

## **DRAFT REPORT**

**PROJECT TITLE: VISSER VALE CHALETS AND INTENSIVE AGRICULTURE**

**PROJECT LOCATION: FARM 1/96, COLCHESTER, SUNDAYS RIVER VALLEY LOCAL MUNICIPALITY, EASTERN CAPE**

**ASSESSMENT TYPE: AQUATIC AND VEGETATION SURVEY AND ASSESSMENT**



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**Submission Date: 7 January 2020**

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## **SPECIALIST STATEMENT DETAIL**

This statement has been prepared with the requirements of the Environmental Impact Assessment Regulations and the National Environmental Management Act (107 of 1998), any subsequent amendments and any other relevant National and / or Provincial Policies related to ecological or biodiversity assessments in mind, such as the National Environmental Management: Biodiversity Act (10 of 2004) and National Water Act (36 of 1998).

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I, **Ms Deborah Vromans**, declare that this report has been prepared independently of any influence or prejudice as may be specified by the National Department of Environmental Affairs.

Signed:



Date: 7 January 2020 (Draft, *not finalized*)

## **ACKNOWLEDGEMENTS**

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## EXECUTIVE SUMMARY

### Introduction

Habitat Link Consulting is implementing an Environmental Impact Assessment for the Applicant, Mr Luc De Villers, in terms of Section 24(5) of the National Environmental Management Act (NEMA) (107 of 1998). The proposed development is comprised of three chalets, one residence and one warehouse, including planted pastures on the Farm Vissers Vale No. 96 (Remainder Portion 1), near Kirkwood (Sundays River Valley Local Municipality, Eastern Cape).

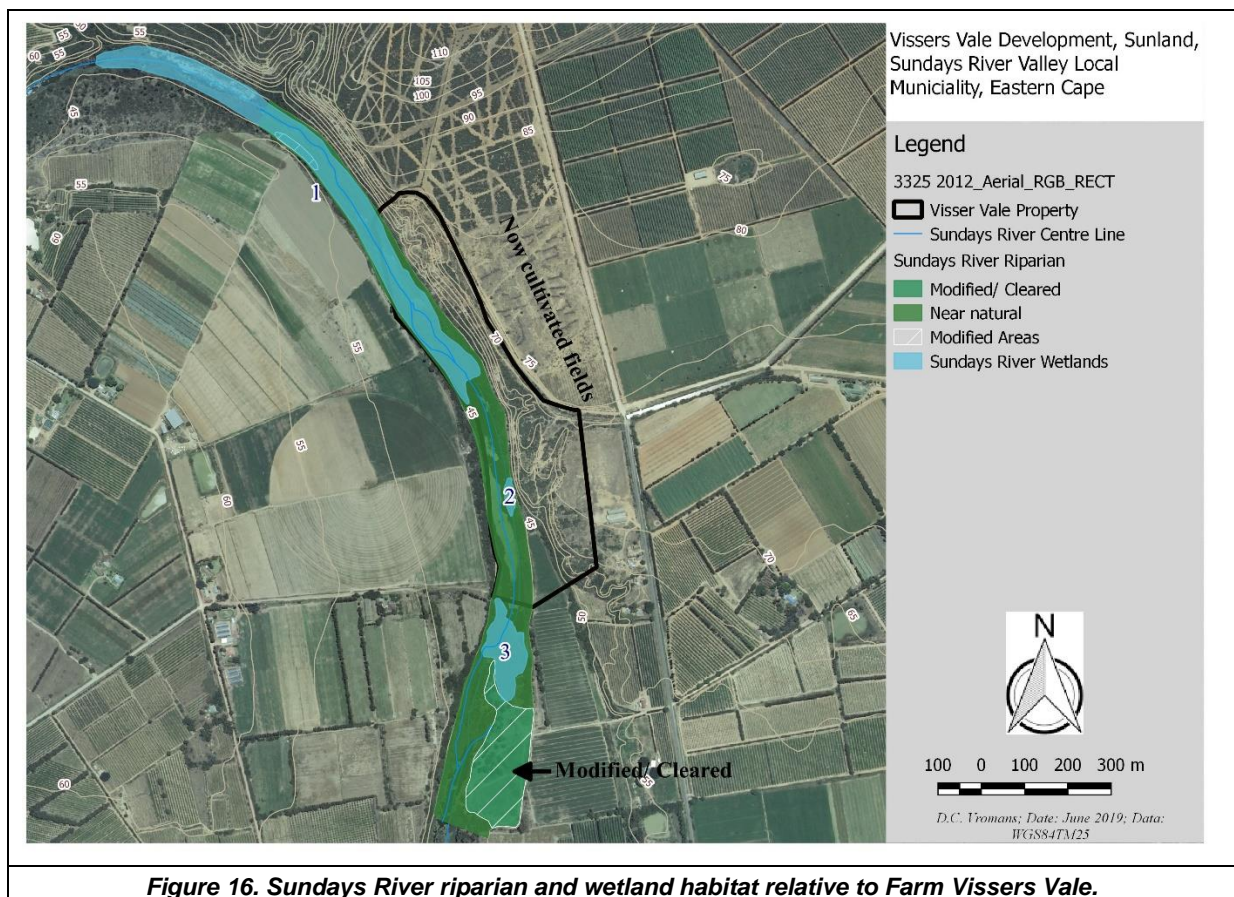
### Rivers and Watercourses

The Sundays River lies along the western boundary of the property. The riparian habitat has been delineated, which serves to represent the regulated area of a watercourse (in the absence of a 1:100 year floodline).

### Wetland Habitat

There are riverine wetlands along the Sundays River, which have been delineated for this assessment; and which occur within 500 m of the proposed development.

**Recommended Buffers:** See Ecologically Sensitive Areas / Biodiversity No-Go Areas (Figure 25).



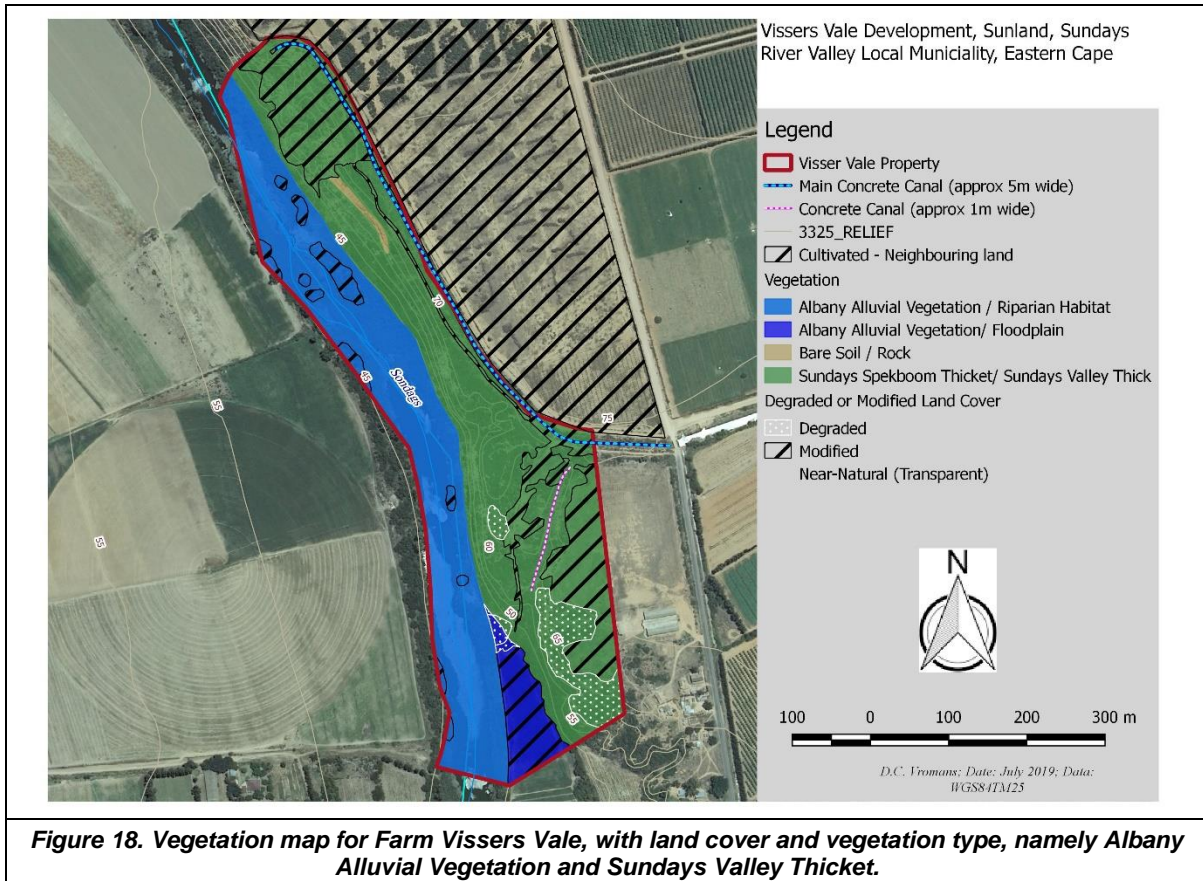
### Water Use License Application (WULA) or General Authorisation (GA)

A section 21c and 21i water use application is required due to the proposed development falling within the 500 m regulated area of a wetland (or 500 m radius).

A risk assessment must be undertaken to determine if a WULA or GA applies.

**Terrestrial Habitat (Section 4.3)**

The dominant vegetation type is Sundays Valley Thicket (or STEPs Sundays Spekboom Thicket) (Figure 18). Approximately 64.9 % is natural to near-natural, ~29.5 % is modified (transformed) and ~5.6 % is degraded (Section 4.4, Table 12 and Figure 21).



**Figure 18. Vegetation map for Farm Vissers Vale, with land cover and vegetation type, namely Albany Alluvial Vegetation and Sundays Valley Thicket.**

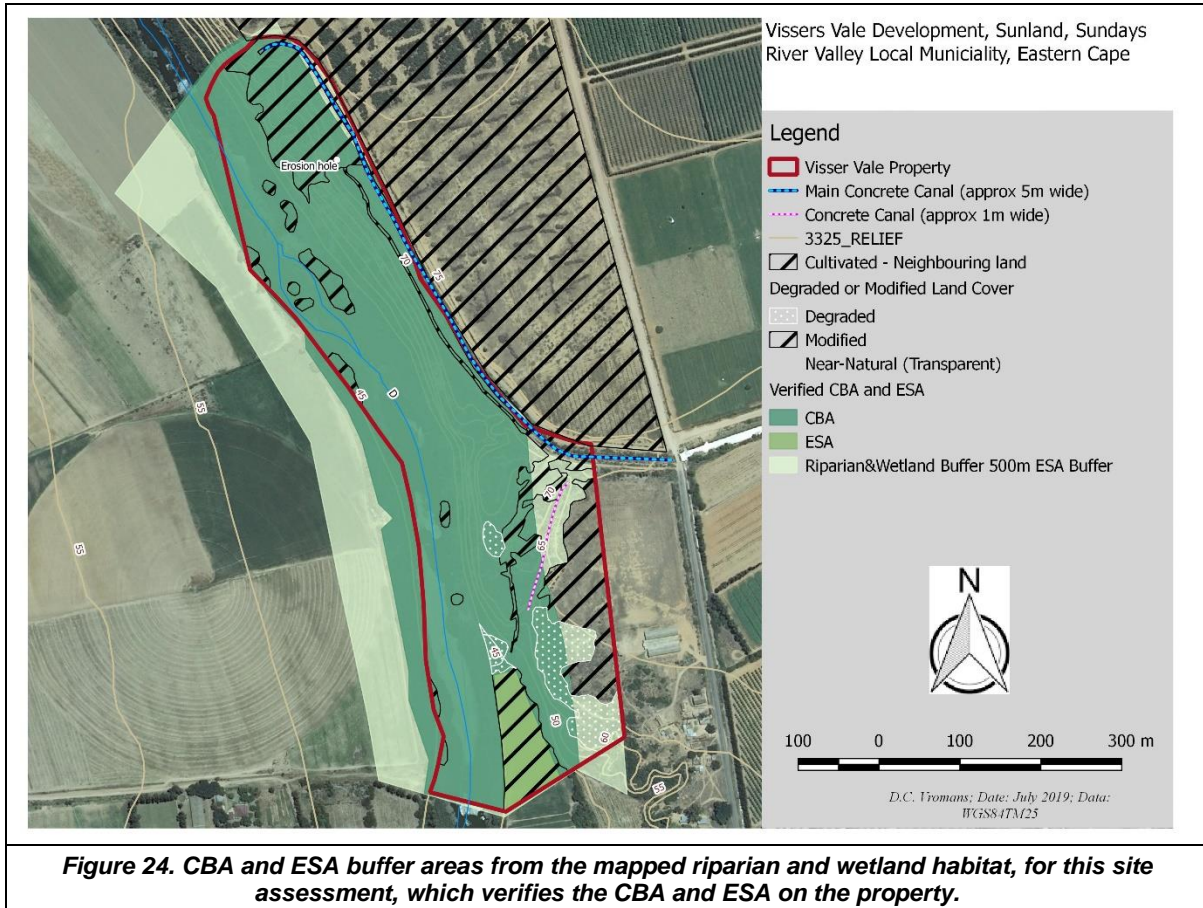
**Species of Special Concern (Section 4.3.1)**

Species	Family	Red Data Listing/ Conservation Status	Endemism	Protected By
<i>Aloe pluridens</i>	ASPHODELACEAE	Least Concern	Endemic	PNCO
<i>Aptenia haeckeliana</i>	AIZOACEAE	Least Concern	Endemic	PNCO
<i>Drosantherum hispidum</i>	AIZOACEAE	Least Concern	Endemic	PNCO
<i>Delosperma ecklonis</i> (orange and pink)	AIZOACEAE	Least Concern		PNCO
<i>Galenia pubescens</i> ( <i>Aizoon rigidum</i> )	AIZOACEAE	Least Concern	Endemic	PNCO
<i>Glottiphyllum longum</i>	AIZOACEAE	Least Concern	Endemic	PNCO
<i>Haemanthus albiflos</i>	AIZOACEAE	Least Concern	Endemic	PNCO
<i>Malephora lutea</i>	AIZOACEAE	Least Concern	Endemic	PNCO
<i>Mesembryanthemum crystallinum</i>	AIZOACEAE	Least Concern		PNCO
<i>Ruschia uncinata</i>	AIZOACEAE	Least Concern		PNCO
<i>Pachypodium succulentum</i>	APOCYNACEAE	Least Concern	Endemic	PNCO
<i>Psilocaulon bicornis</i>	AIZOACEAE	Least Concern	Endemic	PNCO
<i>Tritonia laxifolia</i>	AMARYLLIDACEAE	Least Concern		PNCO



**Sundays River Valley Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA) (Section 4.5.3)**

Based on the site survey and assessment, most of the transformed /modified land can be excluded from CBA status (see Figure 24), apart from the alien invasive plants within the riparian habitat and the steep slopes adjacent to the Sundays River (that are badly eroded). These should remain CBA. The reason for the eroded areas to remain CBA is to prevent any further development that may be susceptible to landslides, while protecting the Sundays River as well.



**Figure 24. CBA and ESA buffer areas from the mapped riparian and wetland habitat, for this site assessment, which verifies the CBA and ESA on the property.**

**Catchment Transformation Thresholds (Section 4.4.2)**

The land cover statistics for the sub-quaternary catchment indicates that approximately 46.2 % is modified and 6 % is degraded (Table 14, Figure 23). The transformation threshold (<20% for Aquatic CBA 2b) has been exceeded.

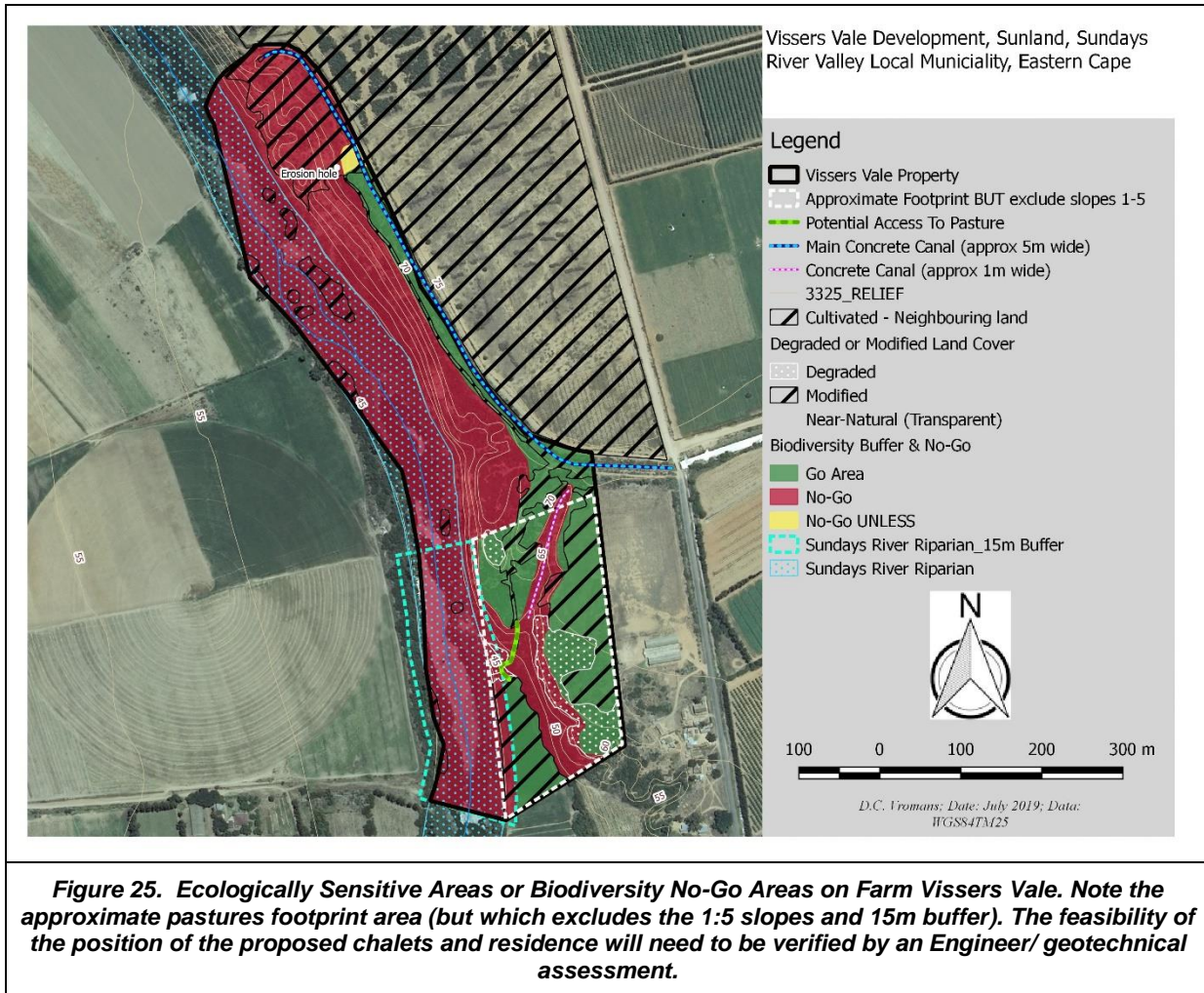
Both the Sundays River Valley CBA Map and the NFEPA map do not recommend transformation thresholds. However; and in contrast to the above, studies by Allan (2004) showed that streams in agricultural catchments usually remain in a good condition until the coverage of agriculture in the catchment exceeds 30 % -50 % (Driver et al., 2012 – NFEPA Implementation Manual) (Section 5.1).

**National and Provincial Protected Area Expansion Strategy (Section 3.3.5)**

The farm does not fall within a focus area.

**Ecologically Sensitive Areas and Biodiversity No-Go Areas (Section 4.6)**

The Figure below presents the ecologically sensitive areas relative to the farm and proposed infrastructure, which include the aquatic resources, associated aquatic buffer, and the NO-GO areas.



**Impact Assessment**

The proposed development is not considered to be a fatal flaw if the final layout avoids the biodiversity NO-GO areas as depicted in Figure 25 (Section 4.6) or Figure 26; and the proposed mitigation measures are adopted. It is critical that the Geotechnical Engineer's feasibility report provides the appropriate siting of the residence, chalets and associated infrastructure due to the significant erosion (Plate 4), particularly at the northern end of the property; and the limited space along the narrow plateau, which is further restrained by the defunct concrete canal.

**Summary of impacts pre- and post-mitigation**

ENVIRONMENTAL IMPACT	DEVELOPMENT PHASE	PRE- MITIGATION	POST MITIGATION
IMPACT 1: Loss of vegetation due to clearing (biodiversity loss)	Establishment & Operational	<u>Alternative 1:</u> Moderate (Score -60)	<u>Alternative 2:</u> Low (Score -52.5)
IMPACT 2: Loss & fragmentation of CBA and ESA due to clearing (biodiversity loss)	Establishment & Operational	<u>Alternative 1:</u> Moderate (Score - 60)	<u>Alternative 2:</u> Moderate (Score - 55)
	Establishment &	<u>Both Alternatives</u>	

<b>ENVIRONMENTAL IMPACT</b>	<b>DEVELOPMENT PHASE</b>	<b>PRE- MITIGATION</b>	<b>POST MITIGATION</b>
<i>IMPACT 3: Loss of floral species of special concern due to clearing (biodiversity loss).</i>	Operational	Moderate (-60)	Low (-45)
<i>IMPACT 4: Potential water quality degradation of the Sundays River and associated riparian and wetland habitat (hydrological processes and biodiversity loss).</i>	Establishment & Operational	<u>Alternative 1:</u> Low (-30)	<u>Alternative 2:</u> Low (-28)
<i>IMPACT 5: Potential sedimentation and erosion of the Sundays River and associated riparian and wetland habitat due to agriculture (hydrological processes and biodiversity loss)</i>	Establishment & Operational	<u>Alternative 1:</u> Very High (-64)	<u>Alternative 2:</u> Low (-28)
<i>IMPACT 6: Potential erosion of steep slopes and consequent erosion and sedimentation of the Sundays River due to the proposed chalets, residence and access road (hydrological processes and biodiversity loss)</i>	Establishment & Operational	<u>Alternative 1:</u> Very High (-85)	<u>Alternative 2:</u> Low (-42)
<i>IMPACT 7: Potential impact of sewage pollution (Hydrological Processes and Biodiversity Loss)</i>	Operational	<u>Alternative 1:</u> Medium (-75)	<u>Alternative 2:</u> Low (-30)

A summary of the mitigation measures to be incorporated into the Environmental Management /Monitoring Programme is provided in Section 6.5.



## 1. SECTION 1: THE PROPOSED DEVELOPMENT: BRIEF INTRODUCTION AND DESCRIPTION

### 1.1. BRIEF INTRODUCTION

Habitat Link Consulting were appointed by the Applicant, Mr Luc De Villers, to undertake an environmental assessment in terms of Section 24(5) of the National Environmental Management Act (NEMA) (107 of 1998) for the proposed development. Refer to the Environmental Impact Assessment (EIA) report for more detail with regards to the listed activities which the proposed development has triggered.

This vegetation and aquatic assessment report will therefore provide input into the EIA process.

This aquatic assessment also aims to determine the requirement for a Section 21(c) and 21(i) water use license application (WULA) regarding the 2009 General Authorisation in terms of Section 39 of the National Water Act (36 of 1998). Section 21(c) refers to impeding or diverting the flow of water in a watercourse, and Section 21(i) refers to altering the bed, banks, course or characteristics of a watercourse. Section 21(c) and 21(i) also refers to any development that falls within 500 m of a wetland and within 100 m of a river or stream (watercourse), or if the riparian area is delineated, within the watercourse or riparian area of watercourse.

#### **In terms of the National Water Act (36 of 1998), the following definitions apply:**

**“Watercourse”** means (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 or declare to be a watercourse, and reference to a watercourse includes, where relevant, its bed and banks.

**“Wetland”** means 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. Wetlands and dams are therefore included in the definition of a watercourse within the National Water Act. This implies that whatever legislation refers to watercourses will also be applicable to wetlands and dams, where relevant and as indicated by the Authority.

***The National Wetland Classification System (NWCS) classifies wetlands into natural and artificial wetlands. Artificial wetlands are produced anthropogenically; and are not naturally occurring. The NWCS defines a wetland as: “an area of marsh, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed ten metres” (Ollis et al, 2013; SANBI, 2009).***

***The Inventory of Inland Aquatic Ecosystems (SAIIAE) (Version 2) defines artificial waterbodies / artificial wetlands as including terrestrial and aquatic ecosystems which have been modified by humans to varying degrees either within or in the vicinity of aquatic ecosystems. Such datasets may include point or polygon data on the extent and distribution of for example artificial wetlands, aquaculture facilities, bridges, canals, excavations, railways, reservoirs, roads, salt works, sand mining, treatment works and weirs (van Deventer et al., 2018).***

**“Riparian habitat”** includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, 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 land areas.

“Water resource” includes a watercourse, surface water, estuary, or aquifer.

**In terms of the national wetland classification system (SANBI, 2009), the following definition applies:**

**An Inland System** is defined as an aquatic ecosystem with no existing connection to the ocean. These ecosystems are characterised by the complete absence of marine exchange and/or tidal influence.

**A wetland** is an area of marsh, peatland or water, whether natural **or artificial**, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed ten metres. *(This definition was sourced and adapted from the RAMSAR convention, since South Africa is a signatory).*

## 1.2. PROJECT LOCATION AND DESCRIPTION

The proposed development is located within the Sundays River Valley Local Municipality (Eastern Cape) on Farm 1/96, along the Sundays River.

The property measures ~**18.67 ha** in extent (Figure 1) (QGIS measurement). Approximately 5.5 ha or 29.5 % of the property is planned to be cleared. However, this does not include the 1:5 steep slopes that will be avoided; and is thus an over-estimate.

Refer to Table 1 below for a summary of the project description, provided by the Applicant.

**Table 1. Project description summary**

Attribute	Details
Location	Sunland, Sundays River Valley Local Municipality Along Sundays River.
Property	Remainder of Portion 1 of the Farm Vissers Vale No. 96
GPS coordinates Approximate centre of property:	33°28'50.68"S 25°36'38.79"E
Development Type	3 Chalets, 1 residence and 1 warehouse, including agricultural purposes.
Property size (ha)	18.67 ha (Calculated in QGIS WGS84TM25)
Total Footprint Size (ha) – proposed by Applicant (without specialist no-go areas)	3 X Chalets (100m <sup>2</sup> each) = 300m <sup>2</sup> 1 X Warehouse (4 500m <sup>2</sup> ) = 4500m <sup>2</sup> 1 X Residential dwelling (200m <sup>2</sup> ) = 200m <sup>2</sup> <b>Agricultural Pastures = 5 ha (worse-case, not as per Engineers Report which indicates 4.5 ha)</b> <b>Total: 5.5 ha</b>
Water supply	<i>As per the Engineers Report (Spies, 2019):</i> Currently there is an agreement between the Owner of Remainder of Portion 219 of the Farm Selborne No. 115, Mr David Stuart Robinson; and the Owner of Portion 1 of the Farm Vissers Vale No. 96, Mr Luc de Villiers to get water to the last-mentioned property via a minimum 25mm diameter piped connection.  Annual Average Daily Demand (AADD) of the proposed residential development under discussion will be 2.8 kilolitres (2.8m <sup>3</sup> ) per day.  <b>Subject to the outcome of the test results on the water received from the neighbouring property, an on-site water treatment system could be required.</b>  A dual chamber reservoir with a minimum effective storage capacity of 50kl (50m <sup>3</sup> ) capacity for the treatment (if required).  To investigate the <b>following alternative water sources and saving proposals.</b>

Attribute	Details
	<p>As far as practically possible, the Architect should also make provision for <b>roof rain water harvesting</b> in the architectural guidelines.</p> <ul style="list-style-type: none"> <li>✓ The roof-collected water can be used for outdoor and indoor purposes e.g. irrigation &amp; indoor purposes (hot water, washing, toilet, etc).</li> </ul> <p>The <b>use of water</b> can also be <b>saved</b> by using water saving products listed as follows:</p> <ul style="list-style-type: none"> <li>✓ Water saving toilets (capacity 6 litres and less) with a dual-flush valve</li> <li>✓ Water saving taps with spray cartridges.</li> <li>✓ Water-saver shower heads with a flow rate of 4 to 9 litres per minute by generating finer droplets</li> <li>✓ As far as possible, install at least 2 x 5000 litre water tanks at the residential unit, 1 x 5000 litre tank at each of the chalets and 2 x 10 000 litre water tanks at the general warehouse.</li> </ul>
<i>Water use rights</i>	No existing rights or new rights to be applied for. See above.
<i>Sewage system</i>	<p><u>As per the Engineers Report (Spies, 2019):</u> Conservancy tanks i.e. a closed sewage storage facility.</p> <p>The storage capacity of the conservancy tank of the house shall be 15.75m<sup>3</sup> (4m x 4m x 1.5m deep) and 8.4m<sup>3</sup> (3m x 3m x 1.5m deep) for each chalet.</p> <p>The effluent of the proposed mixed development will be treated by the Addo Waste-Water Treatment Works as confirmed with Mr R.J. Herholdt of the Sundays River Valley Municipality on 21 November 2019.</p>
<i>Electricity supply</i>	Will connect to existing grid, but no information available yet.
<i>Agriculture</i>	<p>Dryland crop (fodder) to be planted only, as no water rights to property. Planting required every 5 years. Slope steepness to be considered (steeper than 1:5 to be excluded).</p>
<i>Placement of Chalets and Residence</i>	Refer to the Engineers Report (Spies, 2019). Stormwater and erosion control measures shall be put in place to avoid further erosion from the proposed development. The Report 'It is Strongly recommended to do an engineering geological investigation prior to the detailed design stage of the development



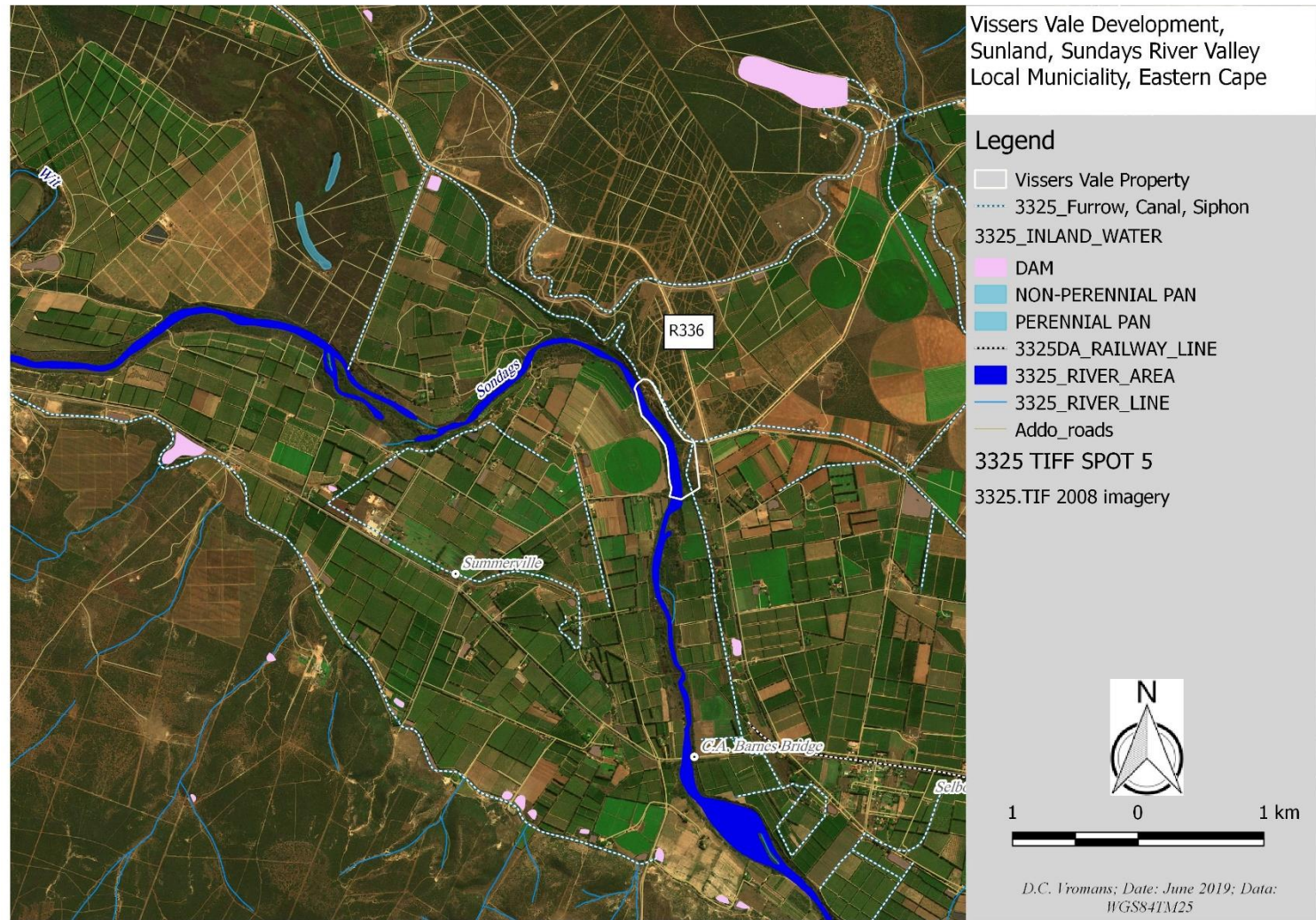


Figure 1. Map indicating the location of Farm 1/96, adjacent to the Sundays River, Sunland (Sundays River Valley Local Municipality, Eastern Cape (2008 SPOT 5 Satellite imagery).





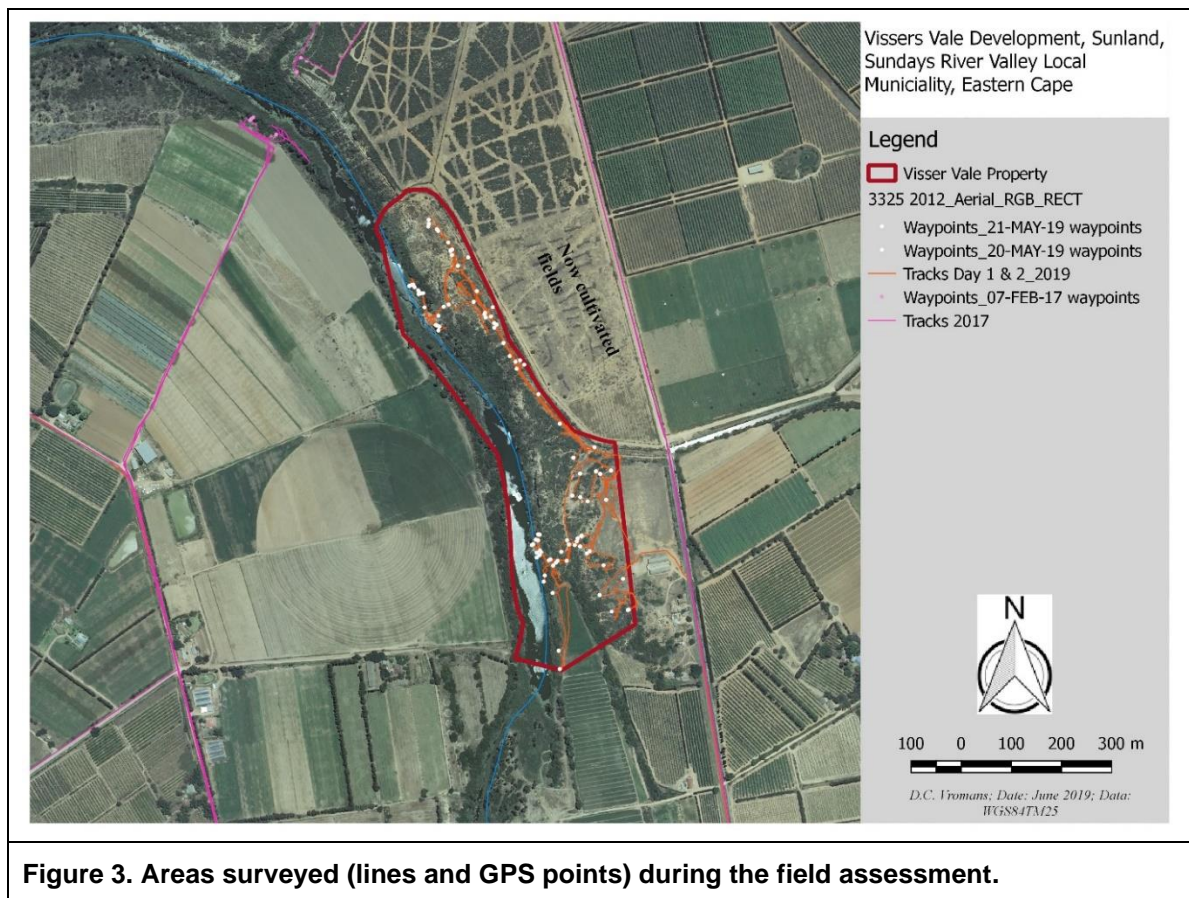
Figure 2. Map indicating the proposed layout on Farm 1/96, provided by Habitat Link Pty Ltd.



## 2. SECTION 2: ASSESSMENT METHODOLOGY

A 2-day field survey was conducted over the period 21 – 22 May 2019 in order to assess the vegetation on site (Figure 3), as well as aquatic features. The objective was to determine vegetation type(s) or habitat(s) and plant species composition (key species, protected and threatened species, alien invasive plants), as well as ecological condition. In addition, to survey the Sundays River (along the property's western boundary), and to determine if any wetlands or drainage areas (watercourses) occur on the site, and within the 500 m and 100 m “regulated area of a watercourse / radius” of the proposed development.

A previous aquatic survey along the Sundays River, to the north of the property, was undertaken in February 2017. The delineation data was used for this assessment.



**Figure 3. Areas surveyed (lines and GPS points) during the field assessment.**

### Vegetation and Floristics

As much of the site and proposed footprints were surveyed on foot. The available vegetation maps were consulted to inform survey areas and final vegetation descriptions.

Literature was consulted to determine vegetation type (correlated to that identified on site), presence of special habitats and ecosystem status, including potential presence of species of conservation concern (not identified during the field survey due to the impenetrable thicket/ inaccessible topography). The distribution of species of conservation concern in the region has been mapped by the Maputoland-Pondoland-Albany Hotspot study (SANParks metadata, 2010) according to their location in a Quarter Degree Square (i.e. an area of approximately 30 km by 30 km covered by one 1:50 000 South African topographical map. These biodiversity features were mapped with Quantum GIS (Version 2.18), as well as level of degradation or sensitivity of the study site described. Although the SANBI POSA database



was consulted, threatened species lists need to be requested. These were requested (May 2019), but data was not forthcoming (the case for several assessments to date). The data is not to be made available to the general public due to risk of illegal poaching. Some botanical specimens, not identified in the field, were identified at the Selmar Schonland Herbarium in Grahamstown, with the assistance of Tony Dold (Botanist).

The Sundays River Valley Critical Biodiversity Areas (SRV CBA) Map, also referred to as the Addo CBA Map, was consulted to assist with determining the ecological importance of the area (Skowno and Holness, 2012), as well as the Eastern Cape Biodiversity Conservation Plan (ECBCP) CBA Map (Berliner and Desmet, 2007). The Subtropical Thicket Ecosystem Programme (STEP) biodiversity map (2003) is superseded by both former maps and was therefore not consulted with regards to the determination of CBAs; as it is out-dated. Notably, however, most of the STEP data was integrated into the systematic biodiversity planning process for generation of the ECBCP (Refer Berliner and Desmet, 2007), and therefore the SRV CBA Map. The SRV CBA Map supersedes the ECBCP and is thus being used to update the ECBCP, which is currently being implemented for the Province. It should also be noted that the National Freshwater Ecosystem Priority Assessment (NFEPA) is an aquatic update of the ECBCP (Section 3.1.2); and was used in the development of the Sundays River Valley CBA Map. However, the integration of the SRV CBA Map into the revised ECBCP is still to be made available.

Although the National Land Cover Map (2013/2014) and ECBCP land cover (2000) were consulted and/or presented in the report, the land cover for the SRV CBA Map was produced at a finer-scale (1:20 000); and is thus more accurate. However, the field survey aimed to improve on the accuracy of the land cover at the site level.

The NPAES (2008) and the ECPTA provincial protected area expansion strategy (2012) maps were consulted to determine the ecological importance of the site and surrounds. The SRV CBA Map also identified focus areas for expansion of the Addo Elephant National Park (a project led by South African National Parks to address expansion and protection of the park as one of its mandates), which are not necessarily aligned with the former expansion strategies. The Addo Elephant National Park (AENP) buffer zone was also consulted to determine the location of the proposed development relative to Priority Natural Areas and Catchment Protection Areas (the ecological buffers only), as identified in the AENP management plan (2015-2025) (Section 3.3.5).

### **Aquatic Features: Survey and Delineation**

Aerial imagery (2008 satellite imagery, 2009 aerials, Google Earth 2015), available National Freshwater Ecosystem Priority Assessment (Nel et al., 2011) wetland data, the National Wetland Inventory (NWI) Version 5 wetland data and the field survey verified wetland presence. The National Freshwater Ecosystems Priority Areas (NFEPA) Map (Nel et al., 2011) was consulted to determine if the Sundays River and associated catchment was mapped as a priority, referred to as Freshwater Ecosystem Priority Area (FEPA).

#### *The Sundays River lies adjacent to the farm:*

*Wetland delineation* should always be directed by the occurrence of typical wetland species adapted to wet conditions (i.e. hydrophytes and obligates<sup>1</sup>), including the identification of typical wetland soils (i.e. hydromorphic soils) and the presence of surface water. Generally, a grey soil matrix and/or mottles must be present in the soil horizon to qualify as a wetland temporary, seasonal and/or permanent zone. The methodology described by 'A practical field procedure for identification and delineation of wetlands and riparian areas' (DWAF, 2005) was followed for delineating the riverine wetlands identified along the

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<sup>1</sup> Grow in wetland or water saturated areas for more than 99 % of the time.

Sundays Rive, *as well as the riparian habitat*. A botanical assessment was conducted to identify the presence of key wetland and/or riparian plant species, and Species of Conservation Concern (i.e. protected or threatened species).

Strategic input from Dr Brian Colloty (Aquatic Specialist) was gained regarding delineations and potential ecological risks.

GPS coordinates were used to delineate the wetland and riparian boundaries. Some error with regards to the accuracy of the boundaries should be expected, especially since the banks were challenging to access – due to steepness and dense vegetation cover.

The National Wetland Classification System (SANBI, 2009) methodology was followed, in order to classify the wetlands.

Present ecological state (PES) data, and ecological importance and sensitivity data for the Sundays River were derived from available information, including the Department of Water and Sanitation’s desktop study (DWS, 2014) and the National Wetland Inventory Version 5 (2018). Refer to Table 2 for the PES categories. The ecological importance and ecological sensitivity were also based on available data (Section 3.1.1.1).

The PES was classified according to the standard Department of Water Affairs’ A - F ecological categories (Table 2).

**Table 2: Descriptions of the A-F ecological categories (adapted from Kleynhans, 1996, Kleynhans, 1999; cited in DWAf, 2007 and Kleynhans et al., 2008).**

<b>ECOLOGICAL CATEGORY</b>	<b>PES % SCORE</b>	<b>DESCRIPTION</b>	<b>MANAGEMENT PERSPECTIVE</b>
A	90-100%	Unmodified, natural.	Protected systems; relatively untouched by human hands; no discharges or impoundments allowed.
B	80-89%	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	Some human-related disturbance, but mostly of low impact potential.
C	60-79%	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	Multiple disturbances associated with need for socio-economic development, e.g. impoundment, habitat modification and water quality degradation.
D	40-59%	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	
E	20-39%	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	Often characterized by high human densities or extensive resource exploitation. Management intervention is needed to improve health, e.g. to restore flow patterns, river habitats or water quality.
F	0-19%	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	

<b>ECOLOGICAL CATEGORY</b>	<b>PES % SCORE</b>	<b>DESCRIPTION</b>	<b>MANAGEMENT PERSPECTIVE</b>
		functions have been destroyed and the changes are irreversible.	

## **2.1. LIMITATIONS OF THE ASSESSMENT**

*Limitations of the assessment are as follows:*

1. One baseline assessment or field visit was conducted, which limits the amount of floral biota identified on site. Plant identification is improved with fertile specimens, which are not present for all species.
2. One baseline assessment or field visit was conducted to identify wetlands, this limits wetland verification i.e. missing seasonal, intermittent or temporary inundation cycles. However, this assessment is considered to have a high confidence.
3. The impenetrable thicket and steep topography limited access, however, the field survey areas are considered to be representative of the site.
4. Impenetrable vegetation and steep riparian banks limited access along the Sundays River, and thus delineations are based on sites surveyed and aerial imagery.
5. The riparian and wetland vegetation to the south of the property was not accessible at the time of the survey, and thus delineations are based on sites surveyed and aerial imagery.
6. Depth to groundwater is unknown.
7. All calculations (distance and area) were done in GIS.
8. Some inaccuracy in the hand-held Global Positioning System and Geographical Information System (GIS) is expected.
9. A geotechnical assessment has not been conducted to address the severe erosion on site and the limited space along the narrow plateau between the defunct concrete irrigation canal and the steep 'cliff' edges.

## **3. SECTION 3: AVAILABLE DATA - LITERATURE REVIEW**

Available literature on ecological features was sourced. It is important to note that the results section (Section 4), serves to ground-truth this data; and should thus be consulted for final ecological feature descriptions.

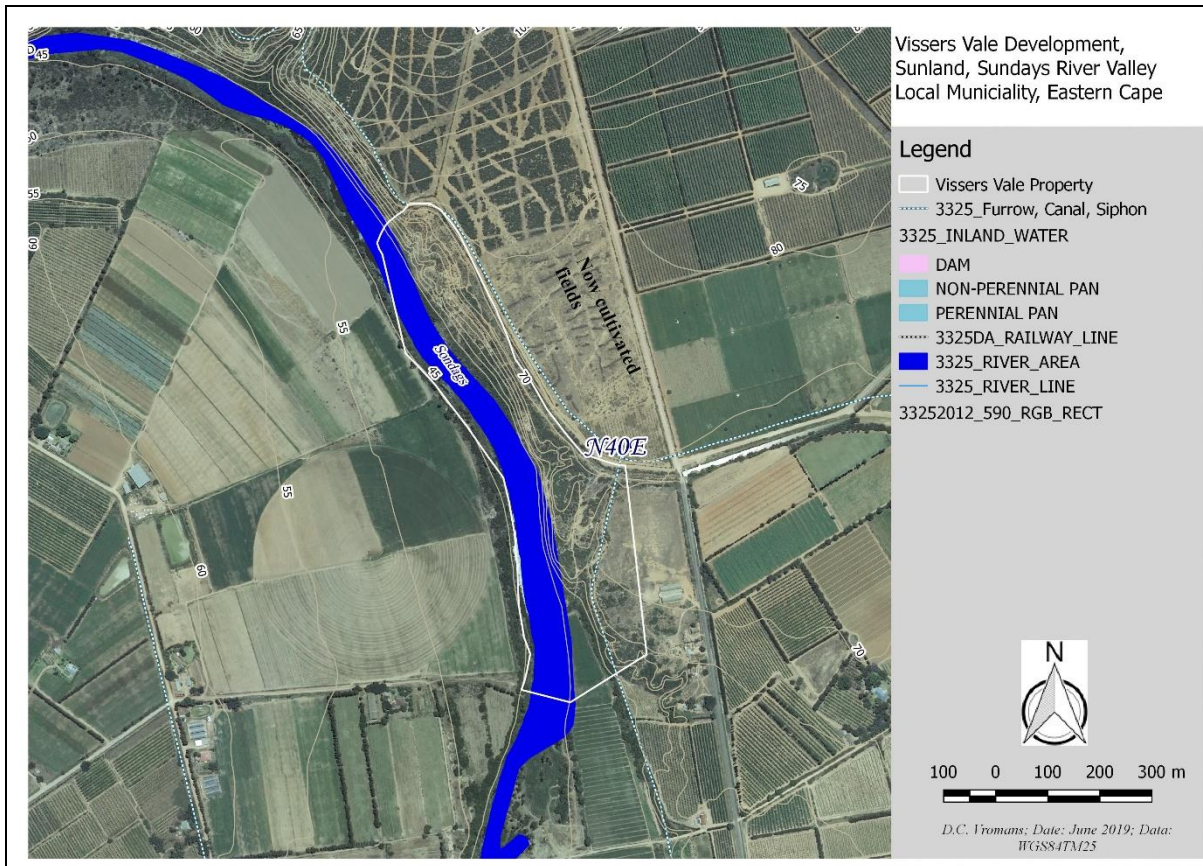
### **3.1. AVAILABLE DATA - AQUATIC ECOSYSTEMS AND CATCHMENT OVERVIEW: SUNDAYS RIVER, WETLANDS, AND ASSOCIATED CATCHMENT**

The property is situated within quaternary catchment N40E (Mzimvubu-Tsitsikamma Water Management Area), just eastward of and adjacent to the Sundays River (Figure 4). Intensive cultivation occurs along most of the stretch of the Sundays River, apart from the larger portion of the Vissers Vale property i.e. along the mid to northern extreme.

Surface run-off from the **property** will drain towards the Sundays River, from the plateaus and via the small kloofs or gullies (Figure 4). The proposed chalets are located at least 25 m above the Sundays River, beyond vertical gradients that lead down to the riparian habitat. In contrast, the proposed dry

crop agriculture is located within metres from the steeply incised river banks, located at the 45 m contour (approximate).

Severe erosion is present at the northern extreme of the property, where the old irrigation canal (concrete) has been broken mid-slope. The steep, to vertical slopes are also subject to erosion.



**Figure 4. Map of the general hydrology of the property, within the N40E catchment, and adjacent to the Sundays River, with the SA 1:50 000 Topographical Data presented.**

### 3.1.1. The Sundays River

The Sundays River lies within the N40E catchment of the Mzimvubu to Tsitsikamma Water Management Area.

The Sundays River is a large system, originating around Graaff-Reinet (Camdeboo Municipality) beyond the municipal boundaries, to the north-west. This once seasonal river is now perennial (IWR, 2013). The river flows along the southern slopes of the Zuurberg Mountains and veers towards Kirkwood and Addo; and finally flows along the south-eastern boundary of the municipality, where it enters the Indian Ocean at the small town of Colchester. It is ~310 km long with a catchment area of ~22,000 km<sup>2</sup> (Baird, 2006 cited in Vromans et al., 2012). Six main tributaries feed into the Sundays River, including, from west to east, the Kariega, Holbak, Kabougas, Uie, Wit, Bezuidenhouts and Coerney (Vromans et al., 2012).

### 3.1.1.1. Present Ecological State, Ecological Importance and Ecological Sensitivity

The latest present ecological state rating of **Largely Modified (Class D)** was assigned in the national South African Inventory of Inland Aquatic Features (SAIAB Version 5, 2018) (Van Deventer et al., 2018).

The previous PES rating by the Department of Water and Sanitation (DWS, 2014) and the National Freshwater Ecosystem Priority Assessment (Nel et al., 2011), indicates the same PES class. The available DWS 2014 rating is provided in Table 3.

The key reason for the modified state is the large-scale farming along the river, which includes the addition of irrigation water (due to supplementation from the Orange-Fish-Sundays Inter-Basin Transfer / lower Sundays Irrigation Scheme), pesticide and fertilizer run-off as well as sedimentation and erosion impacts. The latter the result of causeways; including road and railway crossings.

The **ecological importance and ecological sensitivity** are both **Moderate** (DWS, 2014).

**Table 3. The Present Ecological State data for the 2014 desktop study (DWS, 2014)<sup>2</sup>**

SUNDAYS RIVER PRESENT ECOLOGICAL STATE (DWS, 2014)		
<b>SQ REACH</b>	N40E-08640	
<b>SQR NAME</b>	Sundays	
<b>PES CATEGORY BASED ON MEDIAN OF METRICS</b>	D	
<b>PES CATEGORY DESCRIPTION</b>	LARGELY MODIFIED	
<b>METRIC</b>	<b>RATING</b>	<b>CONFIDENCE</b>
<b>INSTREAM HABITAT CONTINUITY MODIFICATION</b>	MODERATE	3,0
<b>RIP/WETLAND ZONE CONTINUITY MODIFICATION</b>	LARGE	3,0
<b>POTENTIAL INSTREAM HABITAT MODIFICATION</b>	LARGE	3,0
<b>RIPARIAN-WETLAND ZONE MODIFICATION</b>	LARGE	3,0
<b>POTENTIAL FLOW MODIFICATION</b>	SERIOUS	3,0
<b>POTENTIAL PHYSICO-CHEMICAL MODIFICATION ACTIVITIES</b>	SERIOUS	3,0
<b>PES BEST METRIC RATING</b>	2,0	
<b>PES WORST METRIC RATING</b>	4,0	
<b>PES OVERALL AVERAGE CONFIDENCE</b>	3,0	

<sup>2</sup> The older 2014 data is provided as a summary spreadsheet for the 2018 assessment is not available.



SUNDAYS RIVER PRESENT ECOLOGICAL STATE (DWS, 2014)	
PES OVERALL COMMENT	<i>Habitat &amp; continuity (fish):</i> Road causeways. Habitat (invertebrates) & flow: Orange-Fish-Sundays Inter-Basin Transfer; lower Sundays Irrigation Scheme; roads; railway line. <i>Riparian/wetland zone &amp; continuity:</i> River areas impacted upon by large scale citrus farming. <i>General, physico-chemical:</i> Area is intensely cultivated; appears to be a citrus packaging or processing plant in the reach.

### 3.1.2. National Freshwater Ecosystem Priority Areas (NFEPA) Map (2011) and National Wetland Inventory (NWI) Version 5 (2018)

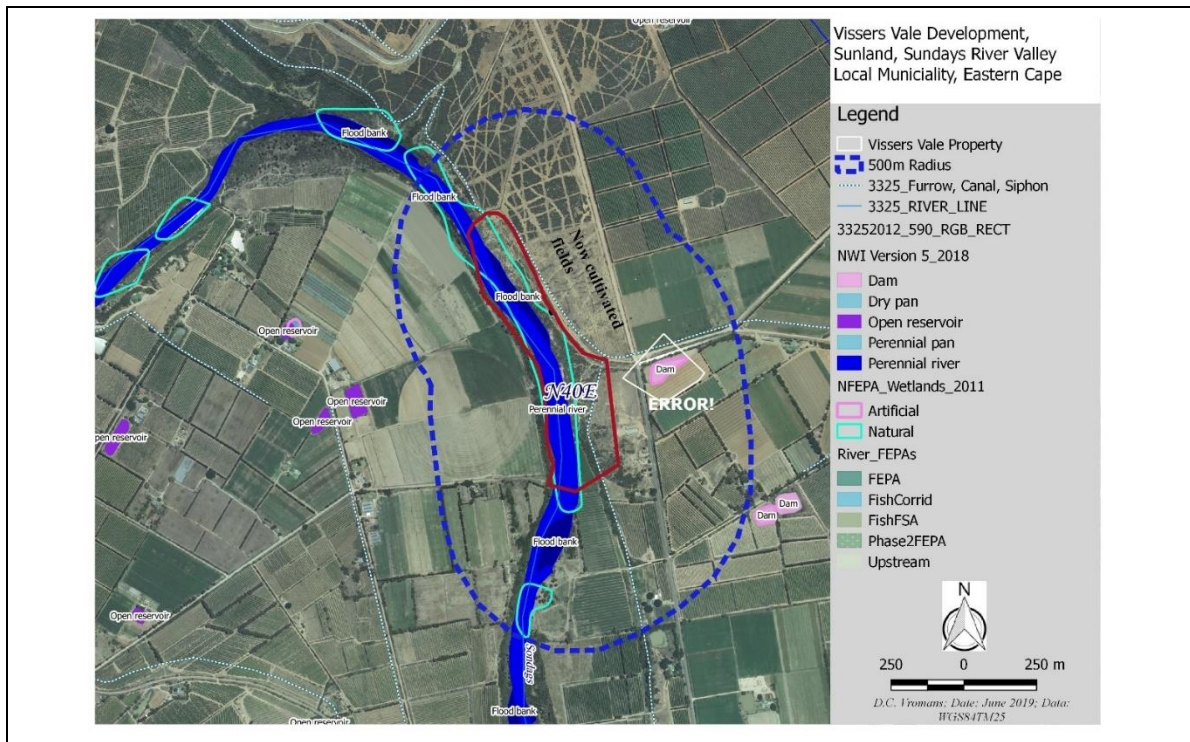
#### Catchments

In terms of the National Freshwater Ecosystem Priority Areas (NFEPA) Map (Nel et al., 2011), the Sundays River and associated catchment is **not** indicated as a Freshwater Ecosystem Priority Area or other important catchment (Figure 5).

#### Wetlands

The National Wetland Inventory (NWI) Version 5 (CSIR, 2018) is more accurate than the NFEPA wetlands map. The key difference is that the NFEPA has mapped large wetlands along the Sundays River, **some of which are errors**. No wetlands are mapped on the property or within 500 m of the proposed development (apart from those along the Sundays River) (Figure 5).

The survey validated and corrected the available sets of wetland data. See wetland results (Section 4.2).



**Figure 5. The National Wetland Inventory (NWI) Map Version 5 (CSIR, 2018) and National Freshwater Ecosystem Priority Areas (NFEPA) Map (Nel et al., 2011). The NFEPA does not indicate the Sundays River or the associated catchment to be a priority, nor does it map priority or FEPA wetlands, although it does map some wetlands along the Sundays River. Refer to Section 4.2 for verified wetland habitat.**

Cumulative impacts

Research has shown that streams in agricultural catchments usually remain in a good condition until the extent of agriculture in the catchment exceeds 30 % - 50 % (Allan, 2004 cited in Driver et al., 2012). Similarly, for every 10 % of altered catchment, a correlative 6 % loss in freshwater diversity was noted (Weitjers et al., 2009 cited in Driver et al., 2012 – NFEPA Implementation Manual).

**It should be noted that the NFEPA data was used to develop the Sundays River Valley CBA Map (Section 3.3.1).**

**3.1.3. Available Fish Data**

**The following fish data is available for the Sundays River (Nel et al., 2011 and SANParks, 2010):**

<b>Fish species</b>	<b>Common name</b>	<b>IUCN Red Listing</b>
<i>Anguilla marmorata</i>	Giant Mottled Eel	Least Concern
<i>Anguilla mossambica</i>	Longfin Eel	Least Concern
<i>Barbus anoplus</i>	Chubbyhead Barb	Least Concern
<i>Barbus pallidus</i>	Goldie Barb	Least Concern
<i>Gilchristella aestuaria</i>	Estuarine Round-Herring	Least Concern
<i>Glossogobius callidus</i>	River Goby	Least Concern
<i>Labeo umbratus</i>	Moggel	Least Concern
<i>Myxus capensis</i>	Freshwater Mullet	Least Concern
<i>Mugil cephalus</i>	Flathead Mullet	Least Concern
<b><i>Oreochromis mossambicus</i></b>	<b>Mozambique Tilapia</b>	<b>Near Threatened</b>
<b><i>Pseudobarbus afer</i></b>	<b>Eastern Cape Redfin</b>	<b>Endangered<sup>3</sup></b>

**Near Threatened Mozambique Tilapia**

Mozambique Tilapia prefer standing water rather than fast fast-flowing rivers and streams. It is an adaptable fish that is considered to be a freshwater species. It is also found in estuaries and coastal lakes, especially in the southern part of its range.

**Endangered Eastern Cape Redfin**

Eastern Cape Redfin are restricted to the Sundays, Baakens and Swartkops river systems in the eastern Cape Fold Ecoregion. It inhabits relatively undisturbed clear water mountain streams with cobbles, pebbles and boulders, that recede into a series of isolated pools during the dry season. The species is thus adapted to the extreme fluctuations in flow, water temperature and water quality; which are characteristic of these intermittent streams (Ellender et al. 2015 cited on IUCN webpage).

<sup>3</sup> Chakona, A., Weyl, O. & Ellender, B.R. 2017. *Pseudobarbus afer*. *The IUCN Red List of Threatened Species*2017: e.T107654052A107654388. <http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T107654052A107654388.en>. Downloaded on 08 July 2019.

### 3.2. AVAILABLE DATA - TERRESTRIAL ECOSYSTEMS: VEGETATION & FLORISTICS

#### 3.2.1. Available Broad-Scale Vegetation Maps

Refer Table 4 below for the vegetation types that have been mapped on the property by the two key broad-scale vegetation maps, namely the South African Vegetation Map (2018) and the STEP Vegetation Map (2002).

Low and Rebelo (1996), including Acocks (1975) were also consulted for additional support, but are not presented in the table. These older vegetation maps are generally used to develop the more recent vegetation maps; and are thus consulted to understand species structure and composition.

**Table 4. Vegetation types mapped on the property (pre-transformation/ modification)**

VEGETATION TYPE	SOURCE	ECOSYSTEM STATUS	BIODIVERSITY TARGET	PROTECTION LEVEL
<b>Mapped on the Farm</b>				
Albany Alluvial Vegetation	SA VegMap (2018)	Endangered (2011 status)	31%	Poorly Protected
Sundays Doringveld	STEP Vegetation Map (2002)	Vulnerable	17 %	Not available (STEP)

#### 3.2.1.1. National South African Vegetation Map (2018) (Pre-Transformation)

The South African Vegetation Map (**SANBI, 2006-2018**) indicates that the Farm supports Albany Alluvial Vegetation (Figure 6).

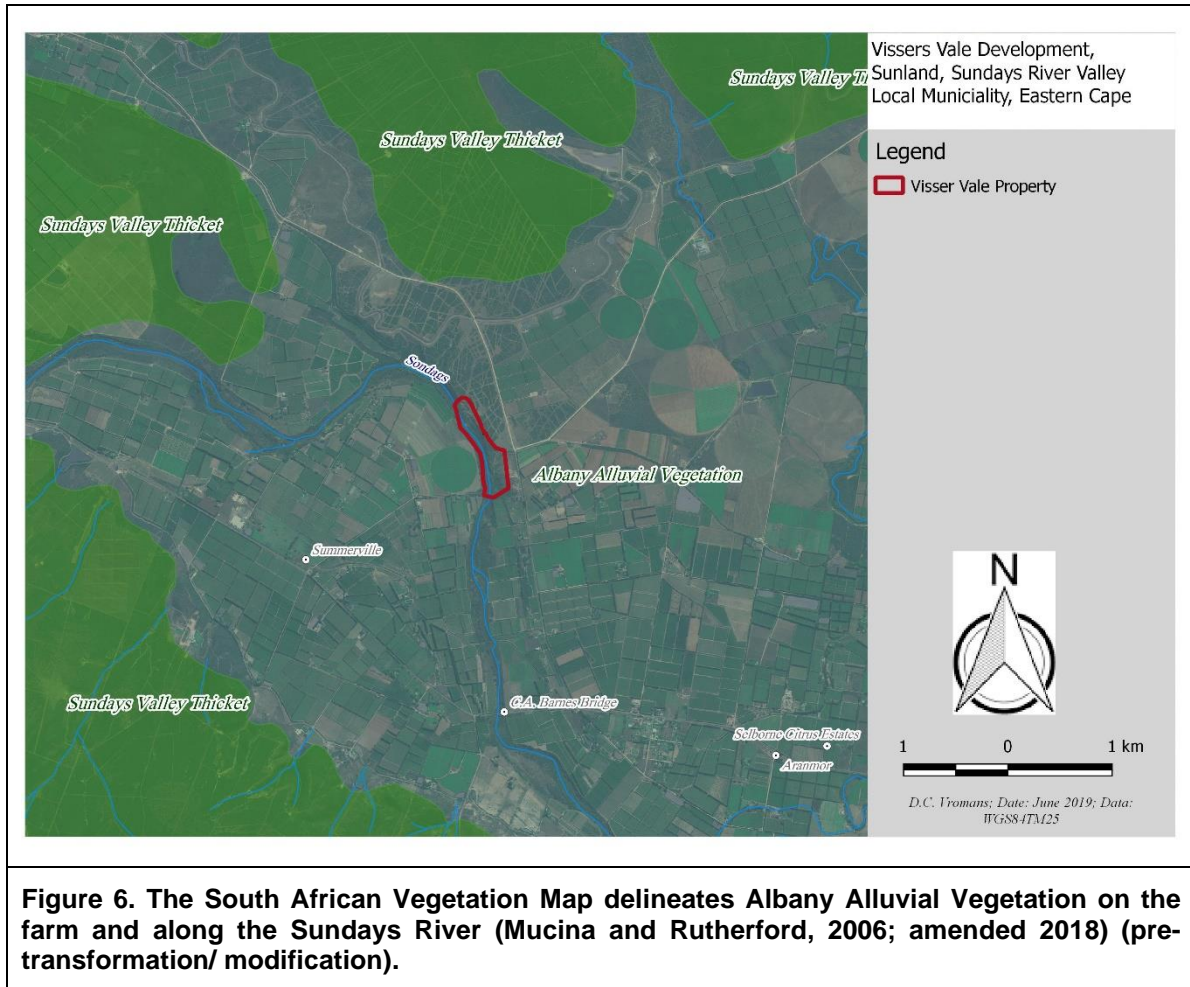
##### Mapped on the Farm

##### **Albany Alluvial Vegetation**

Albany Alluvial Vegetation is mapped in the larger valleys (as is the case for the Sundays River) (Figure 6). It is **restricted to narrow floodplain zones in the coastal areas as riverine thicket and along the wide floodplains** further inland as thornveld (*Acacia natalitia*), of recent alluvial deposits. It is an inland azonal vegetation type that is characteristically linked to water, salt and ecological processes that markedly affect species composition. These are brackish habitats that support *Acacia natalitia*, *Salix mucronata* subsp *mucronata*, *Schotia afra*, *Searsia longispina* and *Acacia caffra*. *Aloe africana*, *A. ferox*, *Azima tetraantha*, *Lycium cinereum*, *Cadaba aphylla* and *Pentzia incana* are common. *Eragrostis curvula* and *Eragrostis obtusa* are amongst the key grasses, while *Cynodon dactylon* occurs in the floodplains. *Cotyledon campanulatum* and *Malephora lutea* are amongst the succulents supported and *Rorippa fluviatilis* one of the herbs, whereas *Phragmites australis* and *Cyperus textilis* occur in the reed beds (Mucina and Rutherford, 2006).

Albany Alluvial Vegetation is *Endangered* with a target of 31% (2011 National Biodiversity Assessment). Consequently, it is listed as a Threatened Ecosystem in terms of the National Environmental Management: Biodiversity Act (10 of 2004).

**This vegetation cannot and does not apply to that portion of the property that is on the steep to vertical inclines and plateaus above the Sundays River.**



**Figure 6. The South African Vegetation Map delineates Albany Alluvial Vegetation on the farm and along the Sundays River (Mucina and Rutherford, 2006; amended 2018) (pre-transformation/ modification).**

### 3.2.1.2. Subtropical Thicket Ecosystem Programme (STEP) Map (2002) (Pre-Transformation)

The Subtropical Thicket Ecosystem Programme (STEP) vegetation map classified the thicket vegetation in more detail, and was utilized by the South African Vegetation Map, although the final vegetation classifications differ in species composition somewhat.

The STEP Vegetation Map (2002) does not delineate vegetation types along the Sundays River nor on the majority of the property (Figure 7). This is the case where the vegetation is considered non-thicket; and is likely for areas proximate to the Sundays River; and influenced by hydrology i.e. riparian and floodplain vegetation.

#### **Mapped on the Farm**

Sundays Doringveld, which was integrated into the SA VegMap's Albany Alluvial Vegetation, is mapped beyond and partially on the property (Figure 7). It is assumed to be a projection / scale issue that most of the farm is not mapped as Sundays Doringveld.

Sundays Doringveld is restricted to the often deep, red, alluvial soils of the Sundays River, Coega and Swartkops floodplains. Thicket clumps are often species-poor but those present are typical of the Sundays Valley Thicket. *Vachellia (Acacia) karroo*, *Aloe ferox* (including *A. ferox* x *A. africana* hybrids) and *Pentzia incana* grow abundantly. The grass component (*Eragrostis* and *Panicum* species) is well developed when not impacted, whereas *Cynodon dactylon* is abundant in the heavily grazed areas. There are many small succulents e.g. *Cotyledon campanulata*, *Glottiphyllum longum*, *Malephora lutea*, etc., and woody shrubs e.g. *Cadaba aphylla*, *Lycium cinereum*, *Lycium ferocissimum*, *Pentzia incana*,

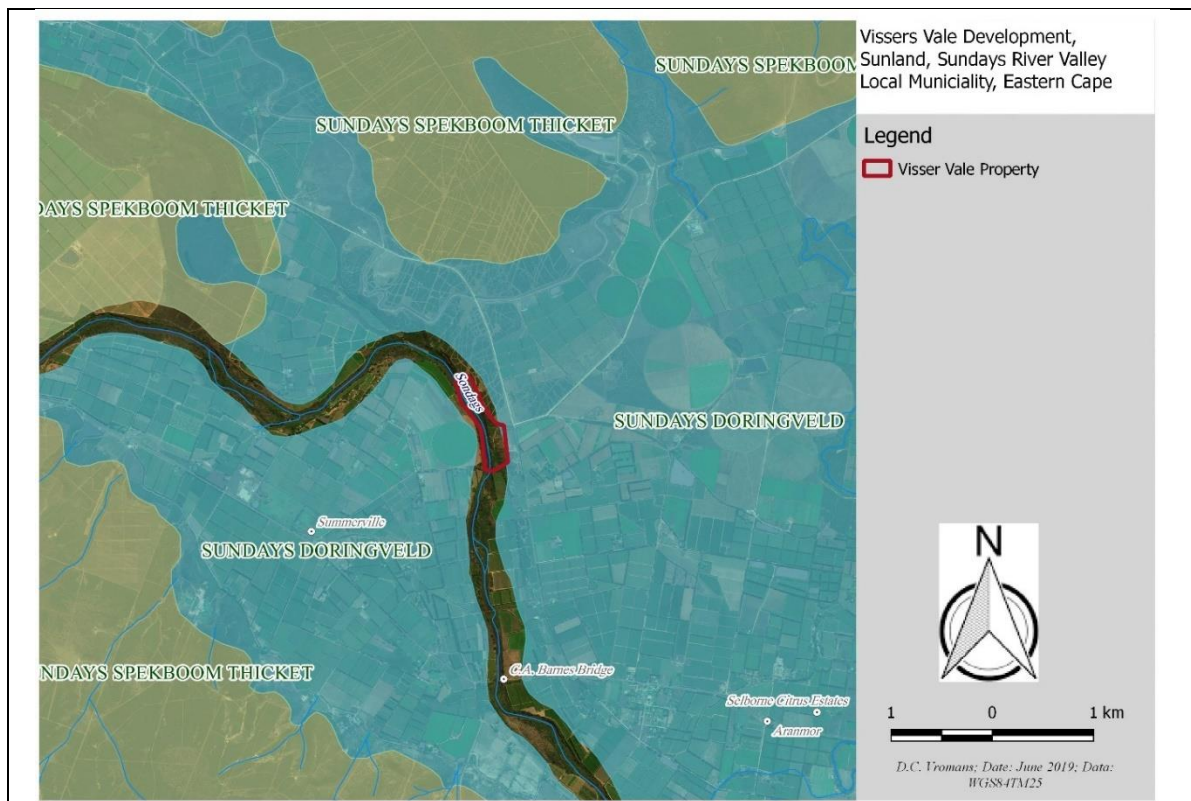


etc. Rare species include, e.g. *Orbea pulchella*, *Euphorbia sp. nov.*, *Haworthia sordida var. sordida*, etc., *Aphiglossa callunoides* and *Thesium junceum*, etc. The highly localised endemic, *Brachystelma tabularum*, is probably extinct due to agricultural and urban development (Vlok and Euston-Brown, 2002).

Sundays Doringveld was incorporated into the Albany Alluvial Vegetation unit of the SA Vegetation Map. Refer above.

According to the biodiversity targets set by the STEP's systematic conservation plan (Cowling et al., 2002), Sundays Doringveld is assigned an ecosystem status of Vulnerable, with a biodiversity target of 17%.

**This vegetation cannot apply to that portion of the property that is on the steep to vertical inclines and plateaus above the Sundays River.**



**Figure 7. STEP vegetation map does not delineate Thicket vegetation on the majority of the property, only a small portion represents Sundays Doringveld (pre-transformation/modification). Riparian and floodplain vegetation are non-thicket and were thus not mapped.**

**3.2.1.3. Other Vegetation Maps (Pre-Transformation)**

Vegetation of South Africa, Swaziland and Lesotho (Low and Rebelo, 1996)

Low and Rebelo (1996) delineate Xeric Succulent Thicket on the farm. This unit occurs in the dry areas of the Sundays and Fish rivers, with deep lime-rich sandy or solonetic soils. A high proportion of succulents occur due to its transition from Pondoland-Tongoland and Karoo-Namibian flora. Characteristic species include *Grewia robusta*, *Brachylaena ilicifolia*, *Gymnosporia capitata*, *Euphorbia caerulescens* and *Portulacaria afra*.

Acocks Veld Types of South Africa (1975)

Acocks (1975) maps Valley Bushveld, or Sundays River Scrub. *Portulacaria afra*, *Euphorbia caerulescens* (previously *ledienii*), *E. grandidens*, *Aloe africana* and *A. ferox*. Woody species include, e.g. *Carissa bispinosa*, *Schotia afra*, *Euclea undulata*, *Searsia longispina*, *Plumbago auriculata* and *Azima tetraacantha*, amongst others.

### 3.2.2. Species of Conservation Concern

Species of Conservation Concern (SCC) refer to those species that are listed as Critically Endangered, Endangered, Vulnerable, Rare and Declining. The following threatened species were mapped by the Maputoland-Pondoland-Albany Hotspot study (SANParks metadata, 2010) in the respective quarter degree grids.

**None of these species were recorded at the surveyed site, however, every inch of the site was not surveyed due to impenetrable thicket and extensive area. As a result, those species indicated as ‘potentially occurring’ are referenced.**

Species	Quarter Degree Grid	Conservation Status	Habitat (SANBI Threatened Species Programme)	Likelihood of Presence
<i>Apodolirion macowanii</i>	3325DB	Vulnerable	Clay soils, valley bushveld. Six locations known.	Possible but not recorded.
<i>Argyrobolium barbatum</i>	3325DB	Vulnerable	Albany Thicket Bushveld, limestone outcrops.	Possible but not recorded.
<i>Encephalartos horridus</i>	3325DA	Endangered	Xeric thicket, often on rocky quartzite outcrops. Port Elizabeth to Uitenhage.	Possible, but unlikely as numerous thicket, shady areas surveyed.
<i>Euryops ericifolius</i>	3325DA	Endangered	Fynbos. Port Elizabeth to Uitenhage.	Not likely. Not recorded.
<i>Haworthia aristata</i>	3325DA	Endangered	Albany Thicket. Port Elizabeth to Kommadagga.	Not likely.
<i>Haworthiopsis (Haworthia) attenuata attenuata</i>	3325DA	Endangered	Not evaluated. Similar to species above.	Not likely.
<i>Hypodiscus procurrens</i>	3325DA	Endangered	Western Cape.	Not likely.
<i>Ruschia leptocalyx</i>	3325DB	Endangered	Albany Thicket, Fynbos. Calcrete.	Calcrete not observed. Not likely and not recorded.
<i>Syncarpha recurvata</i>	3325DA	Endangered	Albany Thicket, Fynbos. Calcrete.	Calcrete not observed. Not likely and not recorded.
<i>Thamnochortus pluristachyus</i>	3325DB	Vulnerable	Canca Limestone Fynbos, De Hoop Limestone Fynbos, Agulhas Limestone Fynbos. Coastal limestone pavements, in cracks in the limestone bedrock, 50-100 m. Southern Cape coast from the Agulhas Plain to Stilbaai.	Not likely and not recorded.

### 3.3. AVAILABLE DATA: BROAD-SCALE SYSTEMATIC BIODIVERSITY PLANS

Systematic biodiversity plans or maps that have been produced for the region, in which the farm portion is located, include:

- The Sundays River Valley (SRV) Critical Biodiversity Area (CBA) Map (Skowno and Holness, 2012), *which supersedes the Eastern Cape Biodiversity Conservation Plan's (ECBCP) (2007) and Subtropical Thicket Ecosystem Programme (STEP) Biodiversity Map (2002)*.
- The Eastern Cape Biodiversity Conservation Plan's (ECBCP) CBA Map (Berliner and Desmet, 2007). The ECBCP is currently being updated and is planned to be gazetted in terms of the NEMBA.
- The Maputoland-Pondoland-Albany Hotspot's (MPAH) Biodiversity Map (2010).
- The National and Provincial Protected Areas Expansion Strategies (2008/2012).

#### 3.3.1. The Sundays River Valley (SRV) Critical Biodiversity Areas (CBA) Map (2012)

##### Introductory Comments

The SRV CBA Map (with associated land use guidelines), is the central component of the SRV Biodiversity Sector Plan (BSP). The SRV BSP was prepared to accompany and further explain the CBA Map for the Sundays River Valley Local Municipality (Vromans et al., 2012). The SRV CBA Map is also referred to as the Addo CBA Map (refer SANBI BGIS).

##### The SRV CBA Map versus the Eastern Cape Biodiversity Conservation Plan (ECBCP) CBA Map

The SRV CBA Map is based on the ECBCP; and is thus not a new systematic plan. A refined and updated CBA Map was developed through integrating existing and new data (Refer Skowno & Holness, 2012), which resulted in some modifications. Its greatest value lies in the fact that it significantly improved upon the accuracy of the land cover data (i.e. modification/ transformation levels versus near-natural/ intact habitat) and integrated the more up to date National Freshwater Ecosystem Priority Assessment data (NFEPAs; with priority wetlands, catchment and rivers). The ECBCP CBA Map (2007) is thus superseded by the SRV CBA Map (2012) (refer SANBI BGIS), since the former is out-dated and not as fine-scale as the latter (1:20 000).

In addition, the ECBCP is currently being updated and will incorporate the SRV CBA Map 'as it stands' unless the land cover indicates otherwise i.e. if a CBA is indicated as 'cultivation or settlement' in the latest land cover map it will not be classed as CBA in the updated ECBCP (Pers. Comments: Dr Philip Desmet). This will however need to be verified once the newly revised ECBCP is finalized.

##### Key limitations of the SRV CBA Map

- i. The scale of land cover was done at 1:20 000. Ground-truthing was, therefore, required (Refer 'evaluation' below).
- ii. Land cover was based on 2006 agricultural land cover data, and 'on screen' digitizing of built up areas (urban, mines, quarries) in 2012.
- iii. Degradation levels are an underestimate (due to the use of outdated STEP and ECBCP data; and the lack of new data).
- iv. Although the systematic biodiversity planning methodology attempts to avoid known conflicting land uses, such as agriculture, it is unable to adequately avoid high potential agricultural land, which is determined via fine-scale data; that is usually not available. Thus, it is the biodiversity sector's input into land use planning and decision making, which does not adequately take socio-economic demands into consideration. *This is particularly the case in the Sundays River Valley, which is a known agricultural hub, of the region and South Africa.*

**3.3.1.1. SRV CBA Map relative to the Farm**

The farm is largely Critical Biodiversity Area (CBA), with some Ecological Support Area (ESA) No Natural Areas Remaining (NNR) sited along the north-western boundary (Figure 11).

The criteria for the CBA status is due to the following: (a) 100 m river buffer, (b) ECBCP CBA status, (c) 100 m NFEPA wetland buffers. The buffers are for retaining hydrological processes and are CBA if near-natural land cover. (Refer CBA Look Up table metadata; Skowno and Holness, 2012).

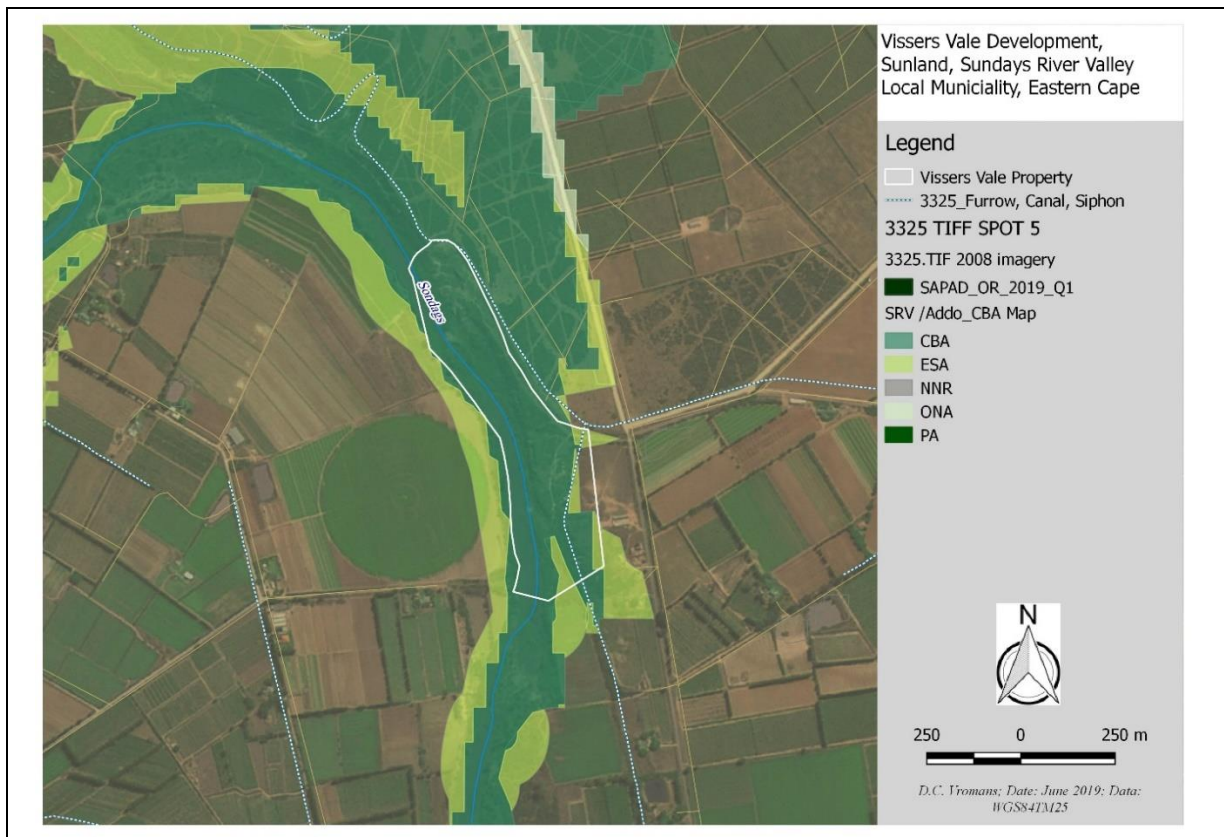
The criteria for the ESA status is due to the following: (a) 100 m NFEPA wetland buffers for No Natural Areas Remaining (NNR); and (b) 500 m river buffer for natural areas (Figure 8).

The SRV or Addo land cover map indicates much of the property to be in a natural state, apart from the pastures adjacent to the river and on the higher plateau (Figure 9).

Surrounding landscape

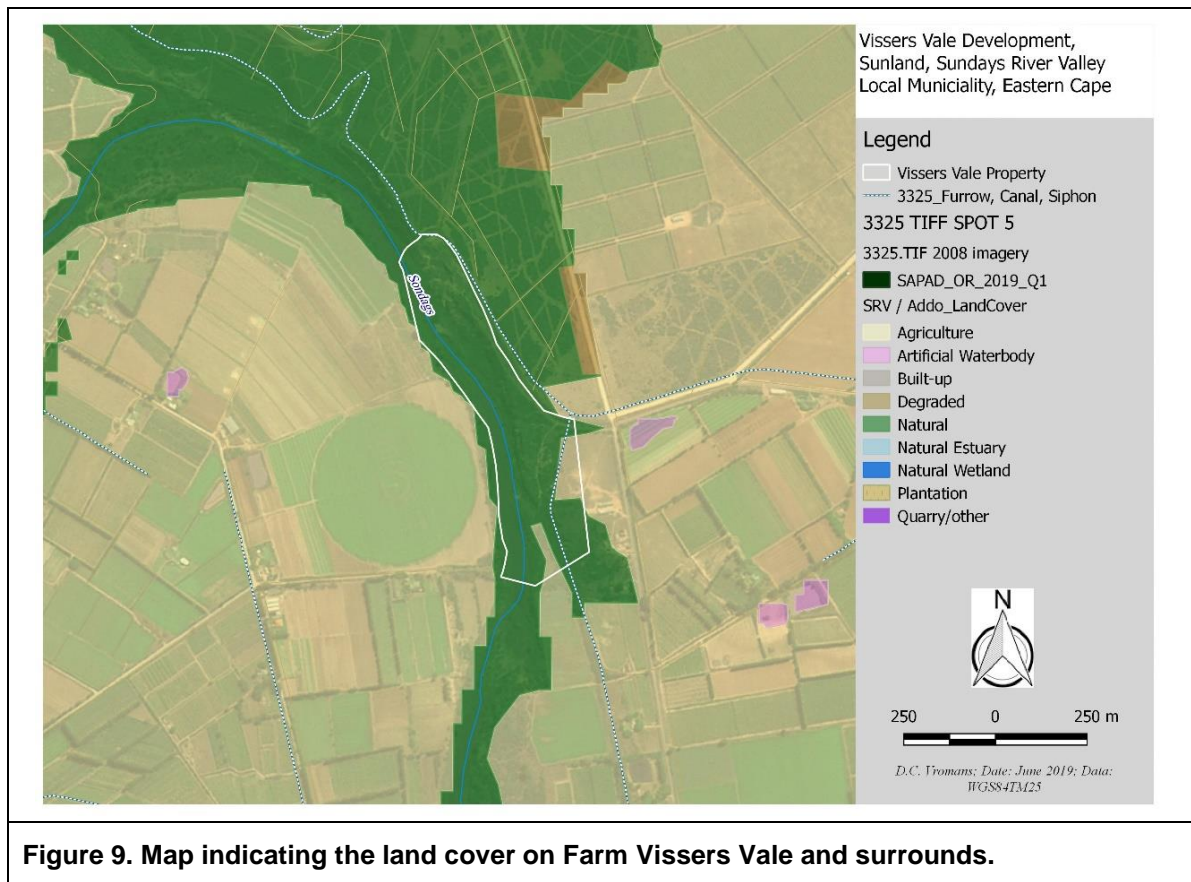
The Sundays River and associated buffers are CBA and/ or ESA (depending on land cover), where these extend beyond the property boundaries (Figure 8 and 9).

**Refer to Skowno and Holness (2012), the technical report, for CBA and ESA classification to understand the approach.**



**Figure 8. Map indicating Critical Biodiversity Area (CBA) and Ecological Support Area (ESA) on Farm Visser's Vale and surrounds.**





### 3.3.1.2. Land Use and Land Use Management Guidelines

- CBAs and ESAs are recommended sites for low impact/ low intensity developments types, not intensive agriculture.
- Supporting infrastructure, such as water supply pipelines, can be conditionally permitted in CBA and ESA (indicated as 'restricted', meaning conditional). This means essential irrigation infrastructure could be permitted if the impact is not significant and will not result in the deterioration of CBA or ESA. Although the land use guidelines state general avoidance of sensitive habitats by infrastructure, such as rivers, crossing for linear infrastructure, such as irrigation pipelines and roads, these cannot always be avoided.
- Other Natural Areas (ONA) and No Natural Areas Remaining (NNR) are favourable sites for development, as long as sustainable development is promoted (ecologically, socially and economically).

### 3.3.1.3. SRV CBA Map relative to the N40E Catchment

#### Motivation for consulting catchment data

Consulting the catchment data allows one to assess cumulative impacts at the strategic level, noting that quaternary catchments are the basic unit for water use management in South Africa i.e. management of rivers and wetlands, which relies on preventing large scale modification (clearing) of natural habitat at the catchment level.

#### N40E quaternary catchment data

According to the GIS statistics (WGS84 TM25), ~ 62 % of the N40E quaternary catchment is designated as Protected Area (PA), CBA and ESA (Table 5, Figure 10). Other Natural Area (ONA) amounts to ~25 % and No Natural Area Remaining (NNR) is ~12.7 %.

In the Sundays River Valley Municipality, the level of transformation in the municipal area is ~13.3 %, while ~24.8 % of the land is formally protected, ~30.6 % is classed CBA, ~22 % is designated as ESA and ~9.4 % is classified as Other Natural Area (Vromans et al., 2012).

**Note: The N40E quaternary catchment is covered largely by the Addo / SRV CBA Map, with a smaller portion in the south covered by the Nelson Mandela Bay Bioregional Plan CBA Map (SRK, 2014), within the latter's jurisdiction.**

**Table 5. CBA Map statistics for the N40E catchment (WGS84 TM25 calculations).**

<b>CBA Map Category</b>	<b>Hectares</b>	<b>Percentage</b>
Protected Area (PA)	851,79	1,7
CBA	10 448,09	20,5
ESA	20 398,59	40,0
Other Natural Area (ONA)	12 812,36	25,1
No Natural Area Remaining (NNR)	6 498,41	12,7
<b>TOTAL N40E CATCHMENT</b>	<b>51 009,24</b>	<b>100</b>
<b>CBA, ESA, PA</b>	<b>31 698,47ha</b>	<b>62%</b>

Vissers Vale Development, Sunland, Sundays River Valley Municipality, Eastern Cape

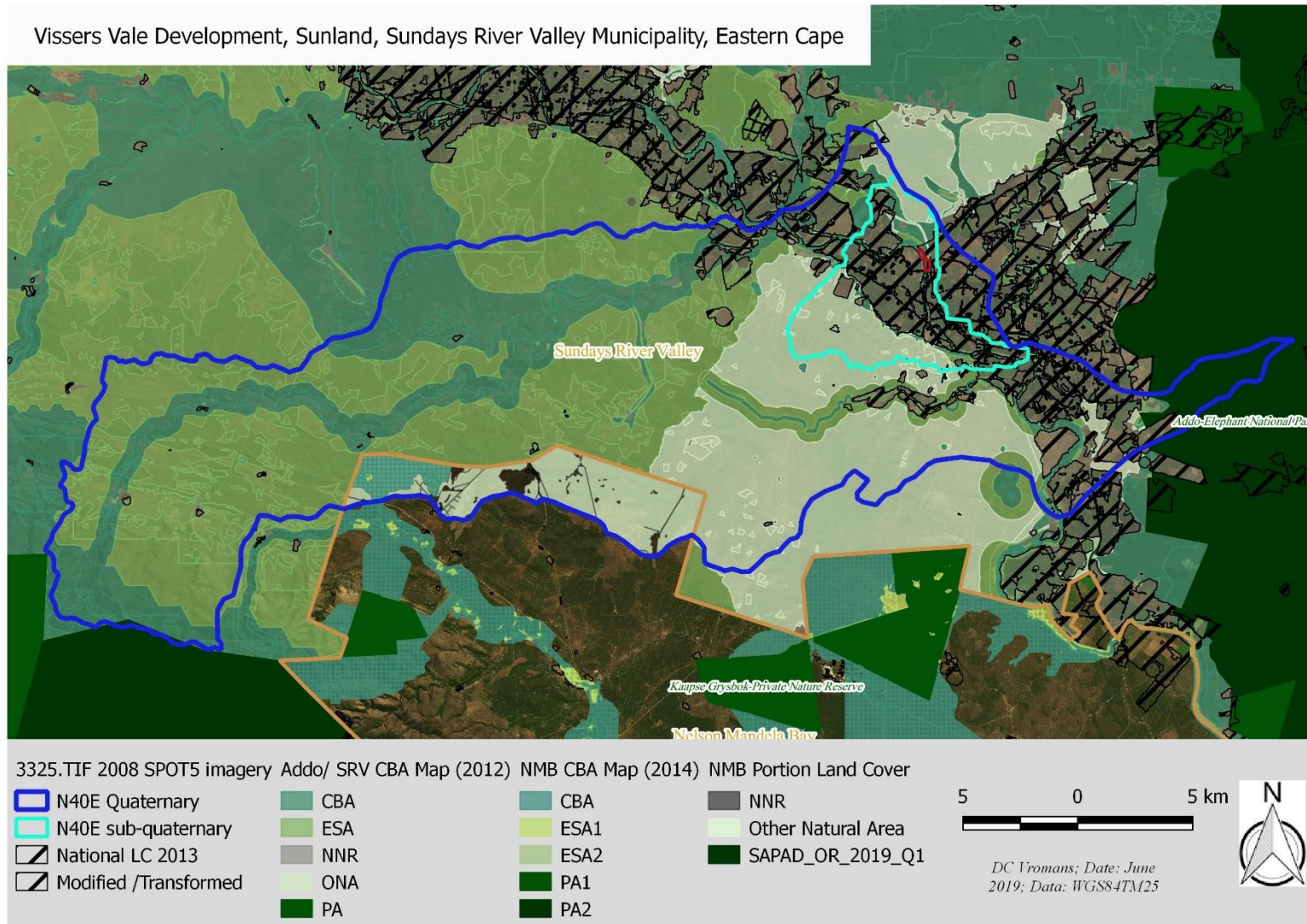


Figure 10. The N40E catchment relative to the property and associated CBA Map categories.



### **3.3.2. The Eastern Cape Biodiversity Conservation Plan (ECBCP) Critical Biodiversity Areas (CBA) Map (2007)**

Although the SRV CBA Map supersedes the ECBCP (refer SANBI BGIS website) and is at a finer scale, the ECBCP must be consulted as it represents the systematic biodiversity plan adopted by the competent authority (DEDEAT), which identifies listed activities requiring Environmental Authorisation in CBA. Furthermore, the ECBCP was consulted for the recommended transformation thresholds for the sub-quadernary catchment (N40E).

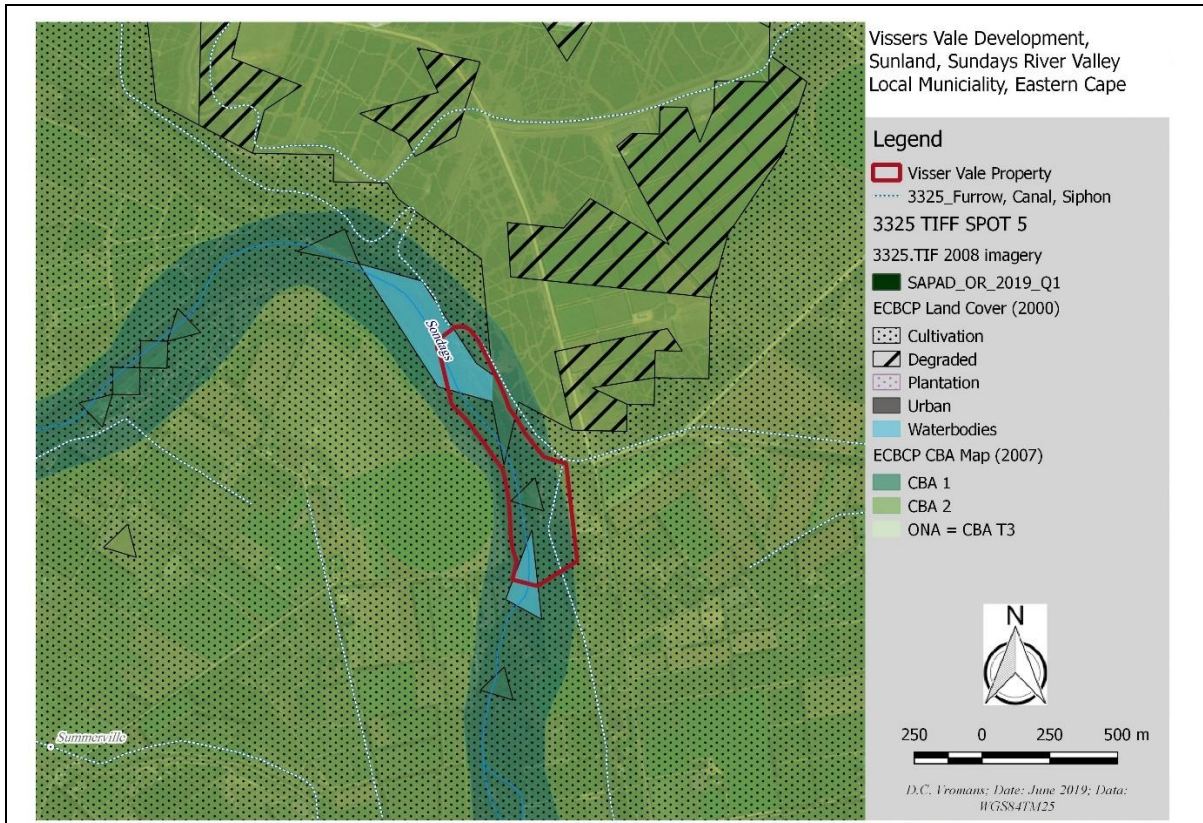
#### **Key limitations of the ECBCP CBA Map**

- i. ECBCP is a provincial scale assessment, with data such as STEP at a scale of 1:100 000, expert mapping at 1:250 000 etc. Ground-truthing is, therefore, required. (Refer 'evaluation' below).
- ii. Land cover reflects patterns around 2000 i.e. it is out-dated.
- iii. The updated NFEPA wetlands data was not available at the time to better reflect wetlands or priority catchments (due to outdated land cover etc.).
- iv. Degradation is not accurately mapped and is an underestimate.
- v. Since the SRV CBA Map is based on the ECBCP, point (iv) of its key limitations also apply (Section 3.3.1).

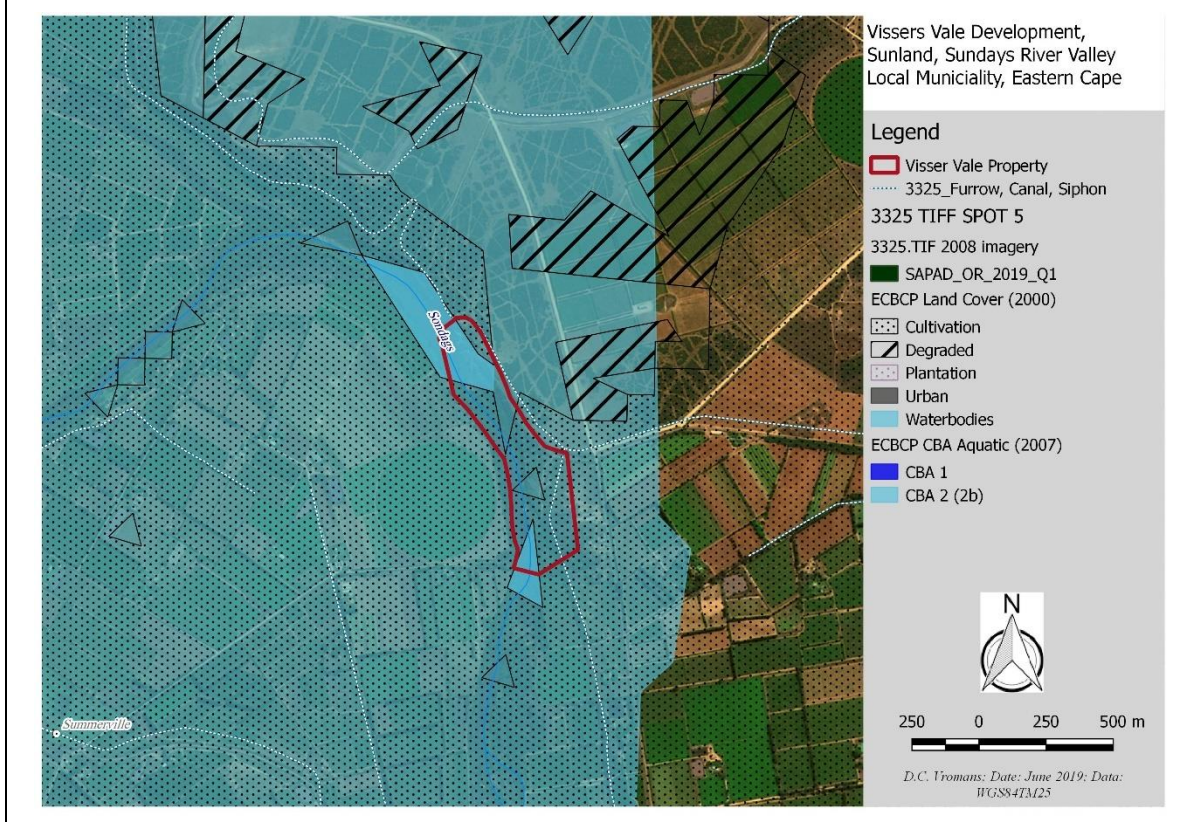
#### **3.3.2.1. ECBCP CBA Map relative to the Farm**

The terrestrial CBA Map, displayed below, classifies the majority of the land to be agriculture (transformed) with limited CBA 1 (Figure 11). These transformed areas that represent agriculture in the ECBCP land cover layer (2000), however are an error. In this case, the Sundays River and associated riparian vegetation should be CBA 1, as well as any vegetation that is Albany Alluvial Vegetation (field verified). This would be in line with the ECBCP criteria. This means that the ECBCP land cover map is an error due to spatial inaccuracies. The land cover is overlaid in Figure 11 below and the CBA 1 status can be discerned 'below'.

In terms of the Aquatic CBAs, the property falls within Aquatic CBA 2 (A2b) (Figure 12). The A2b category is for free flowing rivers/ fish migratory systems. The Sundays River is not a free flowing river and thus must be classified as a fish migratory system.



**Figure 11. The Eastern Cape Biodiversity Conservation Plan (ECBCP) classifies the majority of the farm as CBA 1 (natural), with some urban / transformed land and CBA 1 degraded land.**



**Figure 12. The Eastern Cape Biodiversity Conservation Plan (ECBCP) classifies the natural areas of the farm as Aquatic CBA 2 (2b).**

**3.3.2.2. Land Use and Land Use Management Guidelines**

The land use recommendations for the associated categories are presented in Table 6 below, while the recommended transformation thresholds for Aquatic CBA sub-quaternary catchments is in Table 7.

**Table 6. Terrestrial Biodiversity Land Management Classes (BLMC), Recommended Land Use Objectives and Land Use (Berliner and Desmet, 2007).**

CBA Map Category	BLMC	Recommended Land Use Objective	Recommended Land Use
CBA 1 (natural)	BLMC 1: Natural Landscapes	Maintain biodiversity in as natural state as possible. Manage for no biodiversity loss.	Conservation
CBA 1 (Degraded) CBA 2	BLMC 2: Near Natural Landscapes	Maintain biodiversity in near natural state with minimal loss of ecosystem integrity. No transformation of natural habitat should be permitted.	Conservation, communal livestock and game farming
Other Natural Areas	BLMC 3: Functional Landscapes	Manage for sustainable development, keeping natural habitat intact in wetlands (including wetland buffers) and riparian zones. Environmental authorisations should support ecosystem integrity.	Conservation, communal livestock and game farming, Commercial livestock ranching.  Conditional: Dry land cropping, irrigated cropping, dairy farming, timber, settlement.

Recommended Transformation Threshold (<20%): Aquatic CBA 2b Sub-Quaternary Catchments

The recommended transformation threshold for an Aquatic CBA 2b **sub-quaternary** catchment is <20% of the total area of the sub-quaternary catchment. The generic buffer recommendations, pre-site verification, are also provided in Table 7.

**Table 7. Aquatic CBA with recommended transformation thresholds and aquatic buffers (Berliner and Desmet, 2007).**

CBA MAP CATEGORY	BLMC	RECOMMENDED TRANSFORMATION THRESHOLD
Aquatic CBA 2b	ABLMC 2	<20% of total area of sub-quaternary catchment
AQUATIC FEATURE	GENERIC BUFFER RECOMMENDATION	
Estuaries	No new development below the 5 m contour around an estuary	This would allow for the protection of most important estuarine ecosystem processes and drivers, other than upstream development pressures on estuaries, which are addressed through the catchment transformation thresholds.
Wetlands	50 m	Currently there is no accepted priority ranking system for wetlands. Until such a system is developed, it is recommended that a 50 m buffer be set for all wetlands.
Mountain streams and upper foothills of all 1:500 000 rivers	50 m	These longitudinal zones generally have more confined riparian zones than lower foothills and lowland rivers and are generally less threatened by agricultural practices.
Lower foothills and lowland rivers of all 1:500 000 rivers	100 m	These longitudinal zones generally have less confined riparian zones than mountain streams and upper foothills and are generally more threatened by agricultural practices. These larger buffers are particularly important to lower the amount of crop-spray reaching the river.



<p>All remaining 1:50 000 streams</p>	<p>32 m</p>	<p>Generally smaller upland streams corresponding to <b>mountain streams and upper foothills</b>, smaller than those designated in the 1:500 000 rivers layer. They are assigned the riparian buffer required under South African legislation.</p> <p><b><i>Important definitions to consider are therefore:</i></b>  <i>Mountain Streams</i> are characterised by steep-gradients dominated by bedrock and boulders, locally cobble or coarse gravels in pools; reach types include cascades, bedrock fall, step-pool; approximately equal distribution of 'vertical' and 'horizontal' flow components. Characteristic gradient is 0.04–0.99 (SANBI, 2009).  <i>Upper Foothill Rivers</i> are characterised by moderately steep, cobble-bed or mixed bedrock-cobble bed channels, with plain-bed, pool-riffle or pool-rapid reach types; length of pools and riffles/rapids is similar. Characteristic gradient is 0.005–0.019 (SANBI, 2009).  <i>River channels:</i> These are comprised of an active channel - a channel that is inundated at sufficiently regular intervals to maintain channel form and keep the channel free of established terrestrial vegetation. These channels are typically filled to capacity during bankfull discharge (i.e. during the annual flood, except for intermittent rivers that do not flood annually) (SANBI, 2009).</p>
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### 3.3.2.3. ECBCP CBA Map relative to the N40E Catchment

As indicated above, the property falls within a sub-quaternary catchment (of N40E), which is classified as Aquatic CBA 2b (Figure 12).

#### Quaternary Catchment N40E

Given the Aquatic CBA 2b, this means that **less than 20 %** of the total area of the sub-quaternary catchment can be modified (transformed) (Berliner and Desmet, 2007). The farm is near-natural to degraded thicket, with some modification (transformation) (Section 4.4, Table 14). Refer Section 4.4.2, Table 15 which indicates that approximately 13.21 % of the quaternary catchment N40E has already been modified, while 6 % has been degraded. This suggests that the catchment is still within the ECBCP transformation thresholds, based on the available data.

The development footprint is approximately **5.5 ha (which is an over-estimate)**. This would increase the total modified area of the quaternary catchment N40E to 13.21 % / 15.3 % (Refer Section 4.4.2, Table 15).

#### Sub-Quaternary Catchment of N40F

The percentage modification in the sub-quaternary catchment will be raised from 46.24 % to 46.25 / 46.33 % (See Section 4.4.2, Table 15). The transformation threshold has already been modified. Since the Sundays River Valley is an agricultural hub, this is expected.

#### Other transformation thresholds

Both the Sundays River Valley CBA Map and the NFEPA map do not recommend the use of catchment transformation thresholds. However; and in contrast to the above, studies by Allan (2004) showed that streams in agricultural catchments usually remain in a good condition until the coverage of agriculture in the catchment exceeds 30 % -50 % (Driver et al., 2012 – NFEPA Implementation Manual) (Section 3.1.2).

### 3.3.3. The Maputoland-Pondoland-Albany (MPAH) Hotspot Biodiversity Conservation Plan, 2010

The Maputoland-Pondoland-Albany Hotspot (MPAH) extends from Mozambique to Jeffreys Bay, including the majority of Swaziland. The MPAH systematic conservation plan mapped 72 key

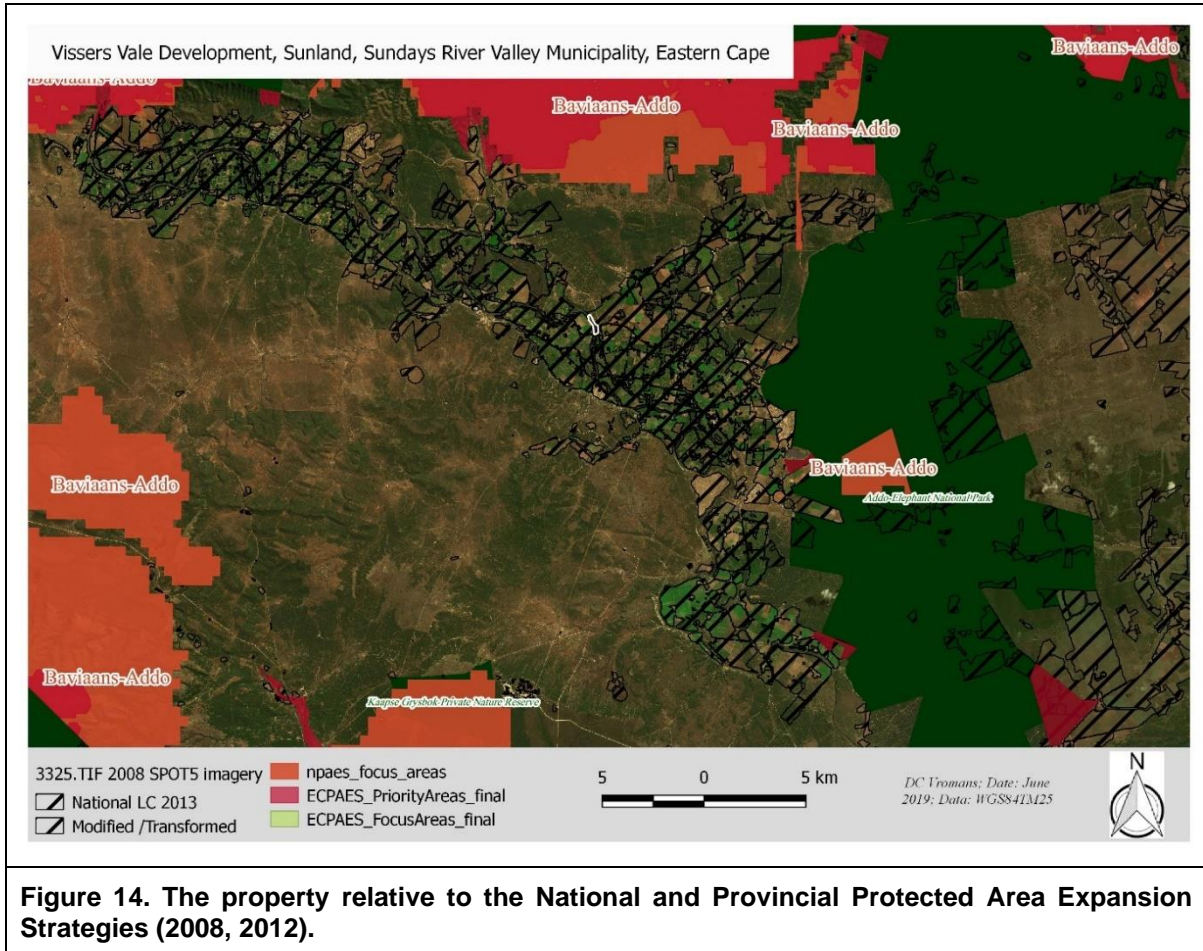


Expansion Strategy. The Farm is situated approximately ~6km south-westward of the Addo Elephant National Park (AENP) boundary, and thus the protected area expansion strategy maps were consulted.

**3.3.4.1. Expansion areas relative to the Farm**

- The property does not fall within a focus area (Figure 14).

Note: The SRV CBA Map demarcated Priority Natural Areas for expansion of the AENP, which represent CBA. These areas are not identified on the Farm.



**3.3.5. The National Strategy on Buffer Zones for National Parks (2012)**

The National Strategy on Buffer Zones for National Parks sets out a strategy for the establishment and management of buffer zones around national parks, in order for South African National Parks to better meet their objectives. The Addo Elephant National Park Management Plan (2015 – 2025) has thus identified a buffer zone around the park. The park buffer zone consists of three categories, namely: Priority Natural Area, Catchment Protection Area and Viewshed Protection Area.

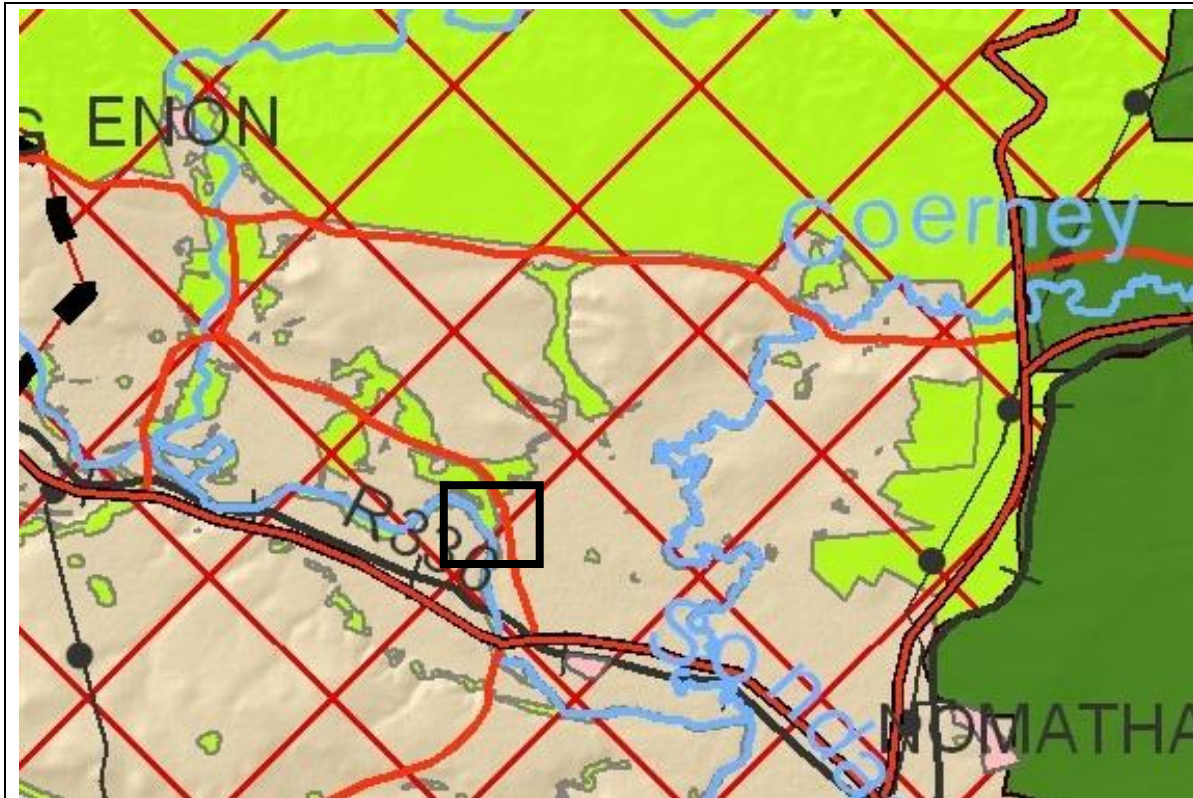
Priority Natural Areas are key pattern and process areas that are required for the long-term persistence of biodiversity in and around the park, which includes future park expansion areas. Catchment Protection Areas are important for maintaining key hydrological processes within the park. Viewshed Protection Areas are located where new developments are likely to impact on the aesthetic quality of the visitor’s experience in the park. These do not form part of this ecological assessment.



According to the AENP Management Plan, the buffer zone guides the park to assess, and where necessary, respond to EIAs where land use changes could impact on the park (SANParks, 2015). The Addo Elephant National Park (AENP) buffer zones relative to the Farm

The farm falls within the AENP Viewshed Protection Area; and appears to fall within (or partially within) Priority Natural Area (Figure 15). The Buffer Zone shapefiles are not available to analyse.

Viewshed protection areas are only broadly indicative of sensitive areas, as many areas within this zone, at the fine-scale, would be perfectly suited for development (AENP, 2015-2025). These areas however are not a subject of this ecological assessment.



**Figure 15. The Addo Elephant National Park Buffer Zone relative to the Farm (black square).**



## 4. SECTION 4: RESULTS OF GROUND-TRUTHING

### 4.1. BIOPHYSICAL ENVIRONMENT: GENERAL CLIMATE, TOPOGRAPHY AND GEOLOGY

**Climate** data supplied by MacFarlane and Bredin's (2017) buffer tool, indicates that the area receives up to 400 mm of rainfall per annum; while the mean annual temperature is 19 °C. According to the Sundays Estuary Management Plan, rainfall in the southern portion of the Sundays River catchment peaks in late autumn and winter, with an average of 400 to 1000 mm. Climate data via the internet indicates that Kirkwood (closest town) has a local steppe climate, which according to the Köppen-Geiger climate classification is BSh. It receives approximately 333 mm of rainfall per annum; and the average annual temperature is 19 °C (<https://en.climate-data.org/>).

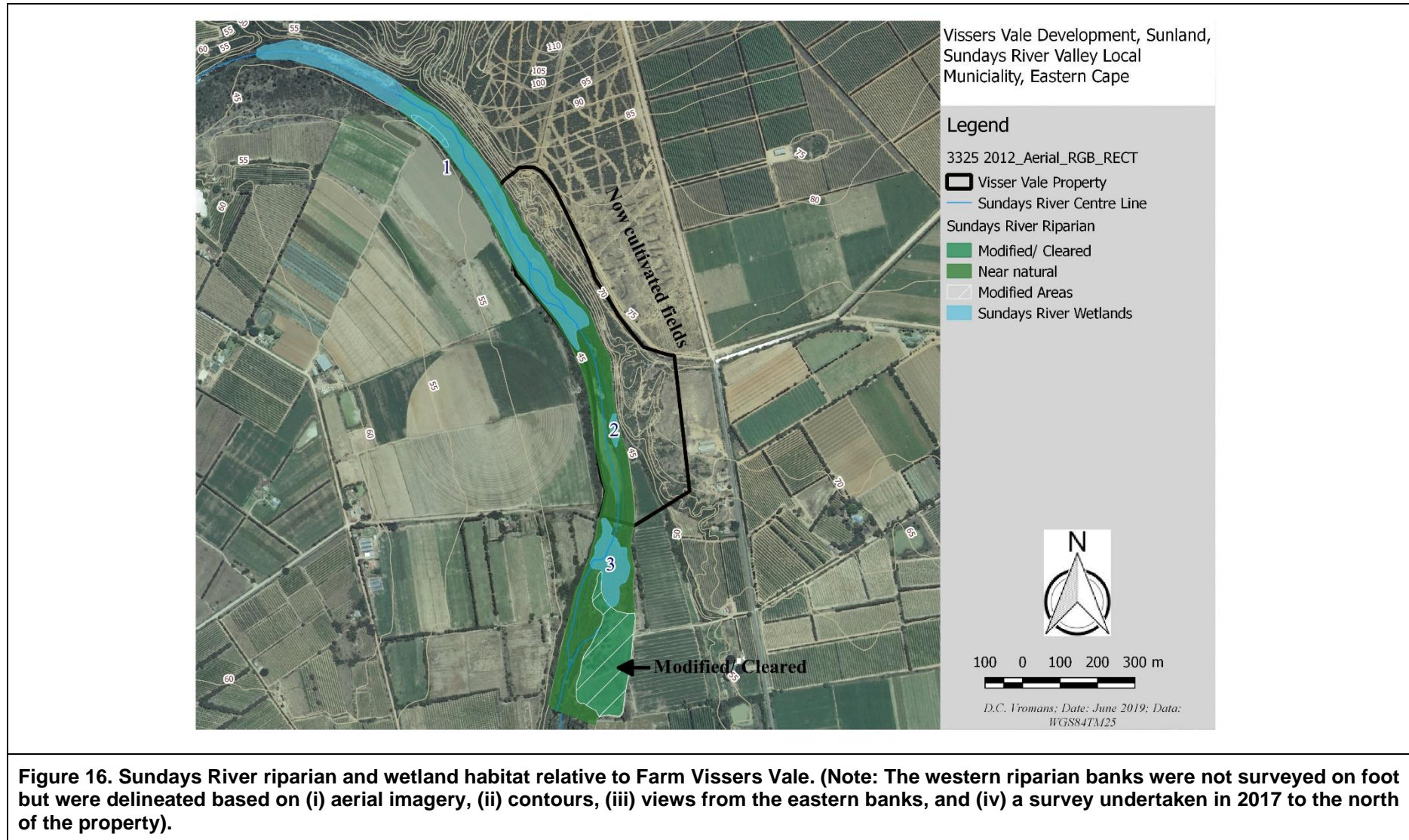
**The topography** of the property is complex, with plateau areas at the higher lying contours, with very steep to vertical slopes leading down to the Sundays River. A series of small valley inclines and ridges occur to the south-east of the property. The steep inclines are subject to severe erosion.

**The predominant geology** of the property is alluvium along the Sundays River, according to the 1:250 000 Geological Series Map (Port Elizabeth 3324). The 1:100 000 lithology describes the geology as the Sundays River Formation (Uitenhage Group), comprising of grey shale, siltstone and sandstone (K-s). Refer to the soil analysis report for more detail regarding soil groups.

### 4.2. RESULTS: AQUATIC SURVEY - SITE ASSESSMENT OBSERVATIONS

**The field survey concluded the following (Figure 16):**

- The Sundays River, with riparian habitat, lies within 15 m horizontally and a few metres vertically of the proposed agriculture / pastures. The riparian habitat is supported on the steep embankments which terminate at approximately the 45 m contour, where the topography generally flattens out.
- The Sundays River, with riparian habitat, lies 52 m (plus) horizontally and 25 m (plus) vertically of the proposed chalets and residence (closest points).
- Wetlands are associated with the Sundays River i.e. within 500 m of the proposed development.



#### 4.2.1. Sundays River: Riparian and Wetland Delineation and Characterisation

The stretch of river surveyed measured approximately 930 m along the eastern banks and higher lying contours (Figure 20). It should be noted however that access to the water's edge was limited to two localities along the Sundays River. In addition, a third survey point was undertaken in February 2017 for another EIA project (Ikamva Lethu Farms Pty Ltd).

Lack of access along the entire stretch of the Sundays River was due to impenetrable vegetation and steep inclines. In addition, access to neighbouring properties, to the south, was also not possible. Thus, aerial imagery, contour information and GIS software was used to delineate the riparian and wetland habitat. The views from the higher contours and the available access points to the water's edge, made surveying and extrapolation to non-surveyed areas possible, although some error should be expected at the fine scale.

#### Sundays River and Wetland Classification

The Sundays River is classified as perennial, lower foothill river. The associated reach is characterised by mixed alluvial substrate with bedrock, including wetland and riparian habitat. See Section 4.2.1.1, (Table 8) for the national classification.

Associated wetlands are floodplain wetlands (See Table 9).

#### Riparian Vegetation

Vegetation along the Sundays River included a band of *Phragmites australis* reed bed which narrowed and widened at different points along the river stretch surveyed. The riparian habitat included a fairly large band of vegetation dominated by *Vachellia (Acacia) karroo*, representing the non-marginal zone. The non-marginal zone extended up to approximately the 45 m contour, where the slope gradient was steeper. *V. karroo* was thus the riparian indicator species, although not an obligate.

Some sections, and particularly on the western embankment, the non-marginal zone falls along very steeply incised river banks. Other species that were interspersed within the *V. karroo* dominated riparian zone included *Roepora (Zygophyllum) morgsana*, *Searsia longispina*, *S. pallens*, *Azima tetracantha*, *Hypoestes forskalii*; and the climber *Cynanchum elliptica*, as well as *Suaeda fructosa*.

The marginal zone comprised of *P. australis* (dominant species), *Cyperus textilis* (endemic but widespread), *Juncus acutus*, *Berula erecta*, *Persicaria attenuata*, *Rumex lanceolata*, *Suaeda fructosa*, *Schoenoplectus scirpoides*, *Typha capensis* and *Sporobolus virginicus*. *Atriplex lindleyi* was also common.

The aquatic submerged plant, *Potamogeton pectinatus*, was also recorded, while large patches of the alien invasive red water fern, *Azolla filiculoides*, were notable in the water, floating at the surface.

The alien invasive plants that were also recorded included *Arundo donax*, *Eucalyptus grandis* and *Tamarix ramosissima*.

#### Wetland Vegetation

Wetland habitat was present where the *Phragmites australis* reed bed tended to increase in extent or the floodplain widened, although still relatively narrow; and were bedrock dominated. The marginal zone species were equivalent to the wetland species. Plants were growing in soil depths of as little as 10 cm above the bedrock.

#### Soils

Soils were inundated or saturated in the reed bed. In the slightly higher lying less moist areas, mottling was observed.

**Riverine and Wetland Fauna**

The MPAH species of special concern data does not map any threatened wetland species within the 3325BC quadrat.

Although not threatened, the Brown Water Snake (*Lycodonomorphus rufulus*) is endemic to southern Africa and is restricted to areas with permanent water; and is very likely to inhabit areas adjacent to permanent rivers and streams, such as the Sundays River. It is also known to frequent dams.

Water Monitors (*Varanus niloticus*), which are Least Threatened, are likely to utilize the river.

Refer to Section 3.3.1 (available fish data). In this regard, the Near Threatened Mozambique Tilapia and Endangered Eastern Cape Redfin are considered to inhabit the Sundays River (by the NFEPA data). However, based on habitat preference of the Eastern Cape Redfin, it is considered unlikely to inhabit the lower reaches of the Sundays River.

Numerous birds will utilize the Sundays River, for example those observed during the field survey, namely: Fish Eagle, Cormorant, Heron, Yellow Billed Duck, Egyptian Geese etc.

Numerous frogs have been recorded in the 3325BC quadrat by the Animal Demography Unit, none of which are threatened however. The recorded frog species include:

<b>Genus</b>	<b>Species</b>	<b>Common Name</b>	<b>Conservation Status</b>
<i>Breviceps</i>	<i>adpersus</i>	Bushveld Rain Frog	Least Concern
<i>Breviceps</i>	<i>verrucosus</i>	Plaintive Rain Frog	Least Concern
<i>Bufo</i>	<i>pardalis</i>	Eastern Leopard Toad	Least Concern
<i>Bufo</i>	<i>rangeri</i>	Raucous Toad	Least Concern
<i>Cacosternum</i>	<i>boettgeri</i>	Boettgers Caco	Least Concern
<i>Cacosternum</i>	<i>nanum</i>	Bronze Caco	Least Concern
<i>Hyperolius</i>	<i>marmoratus</i>	Painted Reed Frog	Least Concern
<i>Kassina</i>	<i>senegalensis</i>	Bubbling Kassina	Least Concern
<i>Phrynobatrachus</i>	<i>natalensis</i>	Snoring Puddle Frog	Least Concern
<i>Afrana</i>	<i>angolensis</i>	Common River Frog	Least Concern
<i>Afrana</i>	<i>fuscigula</i>	Cape River Frog	Least Concern
<i>Semnodactylus</i>	<i>wealii</i>	Rattling Frog	Least Concern
<i>Strongylopus</i>	<i>fasciatus</i>	Striped Stream Frog	Least Concern
<i>Strongylopus</i>	<i>grayii</i>	Clicking Stream Frog	Least Concern
<i>Tomopterna</i>	<i>delalandii</i>	Cape Sand Frog	Least Concern
<i>Xenopus</i>	<i>laevis</i>	Common Platana	Least Concern



Plate 1. Photographic images of the Sundays River and associated wetlands

Photographs taken 20 and 21 May 2019



1.1. Photograph looking southwards towards the Sundays River (near southern end of property). Note the transformed / modified to the left (east) of the river banks. Note the large patches of the alien invasive red water fern, *Azolla filiculoides*, floating at the surface.



1.2. Photograph looking towards the Sundays River (from the same point as photo above). Wetland habitat (no. 1) is located along the eastern banks below this point. Note the large patches of the alien invasive red water fern, *Azolla filiculoides*, floating at the surface.



Photographs taken 20 and 21 May 2019



1.3. Just north of midway of the property, looking towards the Sundays River below, and associated wetland (no. 1). Note the high density of *Phragmites australis*.



1.4. Photograph looking northwards, from the same point of the photograph above (just north of midway of the property).



Photographs taken 20 and 21 May 2019



1.5. Photograph of severe erosion on the steep slopes above the Sundays River (at the northern end of the property). Note the old concrete canal, which is broken.



1.6. View from northern end of property, looking downstream (southwards), with view of bottom-end of wetland no. 1. Note the high prevalence of *Eucalyptus grandis* along the river banks.



Photographs taken 20 and 21 May 2019



1.7. Example of the riparian habitat along steep bank inclines (at the southern end of the property) i.e. comprised of a relatively narrow steep band of reeds.



1.8. Example of the riparian habitat along the steep inclines leading down towards the Sundays River, from about the 45m contour, dominated by *Vachellia karroo* (at the northern end of the property), with wetland habitat closer to the waters edge.



Photographs taken 20 and 21 May 2019



1.9. Example of saturated soils (wetland no. 1), taken from within a patch of *Sporobolus virginicus* grass.



1.10. View from wetland (no. 1), at the sampling site, looking up towards the verticla inclines with severe erosion. Note the band of *Vachellia karroo* representing the riparian habitat, with *Saedua fruticosa* interspersed with *Sporobolus virginicus* representing the wetland habitat; in the foreground. The dead trees are the alien invasive plant, *Tamarix ramosissima*. The soil conditions being too saturated /moist for the tree to survive.



Photographs taken 20 and 21 May 2019



1.11. View of wetland no. 1 (sample area) from the higher contours, with the *Vachellia karroo* dominated riparian habitat in the foreground. Note the extensive bedrock. A patch of *Arundo donax* was observed along the western banks (which are taller and greener in this photo).



1.12. View of wetland no. 2, looking downstream / southwards from slightly elevated contours.



Photographs taken 20 and 21 May 2019



1.13. Example of wetland no. 1 soil sample (gleyed and mottled conditions).

#### 4.2.1.1. River and Wetland Classification

The National Wetland Classification System (SANBI, 2009; Ollis et al., 2013) methodology was followed to classify the Sundays River (Table 8) and associated wetland habitat (Table 9).

**Table 8. Summary table of the classification of the Sundays River according to the national wetland classification system (SANBI, 2009; Ollis et al., 2013)**

CRITERIA		Sundays River
<b>LEVEL 1: SYSTEM</b>	CONNECTIVITY TO OPEN OCEAN	Inland
<b>LEVEL 2: REGIONAL SETTING</b>	ECO-REGION	South Eastern Coastal Belt
<b>LEVEL 3: LANDSCAPE UNIT</b>	LANDSCAPE SETTING	Valley Floor
<b>LEVEL 4: HYDROGEOMORPHIC (HGM) UNIT</b>	HGM TYPE (A)	Channel
	LONGITUDINAL ZONATION (B)	Lower Foothill River
	DRAINAGE OUTFLOW (C)	Not applicable
	DRAINAGE INFLOW (D)	Not applicable
<b>LEVEL 5: HYDROLOGICAL REGIME (&amp; DEPTH OF INUNDATION)</b>	FLOW REGIME	Perennial
<b>LEVEL 6: WETLAND CHARACTERISTICS (DESCRIPTORS)</b>	6A) GEOLOGY	Alluvium and bedrock
	6B) NATURAL VS. ARTIFICIAL	Natural
	6C: VEGETATION COVER TYPE a) Cover	Vegetated
	b & c) Vegetation Form	<u>Includes a combination of:</u> Aquatic – rooted.



CRITERIA		Sundays River
		Herbaceous – grasses, sedges, reeds, salt marsh Thicket.
	d) <i>Vegetation Status</i>	Largely indigenous, but some aliens
	6D) <i>SUBSTRATUM</i>	Silt and mud with bedrock, some gravel
	6E) <i>SALINITY</i>	Saline
	6F) <i>ACIDITY/ALKALINITY</i>	Alkaline

Table 9. Summary table of the classification of the wetlands associated with the Sundays River according to the national wetland classification system (SANBI, 2009; Ollis et al., 2013)

CRITERIA			WETLANDS 1 - 3
<b>LEVEL 1: SYSTEM</b>	<i>CONNECTIVITY TO OPEN OCEAN</i>		Inland
<b>LEVEL 2: REGIONAL SETTING</b>	<i>ECO-REGION</i>		South Eastern Coastal Belt
<b>LEVEL 3: LANDSCAPE UNIT</b>	<i>LANDSCAPE SETTING</i>		Valley floor
<b>LEVEL 4: HYDROGEOMORPHIC (HGM) UNIT<sup>4</sup></b>	<i>HGM TYPE</i>	A	Floodplain
	<i>LONGITUDINAL ZONATION / LANDFORM</i>	B	Flat
	<i>DRAINAGE - UTFLOW*</i>	C	Not applicable
	<i>DRAINAGE - INFLOW*</i>	D	Not applicable
<b>LEVEL 5: HYDROLOGICAL REGIME (&amp; DEPTH OF INUNDATION)</b>	<i>5A: DEPTH OF INUNDATION: Permanent /Seasonal/ Intermittent/ Unknown</i>		Unknown, probably seasonal
	<i>5B: SATURATION PERIODICITY Permanent /Seasonal /Intermittent/ Unknown</i>		Permanently waterlogged
<b>LEVEL 6: WETLAND CHARACTERISTICS (DESCRIPTORS)</b>	<i>GEOLOGY/SOILS:</i>		Alluvium and bedrock
	<i>NATURAL / ARTIFICIAL</i>		Natural
	<i>VEGETATION</i>		Reeds, sedges, grasses, salt marsh
	<i>SUBSTRATUM</i>		Silt and mud with bedrock, some gravel
	<i>SALINITY</i>		Saline
<i>ACIDITY/ALKALINITY</i>			Alkaline
<b>Dominant hydrological characteristics for the HGM unit (SANBI, 2009)</b>			
<b>Inputs</b>	Channel overspill during flooding (predominantly), but there could also be some overland flow from adjacent valley-side slopes (if present) and lateral seepage from adjacent hillslope seeps (if present)		
<b>Through- puts</b>	Diffuse surface flow, interflow, temporary containment and storage of water in depressional areas, possible short-lived concentrated flows during flooding events		
<b>Outputs</b>	Diffuse surface flow and interflow into adjacent channel infiltration and Evaporation (particularly from depressional areas)		
<b>Dominant hydrodynamics for the HGM unit (SANBI, 2009)</b>			
<b>Dominant hydrodynamics</b>	Horizontal: bidirectional; limited vertical: bidirectional (mostly in depressions)		

<sup>4</sup> The hydro-geomorphic (HGM) unit, which is defined on the basis of the geomorphic setting (e.g. hillslope or valley-bottom; whether drainage is open or closed), water source (surface or sub-surface water dominated) and pattern of water flow through the wetland (i.e. diffuse or channelled) (McFarlane et al., 2008).

#### **4.2.1.2. Present Ecological State (PES)**

The latest PES rating for the stretch of the Sundays River is **Largely Modified (Class D)** (Van Deventer et al., 2018).

##### **4.2.1.2.1. Land use activity impacts along the stretch of river surveyed for this assessment**

The stretch of river surveyed measured ~930 m along the eastern banks, although noting that access to the water's edge was impossible below the 45 m contour for much of the stretch.

The entire stretch of the western embankments supports intensive cultivation; within metres of the 45 m contour. Along the eastern embankments, approximately 86 % (1200m of 1500m) is cultivated, either at/ above the 45 m contour or 70 m. The associated impacts would include pollution from pesticides and fertilizers, as well as increased sedimentation and erosion due to proximity to the river banks.

The alien invasive plant, *Eucalyptus grandis*, is prevalent along the banks of the river. At minimum 23 % of the embankments support this large tree (i.e. in terms of coverage digitized for this assessment). *Arundo donax*, the alien reed, was also recorded as a patch near the sample area of wetland no. 1. Large patches of the alien invasive red water fern, *Azolla filiculoides*, were notable in the open water, floating at the surface.

Erosion is severe along portions of the western slopes. This is exacerbated by the old concrete canal which runs along the north-eastern boundary of the property. In fact, the canal has broken at the north-western extreme, where stormwater run off would discharge from the old canal during high rainfall periods. This is of concern and should be addressed by the relevant Authority.

Some clearing for recreational purposes, or access to the river, has also been undertaken.

**From a riparian PES perspective, the Largely Modified state is considered accurate.**

##### **4.2.1.3. Ecological Importance and Ecological Sensitivity**

The ecological importance and ecological sensitivity are both **Moderate** (DWS, 2014).

##### **4.2.1.4. Section 21c and 21i Water Use License Application or General Authorisation – Sundays River Riparian and Wetlands**

The proposed development falls within the regulated area of a watercourse (wetlands) i.e. in terms of the delineated wetland habitat. Therefore, Section 21c and 21i applies to the wetlands along the Sundays River.

#### **4.2.2. Aquatic Buffer Recommendations**

##### **4.2.2.1. Generic Buffers Indicated for Each Province and Other**

According to the NEMA Regulations and the Eastern Cape Biodiversity Conservation Plan (ECBCP; Berliner and Desmet, 2007), a 32 m aquatic buffer is required and recommended around 1:50 000 watercourses (streams/ rivers), while 50 m is recommended by the ECBCP as the generic buffer around wetlands (without field verification and on-site buffer determinations). Buffer determination is usually based on ecological importance and sensitivity, amongst other factors (Macfarlane et al., 2009).

According to South African legislation, a range of buffer recommendations are provided, as indicated in the table text below.

<b>National/ Provincial/ Department</b>	<b>Watercourses</b>	<b>Wetlands</b>
Eastern Cape	<ul style="list-style-type: none"> <li>• 100m (large floodplain river)</li> <li>• 50m (mountain streams and upper foothill river)</li> <li>• 32m (remaining 1:50 000 streams)</li> </ul> (generic without on site assessment)	<ul style="list-style-type: none"> <li>• 50m</li> </ul> (generic without on site assessment)
Mpumalanga		<ul style="list-style-type: none"> <li>• 20m (natural areas)</li> <li>• 30m (urban areas)</li> </ul>
KwaZulu-Natal	<ul style="list-style-type: none"> <li>• 45m (Low intensity industrial)</li> <li>• 70m (High intensity industrial)</li> </ul>	<ul style="list-style-type: none"> <li>• 15m – 20m</li> <li>• 50m (Low intensity industrial)</li> <li>• 75m (High intensity industrial)</li> </ul>
Gauteng	<ul style="list-style-type: none"> <li>• 32m (urban)</li> <li>• 100m (rural)</li> </ul>	<ul style="list-style-type: none"> <li>• 30m (urban)</li> <li>• 50m (rural)</li> </ul>
Department of Forestry		<ul style="list-style-type: none"> <li>• 20m</li> </ul>
National Department of Environmental Affairs	<ul style="list-style-type: none"> <li>• 32m</li> </ul> (NEMA, 107 of 1998)	
City of Cape Town	<ul style="list-style-type: none"> <li>• 10m – 40m (urban)</li> </ul>	<ul style="list-style-type: none"> <li>• 10m – 75m</li> <li>• 32m - 75m or greater (CBA &amp; Critical ESA wetlands)</li> <li>• 10m (Other ESA Wetlands)</li> </ul>
National Freshwater Ecosystem Priority Areas assessment (Nel et al., 2011)	River FEPAs <ul style="list-style-type: none"> <li>• 100m (generic without on site assessment)</li> </ul>	Wetland FEPAs <ul style="list-style-type: none"> <li>• 100m (generic without on site assessment)</li> </ul>
Nelson Mandela Bay Municipality	As per the ECBCP	Bioregional Plan CBA wetlands: <ul style="list-style-type: none"> <li>• 75m – 200m (depending on rank and size), e.g:</li> <li>• Rank 1 &amp; &gt;20ha = 200m</li> <li>• Rank 2 &amp; &gt;20ha = 150m</li> </ul>

Various buffer widths have been researched and recommended. Table 10 below provides a synthesis of these studies for the key functions the buffer will provide (Macfarlane et al., 2009; Macfarlane et al., 2014). The recommended buffer widths vary greatly, and depend on site conditions (e.g. vegetation type, slope, soil types, land use activities), with birds requiring relatively large buffer areas in order to reduce impacts. The most frequently recommended minimum buffer zone width is 15m wide, according to a literature review by Macfarlane et al (2014) (Table 11).

**Table 10: A synthesis of these studies for the key functions the buffer will provide (Macfarlane et al., 2009 and Macfarlane et al., 2014).**

Function	Macfarlane et al. (2009)		Macfarlane et al. (2014)
	Minimum Widths	Maximum Widths	Efficiency Widths
Nutrient removal	4.6m – 260m	7m – 260m (nitrogen)/ 100m (phosphates)	High level of buffer efficiency < 20m but very wide buffers may be needed for high risk situations
Sediment removal (erosion)	1m – 100m	10m – 61m (sediment)/ 122 m (clay)	Sedimentation & turbidity: 2m – 50m
Removal of pathogens (faecal coliforms, salmonella)	3.8m – 50m	3.8m – 50m	2m - 30m
Removal of toxics (pesticides)	2m – 50m	18m – 50m	High levels of buffer efficiency < 20m but up to 80m for high risk situations
Water temperature and microclimate control	5m – 40m	15.2m – 60m	Not applicable
Buffer widths for wetland species for high intensity impacts	30m	100m	
Buffer widths for wetland species for low intensity impacts	15m	30m	
Wetlands that are a significant feature in the landscape or support rare, threatened or endangered species.	75m	300m	
<i>Kniphofia leucocephala</i> (Critically Endangered) or <i>Kniphofia latifolia</i> (Endangered) (selected species not in study area).	200m	600m	
Maintaining habitat for semi-aquatic biota – Amphibians (selected species <u>not</u> in study site, e.g. Giant Bullfrog buffer: 500 m – 1 000 m) (selected species not in study area).	30m – 60m	50m – 1 000m	
Maintaining habitat for semi-aquatic biota – Birds (bird / waterfowl diversity correlated with these buffers) – not South African studies.	15m – 35m	15m – 95m	
Maintaining habitat for semi-aquatic biota – Birds (Blue Swallow, African Marsh Harrier, White Backed Night Heron, Grey Crowned Crane, Half-collard Kingfisher, African Finfoot) - South African studies.	65m – 2 200m	65m – 2 200m (Marsh Harrier 350m)	
Maintaining habitat for semi-aquatic biota – to maintain species diversity (general)	3m – 30m	22m – 110m	
Maintaining habitat for semi-aquatic biota – dragonflies (KZN study)	30m	-	

**Table 11: Review of different buffer types and the recommended minimum buffer zone widths (Macfarlane et al., 2014).**

Buffer type	Minimum Width	Reference (cited in Macfarlane et al. (2014)
Vegetated filter strip	30m	Barling & Moore, 1994
Vegetated filter strip	11m	Corbert et al., 1978



Buffer type	Minimum Width	Reference (cited in Macfarlane et al. (2014))
Vegetated filter strip	20m	Department of Conservation & Environment, 1990
Forested riparian buffer	15m	Blinn & Kilgore, 2001
Forested riparian buffer	15m	Bray, 2010
Grass filter strip and vegetated buffer	35m	Hansen et al., 2010
Vegetated filter strip	5m	Hawes & Smith, 2007
Vegetated filter strip	20m	Ives et al., 2005
Vegetated filter strip	15m	Lee et al., 2004
Vegetated filter strip	10.7m	Lowrance et al., 2001
Vegetated filter strip	50m	Mayer et al., 2007
Forested buffer strip	15m	Palone & Todd, 1997
Vegetated filter strip	27m	Parkyn, 2004
Vegetated filter strip	10m	Parkyn et al., 2000
Vegetated filter strip	30m	Castelle et al., 1994
Vegetated filter strip	45m	Brosofske et al., 1997
Forested buffer strip	9m	Schultz et al., 2004
Grass filter strip and vegetated buffer	15m	Semlitsch & Bodie, 2003
Vegetated filter strip	15m	Technology Associates, 2010
Forested buffer strip	11m	Tjaden & Weber, 1998
Riparian buffer strip	15m	Wegner, 1999
Hardwood buffer	15m	Woodard & Rock, 1995
Vegetated filter strip	25m	Young et al., 1980

#### 4.2.2.2. Buffer Tool Guideline (Macfarlane and Bredin, 2017)

A 1:100 year flood line is not available for this stretch of the Sundays River.

The MacFarlane and Bredin (2017) buffer tool methodology was therefore used to calculate a buffer from the Sundays River riparian habitat, above the 45 m contour/ start of the steep incline.

#### **The MacFarlane and Bredin (2017) buffer tool calculated:**

For the southern section of the property, at the existing pastures adjacent to the Sundays River -

- 18 m for annual crops rotated on an annual basis. The buffer must be measured from the 45 m contour / start of the steep incline.
- 15 m for annual crops rotated on a biennial basis. The buffer must be measured from the 45 m contour / start of the steep incline.
- **The applicant has indicated that planting will be required every 5 years. Consequently, the 15 m buffer will apply.**

The remaining steep slopes, to the north (of the existing pastures) and east of the property (or Sundays River) shall be avoided; which will therefore also buffer the remaining stretch of the Sundays River upstream (of the pastures).

Refer Figure 17 below.

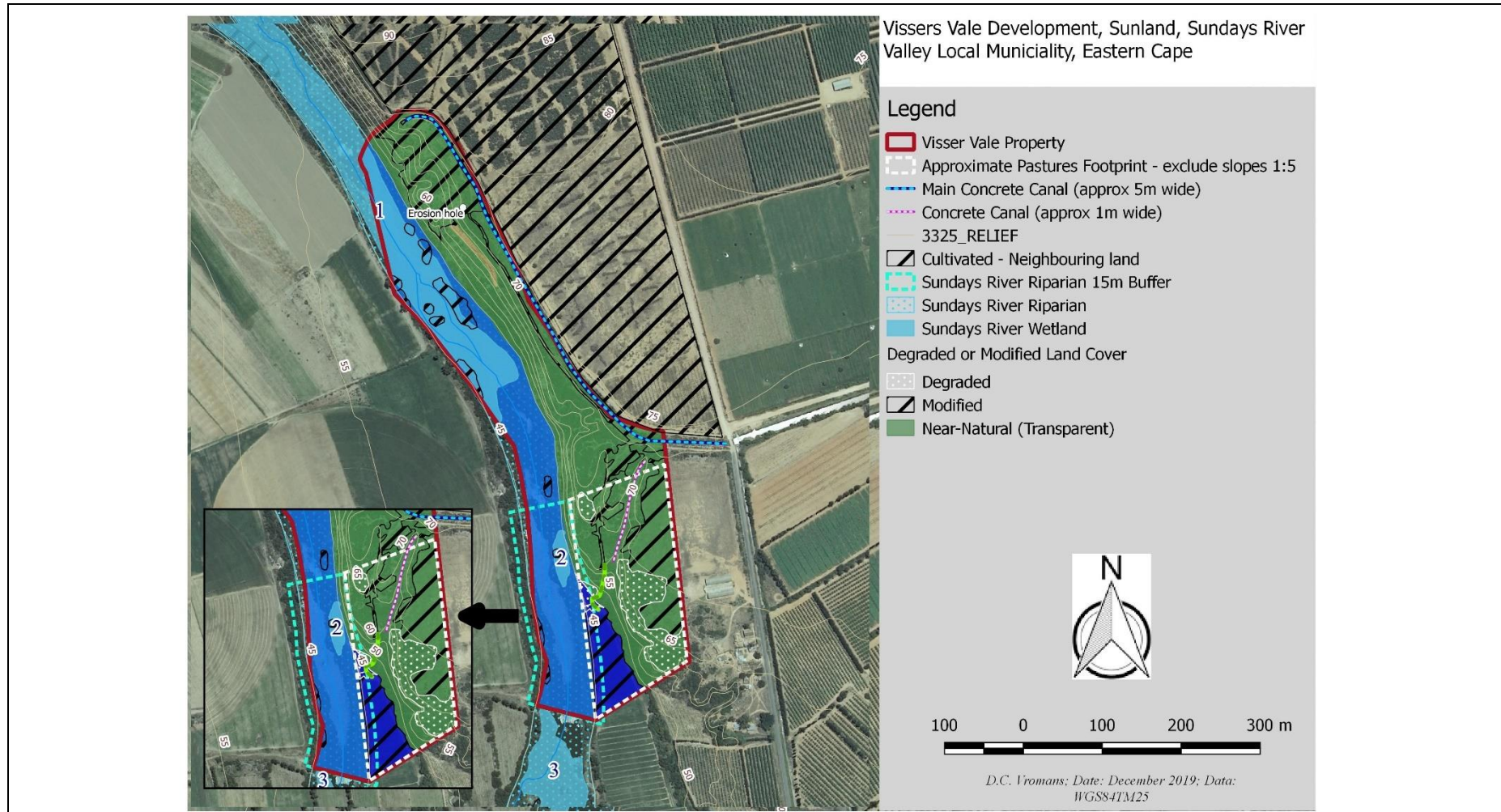


Figure 17. The 15 m aquatic buffer recommendation. The buffer must be measured from the 45 m contour/ start of the steep incline/ riparian habitat. The remaining steep slopes, to the north (of the existing pastures) and east of the Sundays River shall be avoided; and buffer the remaining stretch of the Sundays River upstream.

### 4.3. RESULTS: TERRESTRIAL VEGETATION AND FLORISTICS - SITE ASSESSMENT OBSERVATIONS

#### 4.3.1. Vegetation Pattern or Vegetation Types

##### Vegetation on the Farm

The dominant vegetation type is thicket, with riparian vegetation along the Sundays River. Degradation and modification (transformation) was evident, with degraded areas representing much of the vegetation cover. This can be attributed to past and current livestock grazing, clearing for livestock, pastureland and old un-utilized access tracks, with low alien invasive plant cover. Modification is evident in the open patches of low growing plants.

The national South African vegetation map refers to the thicket unit as Sundays Valley Thicket (Grobler et al., 2018). In terms of the STEP vegetation map, the vegetation unit is Sundays Spekboom Thicket (Vlok and Euston Brown, 2002). It corresponds to Sundays Valley Thicket with Spekboom as a dominant feature; and is a solid thicket. The riparian habitat along the Sundays River is equivalent to the Albany Alluvial Vegetation. It is dominated by *Vachellia (Acacia) karroo*.

Figure 20 below presents the vegetation map for the property.

##### Summary results of vegetation type on Farm Vissers Vale:

VEGETATION TYPE	SOURCE	ECOSYSTEM STATUS	BIODIVERSITY TARGET	PROTECTION LEVEL
Albany Alluvial Vegetation	SA VegMap (2018)	Endangered (2011 status)	31%	Poorly Protected
Sundays Valley Thicket (Old Veg Name: Sundays Thicket)	SA VegMap (2018)	Least Threatened (2011 status) STEP: Least Threatened	SA Veg: 19 % STEP: 22 %	Moderately Protected
STEPs Sundays Spekboom Thicket (equivalent of Sundays Valley Thicket above)	STEP Vegetation Map (2002)	Vulnerable	18 %	Not available (STEP)

Sundays Valley Thicket is comprised of many spinescent species, along with numerous succulents. The succulent *Aloe pluridens* was prevalent on the property. Other key tree/ large shrub species included: *Carissa bispinosa*, *Ehretia rigida*, *Grewia occidentalis*, *Gymnosporia capitata*, *Lycium afrum*, *Pappea capensis*, *Portulacaria afra*, *Roepera (Zygophyllum) morgsana*, *Schotia afra*, and *Searsia pterota*. *Vachellia (Acacia) karroo* tended to dominate disturbed areas (and the riparian habitat). *Euphorbia caerulescens (previously ledienii)* was recorded but was not common. The smaller shrubs *Euryops euryopoides* and *Hypoestes aristata* was common in the thicket, along with *Euphorbia mauritanica*.

*Ornithogalum longibracteatum*, *Felicia muricata* and *Pentzia incana* were abundant in the disturbed or modified areas, as well as several Aizoaceae (Mesembryanthemaceae) species, for example *Malephora lutea*, *Mesembryanthemum crystallinum*, *Delospermum hispidum* and *Delosperma* species.

*Cotyledon* and *Crassula* species were common, and patches of the protected bulb, *Tritonia laxifolia*, were observed in disturbed areas.

Degraded areas tended to have a higher abundance of *Lycium afrum*, *Opuntia ficus indica* and *O. auriantica*.

**Riparian Vegetation along the Sundays River**

Refer Section 4.2.1.

Refer Addendum 1 for the plant inventory.



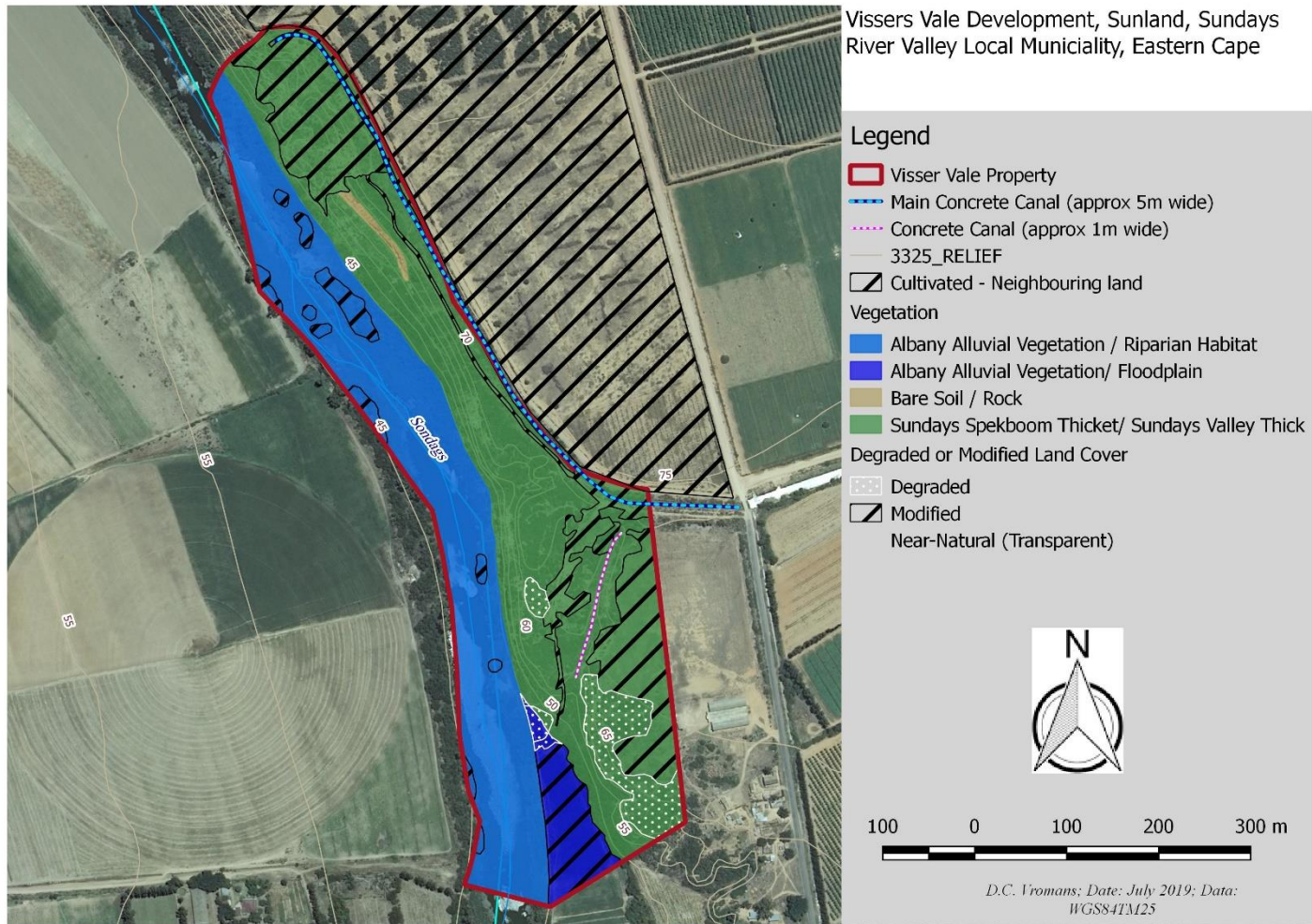


Figure 18. Vegetation map for Farm Vissers Vale, with land cover and vegetation type, namely Albany Alluvial Vegetation and Sundays Valley Thicket.



Plate 2. Photographic images of the vegetation.

Photographic images taken 20 – 21 May 2019



2.1. View looking towards the Sundays River, from the top plateau. Note the valley in the foreground with a higher abundance of *Vachellia (Acacia) karoo*.



2.2. View looking north-westward from the top plateau, note the vehicular access road and undulating landscape with ridges.



*Photographic images taken 20 – 21 May 2019*



**2.3. Looking eastward towards the steep to vertical slopes that lead up to the plateau**



**2.4. Example of the transformed patches, where the thicket has been cleared.**



Photographic images taken 20 – 21 May 2019



2.5. Example of the old concrete canal, overgrown here with alien and weedy species, and generally lined with *Vachellia (Acacia) karroo*.



2.6. The old vehicular access track along the narrow plateau, where the chalets are proposed to be located (looking south-eastward). Now a small footpath, but overgrown with vygies, amongst other species.



*Photographic images taken 20 – 21 May 2019*



**2.7. Proposed site for the residence, near the northern end of the property. Goats were observed grazing here.**



**2.8. The northern end of the property, which is badly eroded and modified/ transformed (looking north-west).**



*Photographic images taken 20 – 21 May 2019*



**2.9. Looking southwards from the northern end of the property, which is badly eroded and modified/ transformed (looking southerly). Note the broken concrete canal mid-slope.**



**2.10. The existing pastures used for grazing purposes, at the southern end of the property.**



#### 4.3.1.1. Alien Invasive Plants (AIP)

Alien invasive plants (AIP) have been declared in terms of the National Environmental Management: Biodiversity Act (10 of 2004) (NEMBA), Alien and Invasive Species (AIS) List (2016), as well as the Conservation of Agricultural Resources Act (CARA) (43 of 1998) (Regulation 15 and 16). The NEMBA 2016 listing has superseded the CARA listing.

*Opuntia ficus-indica* (Prickly Pear) and *O. aurantiaca* were the key alien invasive plants recorded on the property; but were not present in high densities (> 60% cover). A patch of eight *Agave sisalana* succulents were recorded. These species tended to occur along the access tracks and previously cleared areas. In general, cover was low.

*Arundo donax*, *Eucalyptus grandis* and *Tamarix ramosissima* were recorded along the Sundays River; and *Azolla filiculoides*, were notable in the water, floating at the surface.

The succulent alien creeper, *Anredera cordifolia*, was recorded in the thicket but it is not classified as an alien invasive plant.

Refer to Table 10 for the list of alien invasive plants and associated category.

**Table 12. Alien invasive plants recorded on site**

DECLARED ALIEN INVASIVE PLANTS	CARA CATEGORY	NEMBA ALIEN AND INVASIVE SPECIES LIST CATEGORY (JULY 2016)
<i>Agave sisalana</i>	Category 1, which must be destroyed.	Category 1b prohibits the spreading or allowing the spread of any specimen of the species, and prohibits importing it into SA; breeding, growing, moving and selling. A person is exempt from having in possession or exercising physical control over the specimen. In other words, these species must be controlled and wherever possible, removed and destroyed <sup>5</sup> . Trade and planting are prohibited.
<i>Azolla filiculoides</i>		
<i>Arundo donax</i>		
<i>Eucalyptus grandis</i>		
<i>Opuntia aurantiaca</i>		
<i>Opuntia ficus-indica</i>		
<i>Tamarix ramosissima</i>		

#### 4.3.2. Species of Conservation/ Special Concern

Several protected species were recorded, all of which are of Least Concern (Table 11, Plate 3). Many are endemic species.

Numerous *Aloe pluridens* were recorded. The Aiozaceae or vygies were abundant in the open, sunny areas, which mostly represent the modified and degraded areas. They can be considered weedy pioneers species, which quickly cover disturbed areas. *Pachypodium succulentum* was not too common. The small *Tritonia laxifolia* bulb was present in sunny, degraded areas; but not widespread.

<sup>5</sup> According to the brochure "Do the NEMBA regulations affect you?" compiled by the National Department of Environmental Affairs.

All the species are protected by the provincial Nature and Environmental Conservation Ordinance (19 of 1974) (PNCO). These species will require a license from the Provincial Environmental Affairs Department to be removed. A rescue and translocation, and/or rehabilitation plan is usually required.

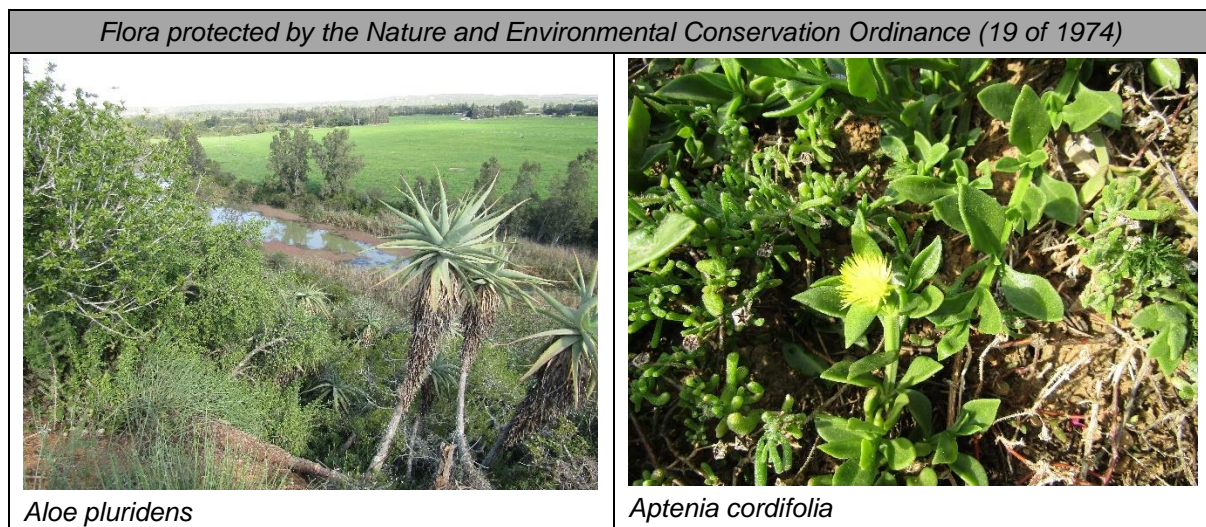
**Table 13. Species of Special Concern recorded on site**

- PNCO = Provincial Nature Conservation Ordinance = Nature and Environmental Conservation Ordinance (19 of 1974). Note that the scheduled species in terms of the Eastern Cape Conservation Bill have not been indicated as the species list that is regulated by the Department of Economic Development, Environmental Affairs and Tourism is in terms of the 1974 PNCO. This is because the Bill has not been gazetted.

Species	Family	Red Data Listing/ Conservation Status	Endemism	Protected By
1. <i>Aloe pluridens</i>	ASPHODELACEAE	Least Concern	Endemic	PNCO
2. <i>Aptenia haeckeliana</i>	AIZOACEAE	Least Concern	Endemic	PNCO
3. <i>Drosanthemum hispidum</i>	AIZOACEAE	Least Concern	Endemic	PNCO
4. <i>Delosperma ecklonis</i> (orange and pink)	AIZOACEAE	Least Concern		PNCO
5. <i>Galenia pubescens</i> ( <i>Aizoon rigidum</i> )	AIZOACEAE	Least Concern	Endemic	PNCO
6. <i>Glottiphyllum longum</i>	AIZOACEAE	Least Concern	Endemic	PNCO
7. <i>Haemanthus albiflos</i>	AIZOACEAE	Least Concern	Endemic	PNCO
8. <i>Malephora lutea</i>	AIZOACEAE	Least Concern	Endemic	PNCO
9. <i>Mesembryanthemum crystallinum</i>	AIZOACEAE	Least Concern		PNCO
10. <i>Ruschia uncinata</i>	AIZOACEAE	Least Concern		PNCO
11. <i>Pachypodium succulentum</i>	APOCYNACEAE	Least Concern	Endemic	PNCO
12. <i>Psilocaulon bicorne</i>	AIZOACEAE	Least Concern	Endemic	PNCO
13. <i>Tritonia laxifolia</i>	AMARYLLIDACEAE	Least Concern		PNCO

\* **Red Data Listing / Conservation Status:** According to the SANBI Threatened Species Programme Website (<http://redlist.sanbi.org/>).

**Plate 3. Photographic images of some of the species of special concern recorded on site.**





*Flora protected by the Nature and Environmental Conservation Ordinance (19 of 1974)*



*Delosperma ecklonis* (yellow)



*Delosperma ecklonis* (pink)



*Drosanthemum hispidum*



*Ruschia uncinata* (above the *Glottophyllum*)



*Haemanthus albiflos* (Photo sourced from another site/ project)



*Malephora lutea*



*Flora protected by the Nature and Environmental Conservation Ordinance (19 of 1974)*



*Mesembryanthemum crystallinum*



*Glottiphyllum longum* (Photo sourced from another site/ project)



*Pachypodium succulentum*

#### 4.4. RESULTS: LAND COVER, LAND USE ACTIVITIES AND ASSOCIATED LAND USE IMPACTS

##### 4.4.1. Land Cover Patterns on Farm Vissers Vale

Approximately 64.9 % of Farm Vissers Vale is near-natural. Modification is relatively high at ~29.5 % and degradation at ~5.6 % (Table 14 and Figure 19). See Figure 20 for the most recent aerial imagery to demonstrate (more accurately) the current land cover situation.

Modification (clearing) is due to vehicular access tracks, past clearings, past excavations and severe erosion, while degradation can be attributed to past clearings and livestock grazing. Severe erosion due to the defunct irrigation canal, which has also broken up mid-slope is resulting in on-going erosion along the steep slopes, at the northern end of the property. Note that tree trunks have been placed in some of the steeper valley slopes. In addition, an 'erosion hole' was observed proximate to the proposed location of the residential unit (Plate 4.1). The potential for landslides is therefore of concern. A geotechnical assessment would need to be conducted. Refer Plate 3.

Some of the oldest orthophotos (1939 and 1974) shows past clearing and intensive cultivation on the property (Figure 21).



Table 14. Land cover on Farm Vissers Vale

Vegetation	Land Cover Description	Land Cover Category	Hectares	Ha / %	
Bare Soil / Rock	Steep slopes, erosion	Near-Natural	0,116	<b>Near-Natural</b> 12,110 ha 64,9 %	
Sundays Valley Thicket	Steep slopes some erosion	Near-Natural	0,265		
Sundays Valley Thicket	Near-Natural	Near-Natural	0,418		
Sundays Valley Thicket	Near-Natural	Near-Natural	5,200		
Albany Alluvial Vegetation / Riparian Habitat	Near-Natural	Near-Natural	6,111		
Sundays Valley Thicket	Past clearing, aliens	Degraded	0,025	<b>Degraded</b> 1,043 ha 5,6 %	
Sundays Valley Thicket	Past clearings, aliens, weedy	Degraded	0,863		
Sundays Valley Thicket	Degraded, some clearing	Degraded	0,078		
Albany Alluvial Vegetation/ Floodplain	Degraded, some clearing, aliens	Degraded	0,024		
Albany Alluvial Vegetation/ Floodplain	Near-Natural / degraded	Degraded	0,004		
Albany Alluvial Vegetation/ Floodplain	Past clearing, aliens	Degraded	0,049	<b>Modified</b> 5,516ha 29.5%	
Sundays Valley Thicket	Irrigation Canal	Modified	0,049		
Sundays Valley Thicket	Sports Field, access tracks, clearing, alien	Modified	1,360		
Sundays Valley Thicket	Access Road and Clearings	Modified	0,613		
Sundays Valley Thicket	Irrigation Canal	Modified	0,149		
Albany Alluvial Vegetation / Riparian Habitat	High AIP	Modified	0,089		
Sundays Valley Thicket	Erosion and collapse, past clearing, along canal	Modified	1,748		
Sundays Valley Thicket	Vehicular access track (old)	Modified	0,134		
Albany Alluvial Vegetation/ Floodplain	Pasture cultivated land	Modified	0,850		
Sundays Valley Thicket	Tree trunks	Modified	0,051		
Albany Alluvial Vegetation / Riparian Habitat	AIP - Eucalyptus grandis	Modified	0,029		
Albany Alluvial Vegetation / Riparian Habitat	High AIP - Eucalyptus grandis	Modified	0,187		
Albany Alluvial Vegetation / Riparian Habitat	AIP - Eucalyptus grandis	Modified	0,020		
Albany Alluvial Vegetation / Riparian Habitat	AIP - Eucalyptus grandis	Modified	0,026		
Albany Alluvial Vegetation / Riparian Habitat	AIP - Eucalyptus grandis, clearing	Modified	0,034		
Albany Alluvial Vegetation / Riparian Habitat	AIP - Eucalyptus grandis	Modified	0,050		
Albany Alluvial Vegetation / Riparian Habitat	AIP - Eucalyptus grandis	Modified	0,021		
Albany Alluvial Vegetation / Riparian Habitat	AIP - Eucalyptus grandis	Modified	0,024		
Albany Alluvial Vegetation / Riparian Habitat	High AIP - Eucalyptus grandis	Modified	0,033		
Albany Alluvial Vegetation / Riparian Habitat	AIP - Eucalyptus grandis	Modified	0,016		
Albany Alluvial Vegetation / Riparian Habitat	AIP - Eucalyptus grandis	Modified	0,033		
<b>TOTAL</b>			<b>18,669ha</b>		<b>100%</b>

\* AIP = Alien invasive plant.

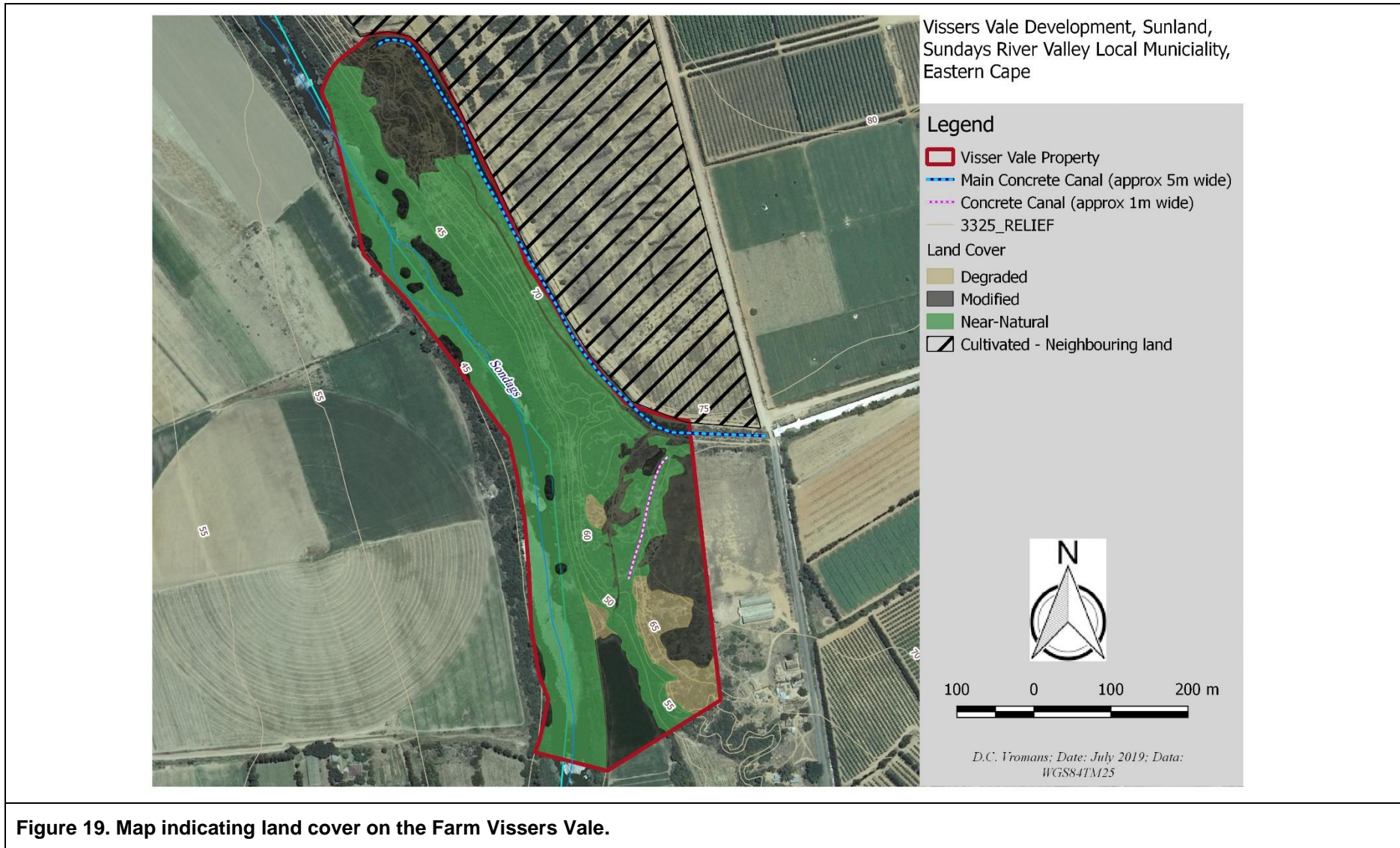


Figure 19. Map indicating land cover on the Farm Visser's Vale.





Figure 20. The latest Google Earth imagery (February 2018) showing the vegetation and land cover (in order to demonstrate the current land cover situation / land cover impacts).



Figure 21. Historical orthophoto 1939 (Top) and 1974 (Bottom), shows past clearing and intensive cultivation on the property. Note the erosion at the northern end of the property.



**Plate 4. Photographic images of the erosion on site**



**4.1. The 'erosion hole' or donga proximate to the proposed residential unit and the very steep slopes leading down to the Sundays River.**





**4.2. Erosion on the steep slopes at the north-western end of the property, also showing the defunct concrete canal that has broken mid-slope.**

#### **4.4.2. Land Cover Patterns within the Larger Catchments**

##### *Motivation for consulting catchment land cover*

Consulting the catchment data allows one to assess cumulative impacts at the strategic level (Section 6), noting that quaternary catchments are the basic unit for water use management in South Africa. The land cover data is consulted at sub-quaternary catchment level in Section 4.4, to relate to the ECBCP transformation thresholds per sub-quaternary. This is because the catchment (within which the property is located) is an Aquatic CBA 2b, which means <20% of total area of sub-quaternary catchment should be modified.

##### *Source of land cover data*

The land cover statistics were derived from the land cover maps metadata generated for the Sundays River Valley Critical Biodiversity Area (CBA) Map (Skowno and Holness, 2012) and the Nelson Mandela Bay land cover map (Stewart, 2009). The National Land Cover Map (DEA, 2013) has been presented for comparison purposes. The former maps however were done at a finer scale and are used in the calculations. That said, the differences are minimal. It must be noted however, that the data are likely to be under-estimates due to being out-dated and not fully ground-truthed. Only a small portion of the Nelson Mandela Bay data was used in the lower portion of the catchment, which is mostly natural to near-natural land cover. It should also be borne in mind that the Sundays River Valley is undergoing or has undergone several environmental impact assessment processes due to the growing citrus economy in the region. Consequently, land cover will change.



Some of the known projects include *Ikamva Lethu Citrus Development* (~656.9ha), *Dunbrody Citrus* (~30ha), *Wolwerton Agriculture* (~47ha) and *Falcon Ridge Cultivation* (~335.62), totaling ~1071 ha).

N40E quaternary catchment data

Quaternary catchments are the basic unit for water use management in South Africa, and thus the modification levels are calculated at this level.

Approximately 13.4 % of the quaternary catchment N40E has been modified, while 23.8 % is degraded (Table 13; Figure 24).

Approximately 0.641 ha of vegetation will need to be cleared (see Table 19). This would marginally increase the total modified area of the quaternary catchment N40E to 13.22 % (Table 15), from 13.21%. If we include some of the known developments, which amount to ~1071 ha, modification will be raised to 15.31 %.

Bear in mind that this does not reflect potential future cumulative loss in the catchment, which cannot be determined without the relevant data. However, the Sundays River Valley CBA Map (Section 3.3.1) designates much of the catchment as CBA and ESA (Figure 22), **which was incorporated into the municipal Spatial Development Framework<sup>6</sup> and Integrated Development Plan**. By doing so, the future modification of the quaternary catchment is, in part, safeguarded.

*The Sundays River Valley (SRV) area is an agricultural hub of South Africa and the region. Citrus expansion is taking place in the SRV due to an increase in the market value of exported citrus, with a number of EIAs underway.*

**Table 15. Land cover statistics for quaternary catchment N40E (GIS metadata Sundays River Valley and Nelson Mandela Bay land cover data)**

Land Cover (N40E)	Hectares	Percentage	Proposed Clearance		With Other Known Projects	
			Area (Ha)	Area (%)	Area (Ha)	Area (%)
Natural	32 118,08	62,97	32117,44	62,96	31 047,92	60,87
Degraded	12 150,64	23,82	12150,64	23,82	12150,64	23,82
Modified/Transformed	6 740,52	<b>13,21</b>	6741,16	13,22	7810,68	15,31
<b>TOTALS</b>	<b>51 009,24</b>	<b>100,00</b>	<b>51009,24</b>	<b>100,00</b>	<b>51009,24</b>	<b>100,00</b>

Sub-quaternary catchment data

The land cover statistics for the sub-quaternary catchment indicates that approximately 46.2 % is modified and 6 % is degraded (Table 14, Figure 23). The transformation threshold (<20% for Aquatic CBA 2b) has been exceeded.

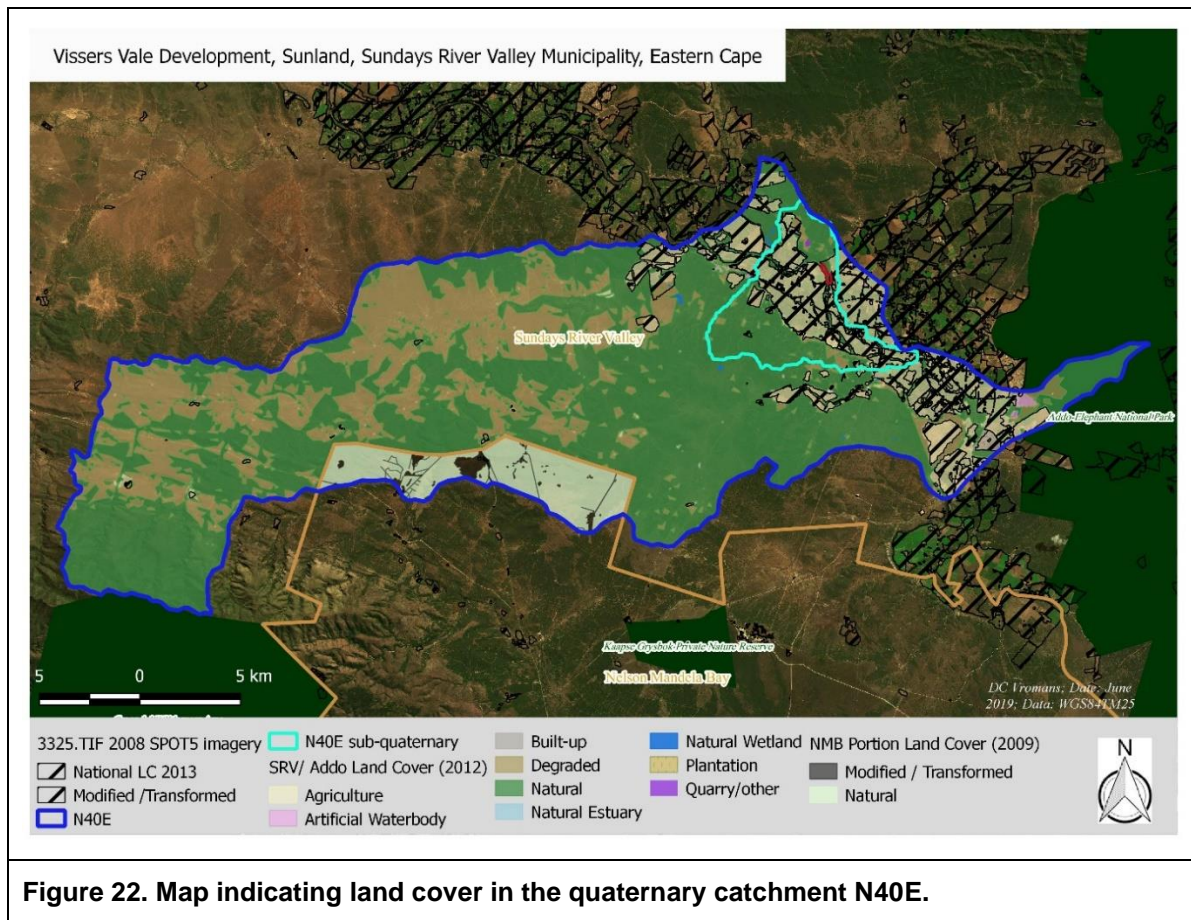
Approximately 0.641 ha of vegetation will need to be cleared (see Table 19). Thus, the percentage modification is raised from 46.24 % to 46.25 %. If we include degradation (as part of the modified land cover to account for other EIAs underway), as well as other known projects, the total impacted land cover totals 52.3 %.

**Table 16. Land cover statistics for the sub-quaternary catchment of N40E (GIS metadata**

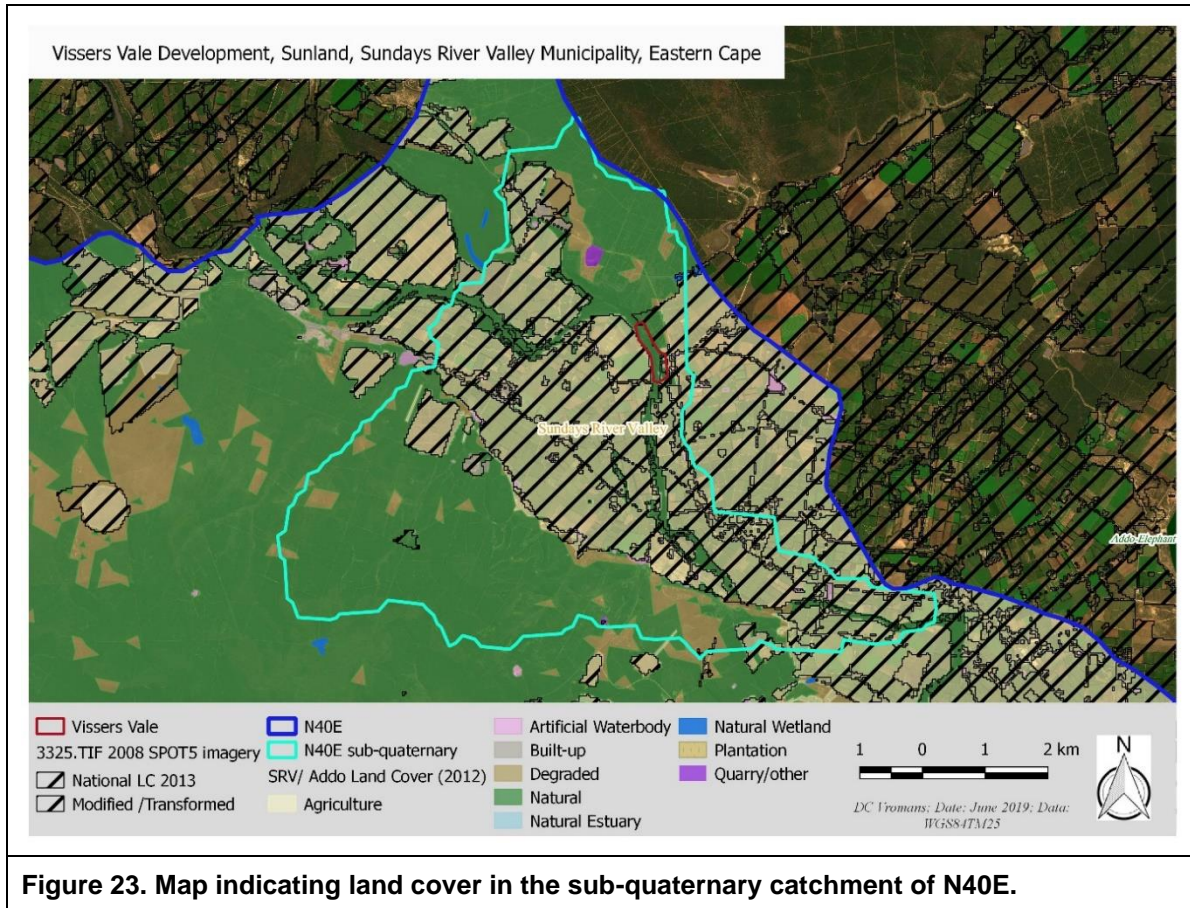
<sup>6</sup> As part of a SANParks biodiversity project, the Sundays River Valley Biodiversity Sector Plan and associated CBA Map was submitted to independent town planning consultants for the revision of the Spatial Development Framework and assistance provided with incorporation into the IDP (in 2012).

Sundays River Valley land cover data)

Land Cover	Area (Ha)	Area (%)	Proposed Clearance		With Other Known Projects	
			Area (Ha)	Area (%)	Area (Ha)	Area (%)
Natural	1 952,05	47,7	1951,41	47,7	1948,11	47,6
Degraded	246,25	6,0	246,25	6,0	246,25	6,0
Modified/Transformed	1 890,55	46,24	1891,19	46,25	1894,49	46,33
<b>TOTAL</b>	<b>4 088,85</b>	<b>100</b>	<b>4088,85</b>	<b>100</b>	<b>4088,85</b>	<b>100,0</b>







**4.5. RESULTS: CRITICAL EVALUATION AND SITE VERIFICATION OF CBA MAPS**

**4.5.1. Critical evaluation of the SRV CBA Map based on site observations**

Based on the site survey and assessment, transformed /modified land can be excluded from CBA status (see the land cover map, Figure 24).

It must be understood that although CBA should be natural or near-natural habitat, degraded habitat can also be classified as CBA. This is particularly the case for site-verified buffers associated with hydrological features (rivers, wetlands and estuaries).

As indicated in Section 3.1, the criteria for the CBA status are: (a) 100 m river buffer, (b) ECBCP CBA status, (c) 100 m NFEPA wetland buffers. The buffers are for retaining hydrological processes and are CBA if within near-natural land cover.

The criteria for the ESA status are: (a) 100 m NFEPA wetland buffers for No Natural Areas Remaining (NNR); and (b) 500 m river buffer for natural areas (Figure 8).

Thus near-natural areas within the 100 m buffer are CBA and those within 500 m are ESA. For no natural remaining, ESA are within the 100m buffer. Refer to Figure 24 for the CBA and ESA buffer areas from the mapped riparian and wetland habitat, for this site assessment.

**4.5.2. Critical evaluation of the ECBCP CBA Map based on site observations**

The SRV CBA Map takes precedence over the available ECBCP CBA Map (2007), notwithstanding both maps classify the majority of the property as CBA. Although the ECBCP would require a 50 m

buffer from the Sundays River and only natural habitat would be classed as CBA. Thus, both CBA Maps are ultimately equivalent.

#### **4.5.3. Site Verification Conclusion *i.e.* CBA and ESA status of the property**

**Based on the site survey and assessment**, most of the transformed /modified land can be excluded from CBA status (see Figure 24), apart from the alien invasive plants within the riparian habitat and the steep slopes adjacent to the Sundays River (that are badly eroded). These should remain CBA. The reason for the eroded areas to remain CBA is to prevent any further development that may be susceptible to landslides, while protecting the Sundays River as well.

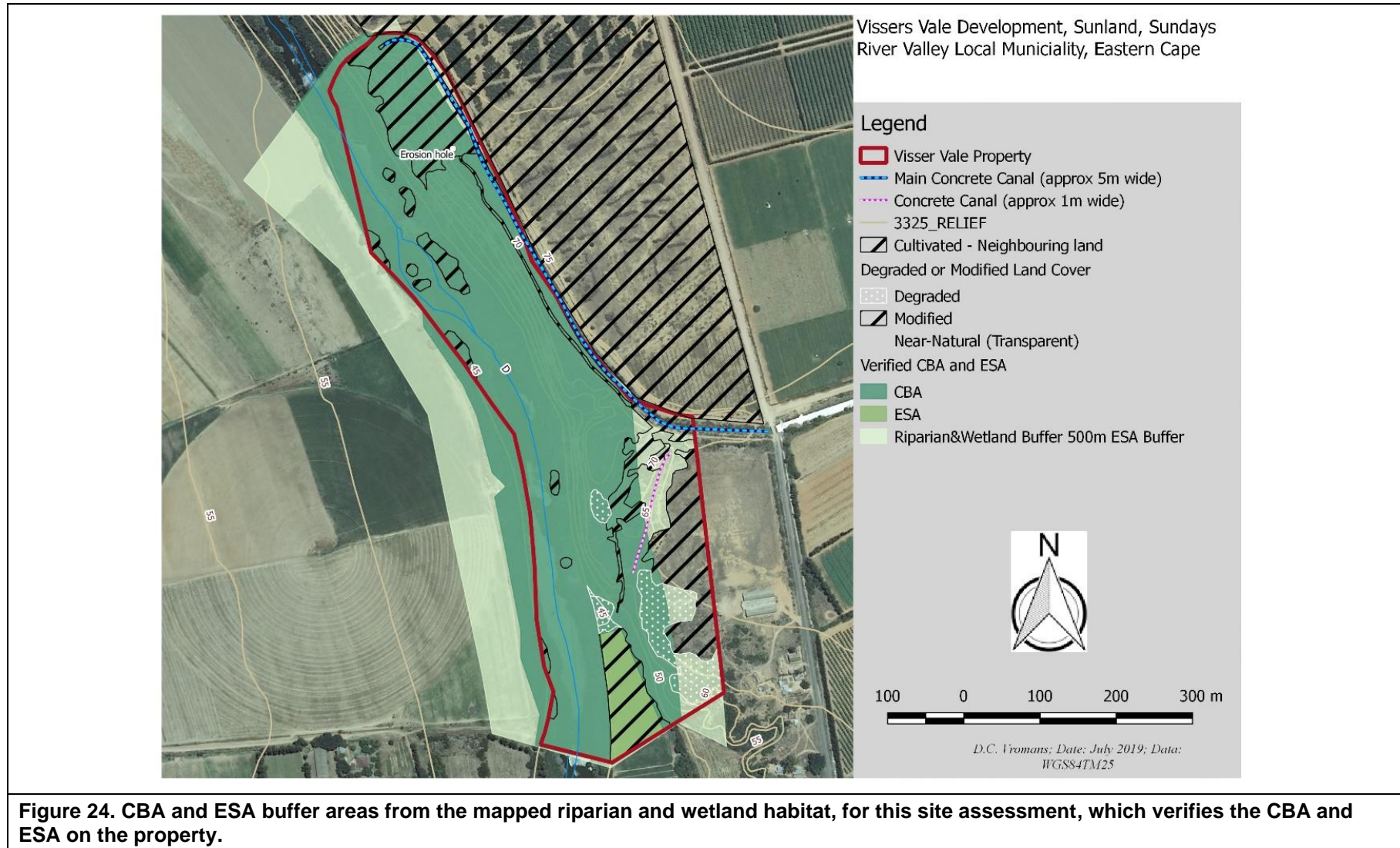
**Biodiversity Target Areas and all riparian and wetland habitat, including site verified buffers**, should be conserved on the property, which are represented in the ecological sensitivity map below (Figure 25, Section 4.6).

**Figure 24 below shows the site verified CBA and ESA, based on the criteria developed in the Addo / SRV CBA Map.**

#### **Implications for the proposed development:**

- Low intensity developments, which shall include the chalets and residence are permitted in CBA and ESA.
- The warehouse is in largely modified land and should be permitted.
- The proposed agriculture can be permitted within the area that is currently modified (and used as pasture-land), near the Sundays River (at the 45m contour), however, a 15 m – 18 m buffer is recommended for infrequent rotation (planting/ tillage) or annual rotation (planting/ tillage) respectively. The remaining agriculture (pastures) is recommended in remaining areas on the property excluding 1:5 slopes, which include verified CBA, ESA and modified land. Refer to Section 4.6 for the recommended biodiversity NO-GO areas.





#### 4.6. COMBINED RESULTS: ECOLOGICALLY SENSITIVE AREAS, BIODIVERSITY NO-GO AREAS AND BIODIVERSITY OFFSETS

Ecologically sensitive areas, biodiversity No-Go areas and biodiversity offsets were identified based on both the vegetation and the aquatic assessments, which also included an evaluation of the CBA Maps (Sections 4.5 above).

Ecological sensitivity and No-Go areas were determined using the criteria described in Table 17 below. Refer to Figure 25 for the ecologically sensitive areas relative to the property and proposed infrastructure. The Biodiversity No-Go Areas amount to approximately 13.7 ha or 73.7 % of the property.

The categories on the ecological sensitivity map or Biodiversity No-Go Map (Figure 25), with associated development implications, are as follows:

Category on Map	Hectares (ha)	Percentage of property (%)	Development Implication
No-Go Area	13,79	73,7	This means no development should take place.
No-Go Unless	0,08	0,4	This refers to the proposed residence footprint. It should only be sited here if the Geotechnical Engineer's feasibility study confirms that the site is safe. This is because an 'erosion hole' (Plate 4.1) was observed within metres of the site, which may result in a land slide in the future; as it is located proximate to the steep slopes that are severely eroded.
Go Area	4,8	25,9	This means development is permitted with the appropriate mitigation measures in place, as well as the Engineer's feasibility study which should confirm that the proposed Chalet sites, with associated infrastructure, can be established on the narrow plateau.

**Table 17. Criteria used to determine ecologically sensitive areas on the property**

CRITERIA	RECORDED DURING THE SITE ASSESSMENT
1. Wetlands	<ul style="list-style-type: none"> <li>Floodplain wetlands occur along the Sundays River.</li> </ul>
2. Watercourse areas (includes streams and 1:50 000 drainage areas) and associated riparian & buffer areas	<ul style="list-style-type: none"> <li>The Sundays River falls along the western boundary.</li> <li>A buffer for the proposed agriculture, adjacent to the river is recommended at <b>15 m</b> (bi-annual crops / infrequent rotation). According to the Applicant, new pastures may be planted every 5 years or so.</li> <li>This means the steep slopes adjacent to the Sundays River are avoided, and the 15 m is measured from the top of the slopes where the gradient flattens.</li> </ul>
3. CBAs and ESAs (includes special/threatened habitats)	<ul style="list-style-type: none"> <li><u><i>This assessment concludes that –</i></u> <ul style="list-style-type: none"> <li>Transformed /modified land can be excluded from CBA status (see Figure 24).</li> <li>The Sundays Estuary buffer recommendation should be assigned CBA status.</li> </ul> </li> </ul>



CRITERIA	RECORDED DURING THE SITE ASSESSMENT
	<ul style="list-style-type: none"> <li>- The near-natural vegetation should be CBA (within 100m of the Sundays River) or ESA (within 500m of the Sundays River).</li> <li>- Transformed land within 100m of the Sundays River is ESA (according to criteria set by the Sundays River Valley CBA Map).</li> <li>- <b>Biodiversity Target Areas</b> should be conserved on the property, in the best quality vegetation cover, which are represented in the 'ecological sensitivity map' (Figure 25).</li> </ul>
4. High conservation value areas due to high species diversity, unique species, rare species etc.	<ul style="list-style-type: none"> <li>• Species diversity was not high or diverse. Refer below i.e. presence of rare species.</li> </ul>
5. Presence of threatened species of conservation concern (Critically Endangered, Endangered, Vulnerable, Rare)	<ul style="list-style-type: none"> <li>• No Threatened plant species were recorded.</li> <li>• According to the available data, the Endangered Mozambique Tilapia and Near Threatened Eastern Cape Redfin inhabit the Sundays River.</li> </ul>
6. Biodiversity Target Areas	<ul style="list-style-type: none"> <li>• The biodiversity target (19%) for Sundays Valley Thicket is retained and exceeded. Approximately 48% of the vegetation is retained.</li> <li>• The biodiversity target (100%) for Sundays River riparian habitat is retained. The floodplain area is currently utilized as pasture and is already transformed and thus cannot contribute to biodiversity targets.</li> <li>• See explanation below (Section 4.6.1, Table 16 and 17).</li> </ul>
7. Degree of intactness of the vegetation cover	<ul style="list-style-type: none"> <li>• The property has fairly extensive areas of degradation and modification but the biodiversity target and no-go areas retain most of the near-natural areas.</li> </ul>
8. Avoiding conflicting land uses i.e. avoiding areas not suitable for citrus/ crop production (e.g. steep soils, slopes)	<ul style="list-style-type: none"> <li>• Steep to very steep slopes lie parallel to the Sundays River, and shall be avoided.</li> <li>• The slopes that are eroded must be avoided.</li> <li>• <b>The steep slopes should not be developed.</b></li> <li>• <b>Siting for the chalets and residence, including associated access road, must be determined by an Engineer. Siting must take into consideration the severe erosion and possibility of future landfalls etc. as well as the fact that limited space is available between the existing defunct concrete channel (along the N-E boundary) and the 'cliff' edge (around the 70m contour). In addition, adequate stormwater management must be designed by the Engineer and constructed/ implemented to prevent erosion, as a result of the proposed infrastructure. Without this, further erosion may exacerbate the existing risk.</b></li> </ul> <p style="text-align: center;"><b><u>Comment from the Civil Engineer (JJ Spies) was received 5 December 2019, namely:</u></b></p> <p style="text-align: center;"><i>'Most of the details regarding the viability to accommodate the proposed locations of the 1 residential unit and 3 chalets will be dictated by the outcome of the geotechnical report. The geotechnical report must indicate the stability of the ground on or near the area under discussion. The geotechnical engineer shall also indicate if it would be practically possible to manipulate and stabilise the existing ground to accommodate the road, buildings and conservancy tanks. If there is a practical and economical way to stabilise and manipulate the profile of the ground on/near the old canal and the cliff, for the development, the position and design of the stormwater structures will be subject to the geotechnical design recommendations.'</i></p>

CRITERIA	RECORDED DURING THE SITE ASSESSMENT
	<i>I will be in a better position to give you meaningful answers if I do have the professional opinion of the geotechnical engineer stating the facts regarding the soil conditions which are suspect.</i>
9. Consolidating agricultural areas proximate to the existing cultivated areas; but avoiding hydrological process areas and potential corridor areas.	<ul style="list-style-type: none"> <li>• Apart from the pastures proximate to the Sundays River, other crop cultivation does not occur on the property.</li> <li>• The property lies adjacent to existing orchards to the east and south.</li> <li>• It is however located along the Sundays River which is an agricultural hub of the region.</li> <li>• The recommended buffer along the Sundays River must be avoided to protect hydrological processes along the river, which represents a key corridor.</li> </ul>

#### 4.6.1. Biodiversity Target and Biodiversity No-Go Areas: Explanation and Calculations

The biodiversity target for Sundays Valley Thicket (STEPs Sundays Spekboom Thicket) is 19 %. This equates to 2.1 ha of this vegetation unit on Farm Vissers Vale (Table 18 and 19). Therefore, at minimum, this target should be retained on the property; and within good quality vegetation cover. A 100% target is allocated to the Sundays River riparian habitat, which represents Albany Alluvial Vegetation. Because the floodplain area, above the 45 m contour is already utilized for pastures, and is thus transformed, this area cannot contribute to targets. The biodiversity target for the remaining riparian habitat is 100%.

The biodiversity No-Go areas retain ~5.3 ha of near-natural Sundays Valley Thicket (STEPs Sundays Spekboom Thicket), which is ~48.4 % of the original extent of the vegetation. The biodiversity target is therefore exceeded.

##### Alternative 1: The Applicant's Proposed Layout

The Applicant wishes to clear ~5.5 ha. This does not include the 1:5 slopes. Therefore the 5.5 ha is an over-estimate. Without an accurate map of the 1:5 slopes (required to be determined via 1 m contours), the extent of these areas cannot be accurately ascertained (in this assessment). A soil feasibility assessment was not required, according to a soil specialist, as the soils on site are considered feasible for pastures. However, in order to calculate the required figures in Table 19, the presumption is that the NO-GO areas within the 'proposed pastures area' **roughly** cover the 1:5 slopes (and excludes the 15 m buffer where the existing pastures are sited). See Figure 25.

The proposed siting of the residence is in modified land, but within metres of an 'erosion hole' (Plate 4.1), near the edge of the steep inclines, therefore this area is classified as a NO-GO UNLESS. The proposed siting of the chalets is in near-natural vegetation cover, while an existing vehicular access track / footprint is the proposed access road footprint. The warehouse footprint is mostly within transformed land, while some of the proposed pasture areas will be as well.

This means that only a relatively small amount of near natural vegetation will be lost due to the proposed layout.

##### Alternative 2: Recommended Biodiversity No-Go Areas (Figure 25)

The biodiversity No-Go areas represent the Alternative 2 Layout. The biodiversity No-Go areas retain ~5.3 ha of near-natural Sundays Valley Thicket (STEPs Sundays Spekboom Thicket), which is ~48.4% of the original extent of the vegetation. The biodiversity target is therefore exceeded. As indicated above, the remaining Albany Alluvial Vegetation is 100 % retained.

##### Conflicts with the Sundays River Valley CBA Map



As noted earlier, the proposed agriculture is sited largely within CBA (where the vegetation is not transformed) and ESA (where the vegetation is transformed but within 100m-500m of the Sundays River), according to the SRV CBA Map, which has been verified in this assessment (Figure 24, Section 4.5.3).

Intensive cultivation is not recommended in CBAs and near-natural ESAs. ESAs that are cultivated land, can be maintained as agricultural land. This is the case for the existing pastures, proximate to the Sundays River.

In this instance, the assessor considered the fact that (i) there is not an adequate amount of or configuration of transformed / modified land cover (which will not qualify as CBA) or (ii) that other feasible agricultural land is not classed as CBA (on the property). Furthermore, (iii) that the CBA Map cannot always be complied with due to the challenges associated with the requirement for socio-economic development (agriculture in this instance), land ownership, market changes, and potential errors or conflicts in mapping. Additionally, although the SRV CBA Map attempted to avoid known conflicting land uses, such as agriculture, the systematic planning process is unable to adequately avoid high potential agricultural land, which can only be determined via fine-scale data that is usually not available. Consequently, identifying and allocating biodiversity target and NO-GO areas, including biodiversity offsets, to a particular property, may assist in the strategic protection of biodiversity within the region, at the landscape-level.

**Table 18. Original extent of vegetation types supported on the Farm pre-transformation/ modification, with approximate area (hectares and percentage), including the required national biodiversity targets (hectares and percentage).**

Vegetation Type	Original Extent (Natural) (ha)	Currently Modified (ha)	Currently Degraded (ha)	Current Extent (Near-Natural) (ha)	National Biodiversity Target (%)	Biodiversity Target of Original Extent (ha)
Sundays Valley Thicket (STEPS Sundays Spekboom Thicket)	10,953	4,104	0,966	5,883	19	2,081
Sundays River riparian and floodplain: Albany Alluvial Vegetation	7,6	1,412	0,077	6,111	31	2,356
<b>TOTAL</b>	<b>18,553*</b>	<b>5,516</b>	<b>1,043</b>	<b>11,994</b>	<b>50</b>	<b>4,437</b>

**Table 19. Remaining vegetation (hectares and percentage) post agriculture for the proposed development**

Vegetation Type	Original Extent (natural) (ha)	Current Extent (ha)	Proposed to be Cleared of the Near-Natural (ha)	Remaining Extent Near-Natural (ha)	Remaining Extent Near-Natural (%)
Sundays Valley Thicket (STEPS Sundays Spekboom Thicket)	10,953	5,883	<b>Alternative 1</b>		
			0,641	<b>5,242**</b>	47,9
			<b>Alternative 2: Adopting the Biodiversity No-Go Areas</b>		
			0,616	<b>5,306***</b>	48,4
Sundays River riparian and floodplain: Albany Alluvial Vegetation	7,6	6,111	<b>Both Alternatives</b>		
			0	6,111	80,4
<b>TOTAL</b>	<b>18,553*</b>	<b>11,994</b>			

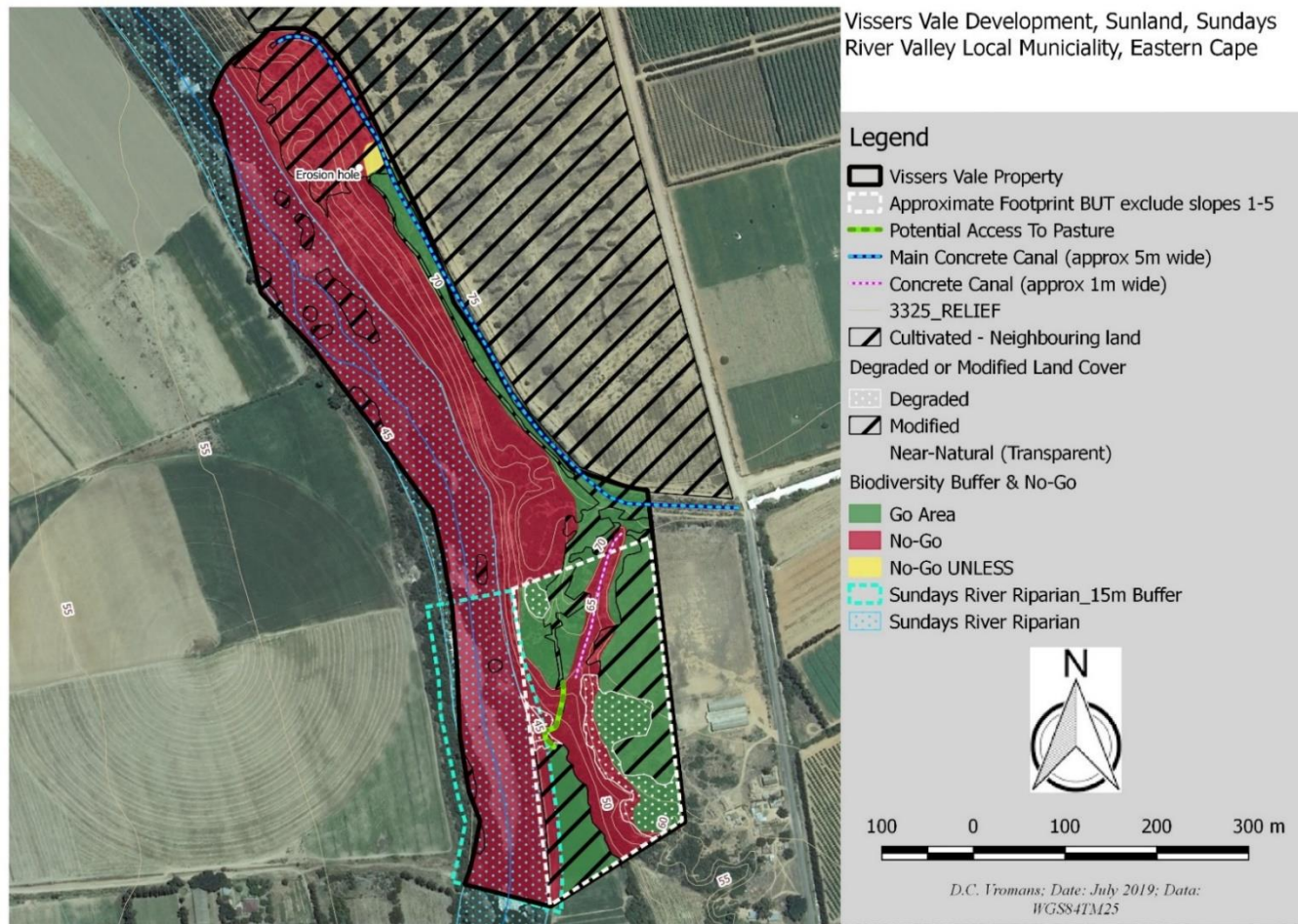
\* This total excludes the bare rock (0.116 ha)

\*\* This figure is based on the presumption that the NO-GO areas within the proposed cultivation areas (Alternative 1) are roughly equivalent to the slopes 1:5 (given these areas are unavailable). See Section 6.2 for the alternatives.

\*\*\* This figure is only slightly different to Alternative 1 due to the proposed warehouse footprint being located in approximately 0.025 ha of near-natural cover.

Note: Approximately 0.68 ha of degraded Sundays Valley Thicket will be cleared in the proposed pasture area.





**Figure 25. Ecologically Sensitive Areas or Biodiversity No-Go Areas on Farm Visser's Vale.** Note the approximate pastures footprint area (which excludes the 1:5 slopes and 15 m buffer). The feasibility of the position of the proposed chalets and residence to be verified by an Engineer/ Geotechnical Assessment. No-Go UNLESS means that the geotechnical assessment must verify the suitability of the area for building purposes due to the presence of a large 'erosion hole' proximate thereto (Plate 4.1).

## 5. SECTION 5: LEGISLATIVE CONTEXT

The key legislation that triggered the ecological assessment, including vegetation and aquatic surveys, is the National Environmental Management Act (107 of 1998) and the National Water Act (36 of 1998), respectively.

The overriding legislation that guided this aquatic assessment pertains to Section 21(c) and 21(i) of the National Water Act (36 of 1998) as it requires that all wetlands are delineated within the 500m radius of a proposed development. Furthermore, that riparian habitat is also delineated within 100m radius of a proposed development. In the absence of delineated riparian habitat and/ or the 1:100 year floodline, the 100m from the edge of a watercourse should be provided.

Thus, the aquatic assessment also aimed to determine the requirement for a Section 21(c) and 21(i) Water Use License Application (WULA) regarding the General Authorisation in terms of Section 39 of the National Water Act (36 of 1998).

**In terms of Section 21(c) and 21(i) General Authorisation (2016 Notice 509), the following terms are defined:**

- **"diverting"** means to, in any manner, cause the instream flow of water to be rerouted temporarily or permanently;
- **"flow- altering"** means to, in any manner, alter the instream flow route, speed or quantity of water temporarily or permanently;
- **"impeding"** means to, in any manner, hinder or obstruct the instream flow of water temporarily or permanently, but excludes the damming of flow so as to cause storage of water;
- **"regulated area of a watercourse"** for section 21(c) or (i) of the Act water uses in terms of this Notice means:
  - (1) 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;
  - (2) 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 (subject to compliance to section 144 of the Act); or
  - (3) A **500 m radius** from the delineated boundary (extent) of any wetland or pan.

**The General Authorisation does not apply:**

- (a) To the use of water in terms of section 21(c) or (i) of the Act for the rehabilitation of a wetland as contemplated in General Authorisation 1198 published in Government Gazette 32805 dated 18 December 2009,
- (b) 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** (Appendix A [*of the general authorisation, not this report*]). This Risk Matrix must be completed by a suitably qualified SACNASP professional member;
- (c) In instances where an application must be made for a water use license for the authorisation of any other water use as defined in section 21 of the Act that may be associated with a new activity;
- (d) Where storage of water results from the impeding or diverting of flow or altering the bed, banks, course or characteristics of a watercourse; and
- (e) To any water use in terms of section 21(c) or (i) of the Act associated with construction, installation or maintenance of any sewerage pipelines, pipelines carrying hazardous materials and to raw water and wastewater treatment works.



*In other words, if the proposed development does not conflict with any of the above, a water use licence application is not required, and a general authorisation in terms of Section 39 of the National Water Act can be issued, thus registering the water use(s).*

**A summary of the relevant legislation that relates to potential ecological impacts that may accrue from the proposed development:**

LEGISLATION AND OBJECTIVE	LEGISLATIVE IMPLICATIONS FOR THE PROPOSED DEVELOPMENT
<p><b>THE CONSTITUTION (108 OF 1996)</b></p> <p>The South African Constitution is the supreme law of the land and ensures that: '<i>... everyone has the right to an environment that is not harmful to their health or well-being; and to have the environment protected for the benefit of present and future generations.</i> It requires that development is sustainable.</p>	<p>Measures must be implemented that 1) prevent pollution and ecological degradation; 2) promote conservation; and 3) secure ecologically sustainable development and use of natural resources, while promoting justifiable economic and social development'.</p>
<p><b><u>NATIONAL WATER ACT (NWA) 36 OF 1998</u></b></p> <p>The NWA is concerned with the overall management, equitable allocation and conservation of water resources in South Africa. It controls and manages water use in terms Section 39 General Authorisation (GA) regarding water abstraction from a natural water resource 21(a), water storage 21(b), wastewater discharge and irrigation 21(e, f, g, h), impact on watercourses, altering or altering a watercourse 21(c and i) and the determination of the Reserve. The GA determines registration or licensing requirements.</p> <p><b><u>Section 21a (Notice 538 of 2016):</u></b> Surface and Ground Water Abstraction Rates and Storage Volumes must be within the limits set by the Authorisation, otherwise a license is required.</p> <p><b><u>Section 21b (Notice 538 of 2016):</u></b> Groundwater A WULA is usually processed for the storage of &gt;2 000m<sup>3</sup> of surface water in the N-Catchment (Sundays River Catchment) (Section 21(b)), where surface water means “<i>a stream or water flowing over land, regardless of whether the flow is intermittent, or an alluvial aquifer directly connected to a stream, or an in-channel dam.</i>”</p> <p><b><u>Section 21c and 21i (Notice 509 of 2016):</u></b> A Water Use Licensing Application (WULA) or GA is processed where a proposed development lies within 500m of wetland habitat or within 100m of a river (watercourse) (in the absence of a 1:100 year flood line and delineated riparian area), in terms of Section 21(c) (impeding or diverting flow in a watercourse) and 21(i) (altering the beds and banks etc. of a watercourse).</p> <p><b><u>Section 21g (Notice 665 of 2013):</u></b> Wastewater storage dams and wastewater disposal sites must be located - (a) outside of a watercourse; (b)</p>	<p>Measures must be implemented that prevent pollution and ecological degradation of aquatic resources i.e. rivers and wetlands.</p> <p><b><u>Section 21a: Water supply:</u></b> Currently there is an agreement between the Owner of Remainder of Portion 219 of the Farm Selborne No. 115, Mr David Stuart Robinson (the neighbour); and the Owner of Portion 1 of the Farm Vissers Vale No. 96, Mr Luc de Villiers, to get water to Vissers Vale via a minimum 25mm diameter piped connection. <b><u>The water supply should be within the limits set within the water use entitlement scheduled to Mr Robinson; as well as water transfer requirements set by the Act, where/if applicable. The applicability of any additional requirements to be confirmed by the Department of Water and Sanitation (DWS). To be undertaken by the Environmental Assessment Practitioner or professional undertaking the water use application to DWS.</u></b></p> <p>Dry land cropping will be practiced.</p> <p><b><u>Section 21b: Water storage/ Dams:</u></b> Do not apply.</p> <p><b><u>Section 21c and 21i:</u></b></p> <p>The Sundays River, with associated wetlands, runs along the western boundary of the property. The proposed development therefore lies within 500m of wetlands but beyond the delineated riparian habitat.</p>



LEGISLATION AND OBJECTIVE	LEGISLATIVE IMPLICATIONS FOR THE PROPOSED DEVELOPMENT
<p>above the 100-year flood line, or alternatively, more than 100m from the edge of a water resource or a borehole which is utilised for drinking water or stock watering, whichever is further; and (c) on land that is not, or does not, overlie, a major aquifer (identification of a major aquifer will be provided by the DWS upon written request).</p> <p><b>Section 144/ 1:100 year floodline:</b> For the purposes of ensuring that all persons who might be affected have access to information regarding potential flood hazards, no person may establish a township unless the layout plan shows, in a form acceptable to the local authority concerned, lines indicating the maximum level likely to be reached by floodwaters on average once in every 100 years. In other words, the developer must delineate the 1:100-year flood line on a map when establishing a township.</p>	<p><b>Wastewater disposal sites - Sewage:</b> Conservancy tanks (closed systems) to be installed. The applicability of Section 21g (sewage disposal) to be confirmed by DWS.</p> <p>Waste storage and disposal sites and township developments are not components of this application.</p>
<p><b>NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) 107 OF 1998</b></p> <p>The NEMA provides for overarching principles that should inform South Africa's environmental management and governance. The NEMA is mainly regarded as a reasonable legislative measure required from the State in order to fulfil the environmental right (Section 24) of the Constitution. It requires development to be socially, environmentally and economically sustainable. The Environmental Impact Assessment (EIA) Regulations, gazetted in terms of Section 24, trigger an authorisation process for certain activities.</p>	<p>The activity requires an <b>Environmental Impact Assessment (EIA)</b>. Refer to the EIA Report for the listed activities.</p> <p>This report serves to inform the process.</p>
<p><b>NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (NEMBA) 10 OF 2004</b></p> <p>The Act provides for the protection of listed endangered ecosystems and restricts activities according to the categorization of the area (not just by listed activity as specified in the Environmental Impact Assessment regulations). It promotes the application of appropriate environmental management tools to protect biodiversity. Chapter 3 allows for the publication of bioregional plans. Chapter 5 of the Act refers to the introduction and control of alien invasive</p>	<p>The ECBCP is a precursor to a bioregional plan. It is a systematic biodiversity plan which has been adopted by the competent authority (DEDEAT) and thus triggers listed activities which require assessment and Environmental Authorisation. All proposed developments should consider the ECBCP. <b>The majority of the farm is classified as CBA 1 (Section 3.3.2). Note the land cover errors which indicate the Sundays River to be cultivated / transformed. The associated sub-quaternary catchment is Aquatic CBA 2b.</b></p> <p>The SRV CBA Map is a precursor to a bioregional plan and should supersede the ECBCP as it is a more detailed (finer scale) and more up-to-date map of</p>

LEGISLATION AND OBJECTIVE	LEGISLATIVE IMPLICATIONS FOR THE PROPOSED DEVELOPMENT
<p>species. The Threatened or Protected Species (ToPs) Regulations, in terms of Section 97 (Chapter 8), requires an authorisation process to be followed.</p>	<p>biodiversity (that is based on the ECBCP systematic plan). Furthermore, it is being integrated into the revision of the ECBCP, which is currently underway. The only modifications to the SRV CBA Map will involve updating the land cover (Pers. Comments: Dr P Desmet). Therefore, any natural habitat that has been removed will be reflected as such in the revised ECBCP. As a result, the SRV CBA Map should be consulted to inform decision-making. <b>Most of the property is classified as CBA and ESA, although the site assessment verified some changes to the CBA Map. Refer Section 4.5 (Figure 24).</b></p> <p>Any threatened or protected species cannot be removed without an authorisation. No NEMBA TOP species were found.</p> <p>Alien species invasion should be controlled. Examples on site included <i>Eucalyptus grandis</i> and <i>Opuntia ficus-indica</i> (Section 4.3.1). However, those along the Sundays River cannot be removed without an authorisation if the banks of the river are disturbed (i.e. if the roots are removed).</p>
<p><b>NATIONAL FORESTS ACT (NFA) 84 OF 1998</b></p> <p>Any area that has vegetation that is characteristic of a closed and contiguous canopy is defined as a 'forest' and as a result falls under the authority of the Department of Forestry. The removal of any indigenous or protected trees or clearing of any woodland, thicket or forest requires a permit.</p> <p>'forest' includes - (a) a natural forest, a woodland and a plantation; (b) the forest produce in it; and (c) the ecosystems which it makes up.</p> <p>"woodland' means a group of indigenous trees which are not a natural forest, but whose crowns cover more than five per cent of the area bounded by the trees forming the perimeter of the group.</p> <p>In terms of policy, building structures must typically be placed outside the forest with a sufficient buffer area to keep the forest margin intact (usually &gt; 20 m). In addition, that only under exceptional circumstances will the Department of Forestry consider clearing forest, while forest habitat that has</p>	<p>No protected trees or forest habitat on site.</p>



LEGISLATION AND OBJECTIVE	LEGISLATIVE IMPLICATIONS FOR THE PROPOSED DEVELOPMENT
<p>been cleared and which will restore with time should be considered forest and the forest policy guidelines should be applied (DAFF, 2007).</p>	
<p><b>CAPE NATURE AND ENVIRONMENTAL CONSERVATION ORDINANCE (19 OF 1974)</b></p> <p>The Ordinance allows for conservation of the natural environment; and the protection of wildlife. Certain biota are scheduled and therefore protected. A permit must be obtained from Department of Economic Development, Environment Affairs and Tourism (DEDEAT), Provincial Environment Affairs (Biodiversity Unit), to remove or destroy any plants listed in the Ordinance.</p>	<p>Several protected species were recorded, which will require a license to be removed (Section 4.3.2).</p>
<p><b>ENVIRONMENT CONSERVATION ACT (ECA) 73 OF 1989</b></p> <p>Section 20 of the Act requires for the appropriate disposal of waste and licensed waste disposal site, although any new waste licenses are subject to approval via the National Environmental Management: Waste Act (NEMWA).</p>	<p>All wastes (general and hazardous) generated should be disposed of at an ECA licensed waste disposal site, if applicable, by the contractor/developer. "If applicable" - because: In terms of Section 81 of the NEMWA, permits issued in terms of ECA Section 20 are still valid unless a NEMWA permit has been requested by the Authority. If so, the licensed site will be NEMWA licensed.</p> <p><b>Waste disposal is not a component of the application, although any waste generated via agricultural activities should comply with any required storage and disposal mechanisms. For example: hazardous and chemical wastes (includes empty containers) should be disposed of at registered landfill sites; and not buried or burnt on site.</b></p>
<p><b>NATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT (NEMPAA) 57 OF 2003</b></p> <p>The Act provides for the declaration of Protected Areas (PAs) in three forms (Chapter 3), namely Special Nature Reserves (Part 2), Nature Reserves (Part 3) and Protected Environments (Part 4).</p> <p>National Parks are the equivalent of National Protected Areas. Section 10 states that a Protected Area, declared in terms of provincial legislation, is either a nature reserve or protected environment.</p>	<p>The Addo Elephant National Protected Area (AENP), a formal protected area, is ~8.2 km from the property, therefore comment from SANParks is required.</p> <p>South African National Parks has a vested interest in the expansion of Protected Areas in terms of the National Protected Area Expansion Strategy, however, the site does not fall within a focus area for expansion. (Section 3.3.4). It does however fall within or partially within Priority Natural Area, and Viewshed Protection Area in terms of the AENP Buffer Zones (See Section 3.3.5). As far as can be determined, the AENP buffer zones (i) have not been established by publication in the Gazette, (ii) are not integrated into the SRVM SDF as a Special Control/ Natural Area; and (iii) have not been declared as a Protected</p>

LEGISLATION AND OBJECTIVE	LEGISLATIVE IMPLICATIONS FOR THE PROPOSED DEVELOPMENT
	Environment in terms of the Act. Thus, the AENP buffer zones are not legislated in terms of the strategy.
<p><b>CONSERVATION OF AGRICULTURAL RESOURCES ACT (CARA) 43 OF 1983</b></p> <p><i>[to be replaced by the Sustainable Use of Agricultural Resources Bill]</i></p> <p>Section 6 of the Act, relates to the prescription of measures which all land users have to comply with, e.g. the prohibition of modifying run-off flow patterns; the control of invader plants; and the restoration of eroded land. <b>Section 7 protects any vlei, marsh, water sponge or watercourse.</b></p> <p>A list of alien invasive species has been regulated.</p>	<p>This Act applies to the proposed cultivation on site as an agricultural application. An agricultural permit will be required to cultivate virgin soil.</p> <p>The NEMA and NWA also effectively deal with the potential impacts of proposed developments in relation to erosion, alien invasive plants and impacts on aquatic resources. <b>No wetland will be ploughed and the Sundays River will be avoided.</b></p> <p>Alien invasive plants occur on site e.g. <i>Opuntia ficus-indica</i>, <i>O. aurantiaca</i>. These should be removed and their spread controlled (Section 4.3). However, those along the Sundays River cannot be removed without an authorisation if the banks of the river are disturbed (i.e. if the roots are removed).</p>

## 6. SECTION 6: ECOLOGICAL RISK/IMPACT ASSESSMENT

### 6.1. IMPACT ASSESSMENT METHODOLOGY

*Issues were assessed in terms of the following criteria:*

CRITERIA	CATEGORIES	EXPLANATION
Overall nature	Negative	Negative impact on affected biophysical or human environment.
	Positive	Benefit to the affected biophysical or human environment.
Type	Direct	Are caused by the action and occur at the same time and place.
	Indirect Secondary or	Are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. May include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
	Cumulative	Is the impact on the environment, which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
Extent: Spatial Extent over which impact may be experienced (E)	Site (1)	Immediate area of activity incorporating a 50m zone which extends from the edge of the affected area.
	Local (2)	Area up to and/or within 10km of the 'Site' as defined above.
	Regional (3)	Entire community, drainage basin, landscape etc.
	National (4)	South Africa.
Duration of impact (D)	Very Short-term (1)	Impact would last for the duration of activities such as land clearing, land preparation, fertilising, weeding, pruning and thinning. Quickly reversible. (0–1 years).
	Short-term (2)	The lifetime of the impact will be of a short duration (2-5 years).
	Medium-term (3)	Impact would last for the duration of project activity, such as harvesting. Reversible over time (>5 - <15 years).
	Long-term (4)	Impact would continue beyond harvesting/ extraction of the trees (> 15 years).
	Permanent (5)	Impact would continue beyond decommissioning.
Severity (S)	Negative	Based on separately described categories examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning or slightly alters the environment itself. <ul style="list-style-type: none"> <li>0 is small and will have no meaningful effect on the environment;</li> <li>2 is minor and will not result in an impact on processes;</li> <li>4 – 5 is low and will cause a slight impact on processes;</li> </ul>
	Positive	



CRITERIA	CATEGORIES	EXPLANATION
		<ul style="list-style-type: none"> <li>• 6 – 7 is moderate and will result in processes continuing but in a modified way;</li> <li>• 8 – 9 is high (processes are altered to the extent that they temporarily cease);</li> <li>• 10 is very high and results in complete destruction of patterns and permanent cessation of processes.</li> </ul>
Reversibility (R)	<b>Completely Reversible (0)</b>	The impact can be completely reversed with the implementation of correct mitigation and rehabilitation measures.
	<b>Partly Reversible (0.5)</b>	The impact can be partly reversed providing mitigation measures are implemented and rehabilitation measures are undertaken
	<b>Irreversible (1)</b>	The impact cannot be reversed, regardless of the mitigation or rehabilitation measures.
Irreplaceable Loss (I)	<b>Resource will not be lost (0)</b>	The resource will not be lost or destroyed provided mitigation and rehabilitation measures are implemented.
	<b>Resource may be partly destroyed (0.5)</b>	Partial loss or destruction of the resource will occur even though all management and mitigation measures are implemented.
	<b>Resource cannot be replaced (1)</b>	The resource cannot be replaced no matter which management or mitigation measures are implemented.
Probability of occurrence (P)	<b>Unlikely (1)</b>	<40% probability. Very improbable (probably will not happen).
	<b>Possible (2)</b>	40% probability. Improbable (some possibility, but low likelihood).
	<b>Probable (3)</b>	>70% probability. Probable (distinct possibility).
	<b>Highly Probable (4)</b>	>80 %. Highly probable (most likely).
	<b>Definite (5)</b>	>90% probability. Definite (impact will occur regardless of any prevention measures).
Mitigation Potential  [i.e. the ability to manage or mitigate an impact given the necessary resources and feasibility of application.]	<b>High Completely Mitigatable</b> or	<p>Relatively easy and cheap to manage. Specialist expertise or equipment is generally not required.</p> <p>The nature of the impact is understood and may be mitigated through the implementation of a management plan or through 'good housekeeping'. Regular monitoring needs to be undertaken to ensure that any negative consequences remain within acceptable limits.</p> <p>The significance of the impact after mitigation is likely to be low or negligible.</p>
	<b>Moderate Partially Mitigatable</b> or	<p>Management of this impact requires a higher level of expertise and resources to maintain impacts within acceptable levels. Such mitigation can be tied up in the design of the Project.</p> <p>The significance of the impacts after mitigation is likely to be low to moderate.</p> <p>May not be possible to mitigate the impact entirely, with a residual impact(s) resulting.</p>
	<b>Low Unmitigatable</b> or	<p>Will not be possible to mitigate this impact entirely regardless of the expertise and resources applied.</p> <p>The potential to manage the impact may be beyond the scope of the Project.</p> <p>Management of this impact is not likely to result in a measurable change in the level of significance.</p>
<b>Impact Significance</b>	<b>Negligible (0-26)</b>	Negligible alterations of the environment and can be easily avoided by implementing appropriate mitigation measures.

CRITERIA	CATEGORIES	EXPLANATION
[Dur+Ext+R+I+Sev] X Probability	Low (>26-52.5)	Largely of HIGH mitigation potential, <u>after</u> considering the other criteria. Low to very low (the impact/risk may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making)
	Moderate (>52.5 ≤ 78/5)	Largely of MODERATE or partial mitigation potential <u>after</u> considering the other criteria. Medium (the impact /risk will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated).
	Very High/ Significant /Substantial (High) (>78.5 - 105)	Largely of LOW mitigation potential <u>after</u> considering the other criteria. Very high (the impact/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making i.e. the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating).

## 6.2. FINAL PROPOSED PROJECT LAYOUT AND ALTERNATIVES

### The following alternatives were assessed:

- **Alternative 1:** The proposed layout is that which is proposed by the Applicant. It includes the *potential* developable area (see Figure 26); but which excludes 1:5 slopes (not yet determined) and the 15 m buffer from the riparian edge. It is the pre-mitigation significance status.
- **Alternative 2:** The recommended biodiversity NO-GO areas and other mitigation measures. It is the post-mitigation significance status.

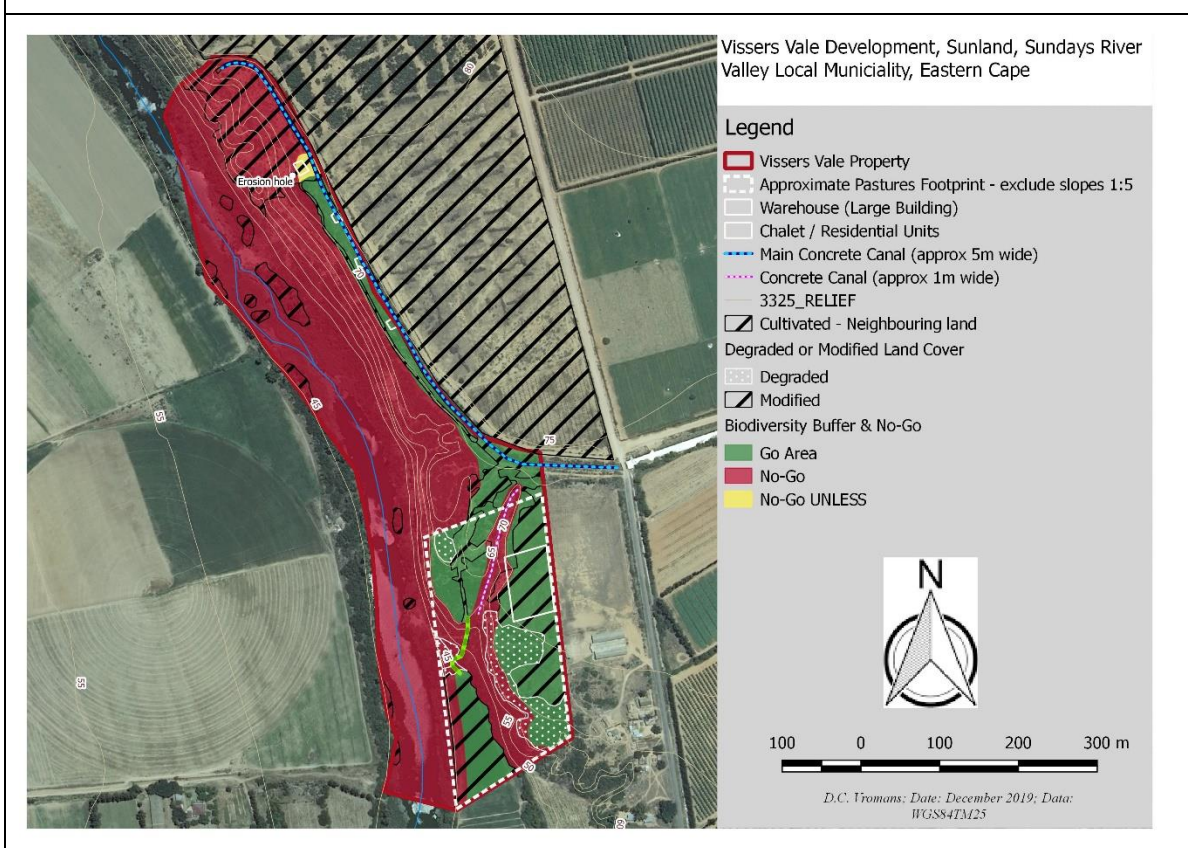
There are only slight differences in the layout between Alternative 1 and Alternative 2. The recommended geotechnical assessment must confirm the viability of the positioning of the residence due to the 'erosion hole' (Plate 4.1 & Figure 26) proximate to the proposed residential unit; and the chalet and septic tanks due to the limited space along the plateau between the cliff edge and defunct canal.

### According to the Engineers Report (Spies, 2019):

*Subject to the outcome of the geotechnical investigation and strict adherence to the detailed design and execution of the bulk earthworks and if required the applicable earth retaining structures as specified and the roads and wet services systems as indicated in this report, we are convinced that the proposed mixed development on Portion 1 of the Farm Vissers Vale No. 96, Administrative District of Uitenhage in the Sundays River Valley Municipality, Eastern Cape near Addo could be serviced effectively from a civil engineering perspective.*

### Further comment from the Engineer was received 5 December 2019, namely:

*'Most of the details regarding the viability to accommodate the proposed locations of the 1 residential unit and 3 chalets will be dictated by the outcome of the geotechnical report. The geotechnical report must indicate the stability of the ground on or near the area under discussion. The geotechnical engineer shall also indicate if it would be practically possible to manipulate and stabilise the existing ground to accommodate the road, buildings and conservancy tanks. If there is a practical and economical way to stabilise and manipulate the profile of the ground on/near the old canal and the cliff for the development, the position and design of the stormwater structures will be subject to the geotechnical design recommendations. I will be in a better position to give you meaningful answers if I do have the professional opinion of the geotechnical engineer stating the facts regarding the soil conditions which are suspect.'*



**Figure 26. The two alternative layouts, Alternative 1 (Top) and Alternative 2 (Bottom). No-Go UNLESS means that the geotechnical assessment must verify the suitability of the area for building purposes due to the presence of a large 'erosion hole' (Plate 4.1).**



**6.2.1. The No-Go Alternative**

The only ‘vegetation and floristics’ impacts that are likely to occur for the No-Go Alternative is (1) the continued spread of alien invasive plants and (2) loss /alteration of vegetation due to erosion.

Currently, the spread of these plants is not being controlled. Consequently, the impact is likely to be worse than the Go Alternative, which would represent the proposed development, if the continued spread of these plants are managed in the long term.

As indicated in Section 4.6, steep slopes and associated erosion are a high risk on the property, especially to the north. Continued erosion will occur, particularly to the north, where stormwater run-off is likely to flow along the defunct and broken concrete irrigation canal. This is currently a HIGH impact. If the appropriate measures are put in place, as recommended by an Engineer, the impact should ideally be negated. The defunct irrigation canal however is not the responsibility of the Applicant.

**6.3. ASSESSMENT OF IDENTIFIED IMPACTS**

**Regarding ECBCP Transformation Thresholds**

The Eastern Cape Biodiversity Conservation Plan (ECBCP) transformation thresholds for aquatic CBA 2 (A2b) were assessed against the proposed agriculture. See Section 4.4.2. The percentage modification is raised from 46.24 % to 46.33 %. Even without the proposed development taking place, the <20% transformation threshold is exceeded. These calculations are based on the available land cover data which is out-dated. In addition, the Sundays River is Largely Modified (SAIAB Version 5, 2018) (Van Deventer et al., 2018).

It should be noted that the NFEPA Map does not indicate the farm as a priority catchment, which was integrated and ‘reflected’ in the Sundays River CBA Map. Furthermore, the NFEPA implementation manual states that research indicates that streams in agricultural catchments usually remain in good condition until the extent of agriculture in the catchment exceeds 30 % - 50 %. (Allan, 2004 cited in Driver et al., 2012). Consequently, the ECBCP Aquatic CBAs or thresholds were not assessed in the impact section below. As noted above, according to available land cover data, the sub-quaternary catchment is already modified by 46.2 %.

***The following impacts were identified and assessed, namely:***

<b>IMPACTS</b>	<b>DEVELOPMENT PHASE</b>	<b>DIRECT / INDIRECT</b>
Impact 1: Loss of vegetation due to clearing (biodiversity loss).	Construction	Direct
Impact 2: Loss and fragmentation of Critical Biodiversity Area and Ecological Support Area due to clearing (biodiversity loss).	Construction	Direct
Impact 3: Loss of species of special concern due to clearing (biodiversity loss).	Construction	Direct
Impact 4: Potential water quality degradation of the Sundays River and associated wetlands due to the use of pesticides and herbicides (hydrological processes and biodiversity loss).	Operation	Direct
Impact 5: Potential sedimentation and erosional impacts on the Sundays River, and consequent alteration of riparian and	Construction & Operation	Indirect

wetland vegetation (hydrological processes and biodiversity loss).		
Impact 6: Potential erosion of the steep slopes and consequent erosion and sedimentation of the Sundays River due to the proposed chalets, residence and access road (hydrological processes and biodiversity loss).	Construction & Operation	Indirect
Impact 7: Potential impact of groundwater abstraction (hydrological processes and biodiversity loss).	Operation	Direct
Impact 8: Potential impact of sewage pollution (hydrological processes and biodiversity loss).	Operation	Direct

**The impacts were assessed as follows:**

**6.3.1. Impact 1: Loss of vegetation and associated habitat due to clearing**

<i>Impact 1: Loss of vegetation and associated habitat due to clearing</i>		
<p><b>Nature:</b> The proposed development footprint is located in largely modified or degraded land cover. Consequently, the clearance of near-natural vegetation cover amounts to approximately 0.64ha or 10.9% of the current near natural vegetation (of the Sundays Valley Thicket). See explanation in Table 19.</p> <p>Sundays Valley Thicket is Least Threatened (2011 biodiversity targets) but STEPs Sundays Spekboom Thicket is Vulnerable (STEP targets). That said, the new SA VegMap integrated the STEP vegetation, and thus the former ecosystem threat status shall apply.</p> <p>The proposed warehouse is located largely within transformed Sundays Valley Thicket. The residence and chalets are in modified to largely near-natural vegetation cover (respectively).</p> <p>The proposed pasture will take place in already transformed Albany Alluvial Vegetation and therefore there is NO IMPACT on this vegetation type. The other areas proposed for crop cultivation will take place in modified, degraded and near-natural areas of Sundays Valley Thicket; but will exclude 1:5 slopes. Consequently, the differences in terms of hectares of near-natural vegetation removed in Alternative 1 compared with Alternative 2 is not great. See explanation in Section 4.6.1.</p> <p>As a result, the pre significance impact (Alternative 1) and post significance impact (Alternative 2) ratings are LOW.</p> <p>Vegetation cover is also providing habitat and is a feeding ground for indigenous fauna. The control of alien species should also be controlled, which is usually implemented within the orchards i.e. minimal alien re-growth occurs, especially plants such as <i>Opuntia ficus indica</i> and <i>O. aurantiaca</i>.</p> <p>The Ecosystem Guidelines for the Albany Thicket Biome (Draft 2018) were consulted. The guidelines basically indicate that intact thicket should not be developed, corridors between intact thicket should be implemented and buffers around Protected Areas should be conserved. Unfortunately, this is not very helpful when considering agricultural development within an agricultural hub. That said, the Sundays River should act as an important corridor, while the more intact vegetation on the slopes further contribute to corridor movement. The movement of large fauna should not be restricted by fencing. Fencing restrictions can lead to a kind of passive hunting that should not be encouraged. Fencing should rather be placed beyond (outside of) buffers.</p>		
<p><b>Alternatives:</b> The differences in terms of hectares of near-natural vegetation removed in Alternative 1 compared with Alternative 2 is not great, however, Alternative 2 clears a little less than Alternative 1.</p>		
<p><b>Project phase:</b> Construction and Establishment phase (clearing and planting crops), as well as the operational phase (although additional loss should not occur in the latter phase).</p>		
Criteria	Without mitigation	With mitigation
	Alternative 1	Alternative 2
Extent (E)	Site (Score 1)	Site (Score 1)
Duration (D)	Permanent (Score 5)	Permanent (Score 5)

<i>Impact 1: Loss of vegetation and associated habitat due to clearing</i>		
<b>Magnitude (M) / Severity</b>	Low (Score 5)	Low (Score 4)
<b>Probability (P)</b>	Definite (Score 5)	Definite (Score 5)
<b>Reversibility (R)</b>	Partly Reversible (Score 0.5)	Partly Reversible (Score 0.5)
<b>Irreplaceable loss of resources (I)</b>	Partially Replaceable (0.5)	Partially Replaceable (0.5)
<b>Significance</b> (E+D+M+R+I)P S =	Moderate (Score -60)	Low (Score -52.5)
<b>Status (positive or negative)</b>	Negative	
<b>Degree of Confidence</b>	High	
<b>Can impacts be mitigated/reduced</b>	Yes	
RECOMMENDED MITIGATION MEASURES		
<ul style="list-style-type: none"> <li>• Adopt the biodiversity NO-GO areas (Figure 25) (Alternative 2). A 5 m set back should be applied from the edge of steep inclines, from the new proposed pastures, to prevent erosion and to negate the worsening of existing erosion on the steep slopes.</li> <li>• The 1:5 slopes should be accurately determined to ensure that the NO-GO areas encompass these areas.</li> <li>• The existing access road within the NO-GO area can be utilized. This access road terminates mid-slope, however, a potential access road is indicated on Figure 25 (or Figure 26).</li> <li>• Maintain remaining land as recommended and remove <i>only</i> the required amount of vegetation i.e. prevent indiscriminate clearing beyond the construction footprint.</li> <li>• Rehabilitation of disturbed areas post establishment with indigenous species, if necessary (as this should be avoided if bullet 2 above is implemented). Plants however can be used in the 'rehabilitation' of other disturbed areas (existing) on the farm or other land owned by the Applicant. Indigenous trees could potentially be purchased and planted in the disturbed areas, and immature trees translocated from the clearing process.</li> <li>• Preference for the use of indigenous windbreaks, if possible (if windbreaks are required).</li> <li>• Clear, control and manage alien invasive plants, such as <i>Opuntia ficus-indica</i> etc.</li> <li>• Audit reporting by the Environmental Control Officer during construction / clearing of orchard areas to align with no-go areas.</li> <li>• Compliance with regulations pertaining to the Conservation of Agricultural Resources Act (43 of 1983), where applicable.</li> </ul>		
CUMULATIVE IMPACTS:		
<p><i>With respect to cumulative impacts on the farm VISSERS VALE:</i> LOW (as per the project specific impact above), post mitigation.</p> <p><i>With respect to cumulative impacts of land uses within the N40E catchment:</i> Based on the land cover data, approximately 46.2 % of the sub-quaternary catchment N40E has been modified / transformed, while ~13.4 % is modified at the quaternary catchment level (Section 4.4.2). The data are under-estimates. The current cumulative impacts in terms of vegetation loss at the quaternary catchment level is likely to be Low (&lt;30%)</p>		
<p><u>The following mitigation measures are not the responsibility of the Applicant, but serve to inform the cumulative impact assessment:</u></p> <ul style="list-style-type: none"> <li>• Maintain biodiversity pattern and process targets on individual properties proposed for development in the future and/or comply with the CBA Map (where applicable). This should include recommended site-verified aquatic buffers, if relevant to a site. <b>(Catchment mitigation measure not within the control of the Applicant).</b></li> <li>• Ensure revision of the CBA Map to compensate for losses every 5 years. <b>(Catchment mitigation measure not within the control of the Applicant).</b></li> <li>• Support expansion of the Protected Area network in terms of the National Environmental Management: Protected Areas Act. <b>(Catchment mitigation measure not within the control of the Applicant).</b></li> </ul> <p>Ensure sustainable development and comply with the municipal urban edge and rural development policies <b>(Catchment mitigation measure not within the control of the Applicant).</b></p>		



<i>Impact 1: Loss of vegetation and associated habitat due to clearing</i>	
<b>Post Mitigation:</b>	
<p>The potential future cumulative impacts cannot be ascertained with certainty. However, based on the Sundays River Valley CBA Map which aims to avoid significant cumulative impacts at the landscape and catchment level, the CBA Map demarcates approximately 62% of the sub-quaternary catchment as Protected Area, Critical Biodiversity Area and Ecological Support Area (Section 3.3.1, Figure 10). Future cumulative impacts in the sub-quaternary and quaternary catchment will potentially be MEDIUM (≥30% - 60%), if the above mitigation measures are adopted.</p> <p><i>Note: The cumulative impacts have not followed the project specific format / calculations, while the land cover provides the indicator of level of transformation /impact, although the calculations would result in a MEDIUM rating (pre- and post-mitigation).</i></p>	
<b>RESIDUAL IMPACTS:</b>	
Possible impact on the remaining catchment due to changes in run-off characteristics from the cultivated areas (cumulative); and into the River	

**6.3.2. Impact 2: Loss and Fragmentation of Critical Biodiversity Area (CBA) and Ecological Support Area (ESA) due to clearing**

<i>Impact 2: Loss and Fragmentation of CBA and ESA due to clearing</i>		
<p><b>Nature:</b> The majority of the property is Critical Biodiversity Area (CBA) and Ecological Support Area (ESA) (see Section 4.5.3). Based on the site survey and assessment, most of the transformed /modified land can be excluded from CBA status (Figure 24), apart from the alien invasive plants within the riparian habitat and the steep slopes adjacent to the Sundays River (that are badly eroded). These should remain CBA. The reason for the eroded areas to remain CBA is to prevent any further development that may be susceptible to landslides. Refer Section 4.5.3 for the full explanation.</p> <p>Biodiversity Target Areas and all riparian and wetland habitat, including site verified buffers, should be conserved on the property, which are represented in the ecological sensitivity map/ Biodiversity No-Go Areas (Figure 25, Section 4.6).</p> <p>Therefore, based on the land cover, but excluding the aforementioned modified CBAs, and biodiversity NO-GO areas, a relatively small amount of CBA (near-natural) and ESA (degraded) will be removed due to the proposed development.</p> <p>However, due to the importance of these areas, the severity of the impact is raised, calculating a MEDIUM pre and post significance.</p>		
<p><b>Alternatives:</b> The differences in terms of hectares of near-natural vegetation removed in Alternative 1 compared with Alternative 2 is not great, however, Alternative 2 clears a little less than Alternative 1.</p>		
<p><b>Project phase:</b> Construction and Establishment phase (clearing and planting crops), as well as the operational phase (although additional loss should not occur in the latter phase).</p>		
<b>Criteria</b>	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent (E)</b>	<b>Site</b> (Score 1)	<b>Site</b> (Score 1)
<b>Duration (D)</b>	<b>Permanent</b> (Score 5)	<b>Permanent</b> (Score 5)
<b>Magnitude (M) / Severity</b>	<b>Low</b> (Score 5)	<b>Low</b> (Score 4)
<b>Probability (P)</b>	<b>Definite</b> (Score 5)	<b>Definite</b> (Score 5)
<b>Reversibility (R)</b>	<b>Partially Reversible</b> (Score 0.5).	<b>Partially Reversible</b> (Score 0.5).
<b>Irreplaceable loss of resources (I)</b>	<b>Partially replaceable</b> (Score 0.5)	<b>Partially replaceable</b> (Score 0.5)
<b>Significance (E+D+M+R+I)P</b>	<b>Moderate</b> (Score - 60)	<b>Moderate</b> (Score - 55)
<b>Status (positive or negative)</b>	Negative	
<b>Degree of Confidence</b>	High	

<i>Impact 2: Loss and Fragmentation of CBA and ESA due to clearing</i>	
<b>Can impacts be mitigated/reduced</b>	Yes
RECOMMENDED MITIGATION MEASURES	
<ul style="list-style-type: none"> <li>• Adopt the biodiversity NO-GO areas (Figure 25) (Alternative 2). A 5 m set back should be applied from the edge of steep inclines, from the new proposed pastures, to prevent erosion and to negate the worsening of existing erosion on the steep slopes.</li> <li>• The 1:5 slopes should be accurately determined to ensure that the NO-GO areas encompass these areas.</li> <li>• The existing access road within the NO-GO area can be utilized. This access road terminates mid-slope; however, a potential access road is indicated on Figure 25 (or Figure 26).</li> <li>• All other impact mitigation measures to be adopted.</li> </ul>	
CUMULATIVE IMPACTS:	
<p><u>With respect to cumulative impacts on the farm VISSERS VALE:</u> MODERATE (as per the project specific impact above).</p> <p><u>With respect to cumulative impacts of land uses within the N40E catchment:</u> According to the available data, the current and potential loss in extent (ha) of CBA and ESA is probably Low (Section 3.3.1), because these areas have been incorporated into the municipal SDF (although this does not guarantee that losses will not occur in the future). Furthermore, large areas of the catchment fall outside of the agricultural farming hub of the Sundays River Valley, while other areas of the landscape fall within mountainous terrain, and most of the areas to the far west are rural in character. However, the potential impact (pre-mitigation) is likely to be a MEDIUM, despite the preamble. This is a more precautionary conclusion and is possibly more realistic without mitigation measures in place, notwithstanding the planning tools in place.</p> <p><u>The following mitigation measures are not the responsibility of the Applicant, but serve to inform the cumulative impact assessment:</u></p> <ul style="list-style-type: none"> <li>• Maintain biodiversity pattern and process targets on individual properties proposed for development in the future and/or comply with the CBA Map (where applicable). This should include recommended site-verified aquatic buffers, if relevant to a site. <b>(Catchment mitigation measure not within the control of the Applicant).</b></li> <li>• Ensure revision of the CBA Map to compensate for losses every 5 years. (Catchment mitigation measure not within the control of the Applicant).</li> <li>• Support expansion of the Protected Area network in terms of the National Environmental Management: Protected Areas Act. <b>(Catchment mitigation measure not within the control of the Applicant).</b></li> <li>• Ensure sustainable development and comply with the municipal urban edge and rural development policies. <b>(Catchment mitigation measure not within the control of the Applicant).</b></li> </ul>	
<p><b>Post Mitigation:</b> The potential future cumulative impacts cannot be ascertained with certainty. However, based on the Sundays River Valley CBA Map, which aims to avoid significant cumulative impacts at the landscape and catchment level, the CBA Map demarcates ~62% of the sub-quaternary catchment as Protected Area, Critical Biodiversity Area and Ecological Support Area (Section 3.3.1, Figure 10). Future loss in the sub-quaternary and quaternary catchment is potentially LOW, if the above mitigation measures are adopted.</p> <p><i>Note: The cumulative impacts have not followed the project specific format / calculations, while the CBA Map statistics provides the indicator for level of protection or retention of CBA and ESAs, although the calculations would result in a LOW rating (pre- and post-mitigation).</i></p>	
RESIDUAL IMPACTS:	
Possible impact on the remaining catchment due to changes in run-off characteristics from the cultivated areas (cumulative); and into the River.	

**6.3.3. Impact 3: Loss of Floral Species of Conservation/Special Concern due to clearing**

<i>Impact 3: Loss of Floral Species of Conservation/Special Concern due to clearing</i>		
<p><b>Nature:</b> No Threatened species was recorded on site during the field assessment.</p> <p>Thirteen protected and Least Concern species were recorded. It should be noted that many of the vygies are common and have established due to past clearing, or due to open, sunny degraded and modified areas.</p> <p>There are a significant number of <i>Aloe pluridens</i>, and vygies, and it is thus likely that some loss will occur despite the proposed mitigation measures.</p>		
<p><b>Alternatives:</b> Both alternatives have the equivalent significant scores pre and post mitigation.</p>		
<p><b>Project phase:</b> Establishment phase (clearing and planting crops), as well as the operational or farming phase (although additional loss should not occur in the latter phase).</p>		
Criteria	Without mitigation	With mitigation
	Both Alternatives	
<b>Extent (E)</b>	Site (Score 1)	Site (Score 1)
<b>Duration (D)</b>	Long-term (Score 4)	Long-term (Score 4)
<b>Magnitude (M) / Severity</b>	Medium (Score 6)	Low (Score 4)
<b>Probability (P)</b>	Definite (Score 5)	Definite (Score 5)
<b>Reversibility (R)</b>	Partially reversible (Score 0.5)	Reversible (Score 0)
<b>Irreplaceable loss of resources (I)</b>	Partially Replaceable (Score 0.5)	Replaceable (Score 0)
<b>Significance (E+D+M+R+I)P</b>	Moderate (-60)	Low (-45)
<b>Status (positive or negative)</b>	Negative	
<b>Degree of Confidence</b>	High	
<b>Can impacts be mitigated/reduced</b>	Yes	
RECOMMENDED MITIGATION MEASURES		
<ul style="list-style-type: none"> <li>• License application to the Department of Economic Development, Environmental Affairs and Tourism for the removal of protected species.</li> <li>• Translocate as many succulent species as reasonably possible. It should be noted that some of the species are pioneers which establish very easily where disturbance has occurred, especially <i>Drosanthemum hispidum</i>, <i>Delosperma ecklonis</i>, <i>Galenia pubescens</i> etc. Focus should therefore be on the <i>Aloes</i> and other vygies.</li> <li>• Rehabilitation of disturbed areas with these species, as soon as possible. Other areas of the farm can be used as translocation areas for the <i>Aloes</i> and vygies, including <i>Aloe ferox</i>.</li> <li>• Audit reporting by the Environmental Control Officer during establishment.</li> </ul>		
CUMULATIVE IMPACTS:		
<p>As per impact 1 above. With loss of natural vegetation comes a loss of species of conservation/special concern.</p>		
RESIDUAL IMPACTS:		
<p>Loss of mature adults of seeding potential.</p>		



#### 6.3.4. Impact 4: Potential water quality degradation of the Sundays River and associated wetlands due to the use of pesticides and herbicides (hydrological processes and biodiversity loss).

##### *Impact 4: Potential water quality degradation of the Sundays River and associated wetlands due to the use of pesticides and herbicides*

**Nature:** During the operational or farming phase, chemical (inorganic) fertilizers and pesticides will be used. The key pollutants associated with fertilizers are an increase in phosphates and nitrogen. Although pesticides are likely to be sprayed, rather than placed in-situ, during rainfall events the pesticides could leach into the soil and be carried with run-off. Nutrient enrichment has the potential to impact on the Sundays River and associated wetlands resulting in eutrophication, while toxic pesticides or herbicides may negatively impact on aquatic biota.

An increase in nutrients usually results in increased plant growth and can result in changes in population structure, such as an increase in *Phragmites australis* and *Typha capensis*. *P. australis* is already dominant along the river. However, the growth of other aquatic species, such as *Azolla filiculoides* and *Potamogeton pectinatus*, reduces the floral biodiversity of the river while impacting indirectly on other biota, such as fish and invertebrates. *A. filiculoides*, an alien invasive aquatic species, is already a problem in the River.

Pesticides kill amphipods and other species that are important food sources for fish, which may impact higher animals in the food chain, such as predator birds (and humans). Farm productivity can also be negatively affected by pesticide impacts on beneficial species. For example, in 1991 it was estimated that pesticide poisoning of honey bees cost the United States \$150 million annually (Pimentel et al., 1991; Cited in WWF, Unknown). Monsanto's Roundup herbicide, used extensively in the United States, is extremely toxic to amphibians. Many of the pesticides registered for use in South Africa have been banned in other countries due to their toxic effects on humans and wildlife (WWF, Unknown).

According to a 2010 CSIR publication, eutrophication of South African water resources due to high nutrient load run-off from agriculture is an area of concern. Furthermore, knowledge relating to many chemical compounds is limited, although these substances "persist to a greater extent than initially anticipated" (UNDP) (CSIR, 2010). The 2010 CSIR publication states that the Sundays River system has experienced elevated concentrations of fertilizers and pesticides, high concentrations of suspended solids from the Gariiep-Orange River transfer and increased salinity due to naturally high salinity, high evaporation rates and increased abstraction. The lower reaches are contaminated with urban run-off on the other hand, and contains high nutrient levels, high levels of pathogenic organisms and high concentrations of salts and Endocrine Disrupting Compounds (EDCs).

EDCs interfere with hormones due to their strong potential to bind to estrogen or androgen receptors. For example, thyroid hormone production can be inhibited by several endocrine disruptor pesticides (amitrole, cyhalothrin, fipronil, ioxynil, maneb, mancozeb, pentachloronitro-benzene, prodiamine, pyrimethanil, thiazopyr, ziram, zineb), while trichlorfon alters thyroid function (Mnif et al., 2011).

The Sundays River (as well as the Blaauwkrantz River, Kariega River, Swartkops River and Kowie River) were all tested for pesticides. Positive results were recorded, although conventional testing methods indicated that there were no pesticides in the rivers. Trace metals however were recorded which are known to inhibit acetylcholinesterase (AChE), thus causing a false positive result. The research showed that acetylcholinesterase (AChE) cannot serve as a substitute for more accurate conventional testing methods but that it can be used as a high throughput initial pre-screening tool. The enzyme acetylcholinesterase (AChE) is responsible for nerve impulse transmission, which all life depends on. The inhibition of this enzyme indicates toxicity (Mwila, K. 2012).

Research on two fish in the Lower Phongolo River, KwaZulu-Natal, showed the relationship between accumulation of toxicants and biomarker responses from agricultural pesticides. Results showed, amongst other, that AChE is greatly inhibited by high levels of DDT and that high levels of both Organochlorine Pesticide (OCP) and DDT were discovered.

Organochlorine Pesticides (OCPs) are being increasingly used in agricultural (and industrial) applications which negatively impact humans, animals and birds. Research on the Jukskei River (Gauteng) showed levels significantly higher than the water criteria values recommended by United States Environmental Protection Agency and the Department of Water and Sanitation for the protection of the aquatic environment. Levels were, however, higher than other surveys elsewhere in South Africa (Sibali et al., 2008). Awofolu and Fatoki (2003) detected persistent organochlorines

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such as DDT, chlordane, hexachlorobenzene (HCB), heptachlor and endosulfan in water and sediment samples of freshwater systems in the Eastern Cape Province which receive agricultural (and industrial) run-off. Some endocrine-disrupting OCPs, e.g. 2, 4'-DDT, 4, 4'-DDT, 2, 4'-DDE, heptachlor, endosulfan and chlordanes were also detected (Awofolu and Fatoki, 2003).

The use of Chlorpyrifos, a widely used agricultural insecticide, is very toxic to birds and insects (including bees), quite toxic to fish, and moderately toxic to humans. Recent research shows a link between chlorpyrifos and lower IQ and developmental problems in small children, according to the Pesticide Action Network.

Pesticide storage and disposal is another issue of concern in South Africa, and studies in Stellenbosch in 2003 showed that many farmers possess large stocks of obsolete pesticides (Dr Mandla Buthelezi, National African Farmers Union, Presentation to the Portfolio Committee on Environment and Tourism, 2007).

Chemical drift via wind may also impact on aquatic resources.

Given the proximity of the farm to the Sundays River, a Medium severity is assigned pre- and post-mitigation.

The contribution of adding pesticides and fertilizers to the existing cumulative impacts would however be considered Low, since it is small in extent relative to the catchment.

It is interesting to note that the organic (chemical free) industry is the fastest-growing industry segment worldwide. World organic food sales jumped from \$23billion in 2002 to \$52billion in 2008 (Datamonitor, 2009 cited in WWF, Unknown). The number of farmland acres certified as organic in the United States increased from 850 000 (1997) to 4 million (2005) (Lester, 2010).

**Alternatives:** Alternative 1 and Alternative 2 include the 15 m aquatic buffer, which is the key mitigation measure to reduce the potential impact, thus the significance scores are not significantly different.

**Project phase:** Operations

<b>Criteria</b>	<b>Without mitigation Alternative 1 (includes 15m buffer)</b>	<b>With mitigation Alternative 2 (includes 15m buffer + other mitigation measures)</b>
<b>Extent (E)</b>	<b>Local</b> (Score 2)	<b>Local</b> (Score 2)
<b>Duration (D)</b>	<b>Permanent</b> (Score 5)	<b>Permanent</b> (Score 5)
<b>Magnitude (M) / Severity</b>	<b>Moderate</b> (Score 7)	<b>Moderate</b> (Score 6)
<b>Probability (P)</b>	<b>Possible</b> (Score 2)	<b>Possible</b> (Score 2)
<b>Reversibility (R)</b>	<b>Partially Reversible</b> (Score 0.5)	<b>Partially Reversible</b> (Score 0.5)
<b>Irreplaceable loss of resources (I)</b>	<b>Partially Replaceable</b> (Score 0.5)	<b>Partially Replaceable</b> (Score 0.5)
<b>Significance (E+D+M+R+I)P</b>	<b>Low (-30)</b>	<b>Low (-28)</b>
<b>Status (positive or negative)</b>	Negative	
<b>Degree of Confidence</b>	High	
<b>Can impacts be mitigated/reduced</b>	Yes	

**RECOMMENDED MITIGATION MEASURES**

- As per impacts above, particularly the adoption of the recommended aquatic buffer (15 m) and NO-GO areas (Figure 25). The recommended buffer must be measured from the 45 m contour / start of steep incline (towards the surface water) that represents the riparian habitat.
- The recommended aquatic buffer should be planted with indigenous trees and shrubs. These can be sourced from cleared areas. The *Aloe pluridens* will be easy to transplant. Be careful not to disturb the riparian area below the 45 m contour.
- As an additional precautionary measure, a shallow trench could be placed along main access tracks, parallel to the Sundays River, to trap surface run-off (with fertilizer and herbicide

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- substances). The trench should be shallow enough/ designed not trap any animals, such as tortoises.
- The use of organic herbicides, fertilizers and mulching is encouraged, as much as possible. Where possible, use organic fertilisers that contain a carbon source (e.g. compost, manure and plant matter, especially from legumes).
  - Analyse soil and crop samples to determine the exact amount and type of fertiliser required; and aim to fill nutrient gaps rather than increasing total nitrogen and phosphorous.
  - Fertilizer applications should be used at the right time and at the required rates (i.e. excess fertilization can increase available nitrogen or phosphates entering aquatic features). Apply fertiliser to coincide with maximum plant uptake periods.
  - Apply fertiliser in regular smaller doses rather than a few large doses.
  - Use of slow release nitrogen fertilizers are encouraged as this can improve nitrogen efficiency and reduce leaching of nitrogen.
  - Reduce the use of pesticides and herbicides that decrease soil micro-organisms.
  - Chemical pesticides and insecticides used should be the safest and least harmful to the environment. Biodegradable products should be used as far as possible.
  - International standards to be complied with, with respect to chemical substances used. Substances banned in other countries, due to their known harmful effects on wildlife and humans, should be avoided.
  - Strict management of potential sources of chemical pollution (e.g. pesticides, fertilizers, hydrocarbons from vehicles and machinery, etc.) i.e. waste management procedures.
  - Chemicals and hazardous waste storage areas shall be stored in the proposed warehouse.
  - Hazardous and chemical wastes (includes old containers) should be disposed of at registered landfill sites.
  - Audit reporting by the Environmental Control Officer during site establishment (to avoid buffer / NO-GO areas).
  - The monitoring of water quality by the Applicant in the Sundays River is challenging as identifying potential chemical pollution from agricultural activities on the property cannot be easily ascertained. This is due to the extensive agricultural activities upstream (and downstream) of the property that contributes to the water quality degradation. A possible solution is for the various farmers to collectively take responsibility for water quality monitoring in the Sundays River Valley region, through the Lower Sundays River Water User Association.
  - The buffer, NO-GO areas and mitigation measures should be maintained and monitored by the Applicant/ Farm Manager.
  - A water use application will be required in terms of Section 21c and 21i of the National Water Act (36 of 1998) due to proximity of the wetland habitat within 500 m.

**CUMULATIVE IMPACTS:**

With respect to cumulative impacts on the farm VISSERS VALE: Low (as per the project specific impact above).

With respect to cumulative impacts of land uses within the N40E catchment: Due to the current agricultural land uses, and the fact that the Present Ecological State of the Sundays River (N40E-08640) is Largely Modified (D Class) the associated CUMULATIVE impact on the Sundays River is likely to be HIGH.

However, looking at the entire N40E catchment - As per cumulative impact 2, according to the available data, the current and potential loss in extent (ha) of CBA and ESA is probably LOW (Section 3.3.1) because these areas have been incorporated into the municipal SDF (although this does not guarantee that losses will not occur in the future). This should reduce the potential for impacts on rivers in the N40E catchments. Furthermore, large areas of the catchment fall outside of the agricultural farming hub of the Sundays River Valley, while other areas of the landscape fall within mountainous terrain, and most of the areas to the west are rural in character (i.e. much of the catchment is in a near-natural state). This is reflected in the Present Ecological State data for the Bezuidenhouts River (see below), which occurs in the mountainous area. Other Natural Areas and No Natural Areas Remaining should be the areas targeted for development, however, if appropriate



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buffers are implemented, including other mitigation measures, the post mitigation rating should not be high.

In the N40E catchment, there are two main rivers, including the Bezuidenhouts and the Sundays River. The following Present Ecological State data is available (DWS, 2014 and Van Deventer et al., 2018):

River reach	River name	Present Ecological State 2014		Present Ecological State 2018
N40E-08678	Bezuidenhouts	B	Largely Natural	Largely Natural
N40E-08743	Unnamed non-perennial (tributary of Sundays)	D	Largely Modified	Largely Modified
N40E-08613	Sondags	D	Largely Modified	Largely Modified
N40E-08640	Sondags	D	Largely Modified	Largely Modified

The Bezuidenhouts River is the only river falling largely outside of the Sundays River Valley agricultural hub, to the west and within the mountainous areas. Thus, it has a PES of Largely Natural, while the remaining stretches of the Sundays River, are impacted on by agricultural activities.

The 2010 CSIR publication states that the Sundays River system has experienced elevated concentrations of fertilizers and pesticides.

*The following mitigation measures are not the responsibility of the Applicant, but serve to inform the cumulative impact assessment:*

- Maintain appropriate buffers around rivers and drainage areas to afford protection of hydrological processes and riparian areas etc., including other aquatic-related mitigation measures. **(Catchment mitigation measure not within the control of the Applicant).**
- Maintain CBA and ESA and/ or maintain biodiversity pattern and process targets on individual properties proposed for development in the future. **(Catchment mitigation measure not within the control of the Applicant).**
- Ensure revision of the CBA Map to compensate for losses every five years. The ECBCP is currently being reviewed. **(Catchment mitigation measure not within the control of the Applicant).**

**Post Mitigation:**

The post mitigation for all rivers beyond the already modified Sundays River should be LOW, if the mitigation measures are adopted.

However, along the Sundays River it is likely to be MEDIUM to HIGH due to the already Largely Modified state i.e. the proposed project does not cause a Medium to High impact but rather this impact already exists. (Without water quality samples, this cannot be determined accurately).

*Note: The cumulative impacts have not followed the project specific format / calculations, while the PES data provides the indicator for level of impacts on the Sundays River, although the calculations would result in the ratings provided here (pre- and post-mitigation).*

**RESIDUAL IMPACTS:**

Possible impacts due to changes in run-off characteristics.

**6.3.5. Impact 5: Potential sedimentation and erosion of the Sundays River and possible impacts on the riparian and wetland habitat due to intensive cultivation (hydrological processes and biodiversity loss)**

<i>Impact 5: Potential sedimentation and erosion of the Sundays River and possible impacts on the riparian and wetland habitat</i>		
<p><b>Nature:</b> With the removal of vegetation during establishment of the newly proposed pastures, bare exposed soils will be created and topsoil may be lost. This may result in erosion and sedimentation, when heavy rainfall occurs and sheet-wash results, especially during the establishment phase / clearing existing vegetation cover.</p> <p>This may arise during operations as well, due to the change in vegetation cover, steep gradients and depending on alignment and number of access tracks/ roads. The closest existing pasture however is on relatively flat land i.e. just above the 45 m contour (riparian habitat of the Sundays River).</p> <p><u>Impacts associated with this include:</u></p> <p>A number of negative impacts associated with sedimentation, e.g. direct impacts on in-stream habitats and therefore aquatic and semi-aquatic biota, with concomitant impacts on population structure, or vegetation encroachment, e.g. reed invasion due to a build-up of sediments. However, the Sundays River, supports a high density of <i>Phragmites australis</i>, therefore the impact would largely be related to fish and invertebrates inhabiting the perennial Sundays River, e.g. increased turbidity levels, alteration of habitat. The Sundays River is already turbid due to discharges from the irrigation canal into the river i.e. high sediment loads from the Orange Fish Transfer Scheme.</p> <p>Erosion occurs on steep gradients on the property, and as a result buffering from the edge of steep inclines is important.</p> <p>Further, the Sundays River is in a Largely Modified state (Class D) due to the extensive agriculture in the valley, and thus all possible mitigations should be considered and adopted.</p> <p><u>Some of the Farming Practices utilized in South Africa to reduce soil erosion</u></p> <p>To improve soil quality, soil erosion is reduced through several farming practices, including contour ridges and ridge drains, windbreaks and shelterbelts, strip cropping and terracing, planting of cover crops during high risk periods, reduced tillage, leaving residues on soil surface and regular addition of organic matter to improve soil structure, and the water and nutrient holding capacity. Conservation agriculture is one approach that (a) Minimises soil disturbance by tillage and seeding directly into soil, eliminating tillage altogether once the soil has been brought to good condition, and keeping soil disturbance from cultural operations to the minimum; (b) Maintains permanent or year round organic matter cover; and (c) Diversifies crop rotation sequences and associations (Mukumbareza, 2014).</p>		
<p><b>Alternatives:</b> Alternative 1 and Alternative 2 include the 15 m aquatic buffer, which is the key mitigation measure to reduce the potential impact, at the existing pastures. Although the steep slopes will be avoided in both Alternatives, the 5m set back recommended as part of Alternative 2 should reduce the severity and probability of significant erosion on the steep slopes. These steep slopes, proximate to the proposed 'new' pastures showed signs of severe erosion. Tree trunks have been placed in some areas presumably to reduce erosion.</p>		
<p><b>Project phase:</b> Establishment phase (clearing and planting), as well as the operational or farming phase (although additional loss should not occur in the latter phase).</p>		
Criteria	Without mitigation Alternative 1	With mitigation Alternative 2
<b>Extent (E)</b>	<b>Local</b> (Score 2)	<b>Local</b> (Score 2)
<b>Duration (D)</b>	<b>Permanent</b> (Score 5)	<b>Permanent</b> (Score 5)
<b>Magnitude (M) / Severity</b>	<b>High</b> (Score 8)	<b>Moderate</b> (Score 6)
<b>Probability (P)</b>	<b>Probable</b> (Score 3)	<b>Possible</b> (Score 2)
<b>Reversibility (R)</b>	<b>Partially Reversible</b> (Score 0.5)	<b>Partially Reversible</b> (Score 0.5)
<b>Irreplaceable loss of resources (I)</b>	<b>Partially Replaceable</b> (Score 0.5)	<b>Partially Replaceable</b> (Score 0.5)

<i>Impact 5: Potential sedimentation and erosion of the Sundays River and possible impacts on the riparian and wetland habitat</i>		
<b>Significance</b> (E+D+M+R+I)P	S =	<b>Moderate (-64)</b>
		<b>Low (-28)</b>
<b>Status</b> (positive or negative)		Negative
<b>Degree of Confidence</b>		High
<b>Can impacts be mitigated/reduced</b>		Yes
<b>RECOMMENDED MITIGATION MEASURES</b>		
<ul style="list-style-type: none"> <li>• As per impacts above, particularly the adoption of the recommended aquatic buffer (15 m) and NO-GO areas (Figure 25). The recommended 15 m buffer must be measured from the 45 m contour; but must commence where the ground is level i.e. beyond any sloped ground or the embankment of the Sundays River.</li> <li>• The 1:5 slopes should be accurately determined to ensure that the NO-GO areas encompass these areas.</li> <li>• The existing access road can be utilized (within the NO-GO Area). This access road terminates mid-slope, however, and a potential access road is indicated on Figure 25 (or Figure 26).</li> <li>• The recommended aquatic buffer should be planted with indigenous trees and shrubs. These can be sourced from cleared areas. The <i>Aloe pluridens</i> will be easy to transplant.</li> <li>• Avoid overgrazing, trampling and soil erosion.</li> <li>• Practice crop-appropriate minimum tillage. If tillage is necessary, till when the soil has the correct moisture content and at the correct speed.</li> <li>• As an additional precautionary measure, a shallow trench could be placed along main access tracks, running parallel to the Sundays River, to trap surface run-off. The trench should be shallow enough/ designed not trap any animals, such as tortoises.</li> <li>• An appropriate stormwater management plan should be compiled, to include measures associated with the main access road to the existing pastures.</li> <li>• Monitor sites for potential erosion risks; and rehabilitate any damaged areas.</li> <li>• A water use application will be required in terms of Section 21c and 21i of the National Water Act (36 of 1998) due to proximity of the wetlands/ within the 500 m radius.</li> </ul>		
<b>CUMULATIVE IMPACTS:</b>		
<p><u><i>With respect to cumulative impacts on the farm VISSERS VALE:</i></u> Anthropogenic causes of erosion and sedimentation were observed on the farm, and particularly along the steep to vertical slopes. The existing defunct concrete canal is exacerbating the problem. The impact is SIGNIFICANT at the N-E extreme of the property, while along the remaining steeper slopes (at higher elevation) it is MEDIUM. The banks of the Sundays River are steeply incised; but donga erosion (along this embankment stretch) was not observed.</p> <p><u><i>With respect to cumulative impacts of surrounding land uses in the N40E catchment:</i></u> The increase in erosion and sedimentation is likely to be MEDIUM due to the current agricultural land use activities in the Sundays River Valley, and the fact that the Present Ecological State of the Sundays River is Largely Modified (D Class). The 2010 CSIR publication states that the Sundays River system has experienced high concentration of suspended solids from the Gariep-Orange River transfer.</p> <p><u><i>The following mitigation measures are not the responsibility of the Applicant, but serve to inform the cumulative impact assessment:</i></u></p> <ul style="list-style-type: none"> <li>• As per cumulative impact 4 above.</li> </ul>		
<p><b>Post Mitigation:</b> The post mitigation for all rivers <u>beyond the already modified Sundays River</u> should be LOW, if the mitigation measures are adopted.</p> <p>However, along the Sundays River it is likely to be MEDIUM due to the already Largely Modified state. Since the Gariep-Orange River transfer comprises high sediment loads, it is likely impacting on sediment levels in the Sundays River.</p>		



<i>Impact 5: Potential sedimentation and erosion of the Sundays River and possible impacts on the riparian and wetland habitat</i>		
<i>Note: The cumulative impacts have not followed the project specific format / calculations, while the PES data provides the indicator for level of impacts on the Sundays River, although the calculations would result in the ratings provided here (pre- and post-mitigation).</i>		
<b>RESIDUAL IMPACTS:</b>		
Expected run-off volumes from the crop/ pasture areas could potentially increase the amount of erosion and/or sedimentation. The buffer and NO-GO areas around the river must therefore be maintained.		

**6.3.6. Impact 6: Potential erosion of the steep slopes and consequent erosion and sedimentation of the Sundays River due to the proposed chalets, residence and access road (hydrological processes and biodiversity loss)**

<i>Impact 6: Potential erosion of the steep slopes and consequent erosion and sedimentation of the Sundays River due to the proposed chalets, residence and access road</i>		
<p><b>Nature:</b> The proposed sites for the chalets and residence, including associated access road/ infrastructure (sewage and electricity), are located on a very narrow plateau, which is further limited by the defunct concrete irrigation canal along the N-E boundary. It may also pose as a flood risk during storm events. The irrigation canal is not the responsibility of the Applicant. However, there is an urgent need for the Department of Water and Sanitation and the Lower Sundays River Water User Association to remediate this high-risk situation.</p> <p>Siting for the chalets and residence, including associated infrastructure, must be determined by an Engineer; and based on a geotechnical study. Siting must take into consideration the severe erosion and possibility of future landfalls etc. (particularly at the northern end of the property), as well as the fact that limited space is available between the existing defunct concrete channel (along the N-E boundary) and the 'cliff' edge (around the 70 m contour). A large 'erosion hole', for want of a better word, was observed inland of the edge of the steep slopes (see Plate 4.1), within metres of the proposed residence. This is cause for concern. The historical imagery (Figure 21) shows that erosion was in existence in 1957 (and thus possibly earlier) at the northern end of the property. Comment from the Engineer was received 5 December 2019, namely:</p> <p><i>'Most of the details regarding the viability to accommodate the proposed locations of the 1 residential unit and 3 chalets will be dictated by the outcome of the geotechnical report. The geotechnical report must indicate the stability of the ground on or near the area under discussion. The geotechnical engineer shall also indicate if it would be practically possible to manipulate and stabilise the existing ground to accommodate the road, buildings and conservancy tanks. If there is a practical and economical way to stabilise and manipulate the profile of the ground on/near the old canal and the cliff for the development, the position and design of the stormwater structures will be subject to the geotechnical design recommendations. I will be in a better position to give you meaningful answers if I do have the professional opinion of the geotechnical engineer stating the facts regarding the soil conditions which are suspect'.</i></p> <p>In addition, adequate stormwater management must be designed by the Engineer and constructed/ implemented to prevent erosion, as a result of the proposed infrastructure. Without this, further erosion may exacerbate the existing high-risk situation.</p> <p>This impact cannot be properly assessed without the Engineer's input/ feasibility report. However, the post mitigation would be based on a design/ siting option that ensures the risk is reduced to LOW.</p>		
<p><b>Alternatives:</b> Alternative 1 is the current proposed siting of infrastructure, while Alternative 2 represents the Engineer's recommendations, based on a geotechnical assessment. The geotechnical report has not yet been compiled.</p>		
<p><b>Project phase:</b> Construction and Operation</p>		
<b>Criteria</b>	<b>Without mitigation</b>	<b>With mitigation</b>

<i>Impact 6: Potential erosion of the steep slopes and consequent erosion and sedimentation of the Sundays River due to the proposed chalets, residence and access road</i>		
	<b>Alternative 1</b>	<b>Alternative 2</b>
<b>Extent (E)</b>	<b>Local</b> (Score 2)	<b>Local</b> (Score 2)
<b>Duration (D)</b>	<b>Permanent</b> (Score 5)	<b>Permanent</b> (Score 5)
<b>Magnitude (M) / Severity</b>	<b>High</b> (Score 9)	<b>Moderate</b> (Score 6)
<b>Probability (P)</b>	<b>Definite</b> (Score 5)	<b>Definite</b> (Score 5)
<b>Reversibility (R)</b>	<b>Partially Reversible</b> (Score 0.5)	<b>Partially Reversible</b> (Score 0.5)
<b>Irreplaceable loss of resources (I)</b>	<b>Partially Replaceable</b> (Score 0.5)	<b>Partially Replaceable</b> (Score 0.5)
<b>Significance</b> S = (E+D+M+R+I)P	<b>Very High (-85)</b>	<b>Low (-42)</b>
<b>Status (positive or negative)</b>	Negative	
<b>Degree of Confidence</b>	Moderate	
<b>Can impacts be mitigated/reduced</b>	Yes	
<b>RECOMMENDED MITIGATION MEASURES</b>		
<ul style="list-style-type: none"> <li>- Implement appropriate siting and design of residence, chalets and associated infrastructure, based on the Engineers feasibility study.</li> <li>- A geotechnical assessment to be undertaken. This should determine risk of landslides, especially at the proposed residence site (where an 'erosion hole' was recorded – see Plate 4.1), based on soil conditions.</li> <li>- The geotechnical assessment shall also indicate the feasibility of manipulating and stabilising the existing ground to accommodate the road, buildings and conservancy tanks.</li> <li>- Design and implement an appropriate stormwater management plan (construction and operations), based on the Engineers feasibility study (both construction and operations).</li> <li>- Rainfall harvesting and permeable access road design should be included to minimize stormwater run-off that can continue to contribute to the severe erosion, especially on the N-E portion of the property.</li> <li>- Monitor sites for potential erosion risks; and rehabilitate any damaged areas.</li> <li>• A water use application will be required in terms of Section 21c and 21i of the National Water Act (36 of 1998) for the Sundays River wetlands that are sited within 500 m of any proposed infrastructure.</li> </ul>		
<b>CUMULATIVE IMPACTS:</b>		
As per impact 5 above.		
<b>RESIDUAL IMPACTS:</b>		
Expected run-off volumes from the developed areas could potentially increase the amount of erosion and/or sedimentation. The buffer and NO-GO areas around the river must be maintained.		

**6.3.7. Impact 7: Potential impact of sewage pollution (hydrological processes and biodiversity loss).**

<i>Impact 6: Potential impact of sewage pollution</i>
<b>Nature:</b> Conservancy tanks are proposed, one per unit. The effluent will be treated by the Addo Waste-Water Treatment Works, as confirmed with Mr R.J. Herholdt of the Sundays River Valley Municipality on 21 November 2019.

<i>Impact 6: Potential impact of sewage pollution</i>		
<p>Without an appropriate site-specific sewage system and ongoing maintenance, sewage leakages and contamination of soils is possible. This could result in the pollution of the Sundays River, albeit this is unlikely due to distance and topography. The closest Chalet / unit (proposed siting) is ~51 m from the Sundays River riparian habitat, and ~25 m above the river.</p> <p>Conservancy tanks (closed system, no soakaway) usually need to be pumped out every five years to maintain proper working conditions. However, if they overflow or become blocked, more regular disposal is required. Regular maintenance of the system is therefore important.</p>		
<p><b>Alternatives:</b> Alternative 1 is the pre-mitigation scenario. Alternative 2 is the post mitigation scenario.</p>		
<p><b>Project phase:</b> Operations</p>		
Criteria	Without mitigation Alternative 1	With mitigation Alternative 2
Extent (E)	Local (Score 2)	Local (Score 2)
Duration (D)	Permanent (Score 5)	Permanent (Score 5)
Magnitude (M) / Severity	High (Score 8)	High (Score 8)
Probability (P)	Highly Probable (Score 4)	Possible (Score 2)
Reversibility (R)	Reversible (Score 0)	Reversible (Score 0)
Irreplaceable loss of resources (I)	Replaceable (Score 0)	Replaceable (Score 0)
Significance (E+D+M+R+I)P	Medium (-60)	Low (-30)
Status (positive or negative)	Negative	
Degree of Confidence	High	
Can impacts be mitigated/reduced	Yes	
RECOMMENDED MITIGATION MEASURES		
<ul style="list-style-type: none"> <li>• A geotechnical assessment to be undertaken. This should determine soil wetness or perched water.</li> <li>• Conservancy tank design/ siting to be informed by the geotechnical assessment.</li> <li>• Regular disposal of waste to the Addo Waste-Water Treatment Works.</li> <li>• Regular check-ups and maintenance activities of the system to be undertaken by the Applicant to avoid spillages or leakages.</li> <li>• In terms of Section 21g, on-site sewage systems should be authorised by the Department of Water and Sanitation, where these are sited within 500 m of a wetland and/ or 100 m of a river.</li> <li>• During construction, provide &amp; maintain potable toilets, which should be placed &gt; 100m from the Sundays River.</li> </ul>		
<p><b>Cumulative impacts:</b>  <i>With respect to the farm:</i> Anthropogenic causes of erosion and sedimentation were not observed on the farm.  <i>With respect to cumulative impacts of surrounding land uses in the catchment:</i> The increase in erosion and sedimentation is likely to be MEDIUM due to the current agricultural land uses in the Sundays River Valley, and the fact that the Present Ecological State of the Sundays River is Largely Modified (D Class).</p>		
<p><b>Residual impacts:</b>                      Changes in local groundwater levels.</p>		

## 6.4. FINAL RECOMMENDATION AND CONCLUSIONS

### 6.4.1. Concluding Impact Statement

The proposed development is not considered to be a fatal flaw if the final layout avoids the biodiversity NO-GO areas as depicted in **Figure 25** (Section 4.6) or **Figure 26**; and the proposed mitigation



measures are adopted. It is critical that the Geotechnical Engineer's feasibility report provides the appropriate siting of the residence, chalets and associated infrastructure due to the significant erosion, particularly at the northern end of the property; and the limited space along the narrow plateau, which is further restrained by the defunct concrete canal. The defunct concrete canal limits may also pose as a flood risk during high storm events (which may be exacerbated due to climate change). The 'erosion hole' (Plate 4.1), proximate to the proposed residential unit, is of special concern as this area may be subject to landslides in future.

**Comment from the Civil Engineer (JJ Spies) was received 5 December 2019, namely:**

*'Most of the details regarding the viability to accommodate the proposed locations of the 1 residential unit and 3 chalets will be dictated by the outcome of the geotechnical report.*

*The geotechnical report must indicate the stability of the ground on or near the area under discussion.*

*The geotechnical engineer shall also indicate if it would be practically possible to manipulate and stabilise the existing ground to accommodate the road, buildings and conservancy tanks. If there is a practical and economical way to stabilise and manipulate the profile of the ground on/near the old canal and the cliff for the development, the position and design of the stormwater structures will be subject to the geotechnical design recommendations.*

*I will be in a better position to give you meaningful answers if I do have the professional opinion of the geotechnical engineer stating the facts regarding the soil conditions which are suspect'.*

**6.4.2. Summary of Impacts Assessed – Vegetation and Aquatic Ecosystems**

Refer Table 20 below for a summary of the impacts pre- and post-mitigation.

The loss of vegetation is considered MEDIUM (-) pre- and post-mitigation. The proposed development allows the conservation targets for Sundays Valley Thicket (or Sundays Spekboom Thicket) to be safeguarded; and to be significantly exceeded (Impact 1).

Some loss of Critical Biodiversity Area (CBA) and Ecological Support Area (ESA) is expected as much of the property is CBA and ESA, according to the criteria set by the Sundays River Valley CBA Map. It should be noted that the existing pasture's land is ESA, and with the continued use of this area as pastures it will remain ESA. This means no further intensification of land use should be encouraged here; while a 15 m buffer from the riparian habitat is recommended. Loss of CBA and ESA is MEDIUM (-); but is limited in the recommended biodiversity NO-GO areas (Impact 2).

The loss of floral species of special concern (protected) can be mitigated (reduced) through the translocation of species, particularly succulents that are easy to transplant. The significance of the impact is LOW post mitigation. Threatened species were not identified during the survey (Impact 3).

The key cumulative impacts associated with clearing vegetation and pasture cultivation was considered in this assessment given that the proposed farming may contribute to chemical pollution, sedimentation, erosion and turbidity of the Sundays River, which is already classified as Largely Modified (Class D). However, project specific ratings were assessed as LOW (post mitigation). This is due to the recommended aquatic buffer and extensive biodiversity NO-GO areas between the newly proposed pastures and the Sundays River, including the fairly complex topography (Impact 4 and 5).

A geotechnical assessment to determine the feasibility of the siting of the proposed residence, chalets and associated infrastructure must still be undertaken. This is critical due to the extensive erosion on the northern portion of the property; and the 'erosion hole' proximate to the proposed residential unit (Plate 4.1). A geotechnical assessment must be conducted in order to guarantee the negation of potential erosion and instability of the steep slopes; along the Sundays River. In addition, the defunct concrete canal and the limited area available does pose some concern. The potential impacts should be reduced to LOW (-) post mitigation, as the geotechnical assessment should guide the siting of infrastructure and feasible engineering solutions (Impact 6).

The sewage system, which is a closed conservancy tank system that will not discharge effluent into the environment, poses a LOW (-) impact, post mitigation (Impact 7).

The associated impacts are therefore not deemed to be a fatal flaw, if adequately mitigated. However, it is vital that a geotechnical assessment be undertaken. The compilation and implementation of an Environmental Management / Monitoring Programme that incorporates the mitigation measures shall also ensure that the mitigation measures and recommendations from the geotechnical assessment are adhered to. This will permit a reduction in the severity of the associated impacts during construction and operations (see Section 6.5 below).

**Table 20. Summary of impacts pre- and post-mitigation**

<b>ENVIRONMENTAL IMPACT</b>	<b>DEVELOPMENT PHASE</b>	<b>PRE- MITIGATION</b>	<b>POST MITIGATION</b>
<i>IMPACT 1: Loss of vegetation due to clearing (biodiversity loss)</i>	Establishment & Operational	<u>Alternative 1:</u> Moderate (Score -60)	<u>Alternative 2:</u> Low (Score -52.5)
<i>IMPACT 2: Loss &amp; fragmentation of CBA and ESA due to clearing (biodiversity loss)</i>	Establishment & Operational	<u>Alternative 1:</u> Moderate (Score - 60)	<u>Alternative 2:</u> Moderate (Score - 55)
<i>IMPACT 3: Loss of floral species of special concern due to clearing (biodiversity loss).</i>	Establishment & Operational	<u>Both Alternatives</u>	
		Moderate (-60)	Low (-45)
<i>IMPACT 4: Potential water quality degradation of the Sundays River and associated riparian and wetland habitat (hydrological processes and biodiversity loss).</i>	Establishment & Operational	<u>Alternative 1:</u> Low (-30)	<u>Alternative 2:</u> Low (-28)
<i>IMPACT 5: Potential sedimentation and erosion of the Sundays River and associated riparian and wetland habitat due to agriculture (hydrological processes and biodiversity loss)</i>	Establishment & Operational	<u>Alternative 1:</u> Very High (-64)	<u>Alternative 2:</u> Low (-28)
<i>IMPACT 6: Potential erosion of steep slopes and consequent erosion and sedimentation of the Sundays River due to the proposed chalets, residence and access road (hydrological processes and biodiversity loss)</i>	Establishment & Operational	<u>Alternative 1:</u> Very High (-85)	<u>Alternative 2:</u> Low (-42)
<i>IMPACT 7: Potential impact of sewage pollution (Hydrological Processes and Biodiversity Loss)</i>	Operational	<u>Alternative 1:</u> Medium (-75)	<u>Alternative 2:</u> Low (-30)

**6.5. ENVIRONMENTAL MANAGEMENT / MONITORING PROGRAMME RECOMMENDATIONS**

A summary of the mitigation measures recommended in Section 6.3 is provided below, which can be incorporated into the Environmental Management/ Monitoring Programme.

<b>Compilation of an Environmental Management / Monitoring Programme that provides the following project specific specifications for the associated impacts:</b>
<i>Loss of vegetation and associated habitat</i>
<ul style="list-style-type: none"> <li>• Adopt the biodiversity NO-GO areas (Figure 25) (Alternative 2). A 5 m set back should be applied from the edge of steep inclines, from the new proposed pastures, to prevent erosion and to negate the worsening of existing erosion on the steep slopes.</li> <li>• The 1:5 slopes should be accurately determined to ensure that the NO-GO areas encompass these areas.</li> <li>• The existing access road within the NO-GO area can be utilized. This access road terminates mid-slope; however, a potential access road is indicated on Figure 25 (or Figure 26).</li> <li>• Maintain remaining land as recommended and remove <i>only</i> the required amount of vegetation i.e. prevent indiscriminate clearing beyond the construction footprint.</li> <li>• Rehabilitation of disturbed areas post establishment with indigenous species, if necessary (as this should be avoided if bullet 2 above is implemented). Plants however can be used in the 'rehabilitation' of other disturbed areas (existing) on the farm or other land owned by the Applicant. Indigenous trees could potentially be purchased and planted in the disturbed areas, and immature trees translocated from the clearing process.</li> <li>• Preference for the use of indigenous windbreaks, if possible (if windbreaks are required).</li> <li>• Clear, control and manage alien invasive plants, such as <i>Opuntia ficus-indica</i> etc.</li> <li>• Audit reporting by the Environmental Control Officer during construction / clearing of orchard areas to align with no-go areas.</li> <li>• Compliance with regulations pertaining to the Conservation of Agricultural Resources Act (43 of 1983), where applicable.</li> </ul>
<i>Loss and Fragmentation of Critical Biodiversity Area and Ecological Support Area</i>
<ul style="list-style-type: none"> <li>• Adopt the biodiversity NO-GO areas (Figure 25) (Alternative 2). A 5 m set back should be applied from the edge of steep inclines, from the new proposed pastures, to prevent erosion and to negate the worsening of existing erosion on the steep slopes.</li> <li>• The 1:5 slopes should be accurately determined to ensure that the NO-GO areas encompass these areas.</li> <li>• The existing access road within the NO-GO area can be utilized. This access road terminates mid-slope; however, a potential access road is indicated on Figure 25 (or Figure 26).</li> <li>• All other impact mitigation measures to be adopted.</li> </ul>
<i>Loss of floral species of special concern</i>
<ul style="list-style-type: none"> <li>• License application to the Department of Economic Development, Environmental Affairs and Tourism for the removal of protected species.</li> <li>• Translocate as many succulent species as reasonably possible. It should be noted that some of the species are pioneers which establish very easily where disturbance has occurred, especially <i>Drosanthemum hispidum</i>, <i>Delosperma ecklonis</i>, <i>Galenia pubescens</i> etc. Focus should therefore be on the <i>Aloes</i> and other vygies.</li> <li>• Rehabilitation of disturbed areas with these species, as soon as possible. Other areas of the farm can be used as translocation areas for the <i>Aloes</i> and vygies, including <i>Aloe ferox</i>.</li> <li>• Audit reporting by the Environmental Control Officer during establishment.</li> </ul>
<i>Potential water quality degradation of the Sundays River and associated wetlands due to the use of pesticides and herbicides</i>
<ul style="list-style-type: none"> <li>• As per impacts above, particularly the adoption of the recommended aquatic buffer (15 m) and NO-GO areas (Figure 25). The recommended buffer must be measured from the 45 m contour / start of steep incline (towards the surface water) that represents the riparian habitat.</li> </ul>



**Compilation of an Environmental Management / Monitoring Programme that provides the following project specific specifications for the associated impacts:**

- The recommended aquatic buffer should be planted with indigenous trees and shrubs. These can be sourced from cleared areas. The *Aloe pluridens* will be easy to transplant. Be careful not to disturb the riparian area below the 45 m contour.
- As an additional precautionary measure, a shallow trench could be placed along main access tracks, parallel to the Sundays River, to trap surface run-off (with fertilizer and herbicide substances). The trench should be shallow enough/ designed not trap any animals, such as tortoises.
- The use of organic herbicides, fertilizers and mulching is encouraged, as much as possible. Where possible, use organic fertilisers that contain a carbon source (e.g. compost, manure and plant matter, especially from legumes).
- Analyse soil and crop samples to determine the exact amount and type of fertiliser required; and aim to fill nutrient gaps rather than increasing total nitrogen and phosphorous.
- Fertilizer applications should be used at the right time and at the required rates (i.e. excess fertilization can increase available nitrogen or phosphates entering aquatic features). Apply fertiliser to coincide with maximum plant uptake periods.
- Apply fertiliser in regular smaller doses rather than a few large doses.
- Use of slow release nitrogen fertilizers are encouraged as this can improve nitrogen efficiency and reduce leaching of nitrogen.
- Reduce the use of pesticides and herbicides that decrease soil micro-organisms.
- Chemical pesticides and insecticides used should be the safest and least harmful to the environment. Biodegradable products should be used as far as possible.
- International standards to be complied with, with respect to chemical substances used. Substances banned in other countries, due to their known harmful effects on wildlife and humans, should be avoided.
- Strict management of potential sources of chemical pollution (e.g. pesticides, fertilizers, hydrocarbons from vehicles and machinery, etc.) i.e. waste management procedures.
- Chemicals and hazardous waste storage areas shall be stored in the proposed warehouse.
- Hazardous and chemical wastes (includes old containers) should be disposed of at registered landfill sites.
- Audit reporting by the Environmental Control Officer during site establishment (to avoid buffer / NO-GO areas).
- The monitoring of water quality by the Applicant in the Sundays River is challenging as identifying potential chemical pollution from agricultural activities on the property cannot be easily ascertained. This is due to the extensive agricultural activities upstream (and downstream) of the property that contributes to the water quality degradation. A possible solution is for the various farmers to collectively take responsibility for water quality monitoring in the Sundays River Valley region, through the Lower Sundays River Water User Association.
- The buffer, NO-GO areas and mitigation measures should be maintained and monitored by the Applicant/ Farm Manager.
- A water use application will be required in terms of Section 21c and 21i of the National Water Act (36 of 1998) due to proximity of the wetland habitat within 500 m.

*Potential sedimentation and erosion of the Sundays River and associated riparian and wetland vegetation (hydrological processes and biodiversity loss)*

- As per impacts above, particularly the adoption of the recommended aquatic buffer (15 m) and NO-GO areas (Figure 25). The recommended 15 m buffer must be measured from the 45 m contour; but must commence where the ground is level i.e. beyond any sloped ground or the embankment of the Sundays River.
- The 1:5 slopes should be accurately determined to ensure that the NO-GO areas encompass these areas.
- The existing access road can be utilized (within the NO-GO Area). This access road terminates mid-slope; however, and thus a potential access road is indicated on Figure 25 (or Figure 26).
- The recommended aquatic buffer should be planted with indigenous trees and shrubs. These can be sourced from cleared areas. The *Aloe pluridens* will be easy to transplant.

<b>Compilation of an Environmental Management / Monitoring Programme that provides the following project specific specifications for the associated impacts:</b>
<ul style="list-style-type: none"> <li>• Avoid overgrazing, trampling and soil erosion.</li> <li>• Practice crop-appropriate minimum tillage. If tillage is necessary, till when the soil has the correct moisture content and at the correct speed.</li> <li>• As an additional precautionary measure, a shallow trench could be placed along main access tracks, running parallel to the Sundays River, to trap surface run-off. The trench should be shallow enough/ designed not trap any animals, such as tortoises.</li> <li>• An appropriate stormwater management plan should be compiled, to include measures associated with the main access road to the existing pastures.</li> <li>• Monitor sites for potential erosion risks; and rehabilitate any damaged areas.</li> <li>• A water use application will be required in terms of Section 21c and 21i of the National Water Act (36 of 1998) due to proximity of the wetlands/ within the 500 m radius.</li> </ul>
<i>Potential erosion of the steep slopes and consequent erosion and sedimentation of the Sundays River due to the proposed chalets, residence and access road</i>
<ul style="list-style-type: none"> <li>• Implement appropriate siting and design of residence, chalets and associated infrastructure, based on the Engineers feasibility study.</li> <li>• A geotechnical assessment to be undertaken. This should determine risk of landslides, especially at the proposed residence site (where an 'erosion hole' was recorded – see Plate 4.1), based on soil conditions.</li> <li>• The geotechnical assessment shall also indicate the feasibility of manipulating and stabilising the existing ground to accommodate the road, buildings and conservancy tanks.</li> <li>• Design and implement an appropriate stormwater management plan (construction and operations), based on the Engineers feasibility study (both construction and operations).</li> <li>• Rainfall harvesting and permeable access road design should be included to minimize stormwater run-off that can continue to contribute to the severe erosion, especially on the N-E portion of the property.</li> <li>• Monitor sites for potential erosion risks; and rehabilitate any damaged areas.</li> <li>• A water use application will be required in terms of Section 21c and 21i of the National Water Act (36 of 1998) for the Sundays River wetlands that are sited within 500 m of any proposed infrastructure.</li> </ul>
<i>Potential impact associated with sewage pollution (hydrological processes and biodiversity loss)</i>
<ul style="list-style-type: none"> <li>• Conservancy tank design/ siting to be informed by the geotechnical assessment.</li> <li>• A geotechnical assessment to be undertaken. This should determine soil wetness or perched water.</li> <li>• Regular disposal of waste to the Addo Waste-Water Treatment Works.</li> <li>• Regular check-ups and maintenance activities of the system to be undertaken by the Applicant to avoid spillages or leakages.</li> <li>• In terms of Section 21g, on-site sewage systems should be authorised by the Department of Water and Sanitation, where these are sited within 500 m of a wetland and/ or 100 m of a river.</li> <li>• During construction, provide &amp; maintain potable toilets, which should be placed &gt; 100m from the Sundays River.</li> </ul>
<b>OTHER</b>
<ul style="list-style-type: none"> <li>• Adopt Green Building Design principles, for example:             <ul style="list-style-type: none"> <li>- Energy saving mechanisms, such as solar energy.</li> <li>- Taking advantage of natural lighting and heating, such as large, north-facing windows.</li> <li>- Water saving mechanisms and practices, such as low flow toilets, water saving taps and low flow shower heads, water re-use and recycling etc.</li> <li>- Use of local materials and labour.</li> </ul> </li> </ul>

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## 8. ADDENDUM 1: PLANT INVENTORY

FAMILY	SPECIES	CONSERVATION STATUS	ENDEMIC
POACEAE	<i>Agrostis lachnantha</i>	LC	No
ASPHODELACEAE	<i>Aloe pluridens</i>	LC	Yes
BASELLACEAE	<i>Anredera cordifolia</i>	Alien/ Exotic	Alien/ Exotic
ASPARAGACEAE	<i>Asparagus aethiopicus</i>	LC	Yes
ASPARAGACEAE	<i>Asparagus asparagoides</i>	LC	No
ASPARAGACEAE	<i>Asparagus crassicaulus</i>	LC	Yes
ASPARAGACEAE	<i>Asparagus striatus</i>	LC	Yes
CHENOPODIACEAE	<i>Atriplex lindleyi</i>	Naturalised exotic; Invasive	Alien/ Exotic
CHENOPODIACEAE	<i>Atriplex semibaccata</i>	LC	No
SALVADORACEAE	<i>Azima tetrachantha</i>	LC	No
ASPHODELACEAE	<i>Bulbine frutescens</i>	LC	No
ASPHODELACEAE	<i>Bulbine latifolia</i>	LC	No
CAPPARACEAE	<i>Cadaba aphylla</i>	LC	No
CAPPARACEAE	<i>Capparis sepiaria</i>	LC	No
APOCYNACEAE	<i>Carissa bispinosa</i>	LC	No
	<i>Chlorophytum comosum</i>	LC	No
ASTERACEAE	<i>Chrysocoma ciliata</i>	LC	No
COMMELINACEAE	<i>Commelina africana</i>	LC	No
COMMELINACEAE	<i>Commelina bengalensis</i>	LC	No
COMMELINACEAE	<i>Commelina sp (larger leaf)</i>		
ASTERACEAE	<i>Conyza scabrida</i>	LC	No
CRASSULACEAE	<i>Cotyledon campanulata</i>	LC	No
CRASSULACEAE	<i>Cotyledon velutina</i>	LC	No
CRASSULACEAE	<i>Crassula capitella</i>	LC	Yes
CRASSULACEAE	<i>Crassula cotyledonis</i>	LC	Yes
CRASSULACEAE	<i>Crassula cultrata</i>	LC	Yes
CRASSULACEAE	<i>Crassula mesembryanthemoides</i>	LC	Yes
CRASSULACEAE	<i>Crassula multicava</i>	LC	Yes
CRASSULACEAE	<i>Crassula muscosa</i>	LC	No
CRASSULACEAE	<i>Crassula nudicaulis</i>	LC	No
CRASSULACEAE	<i>Crassula obovata</i>	LC	No
CRASSULACEAE	<i>Crassula orbicularis</i>	LC	No
CRASSULACEAE	<i>Crassula pellucida</i>	LC	No
CRASSULACEAE	<i>Crassula rubricaulis</i>	LC	No
CRASSULACEAE	<i>Crassula rupestris</i>	LC	No
CRASSULACEAE	<i>Crassula woodii</i>	LC	No
APOCYNACEAE	<i>Cynanchum ellipticum</i>	LC	No
POACEAE	<i>Cynodon nemfluensis</i>	Not Evaluated	No
CYPERACEAE	<i>Cyperus textilis</i>	LC	Yes
LOBELIACEAE	<i>Cyphia sylvatica</i>	LC	No
POACEAE	<i>Digitaria eriantha</i>	LC	No
AIOZACEAE	<i>Delosperma ecklonis</i>	LC	No
AIOZACEAE	<i>Delosperma uncinata</i>	LC	No
AIOZACEAE	<i>Delospermum hispidulum</i>	LC	No
BORAGINACEAE	<i>Ehretia rigida</i>	LC	No

FAMILY	SPECIES	CONSERVATION STATUS	ENDEMIC
POACEAE	<i>Eragrostis curvula</i>	LC	No
POACEAE	<i>Eragrostis obtusa</i>	LC	No
EUPHORBIACEAE	<i>Euphorbia caurulescens</i>		
EUPHORBIACEAE	<i>Euphorbia fimbriatus</i>		
ASTERACEAE	<i>Euryops eurypoides</i>	LC	No
AIZOACEAE	<i>Galenia pubescens / Aizoon rigidum</i>	LC	No
ASPHODELACEAE	<i>Gasteria bicolor</i>	LC	No
ASTERACEAE	<i>Gazania krebsiana</i>	LC	No
AIOZACEAE	<i>Glottiphyllum longum</i>	LC	Yes
MALVACEAE	<i>Grewia occidentalis</i>	LC	No
CELASTRACEAE	<i>Gymnosporia capitata</i>	LC	Yes
MALVACEAE	<i>Hermannia altheoides</i>	LC	No
ACANTHACEAE	<i>Hypoestes aristata</i>	LC	No
CRASSULACEAE	<i>Kalanchoe rotundifolia</i>	LC	No
HYACINTHACEAE	<i>Ledebouria socialis</i>	LC	No
HYACINTHACEAE	<i>Ledebouria sp</i>		
SOLANACEAE	<i>Lycium afrum</i>	LC	Yes
AIZOACEAE	<i>Malephora luteola</i>	LC	No
AIZOACEAE	<i>Mesembrythemum crystallinum</i>	LC	No
CACTACEAE	<i>Opuntia aurantica</i>	Not Evaluated	Alien invasive
CACTACEAE	<i>Opuntia ficus-indica</i>	Not Evaluated	Alien invasive
SAPINDACEAE	<i>Pappea capensis</i>	LC	No
GERANIACEAE	<i>Pelargonium peltatum</i>	LC	No
GERANIACEAE	<i>Pelargonium odoratissimum</i>	LC	Yes
POACEAE	<i>Pennisetum clandestinum</i>	Not Evaluated	No
ASTERACEAE	<i>Pentzia incana</i>	LC	No
POACEAE	<i>Phragmites australis</i>	LC	No
LAMIACEAE	<i>Plectranthus madagascarensis</i>	LC	No
	<i>Polyxena ensifolia</i>		
POLYGALACEAE	<i>Polygala asbestina</i>	LC	SA Endemic
DIDIEREACEAE	<i>Portulacaria afra</i>	LC	No
AIZOACEAE	<i>Psilocaulon bicornis</i>	LC	No
CELASTRACEAE	<i>Putterlickia pyracantha</i>	LC	No
VITACEAE	<i>Rhoicissus tridentata</i>	Not Evaluated	No
RUSCACEAE	<i>Sansevieria hyacinthoides</i>	LC	No
APOCYNACEAE	<i>Sarcostemma viminale</i>	LC	No
FABACEAE	<i>Schotia afra</i>	LC	No
ASTERACEAE	<i>Senecio cuticulus</i>	LC	No
ANACARDIACEAE	<i>Searsia pyroides</i>	LC	No
ANACARDIACEAE	<i>Searsia pallens</i>	LC	No
ASTERACEAE	<i>Senecio tamoides</i>	LC	No
POACEAE	<i>Sporobolus fimbriatus</i>	LC	No
FABACEAE	<i>Vachellia (Acacia) karroo</i>	LC	No
ZYGOPHYLLACEAE	<i>Zygophyllum morgsana - now Roepera morgsana</i>	LC	No

## **9. ADDENDUM 2: CURRICULUM VITAE**

**CURRICULUM VITAE: MS DEBORAH CLAIRE VROMANS**

**ENVIRONMENTAL SCIENTIST : BIODIVERSITY SERVICES PROFESSIONAL**

**BOTANICAL, RIPARIAN, ESTUARINE AND WETLAND SURVEYS, ECOLOGICAL ASSESSMENTS, GIS MAPPING**

**720815 0189 084**

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### **Services and Skills Offered**

- Botanical
- Terrestrial and estuarine botanical surveys and assessments
- Wetland surveys and assessments
- Riparian delineation and assessments
- Basic ecological assessments
- Basic GIS mapping and digitizing

Ms Deborah Vromans holds an MSc degree in Botany (Estuaries) (NMMU), a BA degree in Environmental and Geographical Sciences (UCT), and a National Diploma in Horticulture (Botany) (Cape Technikon). Her MSc permitted publication and poster presentation in the international and national domain (Journal: Aquatic Botany, Conference Poster).

Deborah has 19 years of experience in the environment and biodiversity sector. Her current focus is botanical (terrestrial and aquatic), wetland, basic ecological assessments, and riparian delineation & assessments, coupled with basic GIS mapping and digitizing. The relevant reports are compiled for Environmental Impact Assessment (EIA) consultants in order to guide the layout of proposed developments in order to safeguard biodiversity features. She therefore has a good understanding of environmental and planning legislation.

Deborah has assisted, and is assisting, Eastern Cape Parks and Tourism Agency with a number of biodiversity assessments and protected area management plans for several sites to be declared as protected areas in terms of the National Protected Areas Act.

She has conducted numerous Environmental Impact Assessments, Environmental Management Plans, Basic Assessments, wetland surveys and specialist botanical surveys. She has river and estuary research experience; and can process water use applications. Deborah has also performed several environmental risk assessments for abalone, as well as freshwater and marine fish species, in association with Enviro-Fish Africa (Department of Ichthyology and Fisheries Science, Rhodes University). She also assisted with the development of one of the first Municipal Coastal Management Programmes, required in terms of the Integrated Coastal Management Act (Eden District Municipality).

She was employed by South African National Parks on two Global Environmental Facility (GEF) funded projects, aimed at mainstreaming biodiversity data and policy guidelines into land use planning and decision-making at the local, provincial and national level. Activities encompassed stakeholder consultation, the development of municipal biodiversity sector plan handbooks (main author) and compiling a legislative guide, as well as leading local and provincial capacity building workshops. She provided biodiversity input into the development of draft rural land use management guidelines for the Department of Environmental Affairs and Development Planning (Western Cape).

She undertook a review of 30 key municipal planning documents in the Olifants Catchment (Limpopo, Mpumalanga and Gauteng Provinces), as part of the Resilim-O Project supported by the United States Agency for International Development (USAID), and currently acts as a biodiversity advisor where she is assisting with mainstreaming biodiversity into local municipal planning.

Deborah was co-author in the compilation of the Waterberg District Municipality Bioregional Plan (Limpopo Province) for the Department of Economic Development, Environmental and Tourism; as well as the a Biodiversity Sector Plan for the North West Province for the Rural, Environmental and Agricultural Development, in association with Ecosol GIS, Dr Philip Desmet (the leading conservation planners in South Africa).

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### **QUALIFICATIONS**

#### **Nelson Mandela Metropolitan University (2011)**

- MSc Botany (Estuaries): The Phenology of Macrophytes in a Temporarily Open/Closed Estuary compared with a Permanently Open Estuary, South Africa (71%).

#### **University of Cape Town – Bachelor of Arts Degree (1997)**

- Major Subject - Environmental & Geographical Sciences
- Relevant Subjects - Integrated Environmental Management (IEM), Environmental Impact Assessment (EIA), Conflict Management, Ecological Issues in Africa, Geo-Science, Statistics, Research Methodologies and Report Writing.
- Deans Merit list (1995 & 1996), Class Medal (Geo-Science, 1995; African Religious Traditions, 1996).



**Cape Technikon – National Horticultural Diploma (1994)**

- Relevant Subjects - IEM, EIA, Environmental Studies, Soil Science, Botany, Plant Identification and Landscape Design, Soil Science, Horticultural Science, Propagation and Re-vegetation Practices.
- 10 out of 20 distinctions.

**Additional Courses**

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- Estuary Management Course (2009) - Nelson Mandela Metropolitan University
- Landscape Function Analysis (2005) – Potchefstroom University.
- Rehabilitation Course (2004) – Rhodes University (Prof R Lubke).
- Environmental Impact Assessment (2003) – Coastal & Environmental Services, Rhodes University.
- Class 4 Commercial Diver (2002).

**Other**

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- I have not received a SACNASP registration due to a BA degree, not a BSc undergraduate degree (key requirement for SACNASP registration). I was requested an interview in Johannesburg, but declined as there is no guarantee of success, despite almost 20 years of experience, an MSc degree and the host of projects below demonstrating my capabilities.

**PROFESSIONAL EXPERIENCE**

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**Independent Biodiversity Services Professional: Integrating Biodiversity and Planning (2011 -2020)**

Botanical, Wetland, Riparian and Estuarine Surveys, Basic Ecological Assessments, Basic GIS Mapping Projects -

- Vissers Vale Vegetation and Aquatic Assessment. Proposed Chalet and Agricultural Development. Sunland/ Kirkwood. Sundays River Valley Municipality. (Contracted by: Habitat Link Consulting) (Current).
- Sunriver Citrus Vegetation and Aquatic Assessment. Proposed Agricultural Development. Colchester, Sundays River Valley Municipality. (Contracted by: Sunriver Citrus cc) (2019).
- Biodiversity Advisor to the Association for Water and Rural Development (AWARD) - Integrating Biodiversity into Municipal Planning Documents in the Limpopo Catchment of South Africa and Mozambique. (Contracted by: RESILIM/AWARD – USAID Funded Project) (2017 - 2019t) – developing Biodiversity Sector Plan handbooks, A3 mapbooks and pamphlet for Ba-Phalaborwa and Maruleng Municipalities, Limpopo Province.
- Wolwerton Farm. Revised Project Description. Citrus Cultivation. Vegetation and Aquatic Survey and Assessment. Sundays River Valley Municipality. (Contracted by: Habitat Link Consulting) (Current).
- Biodiversity Assessment for a Protected Area Application to the Eastern Cape Parks and Tourism Agency. Eastern Cape. Portion 89, Port Elizabeth, Nelson Mandela Bay Municipality, Eastern Cape (Contracted by: Mr Toto van der Merwe) (2019).
- Sibuya Game Reserve Environmental Management Plan, as part of the Indalo Protected Environment (Contracted by: Mr Nick Fox) (Current).
- Ikamva Lethu Citrus Water Use License Application: Sundays River Valley Municipality. (Contracted by: Ikamva Lethu Farms Pty Ltd) (2017 - 2019).
- Falcon Ridge Cultivation Water Use License Application: Sundays River Valley Municipality. (Contracted by: Mr Johannes Joubert) (2017 - 2019).
- Ecological Assessment, with Riparian Assessment. Cycads Retirement Development. East London. Buffalo City Metropolitan Municipality Eastern Cape. (Contracted by: Controlab) (Current – await EIA modifications).
- Scheepersvlakte. Vegetation and Aquatic Assessment. Addo. Eastern Cape. (Contracted by: Public Process Consultants) (2018).
- Ecological Assessment, with wetland and riparian assessment. Megamore Park Light Industrial Development. East London. Buffalo City Metropolitan Municipality Eastern Cape. (Contracted by: Environmental Impact Management Services Pty Ltd) (2018).
- Ecological Assessment. Port Alfred, Erf 4669, Residential Development. Ndlambe Municipality Eastern Cape. (Contracted by: Sandy van der Wahl, Independent Consultant) (March – May 2018).
- Vegetation and Floristics Assessment. Riverleigh Mixed Use Development. East London. Buffalo City Metropolitan Municipality Eastern Cape. (Contracted by: Terreco Environmental cc) (2018).
- 5 Biodiversity Assessments and Protected Area Management Plans (Golden Fleece, Balloch, Sompondo Communal Area, Elansberg /Glenara, Mimosa Park). Protected Area Applications to the Eastern Cape Parks and Tourism Agency. Eastern Cape. (Contracted by: Eastern Cape Parks and Tourism Agency) (2018).
- Biodiversity Assessment and Protected Area Management Plan. Intsomi Protected Environment. Protected Environment Application to the Eastern Cape Parks and Tourism Agency. Eastern Cape. (Contracted by: San Miguel South Africa Pty Ltd) (2017 - 2019).
- Protected Area Management Plan. Buffalo Kloof Game Reserve. Protected Environment Application to the Eastern Cape Parks and Tourism Agency. Eastern Cape. (Contracted by: Mr W Rippon) (August 2017 – 2019 final).
- Protected Area Management Plan. Indalo Game Reserves. Protected Environment Application to the Eastern Cape Parks and Tourism Agency. Eastern Cape. (Contracted by: Indalo Game Reserves) (Draft format 2018).
- Chelsea. Vegetation and Floristics Assessment. Port Elizabeth (Contracted by: Habitat Link Consultants) (August 2017 – February 2018).

- San Miguel Sylvania Citrus. Expansion of Citrus. Vegetation and Aquatic Survey and Assessment. Kirkwood, Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (2018).
- Ikamva Lethu. Falcon Ridge Farm Vegetation and Aquatic Assessment: Phase ii Impact Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (2018).
- Lake de la Vie. Vegetation and Aquatic Assessment. Port Elizabeth (Contracted by: Habitat Link Consultants) (Current – await EIA modifications).
- Botanical Survey. Bushmans, Mixed Use Development. Ndlambe Municipality Eastern Cape. (Contracted by: Sandy van der Wahl, Independent Consultant) (August 2017).
- Dunbrody. Water Use License Application to the Department of Water and Sanitation. (Contracted by: Unifrutti Pty Ltd) (July 2017 – March 2018).
- Falcon Ridge. Water Use Application to the Department of Water and Sanitation. (Contracted by: Habata Boerdery Pty Ltd) (November 2017 – May 2018, submitted await authorisation).
- Lebombo Msikaba Wetland Assessment. Eastern Cape. (Contracted by: ETC Environmental Consultants) (August – September 2018).
- Dunbrody Estates. Expansion of Citrus. Vegetation and Aquatic Survey and Assessment. Kirkwood, Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (January - June 2017).
- Falcon Ridge Farm. Vegetation and Aquatic Survey and Assessment. Nelson Mandela Bay Municipality. (Contracted by: Public Process Consultants) (December 2015 –February 2015/Phase 2 2017).
- Falcon Ridge Farm. Vegetation and Aquatic Survey and Assessment. Nelson Mandela Bay Municipality. (Contracted by: Public Process Consultants) (December 2015 –February 2015/Phase 2 current).
- Ikamva Lethu. Vegetation and Aquatic Assessment: Phase ii Impact Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (Current – await EIA modifications).
- Langbos Citrus. Section 21c and 21i water use application. Addo. Sundays River Valley Municipality. (Contracted by: Francois Joubert) (April – August 2017).
- Freshgro Kariega Citrus Development. Section 21c and 21i Supplementary Form Completion, Kirkwood, Sundays River Valley Municipality. (Contracted by: Applicant) (2016).
- Biodiversity Assessment. Buffalo Kloof Game Reserve. Protected Environment Application to the Eastern Cape Parks and Tourism Agency. Eastern Cape. (Contracted by: Mr W Rippon) (December 2016 – February 2017).
- Protected Area Management Plan. Indalo Game Reserves. Protected Environment Application to the Eastern Cape Parks and Tourism Agency. Eastern Cape. (Contracted by: Indalo Game Reserves) (2016 -2017).
- Riparian Desktop Assessment. Proposed Low Level Bridge Crossings at Ngqandulo (Kujadu River) and Suncity (Mzenge River). Ingquza Hill Local Municipality, Eastern Cape. (Contracted by: Izwile Africa Development Consultants) (September 2016).
- Zoetgenoegd Farm – Citrus Agriculture: Ecological Assessment. Addo. Nelson Mandela Bay Municipality. (Contracted by: IWR Terblanche and Associates – Environmental Consulting) (August 2016).
- Wetland Assessment. Chatty Bulk Stormwater Development, Nelson Mandela Bay Municipality, Port Elizabeth. (Contracted by: SRK Consulting) (August 2016).
- Wetland and Riparian Assessment. Bengal Heights Proposed Housing Development, Buffalo City Municipality, East London. (Contracted by: Terreco Environmental cc) (June – July 2016).
- Biodiversity Assessment. Indalo Game Reserves. Protected Environment Application to the Eastern Cape Parks and Tourism Agency. Eastern Cape. (Contracted by: Indalo Game Reserves) (May – August 2016).
- Langbos Farm. Expansion of Citrus. Vegetation and Aquatic Survey and Assessment. Addo, Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (Current, Draft submitted).
- Proposed Mncwasa Bridge Crossing. Present Ecological State Assessment. Mbashe Local Municipality (Contracted by: Ikamva Consulting) (March – April 2016).
- Proposed Quarry along the N2 between Grahamstown and Peddie. Vegetation Survey and Assessment Makana Local Municipality. (Contracted by: Terreco Environmental cc) (March 2016).
- Seven Fountains Mixed Use Development. Aquatic Survey and Assessment. Makana Local Municipality. (Contracted by: Public Process Consultants) (February 2016).
- Misty Mount Aquatic Study. Mthatha, Nyandeni Local Municipality, Eastern Cape (Contracted by: Ikamva Consulting) (January – February 2016).
- Wolweton Farm. Citrus Cultivation. Vegetation and Aquatic Survey and Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (December 2015 – January 2015).
- Habata Portion 15 of 203. Vegetation and Wetland Survey and Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (November 2015).
- Habata Portion 8 of 203. Vegetation and Wetland Survey and Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (November 2015).
- Amajinqi Macadamia Cultivation. Shixini Area, former Transkei. Mbashe Municipality. Aquatic Survey and Assessment. Present Ecological State, Riparian Vegetation Delineation and Impact Assessment. (Contracted by: Laughing Waters) (October – November 2015).
- Wetland Survey and Assessment. Eskom Ankerlig-Sterrekus Powerline 20km, Cape Town, Western Cape (Contracted by: Environmental Impact Management Services Pty Ltd) (Current).
- North West Province Biodiversity Sector Plan (BSP). BSP handbook for the Department of Rural, Environment and Agricultural Development (Contracted by: ECOSOL GIS) (Current).
- Waterberg District Bioregional Plan. Limpopo Province. Department of Economic Development and Environmental Affairs (Contracted by: ECOSOL GIS) (Current).
- Umgcabo Farm Vegetation and Aquatic Assessment. Rapid Environmental Risk Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (June – July 2015).
- Gafney Farm Vegetation and Aquatic Assessment: Sensitive Areas Mapping. Rapid Environmental Risk Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (June – July 2015).
- Aquatic Assessment. Citrus Cultivation of Farm Hitgeist. Sundays River Valley Municipality. Instomi Citrus Cultivation. (Contracted by: Engineering Advise and Services) (Current).

- Aquatic Assessment and Water Use License Application. Sundays River Valley Municipality. Instomi Citrus Cultivation. (Contracted by: Public Process Consultants) (Current/Ongoing).
- Botanical Survey to Mark Threatened and Protected Species. R72 Road Upgrade: Port Alfred to Fish River Estuary – 25 km. (Contracted by: Gibb) (July 2015).
- Freshgro Aquatic Sensitivity Mapping. Sundays River Valley Municipality. Freshgro Citrus Cultivation. (Contracted by: Public Process Consultants) (May 2015).
- Ecological Assessment: Ablution facility at Mtamvuna Estuary, Port Edward. Eastern Cape Province. (Contracted by: Ikamva Consulting Pty Ltd) (March / April 2015).
- Botanical Survey to Identify Protected Plant Species. Eskom Albany-Mimosa Powerline 1.1km, Alicedale, Eastern Cape (Contracted by: Environmental Impact Management Services Pty Ltd) (April 2015).
- Municipal review of the socio-ecological content of spatial and non-spatial planning documents in the Limpopo Catchment. (Contracted by: RESILIM/AWARD – USAID Funded Project) (Current).
- Ecological Assessment: Citrus Cultivation Scheepers Vlakke Farm. Sundays River Valley Municipality. (Contracted by: I.W. Terblanche and Associates) (September/October 2014).
- Buffelspruit Nature Reserve Ecological Assessment: Lodge Development, Maletswai Local Municipality, Eastern Cape (Contracted by: NS Environmental Consulting) (Current).
- Ecological Assessment: Loerie Heights Mixed Use Development, Buffalo City Metropolitan Municipality, Eastern Cape (Contracted by: USK Consulting Engineers) (Current).
- Wetland Aquatic Assessment. Rosedale Water Works. Mthatha. (Contracted by: Scherman Colloty and Associates) (October 2014).
- Aquatic Assessment. Sabelele Road Upgrade, Cofimvaba, Eastern Cape. (Contracted by: SRK Consultants) (August – September 2014).
- Specialist Review: Construction activities within buffers recommended in the Sunny South Housing Development, Buffalo City Metropolitan Municipality, Eastern Cape. (Contracted by: Environmental Impact Management Services Pty Ltd) (August 2014).
- Wetland Survey and Assessment. Gonubie. Buffalo City Metropolitan Municipality (Contracted by: Tshani Consulting) (December 2014).
- Ecological Assessment: Citrus Cultivation Scheepers Vlakke Farm. Sundays River Valley Municipality. (Contracted by: I.W. Terblanche and Associates) (August - September 2014).
- Ecological Assessment: Thina Lodge Development, Thina Falls, Mhontlo Municipality, Eastern Cape (Contracted by: Ikamva Consulting) (September – October 2014).
- Aquatic Assessment. Summerstrand Stormwater Upgrade. Nelson Mandela Bay Metropolitan Municipality (Contracted by: Public Process Consultants) (August 2014).
- Hintsabe Ecological Assessment: Mixed Use Development, Nqgushwa Local Municipality, Eastern Cape (Contracted by: Indwe Environmental Consulting) (August 2014).
- Gonubie Ecological Assessment: Residential Development, Buffalo City Metropolitan Municipality, Eastern Cape (Contracted by: NS Environmental Consulting) (Current).
- Mkuze Wetland Survey and Water Use License Application (Contracted by: Scherman Colloty and Associates) (April - September 2014).
- Specialist Botanical Assessment: Vegetation and Floristics. Thornhill Bulk Water Supply Scheme, Greater Mthatha Area, Eastern Cape (Contracted by: Gibb Africa) (Current).
- Ecological Assessment: Cofimvaba Mixed Use Human Settlement. Cofimvaba, Intsika Yethu Local Municipality, Eastern Cape. (Contracted by: USK Consulting) (February 2014).
- R72 Main Road Biodiversity Assessment. Ndlambe and Ngqushwa local municipalities, Eastern Cape (Contracted by: Scherman Colloty and Associates) (January – March 2014).
- Specialist Botanical Assessment: Vegetation and Floristics. Rosedale Water Treatment Works and Associated Pipeline, Mthatha, Eastern Cape (Contracted by: Gibb Africa) (Current).
- Specialist Ecologist and Wetland Assessment. Coega Tankatara Road Upgrade. Coega Industrial development Zone. Nelson Mandela Bay Municipality. Eastern Cape. (Contracted by: Environmental Impact Management Services Pty Ltd) (2014).
- Msenge Emoyeni Wind Farm Water Use Licensing Application, Bedford (Phase II) – Report Compilation in collaboration with Dr Patsy Scherman (Contracted by: Scherman Colloty and Associates) (Current & Ongoing).
- Mvoti – Mzimkulu Water Management Area (WMA 12) – Assistance with Water Quality component of Classification Study (Contracted by: Scherman Colloty and Associates) (Current & Ongoing).
- Inkomati Water Management Area – Assistance with Water Quality component of Classification Study (Contracted by: Scherman Colloty and Associates) (Current & Ongoing).
- R72 Main Road Biodiversity Assessment. Ndlambe and Ngqushwa local municipalities, Eastern Cape (Contracted by: Scherman Colloty and Associates) (October 2013).
- Swaziland Scoping Study. Biodiversity Data and Mapping Report (Contracted by: Scherman Colloty and Associates) (October 2013).
- Ingquza Wetland Study. Eastern Cape (Contracted by: Scherman Colloty and Associates for AURECON) (September 2013).
- Specialist Ecologist and Wetland Assessment. Proposed Residential Development within 100 m of the High-Water Mark, Kariega Estuary, Kenton-On-Sea. Ndlambe Municipality (Contracted by: Conservation Support Services). (July – September 2013).
- Proposed Dedisa – Grassridge 132 kV Powerline. Protected Species Permit Application - Specialist Botanical Survey. (Contracted by: Scherman Colloty and Associates). (Feb – July 2013).
- Proposed Dedisa – Grassridge 132 kV Powerline Environmental Management Programme and Specialist Botanical Survey. (Contracted by: Scherman Colloty and Associates). (Feb – July 2013).
- Specialist Botanical and Vegetation Assessment. Proposed Upgrade of Storm water Infrastructure. Addo, Sundays River Valley Municipality, Eastern Cape. (Contracted by: Scherman Colloty and Associates). (June – July 2013).
- Specialist Wetland Study. Proposed Port Alfred Central Well Fields. Ndlambe Municipality, Eastern Cape (Contracted by: Coastal and Environmental Services) (June 2013).



- Specialist Ecologist Assessment. Proposed Residential Development within 100 m of the High-Water Mark, Bushmans Estuary, Bushmans Mouth, Kenton-On-Sea. Ndlambe Municipality (Contracted by Conservation Support Services). (March – May 2013).
- Specialist Ecologist and Wetland Assessment. Proposed Access Road and Culvert Crossing over the Salt Vlei Wetland, Port Alfred. Ndlambe Municipality (Contracted by Conservation Support Services). (January – April 2013)
- Specialist Ecologist and Wetland Assessment. Proposed Slipway on the Mthatha River, Mthatha. King Sabata Dalinyendebo Municipality (Contracted by Conservation Support Services) (February – April 2013).
- Specialist Ecological and Wetland Study for the proposed Sunny South Housing Development, Buffalo City Metropolitan Municipality, Eastern Cape. (Contracted by: Environmental Impact Management Services Pty Ltd) (May 2013).
- Specialist Botanical Report for the Kwanobuhle Housing Development, Port Elizabeth, Nelson Mandela Bay Municipality (Contracted by: Scherman Colloty and Associates) (May 2013).
- Swanepoel Kraals Wetland Study. (Contracted by: Scherman Colloty and Associates) (April 2013).
- Watercourse Delineation Study for the formalization of the Mdantsane Townships. East London. Buffalo City Metropolitan Municipality, Eastern Cape. (Contracted by: Scherman Colloty and Associates) (March 2013).
- Letaba Catchment Reserve – Assistance with Water Quality component of Classification Study (Contracted by: Scherman Colloty and Associates) (October 2012 – June 2013).
- Aquaculture Scoping Study for South Africa Environmental Risk Analysis of current species farmed and associated farming methods in South Africa (Contracted by: Enviro-Fish Africa, Department of Ichthyology and Fisheries Science, Rhodes University) (2012).
- Addo Elephant National Park Mainstreaming Biodiversity Project: Ndlambe, Sundays River Valley, Blue Crane Route and Ikwezi Municipalities, Eastern Cape (Contracted by: South African National Park Parks, French GEF funded project) – Biodiversity and Planning Advisor, capacity building at the local and provincial level on the uptake of biodiversity information, production of user friendly products (four handbooks, four posters, a mapbook and DVD), managing the design component of user friendly products. The production of four Biodiversity Sector Plans (main author) (July 2011 – December 2012).
- Eden District Municipality Coastal Management Programme – Assistance with report compilation: Sensitive environments, legislative review, and management action plans (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Ndlambe Wetland Delineation Study – Present Ecological State Assessment and GIS Mapping (Contracted by: Coastal and Environmental Services) (2012).
- Amakhala Emoyeni Wind Farm Water Use Licensing Application (Phase I), Bedford – Assistance with report compilation (Contracted by: Scherman Colloty and Associates) (2012).
- Tsitsikamma Wind Farm Water Use Licensing Application, Kouga Local Municipality – Assistance with report compilation, including an Integrated Water and Waste Management Plan. Technical assistance with wetlands and wetland GIS mapping, including Wetland Delineation and Sensitivity Assessment Report (Contracted by: Scherman Colloty and Associates). (2012).
- Tombo Access Roads: Water Use Licensing Application, Port St Johns Local Municipality – Assistance with report compilation (Contracted by: Scherman Colloty and Associates) (2012).
- Mthatha Corana Bridge Crossings: Water Use Licensing Application, King Sabata Municipality, Eastern Cape - Assistance with report compilation (Contracted by: Scherman Colloty and Associates). (2012).
- Environmental Assessment and Abalone Marine Ranching Proposal Report. Proposed Abalone Marine Ranching Pilot Project EC1: Schoemakerskop (Sardinia Bay) Marine Protected Area to Cape Recife, Eastern Cape, Nelson Mandela Bay Municipality. Including Environmental Management Plan. Report Compilation in collaboration with Aquaculture Specialist Prof P Britz (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Environmental Assessment and Abalone Marine Ranching Proposal Report. Proposed Abalone Marine Ranching Pilot Project EC2: Hamburg to East London Harbour, Eastern Cape. Including Environmental Management Plan. Report Compilation in collaboration with Fisheries (Abalone) Specialist Prof P Britz (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Environmental Assessment and Abalone Marine Ranching Proposal Report. Proposed Abalone Marine Ranching Pilot Project Concession Area EC3: Chintsa to Mazeppa Bay, Eastern Cape Great Kei Municipality. Including Environmental Management Plan. Report Compilation in collaboration with Fisheries (Abalone) Specialist Prof P Britz (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Environmental Assessment and Abalone Marine Ranching Proposal Report. Proposed Abalone Marine Ranching Pilot Project Concession Area EC3: Chintsa to Mazeppa Bay, Eastern Cape Great Kei Municipality. Including Environmental Management Plan. Report Compilation in collaboration with Fisheries (Abalone) Specialist Prof P Britz (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Environmental Assessment and Abalone Marine Ranching Proposal Report. Proposed Abalone Marine Ranching Pilot Project Concession Area NC1: Boegoeberg Noord to Beach North of North Point, Richtersveld Local Municipality, Northern Cape. Including Environmental Management Plan. Report Compilation in collaboration with Fisheries (Abalone) Specialist Prof P Britz (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Environmental Assessment and Abalone Marine Ranching Proposal Report. Proposed Abalone Marine Ranching Pilot Project Concession Area NC4: Skulpfontein to Two Small Rocks 200m From Shore, Kamiesberg Local Municipality, Northern Cape Including Environmental Management Plan. Report Compilation in collaboration with Fisheries (Abalone) Specialist Prof P Britz (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Ecological Risk Assessment. Proposed Aquaculture Development: The Development of a Pilot Land-Based Dusky Kob (*Argyrosomus japonicus*) Mariculture Facility at Hamburg, Ngqushwa Municipality, Eastern Cape. Including Environmental Management Plan. Report Compilation in collaboration with Aquaculture Specialist Dr T Shipton (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Basic Assessment Report. Proposed Trout Aquaculture Facility, Reedsdell Farm, north of Barkley East, Senqu Local Municipality, Eastern Cape. Including Environmental Management Plan (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).

**Biodiversity Consultant - Addo Elephant National Park Biodiversity Mainstreaming Project (SANParks) - Global Environmental Facility Funded project (2011-2012)**

- Duties: Main author of four biodiversity sector plan handbooks for 4 local municipalities (Ndlambe, Ikwezi, Sundays River Valley, Blue Crane Route), Production of user friendly products and input into the design process, Leading local municipal capacity building workshops, Assisting with incorporating biodiversity into IDP and SDF documents.

**Biodiversity Liaison Officer for South African National Parks, Global Environmental Facility Funded project (2007 – 2010) – Garden Route Initiative**

- Duties – Mainstreaming biodiversity into land use planning and decision making through government stakeholder workshops, main author of two biodiversity sector plan handbooks for 5 local municipalities, capacity building at the local and provincial level on the uptake of biodiversity information, the review of municipal Integrated Development Plans and Spatial
- Development Frameworks, the review of biodiversity policy documents e.g. biodiversity offset guidelines and rural land use guidelines developed by the Department of Environmental Affairs and Development Planning.
  - Vromans, D.C., Maree, K.S., Holness, S., Job, N. and Brown, A.E. 2010. The Garden Route Biodiversity Sector Plan for the George, Knysna and Bitou Municipalities. Supporting land-use planning and decision-making in Critical Biodiversity Areas and Ecological Support Areas for sustainable development. Garden Route Initiative. South African National Parks. Knysna. ISBN 978-0-9869776-1-9.
  - Vromans, D.C., Maree, K.S., Holness, S., Job, N. and Brown, A.E. 2010. The Garden Route Biodiversity Sector Plan for the Southern Regions of the Kouga and Koukamma Municipalities. Supporting land-use planning and decision-making in Critical Biodiversity Areas and Ecological Support Areas for sustainable development. Garden Route Initiative. South African National Parks. Knysna. ISBN 978-0-9869776-2-6.

**Environmental Consultant for 'Coastal and Environmental Services' (May 2003 – December 2006)**

- Duties – Quotation and Proposal Compilation, Report Writing, Environmental Impact Assessment and Scoping Studies/Reports, Basic Assessments, Botanical Sampling, Vegetation Surveys and Assessments & Herbarium Work (Plant Identification), Sensitivity Assessments, Rehabilitation Specifications, Environmental Management Plans. Environmental Control Officer. Project Management.

**Projects –**

- Environmental Control Officer – Environmental Auditing Reports for the proposed “Upgrade of Kenton-on-Sea/Bushmansrivermouth - Bulk Water Supply”. Prepared for the Albany Coast Water Board, Eastern Cape (2005).
- The proposed establishment of an ‘Eco-Residential’ Development at Seafield (Kleinemonde) in the Eastern Cape: Environmental Scoping Report (2006).
- The proposed Rosehill Mixed Use Development at Port Alfred: Environmental Impact Assessment (2006).
- The proposed Trailees Wetland Access Road at Port Alfred: Environmental Scoping Report (2006).
- Vegetation Survey, River Sands, Ndlambe Local Municipality (2006)
- Cola Beach Guide Plan Amendment: Vegetation Survey, Knysna Local Municipality (2006)
- Upgrade and extension of the Mpekweni Resort, Ndlambe Local Municipality (2006)
- KZN Vegetation Mapping, Durban, Kwazulu Natal (2006)
- ACSA EL Airport Upgrade: Basic Assessment Report, Buffalo City Municipality, Eastern Cape (2006)
- CSL Vegetation Monitoring, Proposed Mining Project, Mozambique (2006)
- Vegetation Survey and Environmental Scoping Report: Proposed Eco-Lodge Development and Nature Reserve, as an Extension to Lalibela Game Reserve, Eastern Cape (2006)
- Vegetation Survey and Sensitivity Assessment, Proposed Mixed Use Development, Gonubie, Buffalo City Municipality (2006).
- Environmental Scoping study: Proposed Shopping Development, Beacon Bay, Buffalo City Municipality (2006).
- Lima Massacre Heritage Site, Environmental Scoping Study and Vegetation Survey, Queenstown (2006).
- Review and editing of several Scoping Studies, EIAs and Vegetation Surveys (2005 – 2006).
- The proposed upgrading and construction of two tented campsites with jetties along the Kariega River and the reparation of the watercourse bank, Kenton-On-Sea, Eastern Cape. Environmental Scoping Report. Prepared for Foxlaw investments - Private Developer (2004 – 2005).
- Preparation of a Construction and Operational Environmental Management Plan for the proposed “Upgrade of Kenton-on-Sea/Bushmansrivermouth - Bulk Water Supply”. Prepared for the Albany Coast Water Board, Eastern Cape (2005).
- Upgrade of Main Road 435, Coega Industrial Development Zone, Nelson Mandela Metropolitan Municipality, Eastern Cape. Includes Vegetation Survey (2005).
- Environmental Control Officer – Coega Port Rehabilitation (2005).
- The proposed construction of an ‘eco-lodge camp’ on a ridge located on Salem farm # 498 above the Bushmans River, Eastern Cape – Environmental Scoping Report. Prepared for Mr J Kritzing (2003 – 2004).
- The proposed construction of a lodge resort within the Ntlangano Community Reserve adjacent to the Tsitsa Falls and Chipoka Mineral Sands, Salima Bay, Malawi: Volume 1: Scoping and Terms of Reference. Compiled this report. Allied Procurement Agency, Lilongwe, Malawi (2003).
- Establishment of a Community Nature Reserve on the south bank of the Umtamvuna River, Eastern Cape - Environmental Scoping Report. Preparing for PondoCrop, Port Edward. (2003 – 2004).
- The proposed establishment of a Marine and Wildlife Rehabilitation Centre, St Francis Bay, Eastern Cape: Environmental Scoping Report. Prepared for Ajubatis Marine and Wildlife Rescue. (2004 – 2005).
- Construction of a 66kv Power Line, 22Kv Feeder Bays and Substation St Francis Bay, Eastern Cape: Environmental Scoping Report. Prepared for Eskom, Southern Region, East London (2004 – 2005).
- Long term Rehabilitation Plan for the Port of Ngqura. Prepared for the National Ports Authority (NPA), Coega. Port Elizabeth (2004 – 2005).

- Construction of the proposed refurbishment and rebuilding requirements for the Melkhout/Gamtoos 22kv Feeder Powerline and Gamtoos/Melkhout 22kv Feeder Powerline, Eastern Cape. Environmental Scoping Report. Prepared for Eskom, Southern Region, East London (2004 - 2005).
  - The assessment of an Existing Environmental Scoping Study with additional adaptation to the previously proposed layout design for: The proposed establishment of an 'Eco-Residential' development adjacent to the coast and including pristine sand dunes at Aston Bay, Portion 2, Eastern Cape. Prepared for Glenny Buchner Trust (Private Developer) (2004 – 2005)
  - The proposed establishment of an 'Eco-Residential' Development at Aston Bay on Farm Swanlake in the Eastern Cape Environmental Scoping Report. Prepared for Glenny Buchner Trust - Private Developer (2004 – 2005).
  - Letaba Water Quality Reserve: Specialist Trainee – Water Quality Assessment of the Letaba River Catchment - Water quality sampling, statistics and report writing (Dr Scherman & Ms Vromans). Preparing for Department of Water Affairs and Forestry (2003 – 2005).
  - Luanda Dredging Pre-feasibility Study: Assistance in writing part of the dredging report for this study. Prepared for PRDW, Cape Town (2003).
  - Construction of a 66kv Power Line Linking Fort Beaufort and Adelaide, Eastern Cape: Scoping Report. Prepared for Eskom, Southern Region, East London (2003).
  - Corridor Sands Chongoene Export Facility EIA, Volume 2: Specialist Reports: Vegetation & Floristics. Assisted in writing and compiling this specialist report. Prepared for 'Corridor Sands Limitada'. (Prof Lubke & Vromans) (2003).
  - N2 Toll Road Bridges EMP: Vegetation & Sensitivity Analysis. Assisted in writing and compiling the specialist report. (Prof Lubke and Vromans) (2003).
- \* Note that all scoping studies include a vegetation assessment and project management.**

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**Environmental Scientist: Projects Assistant at Enviro-fish Africa PTY (LTD) (Jan – April 2003)**

- Duties – Preparation of Tender Proposals, Literature Research /Information Sourcing and Gathering, Data Capture (Excel); Report Writing: Assisted with the compilation of the 'Nelson Mandela Municipal Metro: Coastal Management Plan'. General Administration and Co-ordination (New Company established).

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**Environmental Scientist: Projects Management and Assistant at 'Anchor Environmental' PTY (LTD) (2000-2002)**

- Duties – Preparation of Tender Proposals, Project Management of Tuna Longline, Hake Longline and West Coast Rock Lobster Observer Programmes, Literature Research/ Information Sourcing and Presentation (Powerpoint), Data Capture (Excel & Access); Report Writing (MSWord); Financial Administration (Pastel 5.2), General Administration, Project Co-ordination & Logistics, Scientific Sampling (SASS), Estuarine Sampling (Vertebrate & Invertebrate), Coastal Zone (Off-Shore & On-Shore) Sampling (Vertebrate & Invertebrate), Class 4 Scientific Diver.

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**REFERENCES**

- Dr Brian Colloty. EnviroSci Pty Ltd. Cell: 083 498 3299. Email: bcolloty@gmail.com.
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