development area (red polygon) in relation to Depth to Groundwater. Source: Department of Water and Sanitation (DWS). The entire development area is mapped as having a depth to groundwater of between 11 – 15 mbgl (metres below ground level).

Figure 20 depicts the proposed development area (red polygon) in relation to Groundwater Quality. Source: Department of Water and Sanitation (DWS). The development area is mapped as having groundwater quality of between 70-370 mS/m (millisiemens/metre), which entails High-Medium Groundwater Quality.

Figure 21 depicts the proposed development area (red polygon) in relation to Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA) of the Western Cape Biodiversity Spatial Plan, 2017. A small area on the southwestern edge of the concerned development area is mapped as a terrestrial CBA, whilst another small area in the centre of the development area is mapped as an ESA (watercourse). This area is defined as not being essential for meeting biodiversity targets but plays an important role in supporting the functioning of PAs (protected areas) and CBAs and is often vital for ecosystem service delivery. The management objectives concerning these ESAs, according to the WCBSP 2017, are to restore and manage these areas to minimize the impact on ecological processes and ecological infrastructure functioning, especially soil and water-related services and to allow for faunal movement.

Figure 4: 20M Contour Lines

Legend

— Contours 20m

Map Center: Lon: 21°13'49.2"E
Lat: 34°5'6.7"S

Scale: 1:25 000

Date created: June 27, 2023

Western Cape Government
Agriculture
FOR YOU

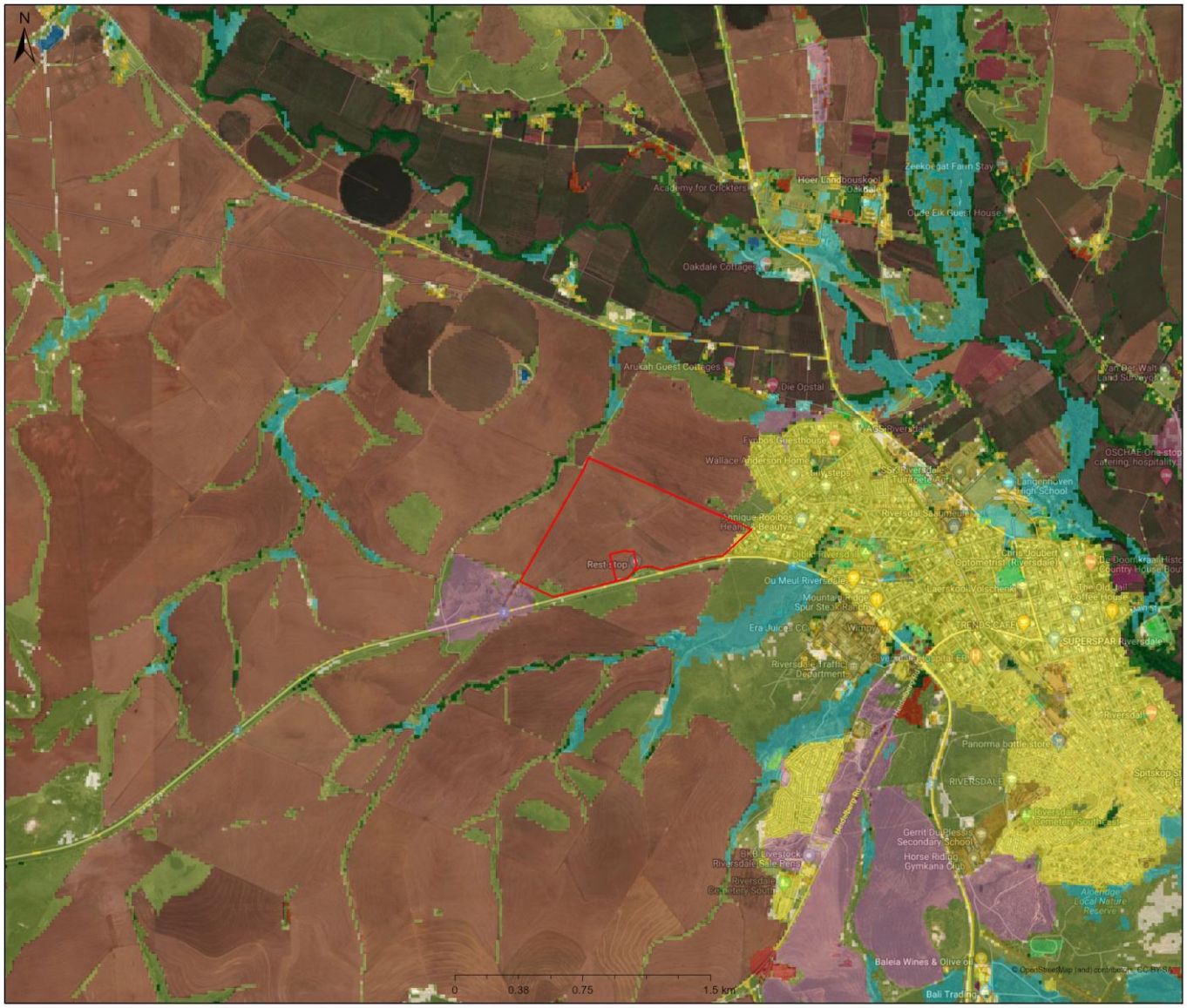

Figure 5: Land Cover 73-Class

Figure 6: Slope Percentage

Legend

Slope Percentage

- 0 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 30
- 31 - 35
- 36 - 40
- 41 - 45
- 46 - 50

Map Center: Lon: 21°13'36.1"E
Lat: 34°5'3.7"S

Scale: 1:25 000

Date created: June 27, 2023

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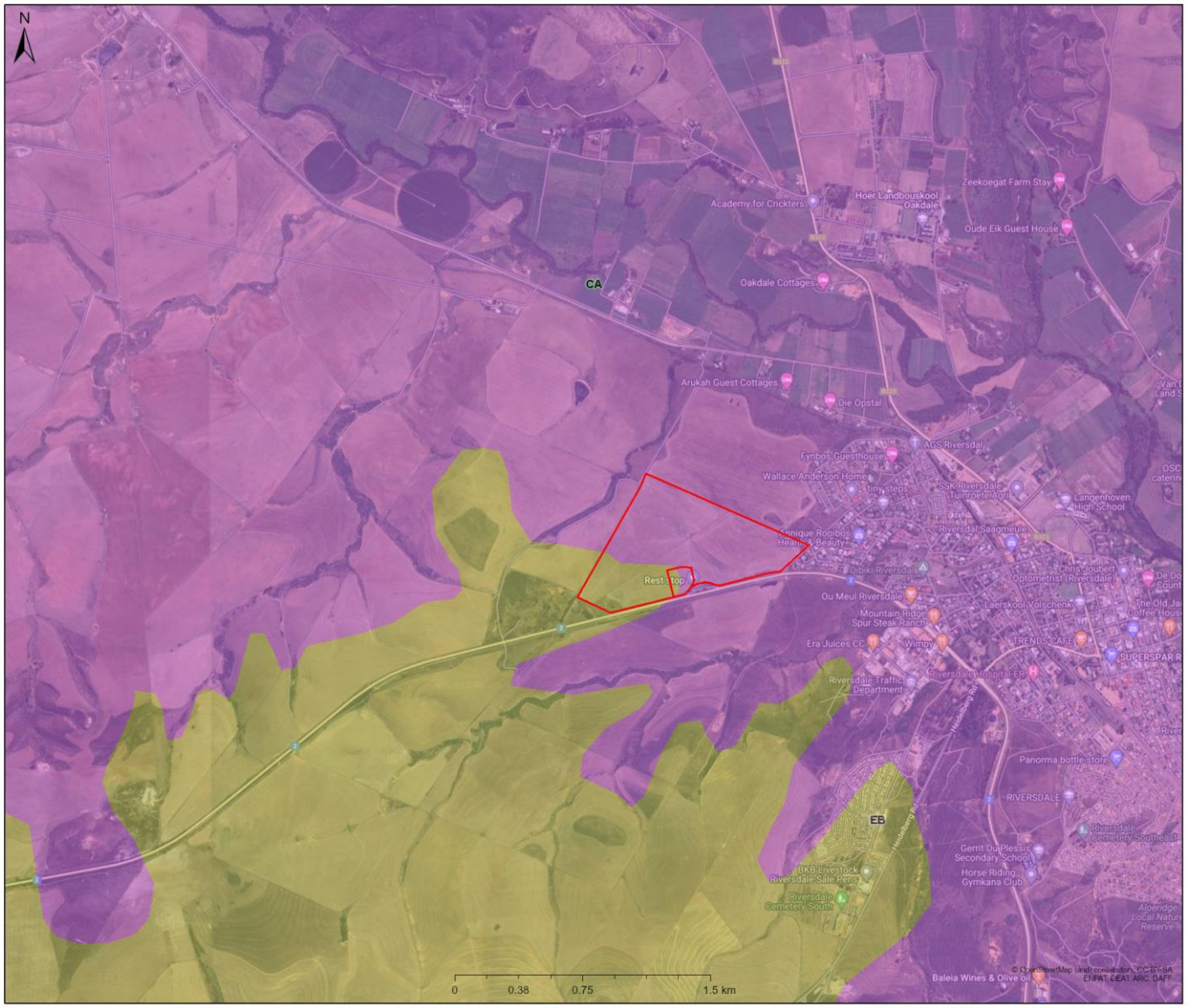

Figure 7: Soil Types

Legend

Soil Types

- CA - Soils with a strong texture contrast
- EB - Soils with limited pedological development

Map Center: Lon: 21°13'36.1"E Lat: 34°5'3.7"S

Scale: 1:25 000

Date created: June 27, 2023

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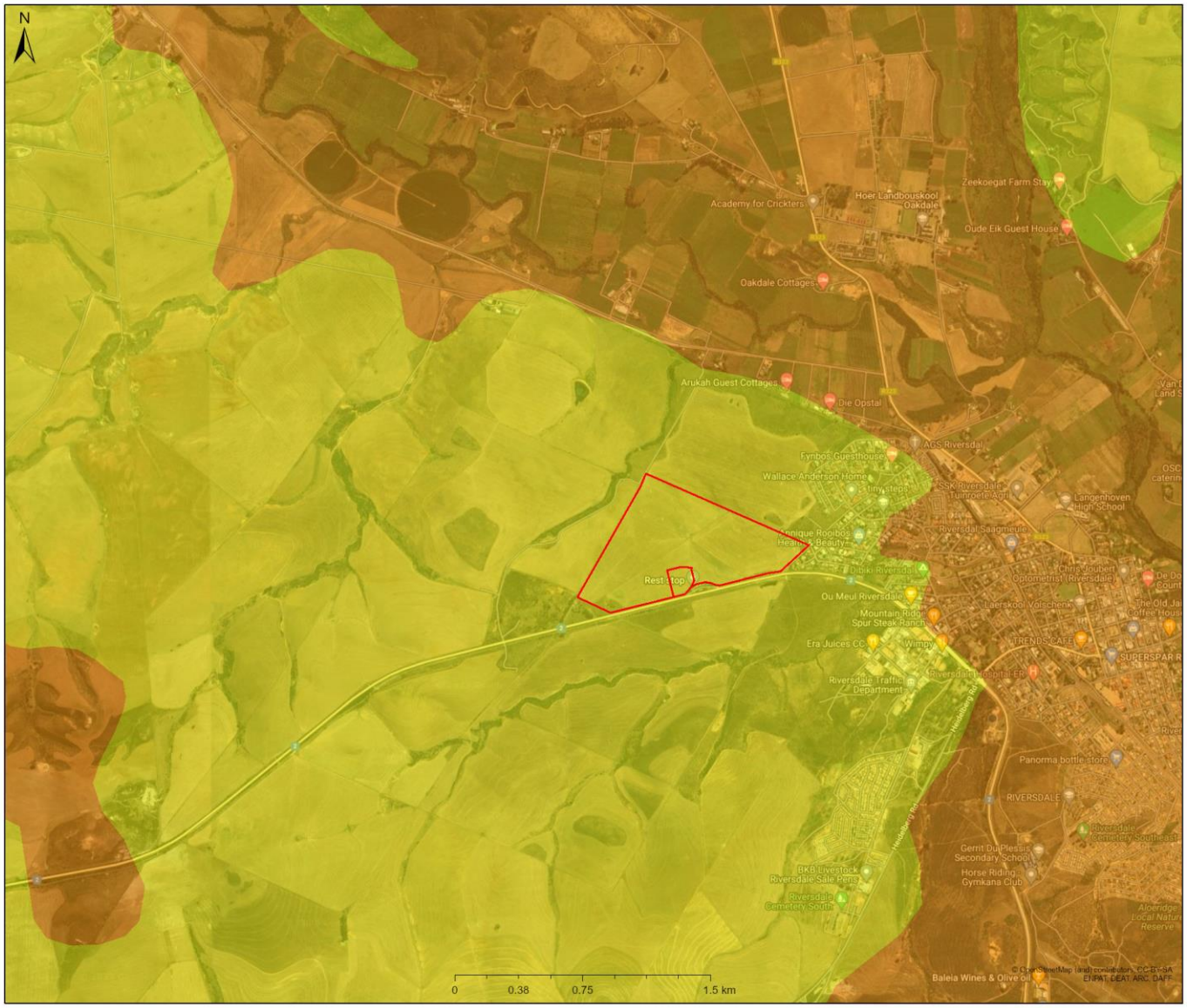

Figure 8: Soil Erodibility

Legend

Soil Erodibility

- Moderate
- High

Map Center: Lon: 21°13'36.1"E
Lat: 34°5'3.7"S

Scale: 1:25 000

Date created: June 27, 2023

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Figure 9: Soil Clay & Depth

Legend

Soil Clay and Depth

Clay: < 15%; Depth < 450 mm

Map Center: Lon: 21°13'36.1"E Lat: 34°5'3.7"S

Scale: 1:25 000

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Figure 10: VegMap 2018

Legend

VEGMAP 2018

- FFc 1 Swellendam Silcrete Fynbos
- FRc 2 R1ens Silcrete Renosterveld
- FRs 13 Eastern R1ens Shale Renosterveld

Map Center: Lon: 21°13'36.1"E
Lat: 34°5'3.7"S

Scale: 1:25 000

Date created: June 27, 2023

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Figure 11: Rivers

Legend

Rivers (DWS)
- Perennial
- NonPerennial

Rivers
- Perennial
- Non-Perennial

Map Center: Lon: 21°13'36.1"E Lat: 34°5'3.7"S
Scale: 1:25 000
Date created: June 27, 2023

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Figure 12: NFEPA Wetlands

Legend

Wetlands (NFEPA)

- Artificial
- Natural

Map Center: Lon: 21°13'36.1"E
Lat: 34°5'3.7"S

Scale: 1:25 000

Date created: June 27, 2023

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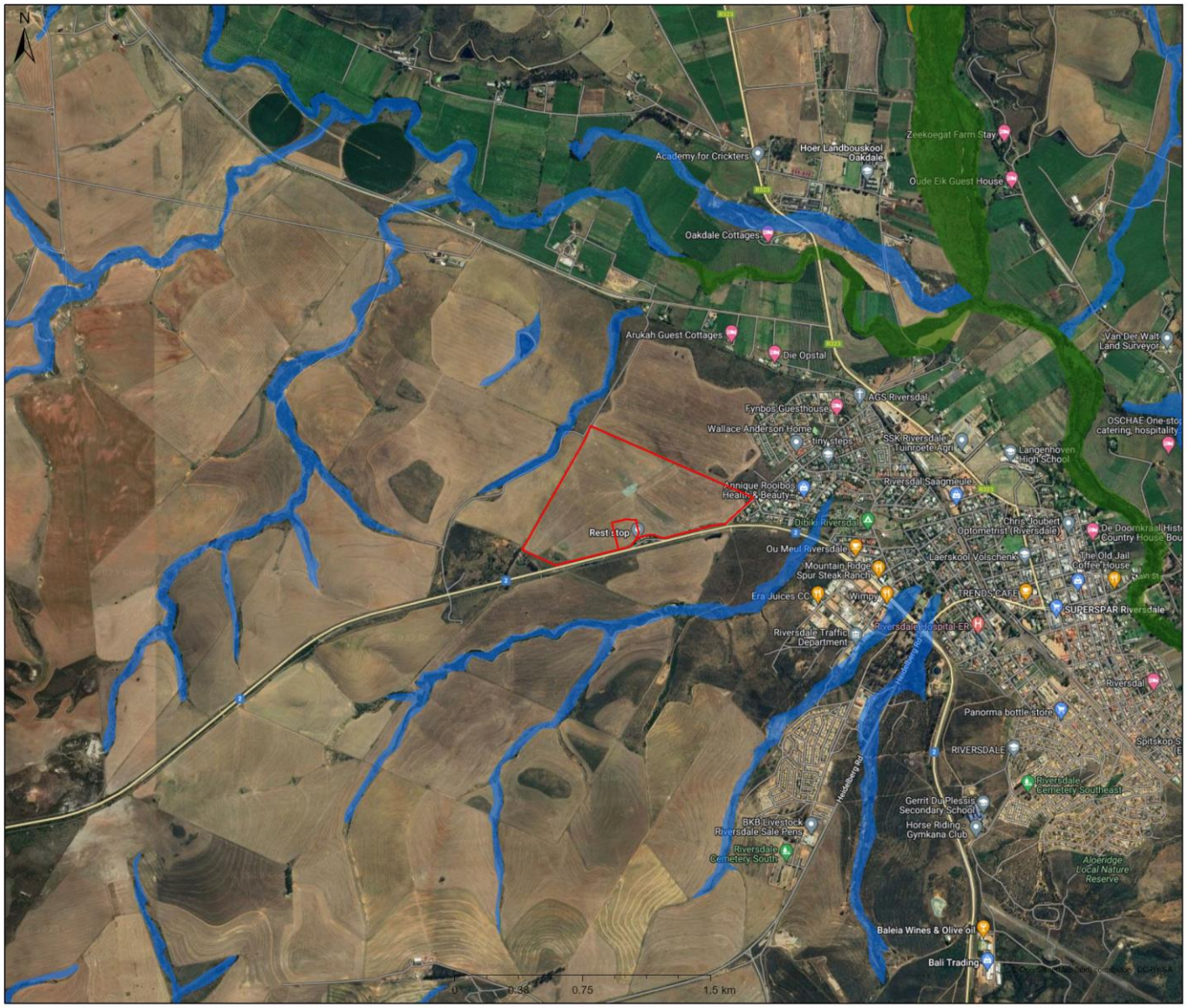

Figure 13: NWM5 Wetlands

Legend

Wetlands (NWM5)

- Channelled valley-bottom wetland
- Depression wetland
- Floodplain wetland
- Seep wetland

Map Center: Lon: 21°13'48.7"E
Lat: 34°5'12.7"S

Scale: 1:25 000

Date created: June 27, 2023

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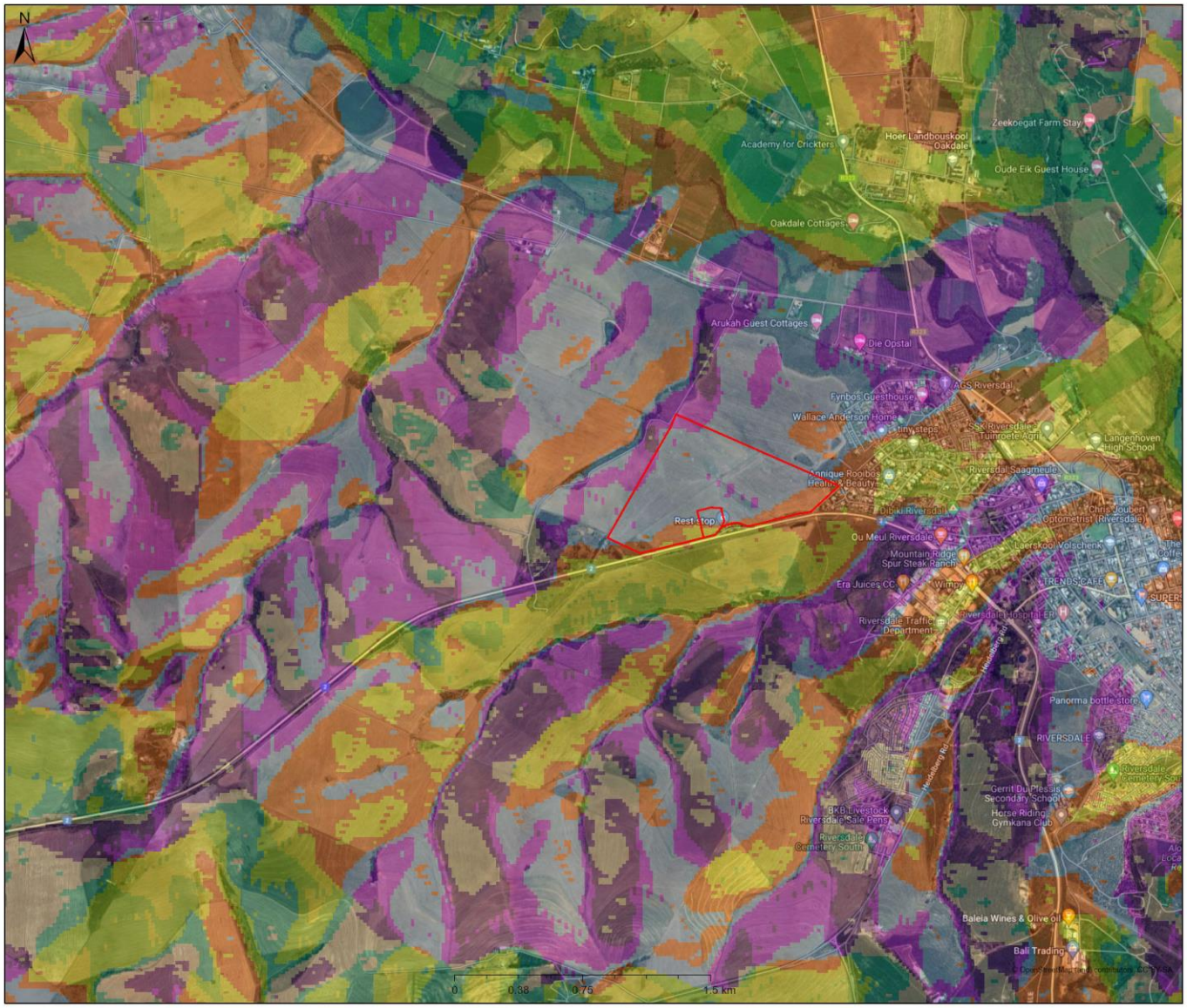

Figure 14: Surface Water Flow Direction

Legend

Flow Direction

- E
- SE
- S
- SW
- W
- NW
- N
- NE

Map Center: Lon: 21°13'29.2"E
Lat: 34°5'14.9"S

Scale: 1:25 000

Date created: June 27, 2023

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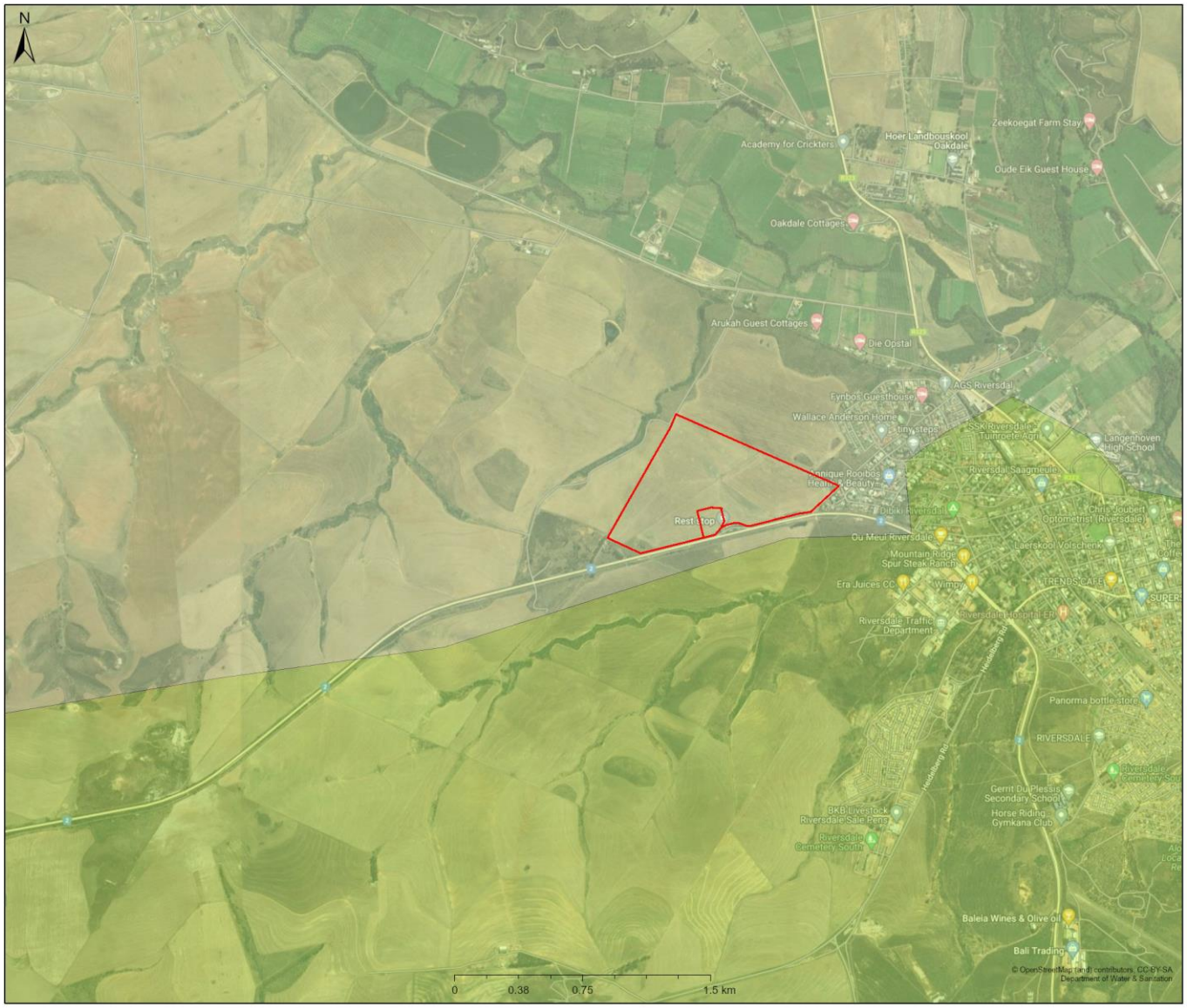

Figure 15: Aquifer Type & Yield

Legend

Aquifer Type and Yield

- Fractured 0.0 - 0.1 l/s
- Fractured 0.1 - 0.5 l/s

Map Center: Lon: 21°13'29.2"E
Lat: 34°5'14.9"S

Scale: 1:25 000

Date created: June 27, 2023

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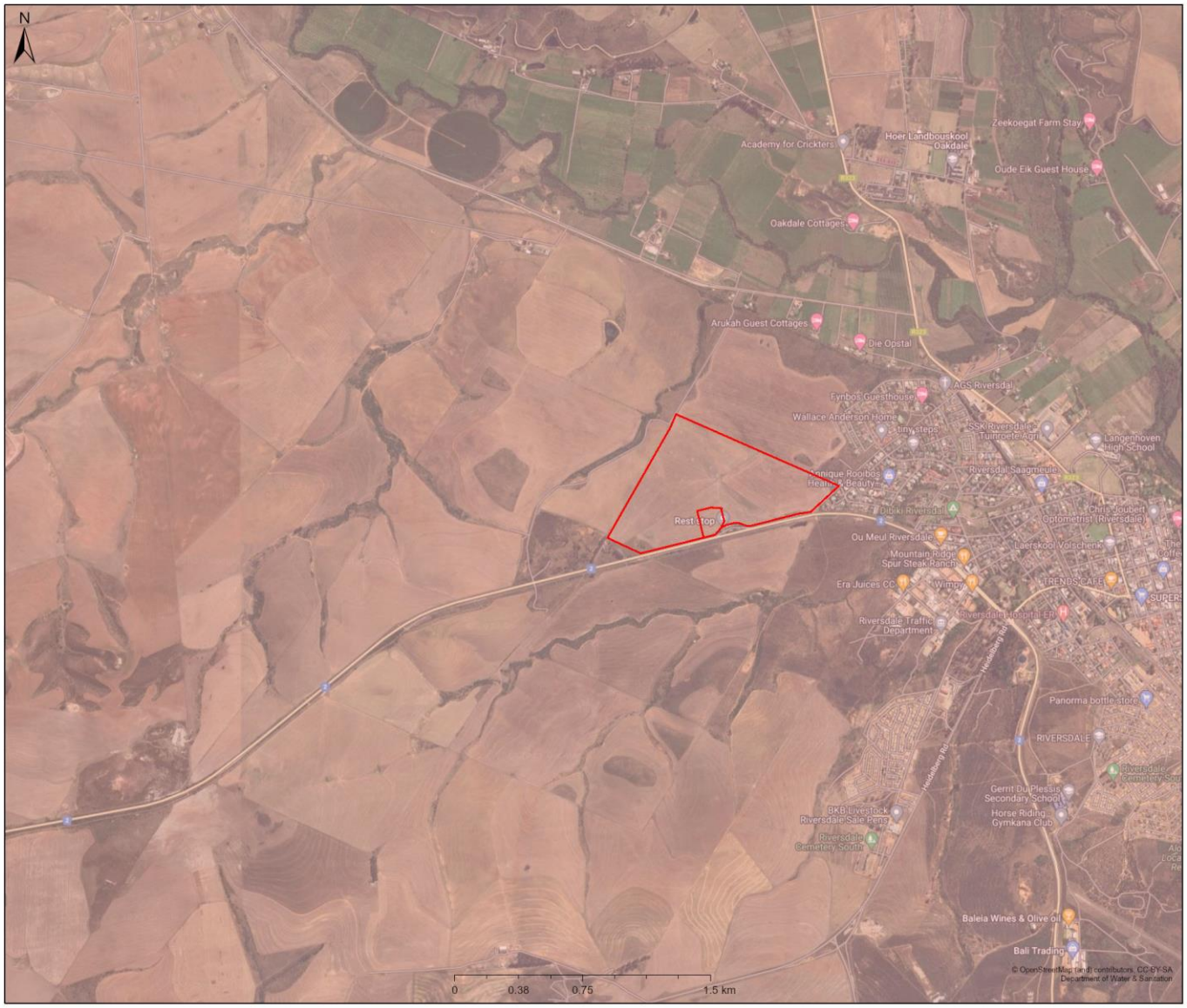

Figure 16: Aquifer Classification

Legend

Aquifer Classification

Poor

Map Center: Lon: 21°13'29.2"E
Lat: 34°5'14.9"S

Scale: 1:25 000

Date created: June 27, 2023

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Figure 17: Aquifer Susceptibility

Legend

Aquifer Susceptibility

Low

Map Center: Lon: 21°13'29.2"E
Lat: 34°5'14.9"S

Scale: 1:25 000

Date created: June 27, 2023

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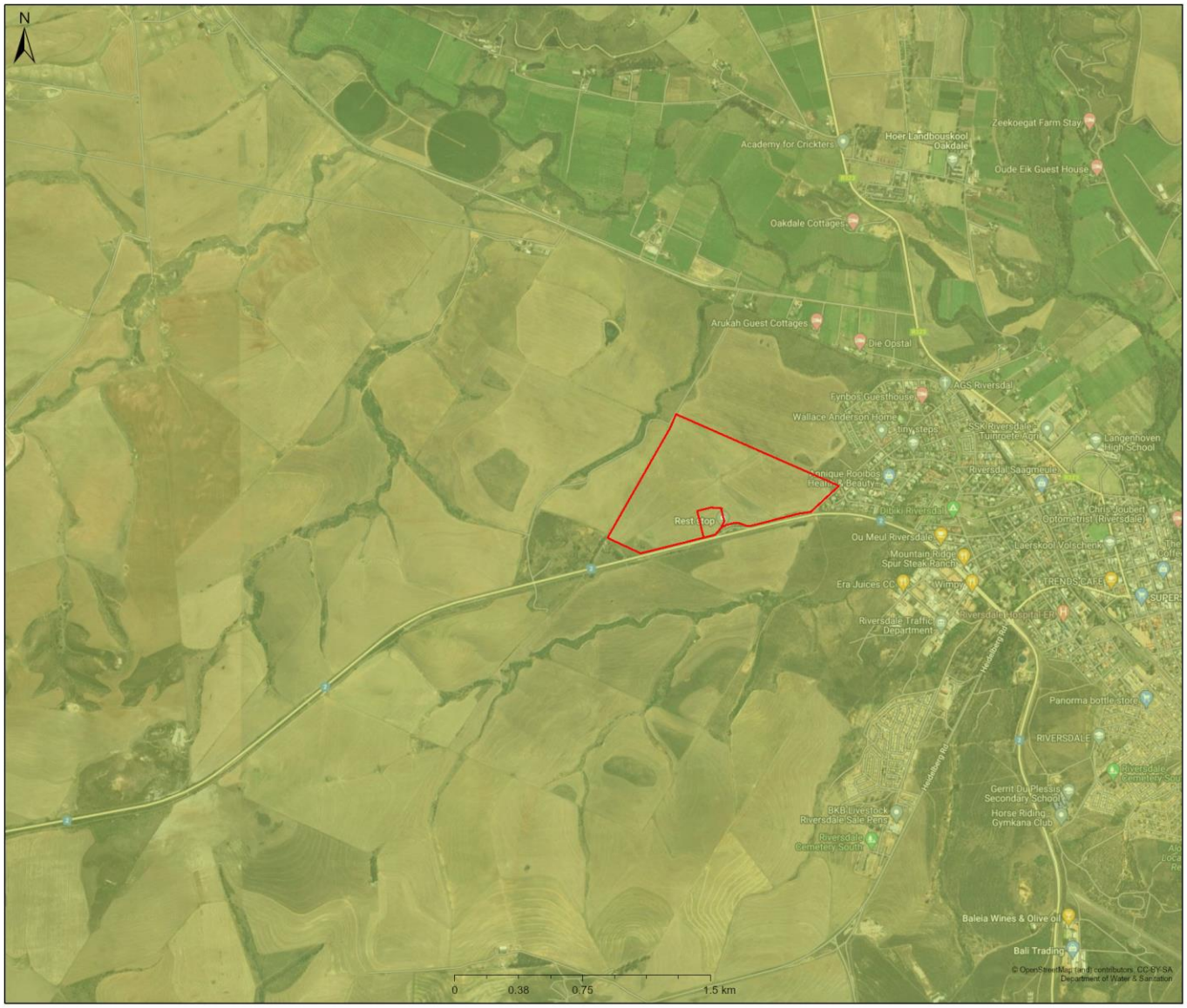

Figure 18: Aquifer Vulnerability

Legend

Aquifer Vulnerability

Least

Map Center: Lon: 21°13'29.2"E
Lat: 34°5'14.9"S

Scale: 1:25 000

Date created: June 27, 2023

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Figure 19: Depth to Groundwater

Legend

Depth to Groundwater

11 - 15

Map Center: Lon: 21°13'29.2"E
Lat: 34°5'14.9"S

Scale: 1:25 000

Date created: June 27, 2023

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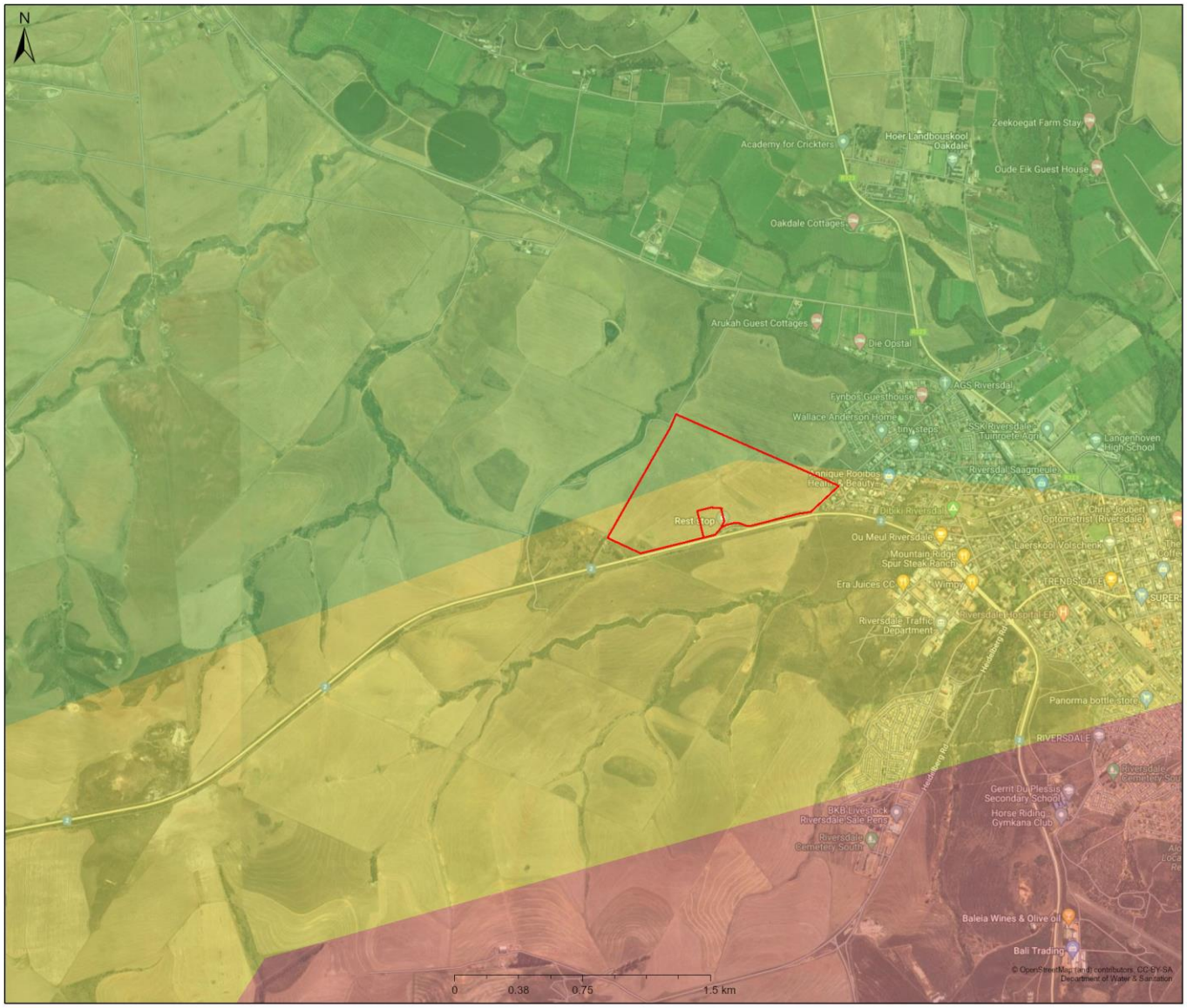

Figure 20: Groundwater Quality

Legend

Electrical Conductivity (mS/m)

- 70 - 150
- 150 - 370
- 370 - 520

Map Center: Lon: 21°13'29.2"E
Lat: 34°5'14.9"S

Scale: 1:25 000

Date created: June 27, 2023

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Figure 21: WCBSP 2017

Legend

BSP ESA: Restore
- ESA2: Restore from plantation or high density IAP
- ESA2: Restore from other land use

BSP CBA: Degraded
- CBA2: Aquatic
- CBA2: Terrestrial

BSP ESA
- ESA: Terrestrial

BSP CBA
- CBA: Terrestrial
- CBA: Forest
- CBA: River
- CBA: Wetland

Map Center: Lon: 21°13'30.2"E Lat: 34°5'16"S
Scale: 1:25 000
Date created: June 27, 2023

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4. SITE ASSESSMENT VERIFICATION - RESULTS

4.1 IDENTIFIED NATURAL WATER RESOURCES

Assessment of the relevant ecological databases as illustrated in Section 3.1 (above) together with the site assessment confirmed areas of increased ecological sensitivity with respect to natural water resources on Erf 266 and a Portion of the Remainder of Erf 21 in Riversdale. A seasonal seep wetland area was demarcated on the concerned property. Additionally, a tributary of the **H90C – 09211 (Naroo River)** is not situated on the concerned properties but is located approximately 100 metres from the western edge of the Portion of the Remainder of Erf 21 associated with the proposed mixed-use development. These natural water resources will be located within the Legislative Regulation Zone of natural water resources. These areas are described below:

4.1.1.1 CLASSIFICATION SYSTEM OF WETLANDS AND OTHER AQUATIC ECOSYSTEMS

Watercourse	Level 3: Landscape Unit	Level 4: Hydrogeomorphic (HGM) Type
Seasonal Seep Wetland	**Slope:** Stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain hill or valley.	**Seep Wetland**: A wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley, but they do not, typically, extend into a valley floor.
Channelled Valley-Bottom Wetland – Associated with Tributary of the H90C – 09211 (Naroo River)	**Valley Floor**: The base of a valley situated between two distinct valley-side slopes.	**Channelled Valley-Bottom Wetland**: A valley-bottom wetland with a river channel running through it.
Non-Perennial Tributary of the H90C – 09211 (Naroo River)	**Slope** **Slope:** Stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain hill or valley.	**River**: Linear landform with clearly discernible beds and banks, which permanently or periodically carry a concentrated flow of water

Table 2: Classification System of Wetlands and other Aquatic Ecosystems (Ollis *et al*, 2013)

4.1.1.2 DELINEATION OF SEASONAL SEEP WETLAND AREA (METHODOLOGY)

Wetland delineation is the process of demarcating the boundary of the temporary wetness zone which marks the edge between the concerned wetland and the adjoining terrestrial zones. The delineation of the concerned seasonal seep wetland area was required to determine the extent of the wetland habitat under consideration together with the extent of the various wetness zones to inform this assessment.

The definition of a wetland according to the National Water Act, 1998 (Act No. 36 of 1998) is as follows:

"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 soils"

Wetland delineation further aims to identify the different wetness zones within a wetland area, which can be defined as:

- Temporary Zone – wet for short periods of the wet season but dry for the remainder of the year.
- Seasonal Zone – wet through most of the wet season but generally dries up during the dry season.
- Permanent Zone – wet throughout the year.

To accurately define the wetland and wetness zone boundaries, the hydrology of the concerned system should be considered. This is however constraint as this requires long-term accurate monitoring which was not feasible as part of this assessment process. Additional factors can however be incorporated to estimate the wetland boundary and different wetness zones with a relatively high degree of accuracy. These factors include:

- Landscape Position – water is directed and collects in the lower-lying area of the landscape with wetlands usually forming in valley bottoms and depression areas.

- Vegetation – macrophytes adapted to anaerobic saturated soil conditions in the root zones indicate flooding.
- Soil–saturated or flooded soils develop anaerobic conditions which give rise to predictable soil morphology that is used to indicate the duration of flooding/saturation.

Vegetation types are also used during the delineation process as an indicator of wetland conditions, given that periodic flooding and anaerobic soil conditions place stress on terrestrial plant species. Additionally, periodic drying places stress on fully (Obligate) aquatic plant species and hence vegetation varies depending on the species' tolerance to flooding as indicated in the image below (source: van Ginkel et al. 2010):

Vegetation Class	Class Description
Obligate	Almost always occurs in wetlands under natural conditions, estimated probability >99%.
Facultative Positive	Usually occurs in wetlands, estimated probability 67%-99%, but is occasionally found in non-wetlands with estimated probability 1%-33%.
Facultative	Equally likely to occur in wetland and non-wetland areas, estimated probability 34%-66%.
Facultative Negative	Usually occurs in non-wetlands, estimated probability 67%-99%, but is occasionally found in wetlands with estimated probability 1%-33%.
Non-Wetland or Terrestrial	Almost always occurs in non-wetlands under natural conditions, estimated probability >99%

The utilisation of different vegetation types for wetland delineation purposes, usually requires undisturbed conditions, due to the presence of facultative wetland species not being diagnostic of wetland areas without additional indicators and/or justification. Vegetation composition can alter rapidly to responses in alteration to hydrology and/or disturbances and therefore accurate delineation of wetland areas should preferably be supported with an additional assessment – the assessment of soil conditions.

Prolonged saturation and/or flooding of soils create anaerobic conditions and fluctuations between aerobic and anaerobic conditions that alter the characteristics of soils. Metals become soluble and leach from and/or precipitate out of the soil profile. This leaching of metals (usually iron and manganese) produces greyish, greenish or blueish soil colours, commonly termed **Gleyed Soils** and can also give rise to **Redox Depletions**. The concentration of metals within the soil profile as a result of precipitation forms **Concretions**, **Mottles** and/or **Pore Linings**. Sulphur usually exists in a reduced state and the rate of organic matter decomposition is reduced. The features described above are collectively termed **Redoximorphic Features** and are used as primary indicators of wetland conditions together with vegetation composition indicators.

<u>Redoximorphic Soil Conditions</u>:

- **Gleyed Soil** – A reduced matrix is characterised by the development of blueish-grey to green colours in the mineral soil profile.
- **Redox depletions** – When iron and manganese oxides are stripped out of the soil profile in localised areas.
- **Redox concentrations** – Mottles and Concretions occur under conditions of fluctuating water levels and are characterised by the development of small patches of concentrated iron and manganese oxides usually orange or yellowish-brown in colour.
- **Sulphur** gets reduced to Hydrogen Sulphide (H_2S) giving a distinct "rotten egg" smell to the soil.

Redoximorphic soil conditions are considered to be the most accurate indicator of wetland conditions as these features persist over long periods despite potential fluctuation/changes to the system's hydrology. The image below as adapted from *Kotze et al. 1994* provides a classification of observed redoximorphic soil conditions related to the various wetness zones within a wetland area.

	Temporary	Seasonal	Permanent
0-10cm	Few/no mottles Low/mod organic matter Non-sulphidic	Many mottles Mod organic matter Seldom sulphidic	Few/no mottles High organic matter Sulphidic
40-50cm	Few/many mottles	Many mottles	No/few mottles
Vegetation	Mainly grasses	Sedges / grasses	Reeds / sedges
Hydrology	<3 months of saturation per annum	>3 months of saturation per annum	Wetness all year round

4.1.1.3 DELINEATION OF SEEP WETLAND AREA - RESULTS

A site assessment and subsequent delineation of the concerned seasonal wetland area was carried out during June 2023 utilising the delineation criteria as described in Section 4.1.1.2 above.

It must be noted, however, that although the presence of prolonged surface water (Permanent Zone) seems to reduce rapidly during the dryer summer months, delineation of the various wetland zones was undertaken for the specific conditions at the time of the site assessment (June 2023). Additionally, it must also be noted that the significant precipitation and flooding experienced in the Western Cape Garden during the timeframe of the site assessment (June 2023) would most probably also have created redoximorphic conditions in the soil profile over and above that which would normally be expected. This complicated the delineation process given the significant precipitation experienced, the subsequent flooding events and the waterlogged soils which resulted during the time of the site assessment. The delineation of the seasonal seep wetland area, in the opinion of the author, is however, deemed to be accurate enough for the purpose of this assessment process and to inform the required legislative processes as the delineation was based on conditions of increased wetness.

It was also not possible to utilise wetland vegetation indicators during the delineation process, given that the concerned property has been significantly disturbed through agricultural activities for several decades. As a result, the topsoil is continuously disturbed by ploughing associated with the cultivation of commercial crops and the application of fertilizers and herbicides. The vast majority of the proposed development area is covered with commercial crops (barley) although the identified seasonal seep wetland area appears to be a staging area for farming equipment and tractors given that this area is located in the centre of 4 commercial crop blocks. Given the continuous disturbance in this area, no indigenous vegetation is present with only emergent grasses identified.

A soil auger was utilised to obtain soil profile samples, where possible, at regular intervals along the gradient from the wettest to the driest zone with soil wetness and soil form indicators documented. The wetness zone was recorded at each of the individual sample points based on the abovementioned soil profile. These sample points were then logged using GPS software with a standard deviation of 4 metres given the slight inaccuracies of most handheld GPS software. The wetland boundary was extrapolated based on the soil wetness gradient with the edge of the wetland area defined where no redoximorphic features were present in the soil profile.

Additionally, it is also important to note that the soil within the concerned delineation area had a very high percentage of rocks, stones, and pebbles which restraint the soil auger process, resulting in the majority of soil profile samples being defined to the top 10cm of soil. However, the presence/absence of redoximorphic

conditions noted within the top 10cm of soil as depicted in the image above (adapted from *Kotze et al. 1994)*, was deemed sufficient to accurately classify each sample point in terms of the different wetness zones and facilitate the delineation process.

Delineated Seasonal Seep Wetland Area

Legend

Wetlands (NWM5)

- Channelled valley-bottom wetland
- Depression wetland

Map Center: Lon: 21°13'56"E
Lat: 34°5'11.5"S

Scale: 1:6 000

Date created: June 30, 2023

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Figure 22 (Above): Delineated Seep Wetland Area (**Orange Polygon**) on proposed development area (Erf 266 & Portion of the Remainder of Erf 21 in Riversdale) in relation to the National Wetlands Map 5 Ecological Database.


Above: Seasonal Seep Wetland Area with water emanating from the ground.


Above: Seasonal Seep Wetland Area located on a gently sloping valley side slope with water emanating from the ground. Indigenous vegetation is absent due to intensive agricultural activities with only emergent grasses noticeable.


Above: Seasonal Seep Wetland Area with water emanating from the ground. Commercial crops (barley) are busy dying back as a result of water-logged soil.

Above: Seasonal Seep Wetland Area with water emanating from the ground. Commercial crops (barley) are busy dying back as a result of water-logged soil.

Above: Seasonal Seep Wetland Area soil auger sample drill hole (approximately 30 cm deep) immediately refilling with water indicating water-logged soil due to significant rain events. The seep wetland area is still anticipated to be seasonal.

Above: Soil auger sample example within Seasonal Seep Wetland Area. Water-logged Gleyed Soil.

Above: Soil auger sample example within Terrestrial Zone. No redoximorphic soil features are present.

4.1.1.4 DETERMINATION OF THE PRESENT ECOLOGICAL STATE OF THE SEASONAL SEEP WETLAND AREA.

The scoresheet for assessing Habitat Integrity based on recommendations of Ollis *et al*. 2014, was used to determine the Present Ecological State (PES) of the Seasonal Seep Wetland area.

The method involves scoring various criteria including Hydrology, Geomorphology, Water Quality and Vegetation, with a score ranging from 0 (critically modified) to 5 (natural). The average score of all of the abovementioned criteria combined is then used to define the overall Present Ecological State (PES) of the wetlands according to the Figure below.

Ecological Category	Description	Impact Score
A	Unmodified, natural.	4 – 5
B	Largely natural with few modifications / in good health. A small change in natural habitats and biota may have taken place but the ecosystem functions are still predominantly unchanged.	3 – 4
C	Moderately modified / fair condition. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	2 – 3
D	Largely modified / poor condition. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	1 – 2
E	Seriously modified / very poor condition. The loss of natural habitat, biota and basic ecosystem functions is extensive.	0 - 1
F	Critically modified / totally transformed. Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota.	0

The Present Ecological State (PES) of the concerned seep wetland area was assessed and summarised below. The results of the PES scoring were used to inform the Section 21(c) & (i) Risk Assessment Matrix as it relates to the National Water Act, 1998 (Act No.36 of 1998), for the assessment of anticipated impacts on this water resource as a result of the proposed mixed-use development.

PES Wetland Scores (0=Critically Modified, 1=Seriously Modified, 2=Largely Modified, 3=Moderately Modified, 4=Semi Natural, 5=Natural)

Seep Wetland			
Criteria	**Description**	**Score**	**Confidence**
Hydrology			
Flow Modification	Abstraction, impoundments or increased runoff potential from developments or agricultural land use. Changes in flow regime, volumes, and velocities affect inundation timeframes of wetland habitats resulting in vegetation assembly changes. Abstraction of groundwater-feeding wetlands.	1	4
Permanent Inundation	Anthropogenic impoundment destroys natural wetland habitats.	1	4
Canalisation	Anthropogenic changes to inundation levels of wetlands and thus changes in natural wetland habitat	1	4
Geomorphology			
Topographic Alteration	Infilling, ploughing, dykes, roads, bridges, railway lines and other activities alter the natural characteristics of soils and sediments.	1	4
Water Quality			
Water Quality Modification	Point of diffuse sources analysed either directly using laboratory analysis or upstream Land Use including Agricultural, Industrial or Residential. Aggravated by a decrease in water volume delivered to the wetlands.	1	4
Sediment Load Modification	Reduction in the natural flow and distribution patterns of sediments due to entrapment by impoundments or increase due to intensive Land Use practices. Unnatural erosion, accretion or infilling of wetlands and subsequent change in natural habitat.	1	4
Terrestrial Encroachment	Desiccation of wetlands and encroachment of terrestrial vegetation due to changes in Hydrology or Geomorphology. Increased change from wetland to terrestrial conditions and subsequent loss of wetland functions	1	4
Indigenous Vegetation Removal	Destruction of natural habitat through anthropogenic activities and increased potential for erosion.	0	4
Invasive Vegetation Encroachment	Wetland habitat altering through changes in natural vegetation community structure and water quality changes.	1	4
Alien Fauna	The presence of alien fauna affects natural community structures	3	4
Overutilisation	Overgrazing, Over-Fishing etc	1	4
Mean Score		**1.09**	**4**
Minimum Score		**0**	
OVERALL PES%		**21.8 %**	
OVERALL PES CATEGORY		**E (Seriously Modified)**	

Table 3: PES Assessment – Seasonal Seep Wetland

The relatively small (approximately 2500 m^2) seep wetland area situated on a gently sloping hillside of the concerned development area was assessed to be in a **Seriously Modified** natural state, given its size and position on the slope of a hill surrounded by commercial crop production, and associated anthropogenic disturbances for several decades, resulting in significant topographic alterations impacting hydrology, geomorphology, sediment balance and water quality.

Intensive agricultural activities within the local upstream catchment together with the associated water abstraction additionally result in significant subsurface flow-related changes negatively impacting hydrology and

geomorphology. Additionally, the intensive agricultural activities have also resulted in the complete removal of indigenous vegetation.

Given the assessment results above, this small and ecologically isolated seep wetland area is expected to only provide limited functional aquatic habitat.

Ecological Category	PES % Score	Description
A	90-100%	Unmodified, natural.
B	80-90%	**Largely natural with few modifications**. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	60-80%	**Moderately modified**. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	40-60%	**Largely modified**. A large loss of natural habitat, biota and basic ecosystem functions has occurred.
E	20-40%	**Seriously modified**. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	0-20%	**Critically / Extremely modified**. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

Above: Present Ecological State categories for describing the present ecological condition of inland aquatic ecosystems (Kleynhans 1996, DWAF 1999).

4.1.1.5 THE PRESENT ECOLOGICAL STATE OF THE TRIBUTARY OF THE H90C – 09211 (NAROO RIVER)

The concerned tributary of the **H90C – 09211 (Naroo River)** is not located on the properties proposed for the establishment of the mixed-use development. The tributary of the H90C – 09211 (Naroo River) is located approximately 100 metres from the western edge of the proposed development area. Given that this watercourse is not located on the concerned properties proposed to be developed, together with accessibility constraints, the Present Ecological State (PES) of this water resource was not assessed as part of the site assessment facilitated during June 2023. The Resource Quality Information System (RQIS) of the Department of Water and Sanitation (DWS) has assessed the H90C – 09211 (Naroo River) as having a **Present Ecological State (PES) Category** of **D (Largely Modified)**. The same PES category was hence assigned to the associated tributary of the H90C – 09211 (Naroo River) and used to inform the assessment of the impacts of the proposed mixed-use development on this natural water resource.

4.2 ASSESSMENT OF IMPACTS OF DEVELOPMENT PROPOSAL ON IDENTIFIED WATER RESOURCES

The potential impact as a result of the establishment of the proposed mixed-use development on Erf 266 and a Portion of the Remainder of Erf 21 on the identified seep wetland area and the tributary of the H90C – 09211 (Naroo River) were categorised in Design Phase, Construction and Operational Phase impacts utilising the criteria outlined in the Department of Environmental Affairs and Development Plannings' Guideline for Biodiversity Specialist Studies (Brownlie 2005). The result of these assessments is summarised as follows:

DESIGN PHASE IMPACTS:

No direct design phase impacts are applicable for the activity proposal as no additional feasible/reasonable alternatives were provided.

CONSTRUCTION PHASE IMPACTS:

- Physical destruction or damage of the identified water resources through the storage of building materials or the temporary lay-down areas for equipment.
- Destruction and/or damage of the identified water resources through the accumulation of sediment as a result of unmanaged runoff from disturbance during construction activities.
- Destruction and/or damage of the identified water resources through spoil material dumping as a result of construction activities.
- Destruction of habitat associated with the identified water resources as a result of vehicular and pedestrian traffic within and/or in close proximity to the water resources.
- Pollution of identified water resources through the leakage of hydrocarbons and other pollutants from construction machinery and/or from the washing of equipment as well as sediments from the de-watering of excavations.
- Contamination of soil and underlaying sub-surface water through the infiltration of hydrocarbons or other pollutants, including cement-contaminated water.
- Increased disturbance of aquatic and semi-aquatic fauna associated with the identified water resources – the presence of construction teams and associated machinery will lead to increased noise levels, which will disturb fauna associated with these systems.

Description of Impact	PRE-MITIGATION					POST MITIGATION					Confidence
	Extent	Duration	Intensity	Probability	Significance	Extent	Duration	Intensity	Probability	Significance	
CONSTRUCTION PHASE IMPACTS											
Damage to instream and riparian habitats of identified water resource as a direct result of construction activities.	Local	Short-Term	Medium	Definite	Low-Medium	Local	Short-Term	Low	Definite	Low	Medium-High
Pollution of identified water resources as a direct result of contaminated runoff from construction areas.	Local	Short-Term	Medium	Highly Probable	Low-Medium	Local	Intermittent	Low-Medium	Probable	Low	Medium-High
Soil and Groundwater Contamination as a result of infiltration of construction-related pollutants.	Local	Short-Term	Medium	Highly Probable	Low	Local	Short-Term	Low-Medium	Probable	Very Low	Medium-High
Disturbance to aquatic and terrestrial fauna within the identified water resources as a result of construction activities.	Local	Short-Term	Low-Medium	Highly Probable	Low	Local	Short-Term	Low	Highly Probable	Very Low	Medium-High

Table 4: Assessment of Construction Phase Impacts on Seasonal Seep Wetland Area.

Description of Impact	PRE-MITIGATION					POST MITIGATION					Confidence
	Extent	Duration	Intensity	Probability	Significance	Extent	Duration	Intensity	Probability	Significance	
CONSTRUCTION PHASE IMPACTS											
Damage to instream and riparian habitats of identified water resource as a direct result of construction activities.	Local	Short-Term	Very Low	Improbable	Very Low	Local	Short-Term	Very Low	Definite	Very Low	Very High
Pollution of identified water resources as a direct result of contaminated runoff from construction areas.	Local	Short-Term	Low-Medium	Probable	Low-Medium	Local	Intermittent	Low-Medium	Probable	Low	Medium-High
Soil and Groundwater Contamination as a result of infiltration of construction-related pollutants.	Local	Short-Term	Medium	Probable	Low-Medium	Local	Short-Term	Low-Medium	Probable	Low	Medium-High
Disturbance to aquatic and terrestrial fauna within the identified water resources as a result of construction activities.	Local	Short-Term	Low-Medium	Highly Probable	Low	Local	Short-Term	Low	Highly Probable	Very Low	Medium-High

Table 5: Assessment of Construction Phase Impacts on a tributary of the H90C – 09211 (Naroo River).

OPERATIONAL PHASE IMPACTS:

- Hydrological and Geomorphological impacts on the identified water resources as a result of the establishment of the proposed mixed-use development.
- Damage to instream and riparian habitats of the identified water resources through vegetation removal and excavations relating to potential periodic maintenance activities.
- Soil and groundwater contamination as a result of the establishment of the mixed-use development and associated potential periodic maintenance activities.

Description of Impact	PRE-MITIGATION					POST MITIGATION					Confidence
	Extent	Duration	Intensity	Probability	Significance	Extent	Duration	Intensity	Probability	Significance	
OPERATIONAL PHASE IMPACTS											
Hydrological and Geomorphological impacts on the identified water resource as a result of the establishment of the proposed mixed-use development. .	Local	Medium-Term	Medium	Definite	Low-Medium	Local	Medium-Term	Low	Definite	Low	Medium-High
Damage to instream and riparian habitats of the identified water resource through vegetation removal and excavations relating to potential periodic maintenance activities.	Local	Short-Term	Medium	Highly Probable	Low-Medium	Local	Intermittent	Low-Medium	Probable	Low	Medium-High
Soil and Groundwater Contamination as a result of the establishment of the mixed-use development and potential periodic maintenance activities.	Local	Medium-Term	Medium	Highly Probable	Low	Local	Short-Term	Low-Medium	Probable	Very Low	Medium-High

Table 6: Assessment of Operational Phase Impacts on Seasonal Seep Wetland Area.

Description of Impact	PRE-MITIGATION					POST MITIGATION					Confidence
	Extent	Duration	Intensity	Probability	Significance	Extent	Duration	Intensity	Probability	Significance	
OPERATIONAL PHASE IMPACTS											
Hydrological and Geomorphological impacts on the identified water resource as a result of the establishment of the proposed mixed-use development.	Regional	Medium-Term	Low	Probable	Low	Regional	Medium-Term	Low	Definite	Very Low	Medium-High
Damage to instream and riparian habitats of the identified water resource through vegetation removal and excavations relating to potential periodic maintenance activities.	Regional	Short-Term	Low	Highly Unlikely	Very Low	Regional	Intermittent	Low	Highly Unlikely	Very Low	High

Soil and Groundwater Contamination as a result of the establishment of the mixed-use development and associated potential periodic maintenance activities.	Regional	Medium-Term	Medium	Highly Probable	Low - Medium	Regional	Short-Term	Low-Medium	Unlikely	Low	Medium-High

Table 7: Assessment of Operational Phase Impacts on a tributary of the H90C – 09211 (Naroo River).

5. DWS SECTION 21 (C) & (I) RISK ASSESSMENT

General Notice 509 of 2016 (as it relates to the National Water Act, 1998 (Act No. 36 of 1998) indicates that any Section 21(c) or 21(i) water use activities, as listed in the National Water Act, 1998 (Act No. 36 of 1998) within the *"regulated areas of a watercourse"* where the risk class is considered to be ***Low***, can be ***Generally Authorised (GA)***. Any activities that score a *Medium* or *High-Risk Class* must undergo a ***Full Water Use Licence Application (WULA)***. The following scoring applies to the outcomes of a Risk Assessment Matrix.

Rating	Class	Management Description
1 -55	**Low**	Acceptable as is or consider a requirement for mitigation. The impact on watercourses and resource quality is small and easily mitigated.
56 - 169	**Medium**	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which require specialist input.
170 - 300	**High**	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.

TABLE 8: DWS RATING CLASSES

Should a sensitivity rating fall within the ***Low - Medium range (56-81)*** a ***manual adjustment*** can be made to allow for a ***Low Risk***, with relevant reasoning and implementation of Mitigation Measures.

According to General Notice 509 of 2016, the ***"regulated area of a watercourse"*** for section 21(c) or (i) of the Act, water uses in terms of General Notice 509 of 2016, means the following:

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

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

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

Exclusions from General Notice 509 of 2016:

"This General Authorisation does not apply –

(a) to the use of water in terms of section 21(c) or (i) of the Act ***within the regulated area of a watercourse*** *where the* ***Risk Class*** *is* ***Medium*** *or* ***High*** *as determined by the Risk Matrix. The Risk Matrix must be completed by a suitable qualified SACNASP professional member."*

The Section 21(c) & (i) Risk Assessment Matrix was applied to the various impacts the establishment of the mixed-use development on Erf 266 and a Portion of the Remainder of Erf 21 in Riversdale will have on the identified water resources.

Additionally, the Section 21(c) & (i) Risk Assessment Matrix was compiled to ascertain the significance of risk associated with the proposed activity on the key drivers and receptors (Hydrology, Water Quality, Geomorphology, Habitat, and Biota) of the identified water resources over and above the reference state.

These considerations are summarised as follows:

- The construction activities are considered to be of relatively short duration, although potential future operational maintenance impacts have also been assessed.
- Most impacts are considered to be easily detectable, and mitigation measures thereof are considered to be easily implemented and managed.
- The Section 21(c) & (i) Risk Assessment was applied assuming that all listed mitigation measures are implemented, thus the results of the risk assessment provided in this report present the perceived impact significance post-mitigation; and

- It was assumed that the mitigation hierarchy as advocated by the DEA&DP *et al.* (2013) would be followed, i.e., the impacts would first be avoided, minimised if avoidance is not feasible, rehabilitated as necessary and offset if required.

TABLE 10: RESULTS OF SECTION 21 (C) & (I) RISK ASSESSMENT: ESTABLISHMENT OF THE PROPOSED MIXED-USE DEVELOPMENT ON THE DELINEATED SEASONAL SEEP WETLAND AREA.

PHASE	ACTIVITY	ASPECT	IMPACT	Flow Regime	Physical & Chemical	Habitat	Biota	Severity	Spatial Scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance/Risk	Risk Rating	Confidence Level	Impact Rating	Reversibility of Impact	MITIGATION MEASURES TO BE IMPLEMENTED
ACTIVE CONSTRUCTION/OPERATIONAL PHASE	CONSTRUCTION/OPERATIONAL ACTIVITIES associated with the construction/installation and periodic maintenance activities associated with the establishment of the proposed mixed-use development on Erf 266 and a Portion of the Remainder of Erf 21 in Riversdale. Located within the Legislative Regulation Zone the delineated Seasonal Seep Wetland Area.	Compaction/Levelling of soil related to excavations and construction/installation of Civil Infrastructure.	Exposure of soil leads to increased runoff and erosion and thus increased sedimentation within the water resources.	3	3	2	2	**2.50**	1	2	**5.50**	1	1	5	2	**9**	**49.5**	LOW	HIGH - 80%	NEGATIVE	FULLY REVERSIBLE	Contractor laydown areas are to be established outside of the identified water resource and only for a short duration in consultation with the appropriate authority. All development footprint areas are to remain as small as feasibly possible and vegetation clearing is to be limited to what is absolutely essential to complete the required scope-of-works. Construction Activities should preferably be undertaken during the drier summer months, to minimise the impact on the Hydrological & Geomorphological Functioning of the water resource. Excavated topsoil is to be stockpiled and re-utilised during backfilling. All construction debris and litter must be removed. It may be temporarily stockpiled outside the extent of the identified water resource but must be removed and disposed of at a licensed Processing Facility. Only authorised construction personnel may be permitted to enter the construction zones to prevent excessive compaction of the soil. Care must be taken, and all construction personnel must receive training on the risks of chemical contamination of the water resource. Chemical spills within and surrounding the water resource should be immediately remediated through the implementation of an Emergency Chemical Spill
		Removal of natural indigenous vegetation Potential erosion of bare exposed soils.	Loss of Aquatic Habitat and Ecological Structure resulting in impacts on Biota.	2	2	2	2	**2.00**	1	2	**5.00**	1	1	5	2	**9**	**45.00**					
		The potential proliferation of alien and invasive vegetation species due to disturbance.	Potential changes to the Ecoservice Provision of the water resources.	3	3	3	2	**2.75**	1	2	**5.75**	1	1	5	2	**9**	**51.75**					
		Altering of natural flow and distribution patterns for water and sediments together with a potential increase in toxicants entering the system via increased stormwater runoff.	Potential degradation of the Water Quality of the water resources, due to contaminated material entering the system.	3	3	3	3	**3.00**	1	2	**6.00**	1	1	5	2	**9**	**54.00**					
			Potential disruption to the Hydrology and Geomorphology (Sediment Balance) of the water resources.	3	3	3	3	**3.00**	1	2	**6.00**	1	1	5	2	**9**	**54.00**					

																						Procedure that must form part of a legally binding Environmental Management Plan (EMP) and be audited for compliance by a suitably qualified Environmental Control Officer (ECO). Sediment control measures (silt traps) are to be installed to ensure that no sediment as a result of the construction activities enters the identified water resource. The location of these silt traps is to be established during the audits by the appointed Environmental Control Officer (ECO). The mitigation measures above are to be incorporated into the approved Environmental Management Plan (EMP) and audited for compliance by a suitably qualified Environmental Control Officer (ECO) and submitted to the Competent Authority at intervals specified by the Competent Authority. The delineated seep wetland area is to form part of a stormwater management structure (stormwater detention area). The relevant civil engineers are to be consulted to provide input regarding the practicable/feasible design of this structure. This structure is to be incorporated into the Stormwater Management Plan for the proposed development which is to be approved by the competent authority and local municipality. Additionally, this area is to be demarcated and zoned for Open Space within the proposed Spatial Development Plan (SDP) which is to be submitted to the Competent Authority and Local Municipality for approval.

TABLE 11: RESULTS OF SECTION 21 (C) & (I) RISK ASSESSMENT: ESTABLISHMENT OF THE PROPOSED MIXED-USE DEVELOPMENT ON THE TRIBUTARY OF THE H90C – 09211 (NAROO RIVER).																					
PHASE	ACTIVITY	ASPECT	IMPACT	Flow Regime	Physical & Chemical	Habitat	Biota	Severity	Spatial Scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance/Risk	Risk Rating	Confidence Level	Impact Rating	Reversibility of Impact	MITIGATION MEASURES TO BE IMPLEMENTED
ACTIVE CONSTRUCTION/OPERATIONAL PHASE	CONSTRUCTION/OPERATIONAL ACTIVITIES associated with the construction/installation and periodic maintenance activities associated with the establishment of the proposed mixed-use development on Erf 266 and a Portion of the Remainder of Erf 21 in Riversdale Located within the Legislative Regulation Zone of the Tributary of the H90C – 09211 (Naroo River).	Compaction/Levelling of soil related to excavations and construction/installation of Civil Infrastructure.	Exposure of soil leads to increased runoff and erosion and thus increased sedimentation within the water resource.	1	2	1	1	**1.25**	1	2	**4.25**	1	1	5	2	**9**	**38.25**	LOW	HIGH - 80%	NEGATIVE	FULLY REVERSIBLE	Contractor laydown areas are to be established outside of the identified water resource and only for a short duration in consultation with the appropriate authority. All development footprint areas are to remain as small as feasibly possible and vegetation clearing is to be limited to what is absolutely essential to complete the required scope-of-works. Construction Activities should preferably be undertaken during the drier summer months, to minimise the impact on the Hydrological & Geomorphological Functioning of the water resource. Excavated topsoil is to be stockpiled and re-utilised during backfilling. All construction debris and litter must be removed. It may be temporarily stockpiled outside the extent of the identified water resource but must be removed and disposed of at a licensed Processing Facility. Only authorised construction personnel may be permitted to enter the construction zones to prevent excessive compaction of the soil. Care must be taken, and all construction personnel must receive training on the risks of chemical contamination of the water resource. Chemical spills within and surrounding the water resources should be immediately remediated through the implementation of an Emergency Chemical Spill
		Removal of natural indigenous vegetation Potential erosion of bare exposed soils.	Loss of Aquatic Habitat and Ecological Structure resulting in impacts on Biota.	1	1	1	1	**1.00**	1	2	**4.00**	1	1	5	2	**9**	**36.00**					
		The potential proliferation of alien and invasive vegetation species due to disturbance.	Potential changes to the Ecoservice Provision of the water resources.	1	1	1	1	**1.00**	1	2	**4.00**	1	1	5	2	**9**	**36.00**					
		Altering of natural flow and distribution patterns for water and sediments together with a potential increase in toxicants entering the system via increased stormwater runoff.	Potential degradation of the Water Quality of the water resources, due to contaminated material entering the system.	3	3	2	2	**2.50**	1	2	**5.50**	1	1	5	2	**9**	**49.50**					
			Potential disruption to the Hydrology and Geomorphology (Sediment Balance) of the water resources.	3	3	2	2	**2.50**	1	2	**5.50**	1	1	5	2	**9**	**49.50.**					

																						Procedure that must form part of a legally binding Environmental Management Plan (EMP) and be audited for compliance by a suitably qualified Environmental Control Officer (ECO). Sediment control measures (silt traps) are to be installed to ensure that no sediment as a result of the construction activities enters the identified water resources. The location of these silt traps is to be established during the audits by the appointed Environmental Control Officer (ECO). The mitigation measures above are to be incorporated into the approved Environmental Management Plan (EMP) and audited for compliance by a suitably qualified Environmental Control Officer (ECO) and submitted to the Competent Authority at intervals specified by the Competent Authority.

Based on the outcome of the Section 21(c) & (i) Risk Assessment, the proposed activities associated with the establishment of the mixed-use development on Erf 266 and a Portion of the Remainder of Erf 21 in Riversdale, on the identified water resources have been assessed to have a ***Low-Risk Significance*** (post mitigation). The primary mitigation measure used to inform the risk assessment process is that the delineated seep wetland area should not be developed and should, preferably, be incorporated into the stormwater management plan as part of a stormwater management structure (stormwater detention area). Additionally, this area is to be demarcated as Open Space and utilised for the management of stormwater runoff associated with the proposed development. The relevant Civil Engineer(s) is to provide input regarding the practicable/feasible design of this stormwater detention area which is to be submitted to the Competent Authority (DEA&DP) and the Local Municipality (Hessequa Municipality) for approval.

Cumulative Impacts

Cumulative impacts are activities and their associated impacts on the past, present, and foreseeable future, both spatially and temporally, considered together with the impacts identified above. Water Resources and Riparian Areas within the region are under continued threat due to Residential Expansion and intensive Agricultural Land Use in the surrounding landscape.

Direct and indirect impacts identified within water resources bordering agricultural land use include an increase in alien and invasive species entering these systems due to regular disturbance of soil and removal of indigenous vegetation. The result is greater inputs of sediments and nutrients from associated stormwater runoff. The impacts on the water resources are unlikely to add to the cumulative effect on the loss and functioning of aquatic habitats within the region since no significant impacts were identified.

The majority of the anticipated impacts on the identified water resources are indirect (with mitigation) and associated with the potential Hydrological and Geomorphological alterations to these water resources as a result of the establishment of the proposed mixed-use development. Given the proposed mitigation measures are adequately implemented and audited, it is the opinion of the author, that these impacts on the identified water resources can be mitigated to acceptable levels of disturbance, whilst still considering the need & desirability of the proposed activity for additional residential opportunities within Riversdale.

6. CONCLUSION

DDK Consulting was appointed by Kapp Environmental Consultants on behalf of Belladonna (Pty) Ltd, to undertake an Aquatic Biodiversity Impact Assessment & DWS Risk Assessment Matrices for the proposed mixed-use residential development on Erf 266 and a Portion of the Remainder of Erf 21 in Riversdale, Western Cape Province.

The proponent, Belladonna (Pty) Ltd, proposes to develop the concerned properties as a larger mixed-use residential development comprising of several different residential offerings. Additionally, the Hessequa Municipality has recently issued a decision to include the concerned properties within the municipal urban edge due to increased demand for residential opportunities within the town of Riversdale.

Assessment of the relevant ecological databases together with the site assessment confirmed areas of increased ecological sensitivity with respect to natural water resources, where the proposed mixed-use residential development will be located within the Legislative Regulation Zones of natural water resources. These include an identified and delineated Seasonal Seep Wetland and a Tributary of the H90C – 09211 (Naroo River).

The potential impact as a result of the establishment of the proposed mixed-use residential development on the identified water resources was categorised in Design Phase, Construction and Operational Phase impacts utilising the criteria outlined in the Department of Environmental Affairs and Development Plannings' Guideline for Biodiversity Specialist Studies (Brownlie 2005). The result of these assessments is summarised as follows:

DESIGN PHASE IMPACTS:

No direct design phase impacts are applicable for the activity proposal as no additional feasible/reasonable alternatives were provided.

CONSTRUCTION PHASE IMPACTS:

- Physical destruction or damage of the identified water resources through the storage of building materials or the temporary lay-down areas for equipment.
- Destruction and/or damage of the identified water resources through the accumulation of sediment as a result of unmanaged runoff from disturbance during construction activities.
- Destruction and/or damage of the identified water resources through spoil material dumping as a result of construction activities.
- Destruction of habitat associated with the identified water resources as a result of vehicular and pedestrian traffic within and/or in close proximity to the water resources.
- Pollution of identified water resources through the leakage of hydrocarbons and other pollutants from construction machinery and/or from the washing of equipment as well as sediments from the de-watering of excavations.
- Contamination of soil and underlying sub-surface water through the infiltration of hydrocarbons or other pollutants, including cement-contaminated water.
- Increased disturbance of aquatic and semi-aquatic fauna associated with the identified water resources – the presence of construction teams and associated machinery will lead to increased noise levels, which will disturb fauna associated with these systems.

Description of Impact	PRE-MITIGATION					POST MITIGATION					Confidence
	Extent	Duration	Intensity	Probability	Significance	Extent	Duration	Intensity	Probability	Significance	
CONSTRUCTION PHASE IMPACTS											
Damage to instream and riparian habitats of identified water resource as a direct result of construction activities.	Local	Short-Term	Medium	Definite	Low-Medium	Local	Short-Term	Low	Definite	Low	Medium-High
Pollution of identified water resources as a direct result of contaminated runoff from construction areas.	Local	Short-Term	Medium	Highly Probable	Low-Medium	Local	Intermittent	Low-Medium	Probable	Low	Medium-High
Soil and Groundwater Contamination as a result of infiltration of construction-related pollutants.	Local	Short-Term	Medium	Highly Probable	Low	Local	Short-Term	Low-Medium	Probable	Very Low	Medium-High
Disturbance to aquatic and terrestrial fauna within the identified water resources as a result of construction activities.	Local	Short-Term	Low-Medium	Highly Probable	Low	Local	Short-Term	Low	Highly Probable	Very Low	Medium-High

Above: Assessment of Construction Phase Impacts on the Delineated Seasonal Seep Wetland Area.

Description of Impact	PRE-MITIGATION					POST MITIGATION					Confidence
	Extent	Duration	Intensity	Probability	Significance	Extent	Duration	Intensity	Probability	Significance	
CONSTRUCTION PHASE IMPACTS											
Damage to instream and riparian habitats of identified water resource as a direct result of construction activities.	Local	Short-Term	Very Low	Improbable	Very Low	Local	Short-Term	Very Low	Definite	Very Low	Very High
Pollution of identified water resources as a direct result of contaminated runoff from construction areas.	Local	Short-Term	Low-Medium	Probable	Low-Medium	Local	Intermittent	Low-Medium	Probable	Low	Medium-High

Soil and Groundwater Contamination as a result of infiltration of construction-related pollutants.	Local	Short-Term	Medium	Probable	Low-Medium	Local	Short-Term	Low-Medium	Probable	Low	Medium-High
Disturbance to aquatic and terrestrial fauna within the identified water resources as a result of construction activities.	Local	Short-Term	Low-Medium	Highly Probable	Low	Local	Short-Term	Low	Highly Probable	Very Low	Medium-High

Above: Assessment of Construction Phase Impacts on Tributary of the H90C – 09211 (Naroo River).

OPERATIONAL PHASE IMPACTS:

- Hydrological and Geomorphological impacts on the identified water resources as a result of the establishment of the proposed mixed-use development.
- Damage to instream and riparian habitats of the identified water resources through vegetation removal and excavations relating to potential periodic maintenance activities.
- Soil and groundwater contamination as a result of the establishment of the mixed-use development and associated potential periodic maintenance activities.

Description of Impact	PRE-MITIGATION					POST MITIGATION					Confidence
	Extent	Duration	Intensity	Probability	Significance	Extent	Duration	Intensity	Probability	Significance	
OPERATIONAL PHASE IMPACTS											
Hydrological and Geomorphological impacts on the identified water resource as a result of the establishment of the proposed mixed-use development. .	Local	Medium-Term	Medium	Definite	Low-Medium	Local	Medium-Term	Low	Definite	Low	Medium-High
Damage to instream and riparian habitats of the identified water resource through vegetation removal and excavations relating to potential periodic maintenance activities.	Local	Short-Term	Medium	Highly Probable	Low-Medium	Local	Intermittent	Low-Medium	Probable	Low	Medium-High
Soil and Groundwater Contamination as a result of the establishment of the mixed-use development and potential periodic maintenance activities.	Local	Medium-Term	Medium	Highly Probable	Low	Local	Short-Term	Low-Medium	Probable	Very Low	Medium-High

Above: Assessment of Operational Phase Impacts on the Delineated Seasonal Seep Wetland Area.

Description of Impact	PRE-MITIGATION					POST MITIGATION					Confidence
	Extent	Duration	Intensity	Probability	Significance	Extent	Duration	Intensity	Probability	Significance	
OPERATIONAL PHASE IMPACTS											
Hydrological and Geomorphological impacts on the identified water resource as a result of the establishment of the proposed mixed-use development.	Regional	Medium-Term	Low	Probable	Low	Regional	Medium-Term	Low	Definite	Very Low	Medium-High
Damage to instream and riparian habitats of the identified water resource through vegetation removal and excavations relating to potential periodic maintenance activities.	Regional	Short-Term	Low	Highly Unlikely	Very Low	Regional	Intermittent	Low	Highly Unlikely	Very Low	High

Soil and Groundwater Contamination as a result of the establishment of the mixed-use development and associated potential periodic maintenance activities.	Regional	Medium-Term	Medium	Highly Probable	Low - Medium	Regional	Short-Term	Low-Medium	Unlikely	Low	Medium-High

Above: Assessment of Operational Phase Impacts on a tributary of the H90C – 09211 (Naroo River).

Based on the outcome of the Section 21(c) & (i) Risk Assessment, the proposed activities associated with the establishment of the mixed-use development on Erf 266 and a Portion of the Remainder of Erf 21 in Riversdale, on the identified water resources have been assessed to have a ***Low-Risk Significance*** (post mitigation). The primary mitigation measure used to inform the risk assessment process is that the delineated seep wetland area should not be developed and should, preferably, be incorporated into the stormwater management plan as part of a stormwater management structure (stormwater detention area). Additionally, this area is to be demarcated as Open Space and utilised for the management of stormwater runoff associated with the proposed development. The relevant Civil Engineer(s) is to provide input regarding the practicable/feasible design of this stormwater detention area which is to be incorporated into the associated Stormwater Management Plan for the proposed development and submitted to the Competent Authority (DEA&DP) and the Local Municipality (Hessequa Municipality) for approval.

Cumulative Impacts

Cumulative impacts are activities and their associated impacts on the past, present, and foreseeable future, both spatially and temporally, considered together with the impacts identified above. Water Resources and Riparian Areas within the region are under continued threat due to Residential Expansion and intensive Agricultural Land Use in the surrounding landscape.

Direct and indirect impacts identified within water resources bordering agricultural land use include an increase in alien and invasive species entering these systems due to regular disturbance of soil and removal of indigenous vegetation. The result is greater inputs of sediments and nutrients from associated stormwater runoff. The impacts on the water resources are unlikely to add to the cumulative effect on the loss and functioning of aquatic habitats within the region since no significant impacts were identified.

The majority of the anticipated impacts on the identified water resources are indirect (with mitigation) and associated with the potential Hydrological and Geomorphological alterations to these water resources as a result of the establishment of the proposed mixed-use development. Given the proposed mitigation measures are adequately implemented and audited, it is the opinion of the author, that these impacts on the identified water resources can be mitigated to acceptable levels of disturbance, whilst still considering the need & desirability of the proposed activity for additional residential opportunities within Riversdale.

Section 21(c) & (i) Risk Assessment Summary:

IMPACT		
RESULTS OF SECTION 21 (C) & (I) RISK ASSESSMENT FOR THE PROPOSED ESTABLISHMENT OF THE MIXED-USE RESIDENTIAL DEVELOPMENT ON ERF 266 AND A PORTION OF THE REMAINDER OF ERF 21 IN RIVERSDALE WITHIN THE REGULATORY AREA OF THE IDENTIFIED WATER RESOURCES.		
	PRE-MITIGATION	**POST-MITIGATION**
Located within the Legislative Regulation Zone of the identified and delineated Seasonal Seep Wetland Area.	**LOW**	**LOW**
	PRE-MITIGATION	**POST MITIGATION**
Located within the Legislative Regulation Zone of the Tributary of the H90C – 09211 (Naroo River)	**LOW**	**LOW**

Table 12: Section 21(c) & (i) Risk Assessment Summary

Additional Mitigation Measures over and above those measures already defined in the Section 21(c) & (i) Risk Assessment:

Development Footprint:

- All development footprint areas should remain as small as feasibly possible to complete the proposed scope of work.
- The boundaries of footprint areas, including contractor laydown areas, are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. Edge effects will need to be extremely carefully controlled.
- Temporary access routes during the construction phase should be restricted to existing gravel roads where feasible.
- Appropriate sanitary facilities must be provided during the construction phase for all personnel and services at regular intervals.
- All hazardous chemicals, as well as stockpiles, should be stored on bunded surfaces and have facilities constructed to control runoff from these areas.
- It must be ensured that all hazardous storage containers and storage areas comply with the relevant SANS codes to prevent leakage and contamination of surface and groundwater.
- No fires should be permitted.

Vehicular Access

- All construction vehicles must be regularly inspected for leaks. Refuelling must take place on a sealed surface area to prevent the ingress of hydrocarbons into the topsoil.
- In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practised near the surface area to prevent the ingress of hydrocarbons into the topsoil.
- All spills should they occur should be immediately cleaned up and treated accordingly.

Soil

- Sheet runoff from access roads should be slowed down by the strategic placement of silt traps in accordance with the approved Environmental Management Plan (EMP).
- As far as feasibly possible, all construction activities should occur during the dry summer months (December – February).

Management Strategy:

The establishment of the mixed-use residential development on Erf 266 and a Portion of the Remainder of Erf 21 in Riversdale, Western Cape Province, is constraint from a Water Resource Management perspective as it will be located within the Legislative Regulation Zone of an identified and delineated Seasonal Seep Wetland Area as well as a Tributary of the H90C – 09211 (Naroo River), in terms of the National Environmental Management Act, 1998 (Act No.107 of 1998) and the National Water Act, 1998 (Act No. 36 of 1998).

Given that the establishment of the mixed-use residential development on Erf 266 and a Portion of the Remainder of Erf 21 in Riversdale, Western Cape Province, was assessed to have a ***Low-Risk Significance*** (with mitigation) on these identified water resources, a Water Use License Application (WULA) in the form of General Authorisation (GA) is to be applied for and obtained from the Department of Water and Sanitation for Section 21(c) & (i) Water Uses in terms of Section 39 of the National Water Act, 1998 (Act No.36 of 1998).

Additionally, Environmental Authorisation (EA) is to be obtained from the Department of Environmental Affairs and Development Planning (DEA&DP) for applicable Listed Activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA").

Recommendation:

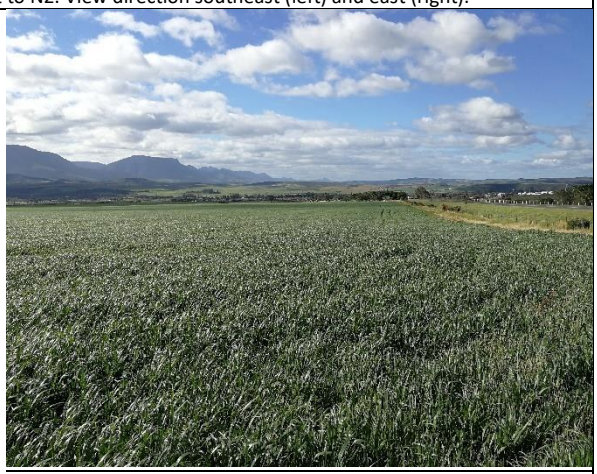
The delineated seep wetland area should not be developed and should, preferably, be incorporated into the stormwater management plan as part of a stormwater management structure (stormwater detention area). Additionally, this area is to be demarcated as Open Space and utilised for the management of stormwater runoff

associated with the proposed development. The relevant Civil Engineer(s) is to provide input regarding the practicable/feasible design of this stormwater detention area which is to be incorporated into the associated Stormwater Management Plan for the proposed development and submitted to the Competent Authority (DEA&DP) and the Local Municipality (Hessequa Municipality) for approval.

END

7. SITE PHOTOGRAPHS


View of the proposed development area from the Rest Stop adjacent to N2. View direction southeast (left) and east (right).

View of the proposed development area from the southeastern corner. View direction northeast (left) and east (right).


View of the development area from the northeastern edge of the concerned properties. View direction southwest (left) and northwest (right).


View of the proposed development area from the northern corner of the concerned properties. View direction southeast (left) and southwest (right)


View of the Tributary of the H90C – 09211 (Naroo River) and associated Riparian Area from the northwestern edge of the proposed development area. The Tributary of the H90C – 09211 (Naroo River) is located approximately 100 metres from the edge of the proposed development area.

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ADDENDUM A – TERMS OF USE AND INDEMNITY

The findings, results, observations, conclusions, and recommendations given in this report are based on the author's best scientific and professional knowledge as well as the available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and DDK CONSULTING reserves the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field or pertaining to this investigation.

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ADDENDUM B – DWS RISK ASSESSMENT METHODOLOGY

For the consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders, and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

The first stage of the Risk/Impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

- An **Activity** is a distinct process or task undertaken by an organisation for which responsibility can be assigned. Activities also include facilities or infrastructure that are possessed by an organisation.
- An **Environmental Aspect** is an "*element of an organizations activities, products and services which can interact with the environment"*. The interaction of an aspect with the environment may result in an impact.
- **Environmental Risks/Impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.
- **Receptors** can comprise but are not limited to, people or human-made systems, such as local residents, communities, and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems.
- **Resources** include components of the biophysical environment.
- **Frequency of activity** refers to how often the proposed activity will take place.
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact the receptor.
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of the receptor to a stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent-setting; threat to environmental and health standards.
- **Spatial extent** refers to the geographical scale of the impact.
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria (refer to the table below). The purpose of the rating is to develop a clear understanding of the influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The Frequency of the Activity, Impact, Legal Issues and the Detection of the Impact together comprise the Likelihood of the impact occurring and can obtain a maximum value of 20. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether mitigation is necessary.

"RISK ASSESSMENT KEY" (Based on DWS 2015 publication: Section 21 C and I water use Risk Assessment Protocol)

Severity (Scores used to rate the impact of the aspect on resource quality: Flow Regime, Water Quality, Geomorphology, Biota and Habitat)

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful and/or wetland(s) involved	5
Where "or wetland(s) are involved" it means that the activity is located within the delineated boundary of any wetland.	

Spatial Scale (Scores used to rate the spatial scale that the aspect is impacting on)

Area specific (at impact site)	1
Whole site (entire surface right)	2
Regional / neighbouring areas (downstream within quaternary catchment)	3
National (impacting beyond secondary catchment or provinces)	4
Global (impacting beyond SA boundary)	5

Duration (Scores used to rate the duration of the impact of the aspect on resource quality)

One day to one month, PES, EIS and/or REC not impacted	1
One month to one year, PES, EIS and/or REC impacted but no change in status	2
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation	3
Life of the activity, PES, EIS and/or REC permanently lowered	4
More than life of the organisation/facility, PES and EIS scores, a E or F	5

Frequency of Activity (Scores used to rate the frequency of the activity)

Annually or less	1
Bi-annually	2
Monthly	3
Weekly	4
Daily	5

Frequency of Impact Scores used to rate the frequency of the activity's impact on resource quality

Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitely / >100%	5

Legal Issues (Scores used to rate the extent to which the activity is governed by legislation)

No legislation	1
Fully covered by legislation (wetlands are legally governed)	5

Detection (Scores used to rate the ability to identify and react to impacts of the activity on resource quality, people, and property)

Immediately	1
Without much effort	2
Need some effort	3
Remote and difficult to observe	4
Covered	5

Rating Classes:

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated.
56 – 169	(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.
170 – 300	(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.

Calculations used to determine the risk of the activity to water resource quality

Consequence = Severity + Spatial Scale + Duration
Likelihood = Frequency of Activity + Frequency of Incident + Legal Issues + Detection
Significance\Risk = Consequence x Likelihood

Reversibility of impacts on the watercourse

Reversibility Rating:	Irreversible (the activity will lead to an impact that is permanent)
	Partially reversible (The impact is reversible to a degree e.g. acceptable revegetation measures can be implemented but the pre-impact species composition and/or diversity may never be attained. Impacts may be partially reversible within a short (during construction), medium (during operation) or long term (following decommissioning) timeframe
	Fully reversible (The impact is fully reversible, within a short, medium or long-term timeframe)

ADDENDUM C – DETAILS, EXPERTISE and CURRICULUM VITAE of AUTHOR

1. (a) (i) Details of the specialist who prepared the report:

Dietmar de Klerk - BSc (Hons) Conservation Ecology (Stellenbosch University)

1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist	DDK Consulting
Name/Contact Person	Dietmar de Klerk
Postal Address	5 Serangetti, Welgevonden Estate, Durbanville
Postal Code	7550
Telephone	078 067 4777
E-mail	dietmar@ddkconsulting.co.za
Qualifications	BSc (Hons) Conservation Ecology
Registrations / Associations	Registered Professional Member of the South African Council of Natural Scientific Professions (SACNASP)

I, Dietmar de Klerk, declare that –

- I act as the independent specialist in this application.
- I will perform the work relating to the application objectively, 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 relevant legislation and any guidelines that have relevance to the proposed activity.
- I will comply with the applicable legislation.
- I have not, 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.

Signature of Specialist

CURRICULUM VITAE OF DIETMAR DE KLERK

CURRENT POSITION: SENIOR SCIENTIST

DDK CONSULTING (5 YEARS)

PREVIOUS POSITION: ENVIRONMENTAL MANAGER

GUILLAUME NEL ENVIRONMENTAL CONSULTANTS (GNEC)
4 YEARS 6 MONTHS

ACADEMIC QUALIFICATIONS:

- **BSc (Hons) - Conservation Ecology** (University of Stellenbosch) 2006 – 2010

MEMBERSHIP – PROFESSIONAL SOCIETIES:

- SOUTH AFRICAN WETLAND SOCIETY (SAWS)
- WESTERN CAPE WETLANDS FORUM (WCWF)
- SACNASP (SOUTH AFRICAN COUNCIL FOR NATURAL SCIENTIFIC PROFESSIONS) – PROFESSIONAL NATURAL SCIENTIST – REG NO – 119173

TRAINING COURSES:

- **IWRM,** the **NATIONAL WATER ACT,** and **WATER USE AUTHORISATIONS, focusing on WULAs and IWWMPs** – FEBRUARY 2018 – Hosted by **Carin Bosman Sustainable Solutions**
- **WETLAND DELINEATION TRAINING SESSION –** AUGUST 2019 **–** Hosted by **Western Cape Wetland Forum** in partnership with **SANBI, DEA, FRC** and **SAEON.**
- **WET-HEALTH TRAINING SESSION –** SEPTEMBER 2019 **–** Hosted by the **Western Cape Wetland Forum** in partnership with **SANBI, DEA, FRC** and **SAEON**
- **TOOLS FOR WETLAND ASSESSMENT (TWA) –** 17TH to 21ST August 2020 **–** in collaboration with GroundTruth (Water, Wetlands and Environmental Engineering), Verdant Environmental, Water Research Commission and endorsed by Rhodes University**.**

KEY PROFESSIONAL EXPERIENCE:

Environmental Impact Assessments (EIAs)

- Administration and Facilitation of Environmental Impact Assessments (EIAs)
- Compilation of Environmental Impact Assessment Reports (EIARs)
- Environmental Management Plans (EMPs)
- River Maintenance Management Plans (RMMPs)
- Rehabilitation Landscaping Plans (RLPs) & Fire Management Plans (FMPs)
- Environmental Control Officer (ECO) Audit Reports
- Database Management
- Facilitation of Public Participation Processes (PPP) to key Commenting Authorities and the General Public, according to relevant Environmental Legislation
- Field Research and Sampling
- Client Liaison

Freshwater Resource Assessments

- Desktop Water Resource Delineation
- Freshwater Verification Reports
- Freshwater Impact Assessment Reports
- Freshwater Ecoservice Assessment Reports
- River Maintenance Management Plans (RMMPs)
- Maintenance and Management Plans (MMPs)
- Water Use License Applications / General Authorisations (GAs) & Water Use License Audits
- Water Quality Monitoring & Analysis

RHODES UNIVERSITY
Where leaders learn

DEPARTMENT OF GEOGRAPHY

TOOLS FOR WETLAND ASSESSMENT

This is to certify that

Dietmar de Klerk

has attended
and demonstrated his/her competence
in the above course.

W. Ellery
Course Director

A L Maddy
Registrar

SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

Dietmar De Klerk

Registration Number: 119173

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)

Environmental Science (Professional Natural Scientist)

Effective **1 August 2018** Expires **31 March 2024**

Chairperson

Chief Executive Officer

To verify this certificate scan this code