

ANNEXURE O:

Electrical Services Report



ENG-TENE-005 20221108

CLIENT: ATTERBURY



ATTERBURY

HOOGELAND COASTAL FARMSTEADS ELECTRICAL ENGINEERING SERVICES REPORT

**PROJECT NAME : HOOGELAND COASTAL FARMSTEADS –
ELECTRICAL**

DATE: FEBRUARY 2026

Compiled for :

Atterbury
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Prepared by :



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REPORT DETAILS :

Lyners Reference No: Hoogeland Coastal Farmsteads

Client: Atterbury

Report prepared by: Jacques van Zyl

Client representative: Gerrit van den Berg

Keywords: Hoogeland Coastal Farmsteads Electrical Services

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1. INTRODUCTION

Neil Lyners and Associates (Pty) Ltd ("Lyners") was requested to compile an Electrical Engineering Services Report for the planned Hoogeland Coastal Farmsteads Development in George.

This report investigates the preliminary electrical load requirements, supply capacity and upgrade details.

The various developments will consist of the following land uses:

- Agriculture Zone I (Farms of $\pm$ 5ha), with equestrian
- General Residential Zone I (Group Housing for the residential Village)
- Open Space Zone II (Private Open Space) for horse riding club, communal equestrian facilities & polo field
- Open Space Zone III (Nature Conservation Area), for the environmentally sensitive farms
- Community Zone I (Place of instruction) to formalise the existing school
- Utility Zone (for the utility services)
- Transport Zone III (Private Roads)

2. SITE LOCATION

The proposed development, Hoogeland Coastal Farmsteads, is located on Pr2470 / Farm Hoogekraal No 238 (several portions), situated on both sides of the National Route 2 and adjacent to Morrison Road and the Maalgate River. The site is easily accessible via Morrison Road, a formal surfaced road. The GPS coordinates for the Hoogeland Coastal Farmsteads site are 34°02'05.6"S 22°20'03.5"E.

3. DETAILS OF THE DEVELOPMENT

The proposal is for a mixed-use residential development and will consist of the following :

- 81 x Agriculture Zone I (Farms of $\pm$ 5ha), with equestrian
- 5 x Agriculture Zone I (Farms of greater than 18.5ha), with equestrian
- 110 x General Residential Zone I (Group Housing for the residential Village)
- 1 x Open Space Zone II (Private Open Space) for horse riding club, communal equestrian facilities & polo field
- Open Space Zone III (Nature Conservation Area), for the environmentally sensitive farms
- 1 x Community Zone I (Place of instruction) to formalise the existing school
- Utility Zone (for the utility services)
- Pumpstations and Treatment Plants

4. ELECTRICAL LOAD ESTIMATE

The anticipated electrical load for this total development is **2919.2 kVA**, with details as follows :

Development Section	Electrical Demand (kVA)
81 x Farms	$87 \times 20.4 = 1774.8$
110 x Residential Units	$110 \times 1.5 = 165$
School	60
Polo Club	50
Treatment Plants	60
Pumpstations	75

5. EXISTING ELECTRICAL CAPACITY

The specific area to be developed falls into the electricity supply area of Eskom, and bulk services will therefore be provided from the nearest Eskom network with adequate capacity.

There are existing overhead lines on the site, which feed existing connections.

A wayleave application was sent to Eskom to provide the existing network drawings. Lyners is awaiting the existing network drawings.

6. BULK ELECTRICAL SERVICES DETAILS

The medium voltage network will be upgraded to provide a connection point near the boundary of each farm in the development. The medium voltage network will consist of overhead lines and transformers.

The existing overhead 11kV lines across the development, which cannot be re-used will be removed.

Final discussions with Eskom will take place as soon as Lyners receive the existing network drawings.

7. INTERNAL ELECTRICAL SERVICES DETAILS

Internal low voltage services will be done for the residential units, the polo club and school.

All owners of farms will have to apply for a low voltage connection at Eskom.

8. DEVELOPMENT CHARGES

Development Charges will not be applicable to George Municipality.

Development Charges will be applicable to Eskom.

9. RECOMMENDATIONS

All designs, material and equipment to be used as well as installation practices will be based on the guidelines for new electricity networks as dictated by Eskom.

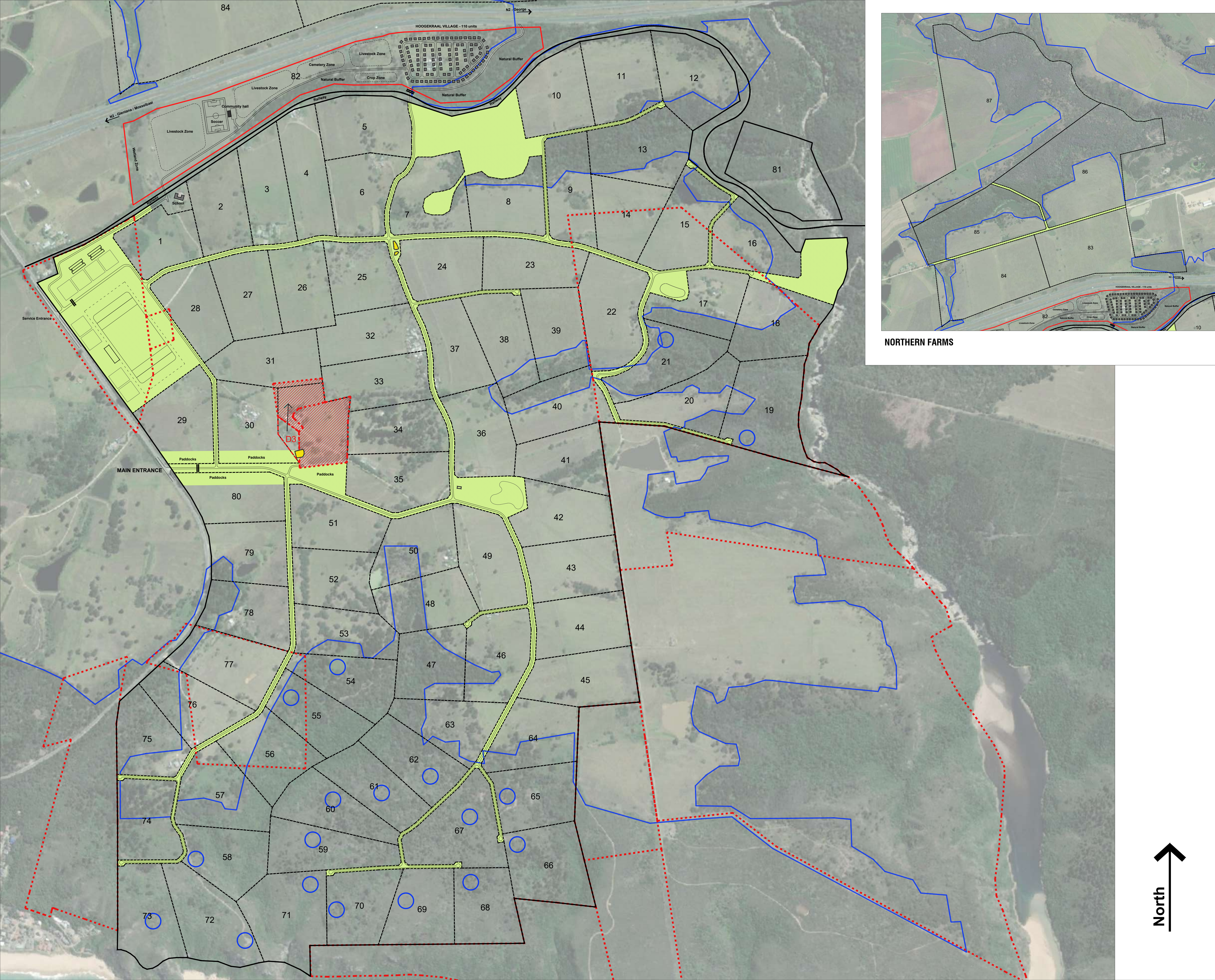
10. CONCLUSIONS

Final discussions will be scheduled as soon as Lyners receive the drawings indicating the existing services.



**JACQUES VAN ZYL Pr Techni Eng
for LYNERS**

ANNEXURE A : SUBDIVISION/MASTERPLAN FROM NUVORM



NORTHERN FARMS

NOTES:

SOUTHERN FARMS			
1	4,45 ha	64	5,73 ha
2	5,12 ha	65	5,26 ha
3	5,30 ha	66	6,30 ha
4	5,61 ha	67	6,95 ha
5	5,83 ha	68	5,10 ha
6	5,40 ha	69	5,21 ha
7	5,11 ha	70	5,11 ha
8	5,01 ha	71	7,20 ha
9	5,27 ha	72	6,52 ha
10	5,59 ha	73	5,96 ha
11	6,27 ha	74	5,11 ha
12	6,37 ha	75	5,13 ha
13	6,63 ha	76	5,17 ha
14	5,17 ha	77	6,09 ha
15	5,79 ha	78	5,20 ha
16	5,01 ha	79	5,07 ha
17	5,03 ha	80	5,08 ha
18	6,26 ha	81	7,42 ha
19	7,78 ha		
20	5,43 ha		
21	5,58 ha		
22	6,67 ha		
23	5,18 ha		
24	5,01 ha		
25	5,10 ha		
26	5,02 ha		
27	5,07 ha		
28	5,02 ha		
29	5,77 ha		
30	5,53 ha		
31	5,52 ha		
32	5,22 ha		
33	5,27 ha		
34	5,08 ha		
35	5,79 ha		
36	5,70 ha		
37	5,05 ha		
38	5,41 ha		
39	5,20 ha		
40	5,68 ha		
41	5,06 ha		
42	5,45 ha		
43	5,62 ha		
44	5,64 ha		
45	6,02 ha		
46	5,73 ha		
47	5,26 ha		
48	5,18 ha		
49	5,98 ha		
50	5,49 ha		
51	5,29 ha		
52	5,06 ha		
53	5,05 ha		
54	5,10 ha		
55	5,12 ha		
56	5,58 ha		
57	6,25 ha		
58	5,14 ha		
59	5,51 ha		
60	5,04 ha		
61	5,07 ha		
62	5,06 ha		
63	5,12 ha		

VILLAGE		
82	24,79 ha	

NORTHERN FARMS		
83	19,47 ha	
84	19,71 ha	
85	18,50 ha	
86	32,87 ha	
87	57,17 ha	

ANNEXURE P:

Traffic Impact Assessment

**HOOGELAND COASTAL FARMSTEADS
PORTIONS OF FARM HOOGEKRAAL NO 238
&
PORTIONS OF THE FARM BUFFELSDRIFT NO 227
GEORGE MUNICIPALITY
WESTERN CAPE**

TRAFFIC IMPACT ASSESSMENT

REPORT 2025-242 Rev 2

MARCH 2026

ATTERBURY PROPERTY GROUP



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Report Information Sheet

Report number : 2025-242 Rev 2
Development name : Hoogeland Coastal Farmsteads
Development site : Several Portions Farm Hoogekraal No 238 and Buffelsdrift No 227
Road Authority : George Local Municipality
Approving Authority : Western Cape Government Transport Infrastructure Branch

Report undertaken by:

Name : A Maritz Pr. Eng.
Signature : 
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Hoogeland Coastal Farmsteads, George
TRAFFIC IMPACT ASSESSMENT

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1 INTRODUCTION AND BACKGROUND

1.1 Introduction

EDS Engineering Design Services (Pty) Ltd was appointed by the Atterbury Property Group to undertake a Traffic Impact Assessment (TIA) for the proposed development, *Hoogeland Coastal Farmsteads*.

The Hoogekraal Farms were previously part of a development application (Lagoon Bay). The application was never finalised. The application area is located south of the N2 National Road, west of the Malgate River, north of the ocean and east of Morrison Road. The development is situated in the Garden Route of the Western Cape Province just off of the N2 interchange to access the town of Glentana.

During 2021, the National Department of Agriculture approved the subdivision of these farms into 205 smaller erven. This approval is still valid. The 205 erven which will entail 123 agricultural / farm units and 80 residential village units. However, for the *Hoogeland Coastal Farmsteads* development now under consideration, **81 agricultural farm units** will be provided along with **110 residential village units**.

The 81 agricultural / farm units will operate as privately owned individual dwelling units. The 110 residential village units are to accommodate families of informal settlers that have acquired permanent occupation rights in terms of the Extension of Security of Tenure Act 62 of 1997 (ESTA).

This study investigates the existing and future operating conditions at the key intersections within the study area, it estimates the expected development trip generation whilst taking cognisance of the type of development proposed, it determines the anticipated traffic impact on the surrounding road network and determines whether it is necessary to implement any road and/or intersections improvements to mitigate the anticipated traffic impact.

The study was undertaken considering the requirements and guidelines as set out in the following:

- *TMH 16 Volume 2 (South African Traffic Impact and Site Impact Assessment Standards and Requirements Manual), COTO, Version 1 dated August 2012;*
- *George Integrated Zoning Scheme By-Law (2023).*
- *TMH 17 Volume 1 (South African Trip Data Manual of 2012);*

1.2 Site Location

The application area is located south of the N2 National Road, west of the Malgate River, north of the ocean and east of Morrison Road. The development is situated in the Garden Route of the Western Cape Province just off of the N2 interchange to access the town of Glentana as seen **Figure 1-1**.

The development site currently has multiple small access points to the various farmlands that make up the development area. The bulk of the development site will be situated south of the N2.



Figure 1-1: Hoogeland Coastal Farmsteads Locality Map

1.3 Context and Background

The proposed development involves the realignment of existing farm boundaries to create a more coordinated layout featuring communal horse and hiking trails and internal farm roads. The overall proposal for the development now underway comprises **81** farm portions (i.e. **agricultural units/farms**) and a **110-unit agri-residential village** for beneficiaries already residing on the parent farm to accommodate the existing farm workers within the application area. The Agri-Residential Village is proposed between the railway line and the N2

The agricultural units/farms will average ± 5 ha each. An existing approval by the National Department of Agriculture allows for 205 smallholdings ranging from 2–60 ha. However, the applicant intends to pursue the revised layout of 81 portions (as per the draft site layout plan provided in **Annexure A**) and an agri-village, subject to George Municipality's approval. If supported, the National Department of Agriculture will be approached for an amendment to the existing approval.

The agri-residential village is reserved for existing beneficiaries with established tenure rights. Beneficiaries will obtain freehold title ownership; no further subdivision or expansion will be permitted.

1.4 Methodology

The methodology of this TIA included the following:

- A site visit was undertaken;
- The relevant roads authority road network planning was considered;
- Traffic counts were obtained at relevant intersections within the study area;
- A trip generation, distribution, and assignment exercise was undertaken;
- The intersections capacity analysis for the worst-case scenario peak hour were undertaken where the background and development traffic demand was considered for the intersections included in the study;
- Alternatives to improve the road capacity were investigated where required;
- Public transport and non-motorised facilities were considered based on available information.

All findings, conclusions, and recommendations are captured in this report

1.5 Existing and Proposed Land-Use Rights

The following farms currently form part of the application area (total count of **31**):

- Remainder Farm Hoogekraal No 238
- Portion 5 of the Farm Hoogekraal No 238
- Portion 6 of the Farm Hoogekraal No 238
- Portion 17 of the Farm Hoogekraal No 238
- Portion 18 of the Farm Hoogekraal No 238
- Portion 19 of the Farm Hoogekraal No 238
- Portion 23 of the Farm Hoogekraal No 238
- Portion 41 of the Farm Hoogekraal No 238
- Portion 42 of the Farm Hoogekraal No 238
- Portion 52 of the Farm Hoogekraal No 238
- Portion 64 of the Farm Hoogekraal No 238
- Portion 65 of the Farm Hoogekraal No 238
- Portion 66 of the Farm Hoogekraal No 238
- Portion 67 of the Farm Hoogekraal No 238
- Portion 68 of the Farm Hoogekraal No 238
- Portion 69 of the Farm Hoogekraal No 238
- Portion 70 of the Farm Hoogekraal No 238
- Portion 72 of the Farm Hoogekraal No 238
- Portion 74 of the Farm Hoogekraal No 238
- Portion 75 of the Farm Hoogekraal No 238
- Portion 76 of the Farm Hoogekraal No 238
- Portion 79 of the Farm Hoogekraal No 238
- Portion 85 of the Farm Hoogekraal No 238
- Portion 88 of the Farm Hoogekraal No 238
- Portion 90 of the Farm Hoogekraal No 238
- Portion 102 of the Farm Hoogekraal No 238
- Portion 148 of the Farm Hoogekraal No 238
- Portion 160 of the Farm Hoogekraal No 238
- Portion 178 of the Farm Hoogekraal No 238
- Portion 179 of the Farm Hoogekraal No 238

- Portion 180 of the Farm Hoogekraal No 238
- Portion 5 of the Farm Buffelsdrift No 227
- Portion 9 of the Farm Buffelsdrift No 227

The current zoning for the development area is Farmlands - i.e. Portion 2470 Farm Hoogekraal No 238 which will undergo rezoning. The rezoning will include various land-uses as follows and as shown on **Annexure A**:

- **Agriculture Zone I:** ±5 ha farms with equestrian activities.
- **General Residential Zone I:** Group housing for the Agri-village.
- **Open Space Zone II:** Private open space for horse riding, communal equestrian facilities, and a polo field.
- **Open Space Zone III:** Nature conservation area for environmentally sensitive farms.
- **Community Zone I:** Formalisation of the existing school.
- **Utility Zone:** Provision of essential utility services.
- **Transport Zone III:** Private internal road network.

The ultimate development is therefore in accordance with the municipal development land-uses for the various land-uses as listed above.

2 DATA COLLECTION

2.1 Study Area and Traffic Counts

The “South African Traffic Impact and Site Traffic Assessment Manual” (TMH 16 Version 1.0 of August 2012) was used to define the extent of the study area. In line with the manual, analyses are required for both the base year and a five-year horizon year.

To establish the base year traffic operating conditions, manual traffic counts were conducted at key intersections. The surveys were undertaken for the Weekday AM peak form 06:00 - 09:00 and for the Weekday PM Peak from 16:00 - 18:00 on Tuesday, 30 September 2025 - which is representative of typical weekday traffic conditions. A summary of the key intersections within the study area, including their current control type, is provided in **Table 2-1**, with the location of each intersection shown on **Figure 2-1**.

Table 2-1: Intersections included in Traffic Statement

No	Intersection	Control Type
1.	N2 northern terminal	Side-road stop controlled for vehicles exiting the N2 eastwards.
2.	N2 southern terminal	Side-road stop controlled for vehicles exiting the N2 westwards.

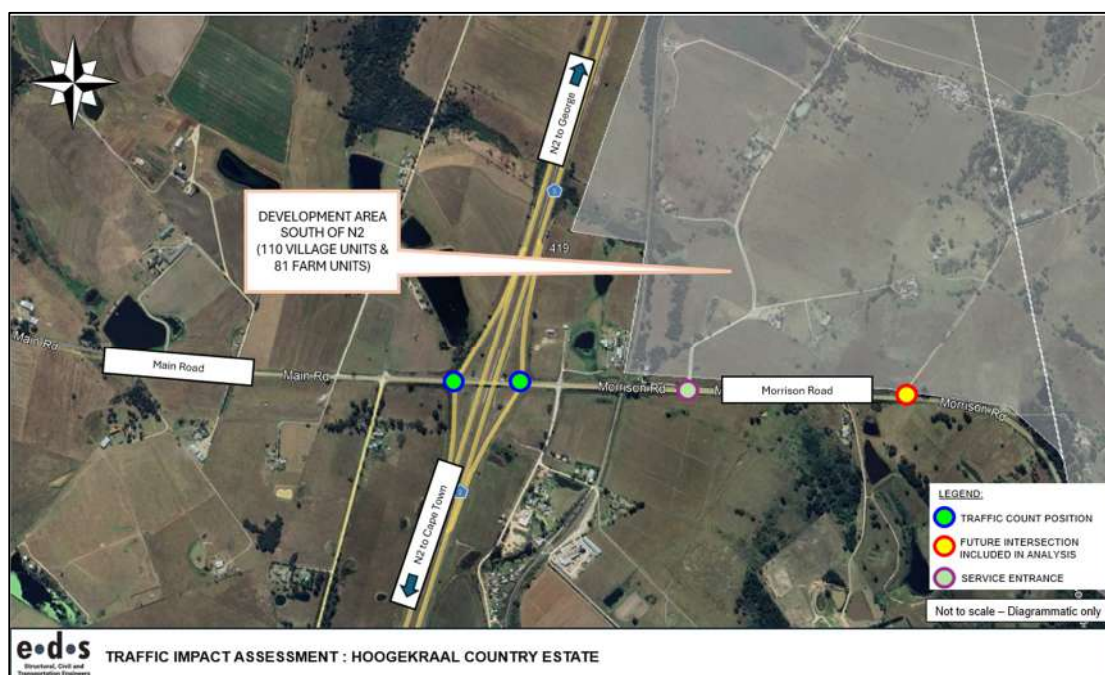


Figure 2-1: Location of Surveys Intersections

2.2 Latent Developments

There are no latent developments in the immediate vicinity of the development that are expected to generate traffic impacts or require road upgrades which could affect the development traffic of the proposed Hoogeland Coastal Farmsteads.

3 ACCESS AND ROAD NETWORK

3.1 Existing Access and Road Network

The application area is located south of the N2 National Road, a Class 1 roadway under jurisdiction of SANRAL. Morrison Road and Main Road (Western Cape Government Main Road MR00348), a Class 2 road, traverses to the west of the development site and is under the jurisdiction of Western Cape Government as Approving Authority and George Municipality as Roads Authority.

Several District Roads bisect the application area. These are all Minor Roads, with a proclaimed road reserve of 10m wide. The proposal is to de-proclaim these roads and to register right-of-way servitudes over the newly constructed roads, in favour of those farms that still require the use of these roads for access purposes. These proclaimed roads are listed below and shown on **Figure 3-1**:

- OP06843
- OP06844
- OP06847
- OP06848
- OP06845
- OP06842

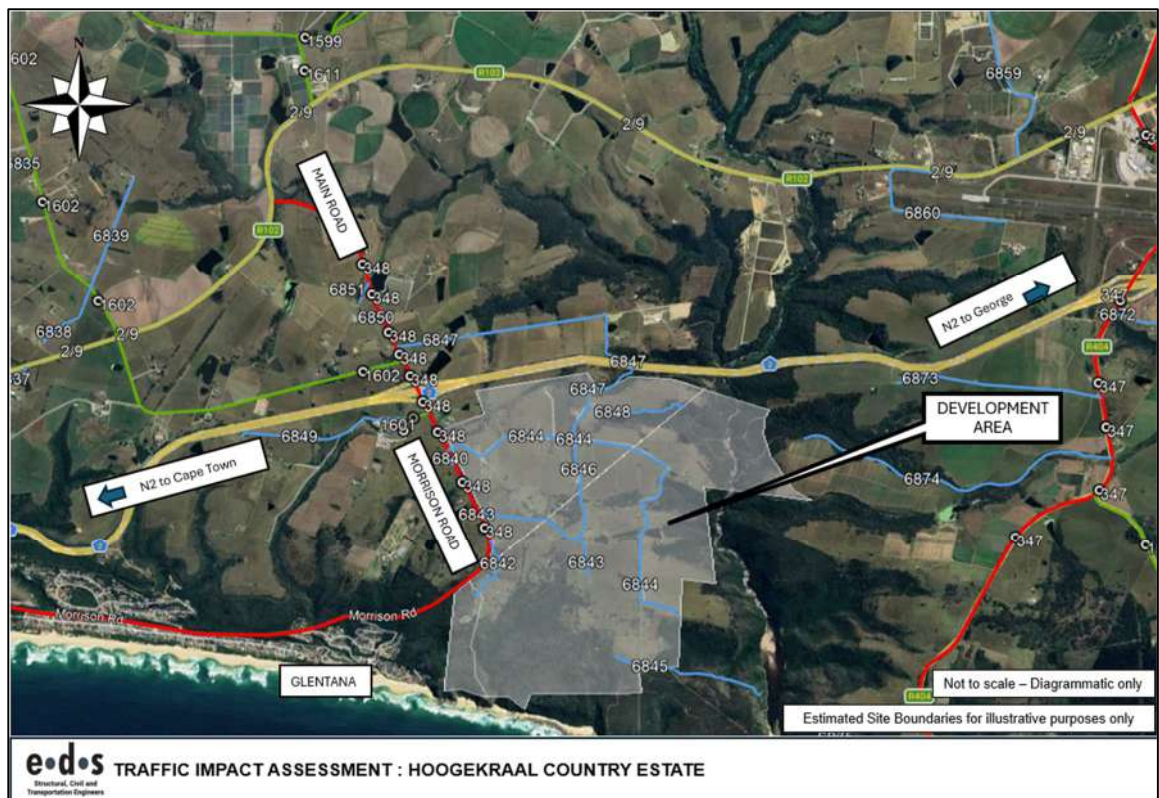


Figure 3-1: WCG in and around the development area

Preliminary discussions with the Provincial Roads Authority confirmed that if no landowner's right to access is affected, and right-of-way servitudes are registered, there is in principle, no objection to the proposed de-proclamation of the roads. Additional discussion will also be held with SANRAL as well as Transnet, due to railway line crossings in the development precinct, once the development is underway and when required.

3.2 Future Access and Road Network

There are currently no planned external road network changes or upgrades expected to impact the proposed development. As discussed in Chapter 3.1, the provincial roadways currently traversing the site will be de-proclaimed. The final alignment of internal roads will be determined during the geometric roadway design process as part of the detailed Site Development Plan.

The development will have a single primary access point south of the N2 to serve the ±81 farm units. Although the agri-village units will access through the identified service entrance, as a worst-case scenario, a single combined access point (i.e. Development Access) was analysed (refer to Chapter 5), for the southern farm units and the agri-residential village sharing a single access.

As Morrison Road and Main Road are under the jurisdiction of the Western Cape Government, all access spacing will comply with the Western Cape Access Management Guidelines (2020), to be confirmed during the detailed design phase of the internal road network for the development area. However, as proposed in the following chapters, 30m dedicated right turning lanes will be provided at both the development access and service access intersections.

4 TRAFFIC DEMAND

4.1 Trip Generation

The trip generation for the development is dependent on the existing land-uses in comparison with the proposed land uses as follows:

The Existing Land-Uses are:

- 31 farms with single dwelling units on each
- 80 internal units

The Proposed Land -Uses are:

- 81 farms with single dwelling units on each
- 110 internal units

The net effect of the development traffic impact is therefore:

- Farm units: 81 new single dwellings units less 31 existing single dwelling units
= 50 additional single dwelling units on development area
- Residential village units: 110 new single dwellings units less 80 existing single dwelling units
= 30 additional single dwelling units on development area.

The net effect is therefore **50 additional single dwelling units** in the development area.

The existing development consists of 31 farm positions which all have rights for a single residential house with the 80 households informally settled across the properties. It should be noted that the existing internal agri-residential village units represent the relocation of existing residents and therefore new trips are only associated with the additional 30 new agri-residential village residential units. Vehicle ownership among these residents is expected to remain very low, as the occupants comprise local farm workers and their families, whose employment and daily activities are largely located within or near the development area. In addition, it was reported that the employment rate for these residents is very low, further reducing the likelihood of regular private vehicle use for commuting. The trip adjustment factor for ***very low vehicle ownership*** for these units have therefore been applied accordingly.

The “South African Trip Data Manual” (TMH 17, Version 1.01, 2013 “South African Trip Data Manual) provides trip generation rates for dwelling units under the category of ***Single Dwelling Units (Land Use 210)*** - which best describes the existing and intended development of the Hoogeland Coastal Farmsteads.

The trip generation for the AM peak, PM peak, and Saturday midday peak hours were therefore calculated as set out in tables **Table 4-1** and **Table 4-2** below.

Table 4-1: Trip Rate Parameters

LAND-USE		UNIT FACTOR	GLA (m²) or UNITS	VERY LOW OWNERSHIP	COMBINED FACTOR (PC)	PEAK HOUR TRIP RATE			DIRECTIONAL SPLIT						FINAL FACTOR	ADJUSTED PEAK HOUR TRIP RATE		
									AM PEAK		PM PEAK		SAT PEAK					
						AM	PM	SAT	IN	OUT	IN	OUT	IN	OUT				
Existing Plots	Single Dwelling Units	1	31	N 0%	0	1	1	0.5	25	75	70	30	50	50	1.00	1.00	1.00	0.50
Village	Single Dwelling Units	1	80	Y 70%	0.7	1	1	0.5	25	75	70	30	50	50	0.30	0.30	0.30	0.15
New Plots (81 less 31)	Single Dwelling Units	1	50	N 0%	0	1	1	0.5	25	75	70	30	50	50	1.00	1.00	1.00	0.50
Village (110 less 80)	Single Dwelling Units	1	30	Y 70%	0.7	1	1	0.5	25	75	70	30	50	50	0.30	0.30	0.30	0.15

Table 4-2: Trip Generation

LAND-USE		UNIT FACTOR	GLA (m²) or UNITS	TOTAL TRIPS GENERATED								
				AM PEAK			PM PEAK			SAT PEAK		
				IN	OUT	TOT	IN	OUT	TOT	IN	OUT	TOT
Existing Plots	Single Dwelling Units	1	31	8	23	31	22	9	31	8	8	16
Village	Single Dwelling Units	1	80	6	18	24	17	7	24	6	6	12
EXISTING TRIPS				14	41	55	39	17	55	14	14	28
New Plots (81 less 31)	Single Dwelling Units	1	50	13	38	50	35	15	50	13	13	26
Village (110 less 80)	Single Dwelling Units	1	30	2	7	9	6	3	9	3	3	6
NEW TRIPS				15	44	59	41	18	59	16	16	32

The AM and PM peak hour trip generation exceeds that of the Saturday and was therefore taken forward in this report.

Other existing on-site uses include a small kiosk (Hoogekraal Superette), an informal preparatory school, and a cemetery. The school and cemetery will remain as part of the agri-residential village, while the Hoogekraal Superette is anticipated to cease operation once the new development is implemented. These activities are reflected in the background traffic volumes on Morrison Road and adjacent terminals. Although the superette's removal could justify a deduction in trips from the net new trips generated by the proposed development, a conservative approach was followed, and no deductions were made. This allows flexibility for potential future land uses within the development. The superette, with an approximate GLA of 385 m², is estimated to generate around 27 daily trips during the PM Peak based on an ITE rate of 7 trips per 100 m² for small retail developments – which is also very low.

The proposed development will introduce new recreational facilities, including a polo field, show-jumping arena, horse trails, and communal spaces. These facilities are expected to generate only occasional traffic peaks associated with events (e.g., polo matches), typically over weekends when residential trip generation is lowest. Other proposed uses, such as horse paddocks and small-scale farming (e.g., microgreens, mushrooms, beekeeping), are primarily for residents' private use and will not contribute to external traffic. Similar recreational activities already exist in the surrounding area; therefore, the proposed facilities are not expected to result in any notable change in traffic patterns once the Hoogeland Coastal Farmsteads is developed.

4.2 Trip Assignment and Distribution

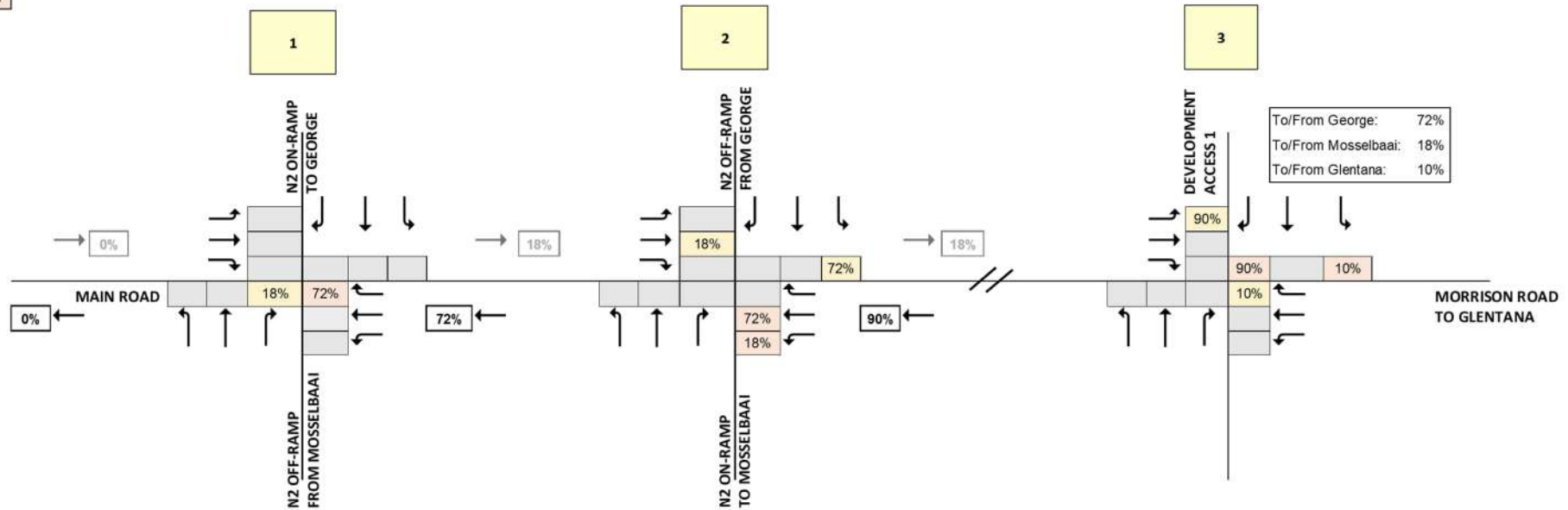
The development traffic assignment for the proposed development is based on observations of the surrounding road network and land use patterns. From these observations the following patterns were derived:

- To/From east (George area) = 72%
- To/From west (Mossel Bay area) = 18%
- To/From Glentana area= 10%

The corresponding trip distribution and assignment pattern model is provided in **Figure 4-1**.

TRIP DISTRIBUTION & ASSIGNMENT

IN
OUT



TRAFFIC IMPACT STUDY : HOOGEKRAAL COUNTRY ESTATE

Figure 4-1: Trip Distribution and Assignment Pattern

5 INTERSECTION TRAFFIC ANALYSIS

The following intersections were included in the traffic analysis:

1. N2 Northern Terminal
2. N2 Southern Terminal
3. Development Access | Morrison Road

The following key factors were considered in the intersection traffic analysis to ensure that the operational assessment accurately reflects both existing and future traffic conditions associated with the proposed development.

1. Determination of the Worst-Case Scenario (Collated Traffic Volumes)

The analyses were undertaken for the two worst case trip generation scenarios which is the AM and PM weekday peak periods.

2. Application of Background Traffic Growth

The 2025 background traffic volumes at the surveyed intersections were projected to 2030 using a 2% annual growth rate. As the development is located within the established, semi-rural town area, the area falls within the low-growth category (0–3%) as defined in TMH 17. The selected 2% annual growth rate is therefore representative of the average growth rate for such an environment.

3. Consideration of Heavy Vehicle Traffic

A uniform heavy vehicle percentage of 2% was applied to all traffic volumes in the analyses, in line with the observed heavy vehicle presence from the manual traffic counts.

4. Dedicated right turning lanes

Dedicated right turning lanes are proposed to be provided along Morrison Road at the accesses to the development, as well as the service entrance (although this access was not analysed). The proposed turning lanes, of 30m length, have already been included in the intersection traffic analyses for the access in this chapter.

The following scenarios were analysed for the external and individual intersections under the AM and PM peak-hour conditions:

Scenario 1:

2025 Base Year Background Traffic Operating Conditions

Scenario 2:

2030 Horizon Year Background Traffic Operating Conditions

Scenario 3:

2030 Horizon Year Background Traffic + Development Traffic Operating Conditions.

The traffic volumes applied for each of the above analysis scenarios are captured in the following Figures that is presented in **Annexure B**:

- **Figure B-1:** 2025 Base Year – AM Peak Background Traffic
- **Figure B-2:** 2030 Horizon Year – AM Peak Background Traffic
- **Figure B-3:** AM Peak Trip Distribution and Assignment
- **Figure B-4:** AM Peak Development Traffic
- **Figure B-5:** 2030 Horizon Year – AM Peak Background Traffic + Development Traffic
- **Figure B-6:** 2025 Base Year – PM Peak Background Traffic
- **Figure B-7:** 2030 Horizon Year – PM Peak Background Traffic
- **Figure B-8:** PM Peak Trip Distribution and Assignment
- **Figure B-9:** PM Peak Development Traffic
- **Figure B-10:** 2030 Horizon Year – PM Peak Background Traffic + Development Traffic

The traffic impact expected from the proposed development at the key intersections within the study area was determined using SIDRA Intersection 9.1, a traffic engineering software package. The SIDRA outputs are included under **Annexure C**.

The existing intersection geometry was replicated as closely as possible in the SIDRA base case analysis, including all turning lanes and the spacing between intersections. A standard lane width of 3.5 metres was applied consistently throughout the analysis.

5.1 Intersection 1: N2 Northern Terminal

The intersection of Morrison (Main) Road and the N2 (i.e. N2 northern terminal) operates as a side-road stop-controlled intersection for the off-ramp from Mossel Bay. The major traffic movement along Morrison (Main) Road is free flowing. The intersection's current geometric layout is schematically shown on **Figure 5-1**.

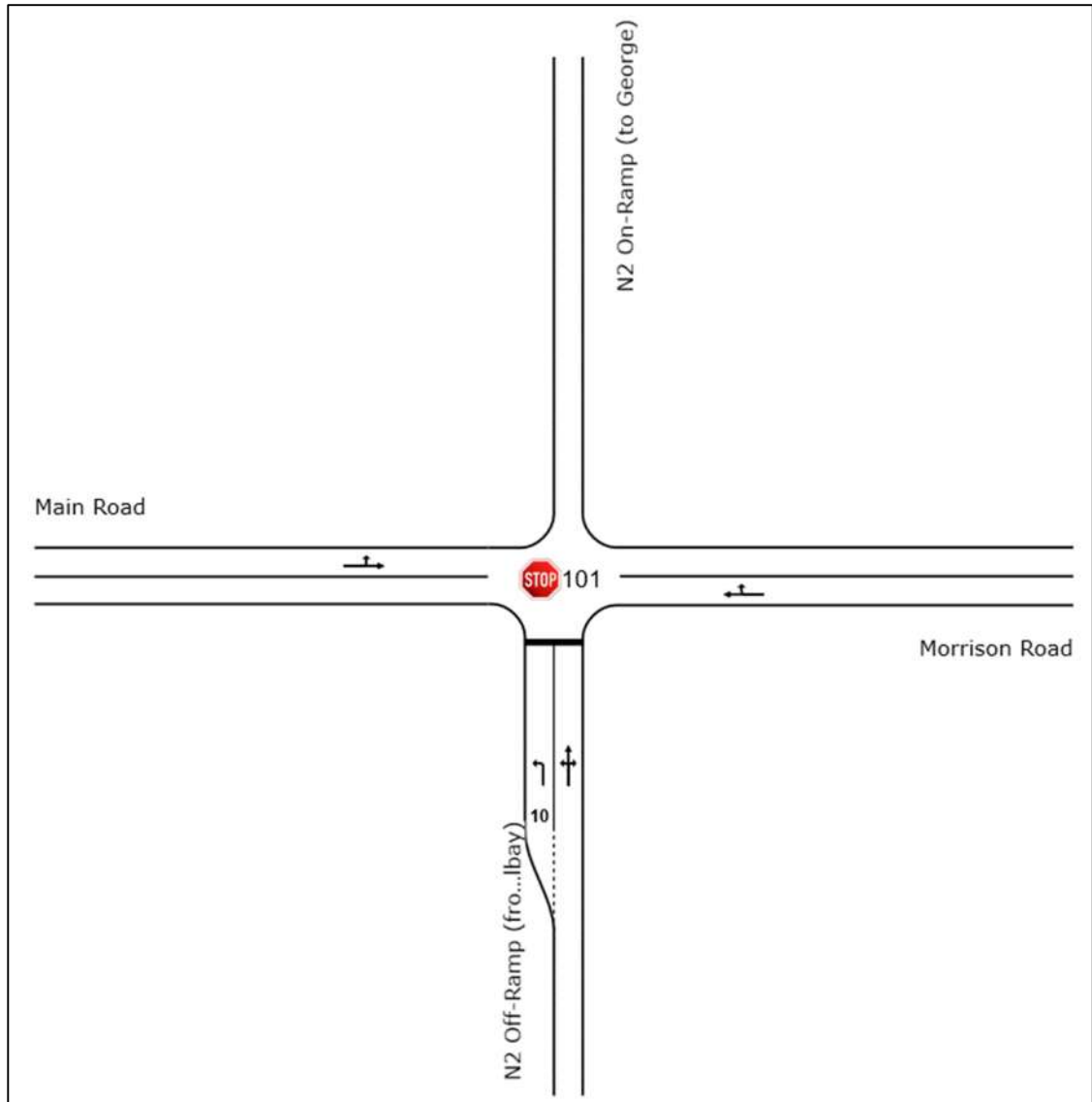


Figure 5-1: N2 Northern Terminal - Schematic Layout of Existing Geometry

The traffic operation conditions for all three analysis scenarios indicate that the intersection will be able to accommodate the existing and expected traffic volumes for all the analysis scenarios and therefore no upgrades to this intersection are required to accommodate the future traffic demand for the background traffic volumes or the development traffic.

Tabled below are the various *Traffic Operating Conditions* for each scenario analysis:

AM PEAK PERIOD:**Scenario 1:**

Approach	Movement	V/C	Delay (s)	LOS
South: N2 Off-Ramp (from Mosselbay)	Left	0,014	8,2	LOS A
	Through	0,014	8,9	LOS A
	Right	0,014	8,8	LOS A
East: Morrison Road	Through	0,112	0,1	LOS A
	Right	0,112	5,8	LOS A
West: Main Road	Left	0,021	5,6	LOS A
	Through	0,021	0	LOS A
Intersection		0,112	4,8	NA

Scenario 2:

Approach	Movement	V/C	Delay (s)	LOS
South: N2 Off-Ramp (from Mosselbay)	Left	0,016	8,2	LOS A
	Through	0,016	9	LOS A
	Right	0,016	8,9	LOS A
East: Morrison Road	Through	0,123	0,1	LOS A
	Right	0,123	5,8	LOS A
West: Main Road	Left	0,022	5,6	LOS A
	Through	0,022	0	LOS A
Intersection		0,123	4,9	NA

Scenario 3:

Approach	Movement	V/C	Delay (s)	LOS
South: N2 Off-Ramp (from Mosselbay)	Left	0,02	8,2	LOS A
	Through	0,02	9,3	LOS A
	Right	0,02	9,2	LOS A
East: Morrison Road	Through	0,143	0,1	LOS A
	Right	0,143	5,8	LOS A
West: Main Road	Left	0,022	5,6	LOS A
	Through	0,022	0	LOS A
Intersection		0,143	5	NA

PM PEAK PERIOD:**Scenario 1:**

Approach	Movement	V/C	Delay (s)	LOS
South: N2 Off-Ramp (from Mosselbay)	Left	0,015	8,2	LOS A
	Through	0,015	8,8	LOS A
	Right	0,015	8,6	LOS A
East: Morrison Road	Through	0,099	0,1	LOS A
	Right	0,099	5,7	LOS A
West: Main Road	Left	0,019	5,6	LOS A
	Through	0,019	0	LOS A
Intersection		0,099	4,6	NA

Scenario 2:

Approach	Movement	V/C	Delay (s)	LOS
South: N2 Off-Ramp (from Mosselbay)	Left	0,018	8,2	LOS A
	Through	0,018	8,9	LOS A
	Right	0,018	8,8	LOS A
East: Morrison Road	Through	0,11	0,1	LOS A
	Right	0,11	5,8	LOS A
West: Main Road	Left	0,021	5,6	LOS A
	Through	0,021	0	LOS A
Intersection		0,11	4,6	NA

Scenario 3:

Approach	Movement	V/C	Delay (s)	LOS
South: N2 Off-Ramp (from Mosselbay)	Left	0,027	8,2	LOS A
	Through	0,027	9	LOS A
	Right	0,027	8,9	LOS A
East: Morrison Road	Through	0,118	0,1	LOS A
	Right	0,118	5,8	LOS A
West: Main Road	Left	0,021	5,6	LOS A
	Through	0,021	0	LOS A
Intersection		0,118	4,8	NA

5.2 Intersection 2: N2 Southern Terminal

The intersection of Morrison (Main) Road and the N2 (i.e. N2 southern terminal) operates as a side-road stop-controlled intersection for the off-ramp from George. The major traffic movement along Morrison (Main) Road is free flowing. The intersection's current geometric layout is schematically shown on **Figure 5-2**.

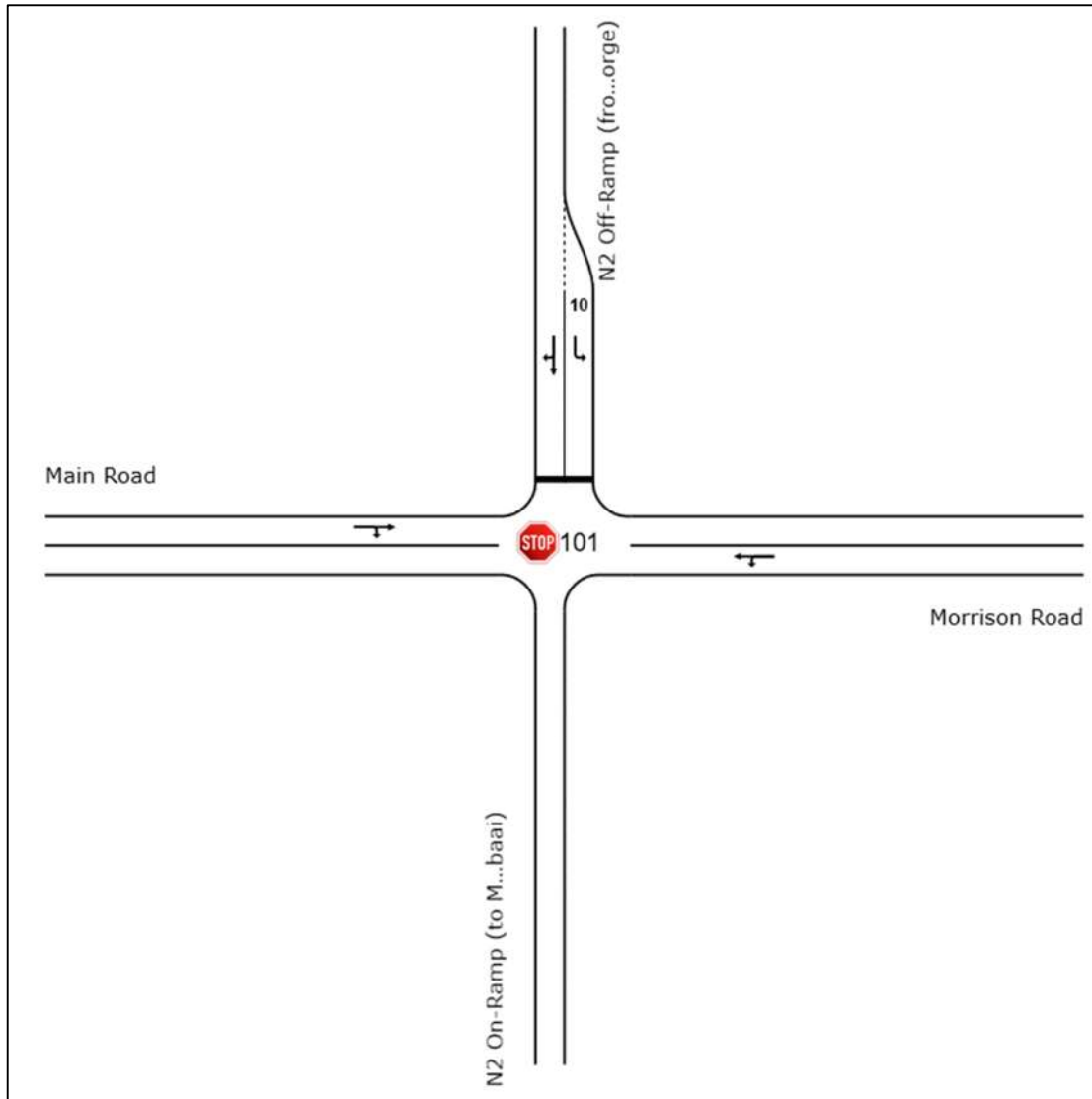


Figure 5-2: N2 Southern Terminal - Schematic Layout of Proposed Geometry

The traffic operation conditions for all three analysis scenarios indicate that the intersection will be able to accommodate the existing and expected traffic volumes for all the analysis scenarios and therefore no upgrades to this intersection are required to accommodate the future traffic demand for the background traffic volumes or the development traffic.

Tabled below is various *Traffic Operating Conditions* for each scenario analysis:

AM PEAK PERIOD:**Scenario 1:**

Approach	Movement	V/C	Delay (s)	LOS
East: Morrison Road	Left	0,098	5,6	LOS A
	Through	0,098	0	LOS A
North: N2 Off-Ramp (from George)	Left	0,049	8,1	LOS A
	Through	0,017	8,8	LOS A
	Right	0,017	8,7	LOS A
West: Main Road	Through	0,011	0,3	LOS A
	Right	0,011	6,2	LOS A
Intersection		0,098	2,6	NA

Scenario 2:

Approach	Movement	V/C	Delay (s)	LOS
East: Morrison Road	Left	0,108	5,6	LOS A
	Through	0,108	0	LOS A
North: N2 Off-Ramp (from George)	Left	0,054	8,1	LOS A
	Through	0,019	8,9	LOS A
	Right	0,019	8,9	LOS A
West: Main Road	Through	0,012	0,4	LOS A
	Right	0,012	6,3	LOS A
Intersection		0,108	2,6	NA

Scenario 3:

Approach	Movement	V/C	Delay (s)	LOS
East: Morrison Road	Left	0,13	5,6	LOS A
	Through	0,13	0	LOS A
North: N2 Off-Ramp (from George)	Left	0,062	8,2	LOS A
	Through	0,02	9,2	LOS A
	Right	0,02	9,2	LOS A
West: Main Road	Through	0,017	0,4	LOS A
	Right	0,017	6,4	LOS A
Intersection		0,13	2,6	NA

PM PEAK PERIOD:**Scenario 1:**

Approach	Movement	V/C	Delay (s)	LOS
East: Morrison Road	Left	0,068	5,6	LOS A
	Through	0,068	0	LOS A
North: N2 Off-Ramp (from George)	Left	0,095	8,2	LOS A
	Through	0,028	8,5	LOS A
	Right	0,028	8,4	LOS A
West: Main Road	Through	0,014	0,2	LOS A
	Right	0,014	6	LOS A
Intersection		0,095	4,5	NA

Scenario 2:

Approach	Movement	V/C	Delay (s)	LOS
East: Morrison Road	Left	0,076	5,6	LOS A
	Through	0,076	0	LOS A
North: N2 Off-Ramp (from George)	Left	0,105	8,2	LOS A
	Through	0,031	8,6	LOS A
	Right	0,031	8,5	LOS A
West: Main Road	Through	0,016	0,2	LOS A
	Right	0,016	6,1	LOS A
Intersection		0,105	4,5	NA

Scenario 3:

Approach	Movement	V/C	Delay (s)	LOS
East: Morrison Road	Left	0,085	5,6	LOS A
	Through	0,085	0	LOS A
North: N2 Off-Ramp (from George)	Left	0,128	8,2	LOS A
	Through	0,032	8,7	LOS A
	Right	0,032	8,6	LOS A
West: Main Road	Through	0,018	0,2	LOS A
	Right	0,018	6,1	LOS A
Intersection		0,128	4,6	NA

5.3 Intersection 3: Morrison Road | Development Access

The intersection of Morrison Road and the Development Access will operate as a side-road stop-controlled intersection for the Development Access. The major traffic movement along Morrison Road will remain free flowing, with a **30m dedicated turning right turn lane proposed**. This configuration is schematically illustrated in **Figure 5-3**.

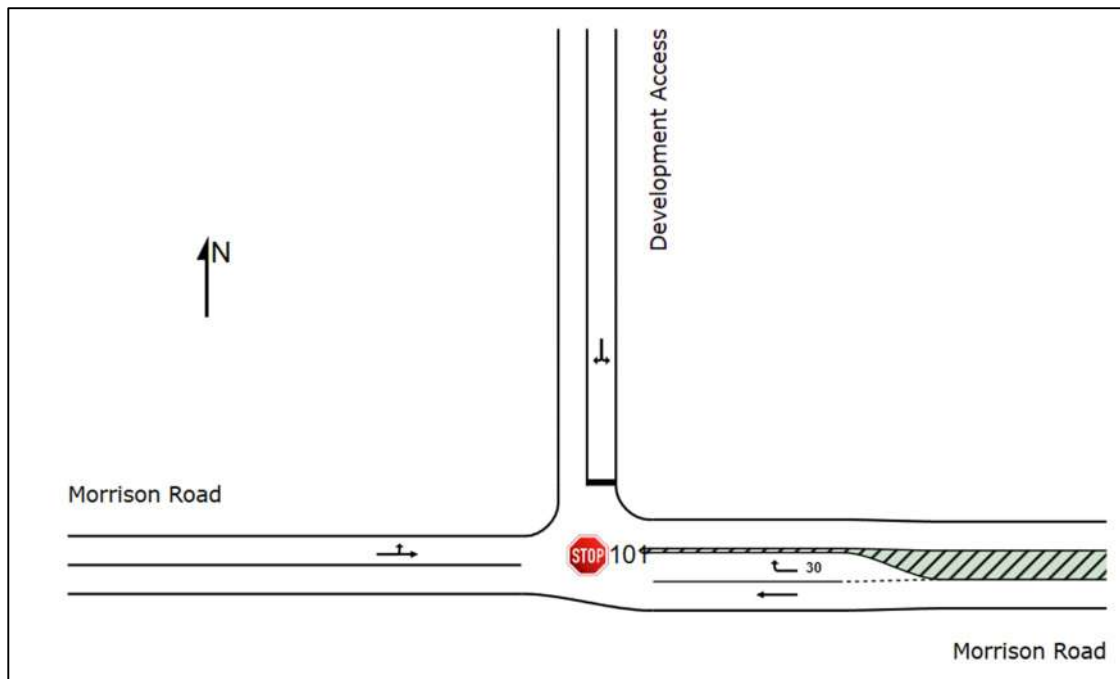


Figure 5-3: Morrison Road | Development Access - Schematic Layout of Proposed Geometry

The traffic operation conditions for all three analysis scenarios indicate the that the intersection will be able to accommodate the existing and expected traffic volumes for all the analysis scenarios and therefore no upgrades to this intersection are required to accommodate the future traffic demand for the background traffic volumes or the development traffic.

Tabled below is various *Traffic Operating Conditions* for each scenario analysis:

AM PEAK PERIOD:**Scenario 1:**

Approach	Movement	V/C	Delay (s)	LOS
East: Morrison Road	Through	0,077	0	LOS A
	Right	0,001	5,7	LOS A
North: Development Access	Left	0,051	8,3	LOS A
	Right	0,051	9,2	LOS A
West: Morrison Road	Left	0,041	5,6	LOS A
	Through	0,041	0	LOS A
Intersection		0,077	1,7	NA

Scenario 2:

Approach	Movement	V/C	Delay (s)	LOS
East: Morrison Road	Through	0,086	0	LOS A
	Right	0,001	5,7	LOS A
North: Development Access	Left	0,053	8,4	LOS A
	Right	0,053	9,4	LOS A
West: Morrison Road	Left	0,045	5,6	LOS A
	Through	0,045	0	LOS A
Intersection		0,086	1,6	NA

Scenario 3:

Approach	Movement	V/C	Delay (s)	LOS
East: Morrison Road	Through	0,086	0	LOS A
	Right	0,002	5,8	LOS A
North: Development Access	Left	0,111	8,4	LOS A
	Right	0,111	9,6	LOS A
West: Morrison Road	Left	0,053	5,6	LOS A
	Through	0,053	0	LOS A
Intersection		0,111	2,9	NA

PM PEAK PERIOD:**Scenario 1:**

Approach	Movement	V/C	Delay (s)	LOS
East: Morrison Road	Through	0,06	0	LOS A
	Right	0,003	5,9	LOS A
North: Development Access	Left	0,022	8,5	LOS A
	Right	0,022	9,3	LOS A
West: Morrison Road	Left	0,079	5,6	LOS A
	Through	0,079	0	LOS A
Intersection		0,079	1,4	NA

Scenario 2:

Approach	Movement	V/C	Delay (s)	LOS
East: Morrison Road	Through	0,067	0	LOS A
	Right	0,003	5,9	LOS A
North: Development Access	Left	0,023	8,6	LOS A
	Right	0,023	9,5	LOS A
West: Morrison Road	Left	0,085	5,6	LOS A
	Through	0,085	0	LOS A
Intersection		0,085	1,3	NA

Scenario 3:

Approach	Movement	V/C	Delay (s)	LOS
East: Morrison Road	Through	0,067	0	LOS A
	Right	0,006	6,1	LOS A
North: Development Access	Left	0,047	8,6	LOS A
	Right	0,047	9,8	LOS A
West: Morrison Road	Left	0,106	5,6	LOS A
	Through	0,106	0	LOS A
Intersection		0,106	2,2	NA

6 CONCLUSIONS

Based on the content of this study, it is concluded from the investigations that:

1. The Traffic Study was conducted in terms of requirements provided in the following design guidelines and standards:
 - TMH 16 Volume 2 (South African Traffic Impact and Site Impact Assessment of 2012);
 - TMH 17 Volume 1 (South African Trip Data Manual of 2012);
 - George Integrated Zoning Scheme By-Law (2023).
2. The proposed development consists of 81 small farms and 110 formal housing for low-income residents to be retained on the development site within the agri-residential village. The latter have very low vehicle ownership and very low employment rates.
3. The existing development consists of 31 farm positions which all have rights for a single residential house, and 110 households informally settled across the properties.
4. The additional peak hour vehicular trip generation of the proposed development is estimated to be 59 trips during the morning and afternoon peak hours respectively. This is not significant from a traffic engineering perspective.
5. Access to the development is via a side road stop-controlled access to the development on Morrison Road. A second side-road stop-controlled service entrance is provided to the development on Morrison Road.
6. The impact of the development traffic on the operating conditions were evaluated at the following intersections using the SIDRA INTERSECTION software:
 - a. N2 Northern Terminal at Morrison (Main) Road
 - b. N2 Southern Terminal at Morrison (Main) Road
 - c. Development Access | Morrison Road
7. The analysis indicates that the intersections can accommodate the expected traffic demand without upgrades and with side road stop control.
8. Although the intersection traffic analyses indicate that no external road upgrades are required to accommodate the development traffic, from a safety perspective it is recommended that dedicated right turn lanes with a length of 30m be provided at the development accesses on Morrison Road (along Morrison Road), as well as the service entrance along Morrison Road, to reduce friction along the road and to improve traffic safety at the respective accesses (i.e. Development Access and Service Entrance).

7 RECOMMENDATIONS

It is recommended that the proposed Hoogeland Coastal Farmsteads development be approved from a traffic engineering perspective with the following conditions:

- a) A dedicated 30m right turning lane be provided along Morrison Road at all main access to the development as well as the service access.

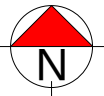


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TRAFFIC & TRANSPORT ENGINEER

for **EDS ENGINEERING DESIGN SERVICES (PTY) LTD**

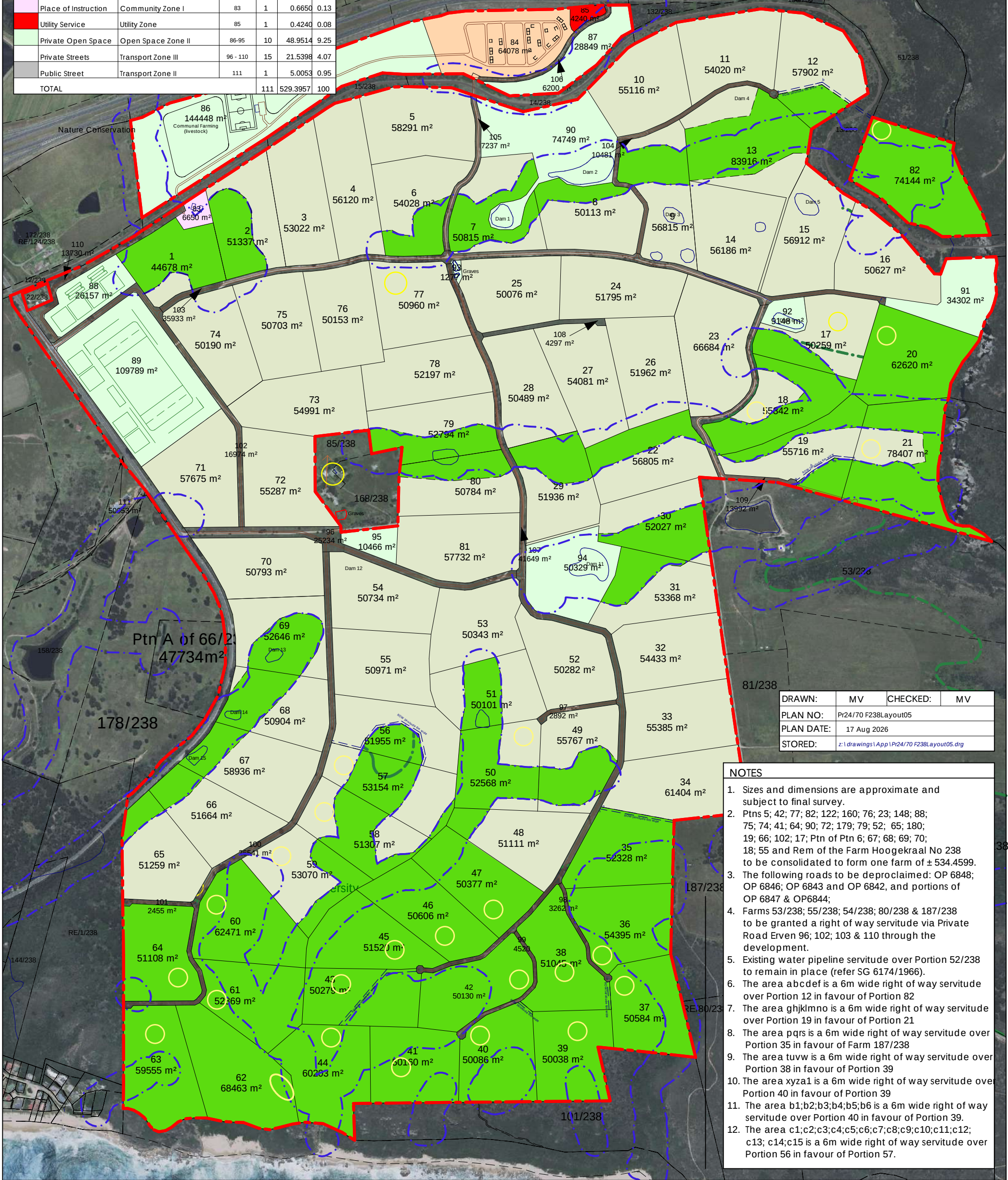
Annexure A: Site Layout Plan

LEGEND: HOOGELAND COASTAL FARMSTEADS						
LAND USE	ZONING	ERF NO	QTY	AREA (HA)	%	
Agriculture	Agriculture Zone I	3-5; 10; 11; 14-16; 23-28; 32-34; 52-55; 70-75; 85	31	166.9614	31.54	
Agric & Conserv Split	Split Zoning: Agric I & OSZIII	1; 2; 6-8; 12; 13; 17; 19; 21; 22; 29-31; 48-51; 56-58; 65-68; 76-80	31	169.1727	31.96	
Nature Conservation	Open Space Zone III	20; 35-47; 60-64; 82;	19	110.2683	20.83	
Group Housing	General Residential Zone II	84	1	6.4078	1.21	
Place of Instruction	Community Zone I	83	1	0.6650	0.13	
Utility Service	Utility Zone	85	1	0.4240	0.08	
Private Open Space	Open Space Zone II	86-95	10	48.9514	9.25	
Private Streets	Transport Zone III	96 - 110	15	21.5398	4.07	
Public Street	Transport Zone II	111	1	5.0053	0.95	
TOTAL			111	529.3957	100	



SCALE 1: 10 000

PLAN 13



DRAWN:	MV	CHECKED:	MV
PLAN NO:	Pr24/70 F238Layout05		
PLAN DATE:	17 Aug 2026		
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NOTES

- Sizes and dimensions are approximate and subject to final survey.
- Ptns 5; 42; 77; 82; 122; 160; 76; 23; 148; 88; 75; 74; 41; 64; 90; 72; 179; 79; 52; 65; 180; 19; 66; 102; 17; Ptn of Ptn 6; 67; 68; 69; 70; 18; 55 and Rem of the Farm Hoogekraal No 238 to be consolidated to form one farm of ± 534.4599.
- The following roads to be deproclaimed: OP 6848; OP 6846; OP 6843 and OP 6842, and portions of OP 6847 & OP6844;
- Farms 53/238; 55/238; 54/238; 80/238 & 187/238 to be granted a right of way servitude via Private Road Erven 96; 102; 103 & 110 through the development.
- Existing water pipeline servitude over Portion 52/238 to remain in place (refer SG 6174/1966).
- The area abcdef is a 6m wide right of way servitude over Portion 12 in favour of Portion 82
- The area ghijklmno is a 6m wide right of way servitude over Portion 19 in favour of Portion 21
- The area pqrs is a 6m wide right of way servitude over Portion 35 in favour of Farm 187/238
- The area tuvw is a 6m wide right of way servitude over Portion 38 in favour of Portion 39
- The area xyza1 is a 6m wide right of way servitude over Portion 40 in favour of Portion 39
- The area b1;b2;b3;b4;b5;b6 is a 6m wide right of way servitude over Portion 40 in favour of Portion 39.
- The area c1;c2;c3;c4;c5;c6;c7;c8;c9;c10;c11;c12; c13; c14;c15 is a 6m wide right of way servitude over Portion 56 in favour of Portion 57.

PORTIONS OF THE FARM HOOGEKRAAL
NO 238, DIVISION GEORGE

LAYOUT PLAN

MUNICIPAL MANAGER

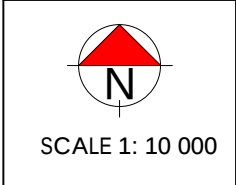
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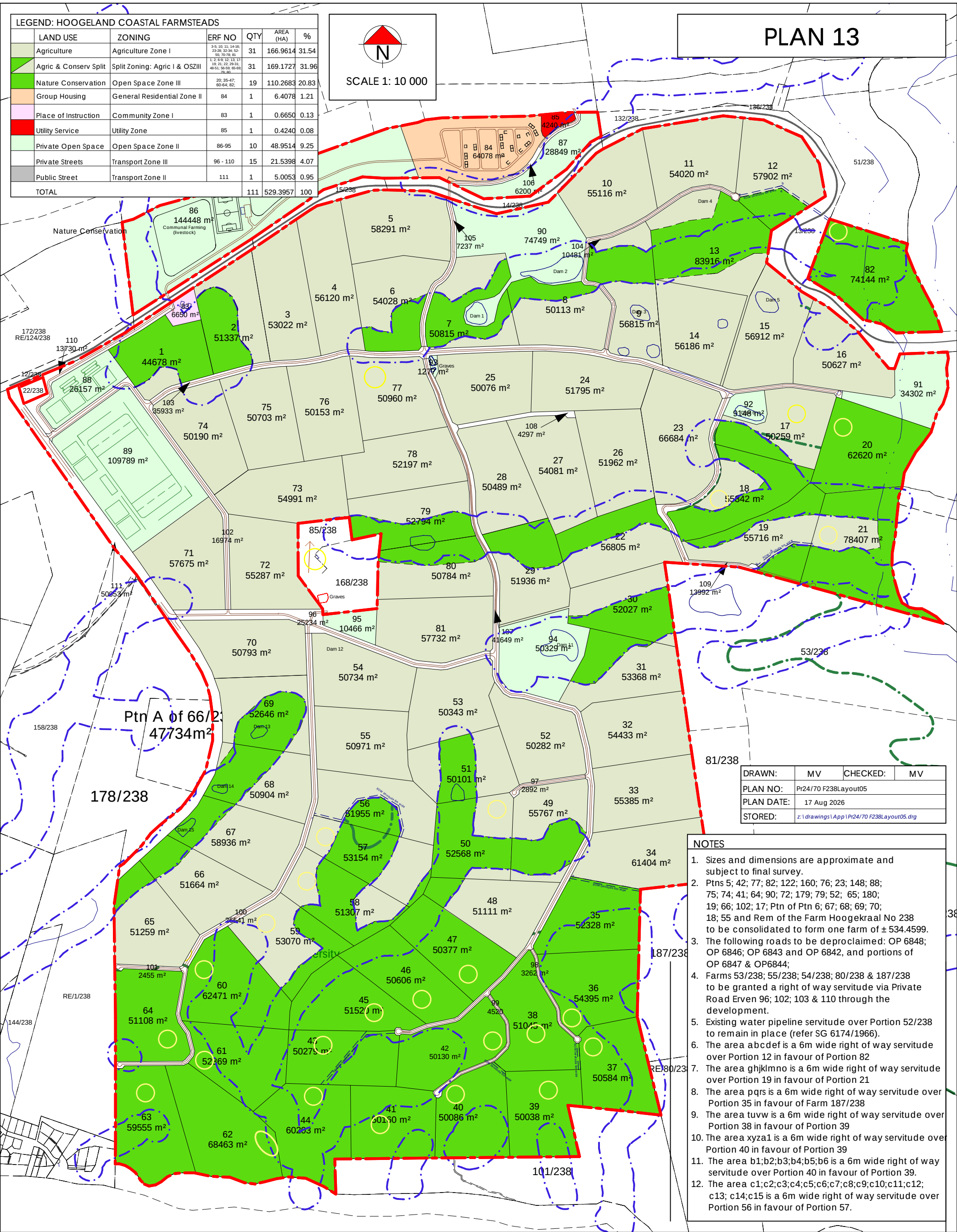
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086-459-2987
e-mail: marike@vreken.co.za
www.vreken.co.za

LEGEND: HOOGELAND COASTAL FARMSTEADS						
LAND USE	ZONING	ERF NO	QTY	AREA (HA)	%	
Agriculture	Agriculture Zone I	3-5; 10; 11; 14-16; 23-28; 32-34; 52-55; 70-75; 85	31	166.9614	31.54	
Agric & Conserv Split	Split Zoning: Agric I & OSZIII	1; 2; 6-8; 12; 13; 17; 19; 21; 22; 29-31; 48-51; 56-58; 65-68; 76-80; 82	31	169.1727	31.96	
Nature Conservation	Open Space Zone III	20; 35-47; 60-64; 82;	19	110.2683	20.83	
Group Housing	General Residential Zone II	84	1	6.4078	1.21	
Place of Instruction	Community Zone I	83	1	0.6650	0.13	
Utility Service	Utility Zone	85	1	0.4240	0.08	
Private Open Space	Open Space Zone II	86-95	10	48.9514	9.25	
Private Streets	Transport Zone III	96 - 110	15	21.5398	4.07	
Public Street	Transport Zone II	111	1	5.0053	0.95	
TOTAL			111	529.3957	100	



PLAN 13



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- NOTES
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 - The area pqrs is a 6m wide right of way servitude over Portion 35 in favour of Farm 187/238
 - The area tuvw is a 6m wide right of way servitude over Portion 38 in favour of Portion 39
 - The area xyza1 is a 6m wide right of way servitude over Portion 40 in favour of Portion 39
 - The area b1;b2;b3;b4;b5;b6 is a 6m wide right of way servitude over Portion 40 in favour of Portion 39.
 - The area c1;c2;c3;c4;c5;c6;c7;c8;c9;c10;c11;c12; c13; c14;c15 is a 6m wide right of way servitude over Portion 56 in favour of Portion 57.

PORTIONS OF THE FARM HOOGEKRAAL
NO 238, DIVISION GEORGE

LAYOUT PLAN

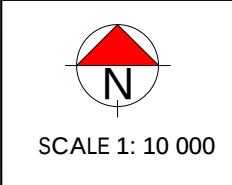
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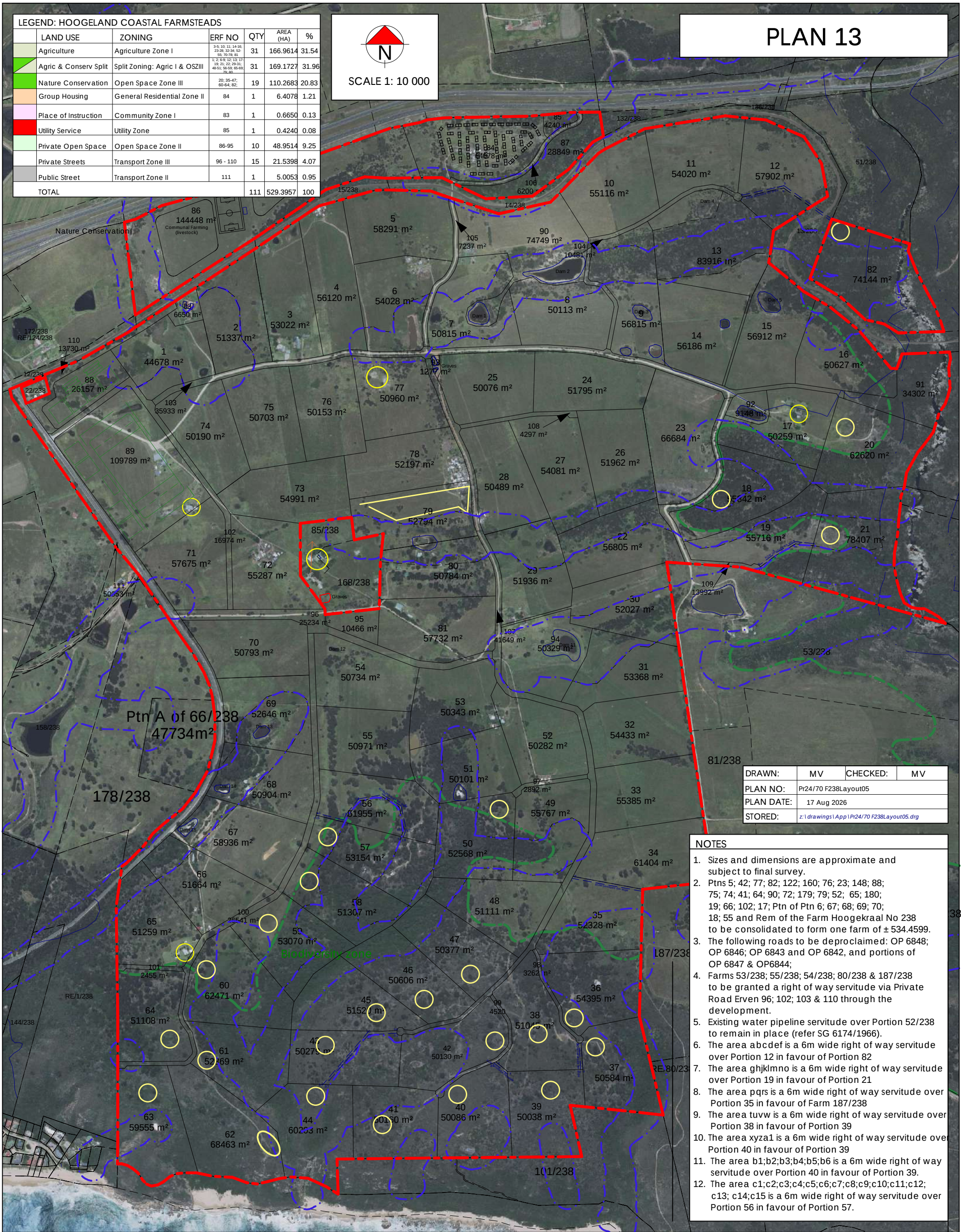
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086-459-2987
e-mail: marike@vreken.co.za
www.vreken.co.za

LEGEND: HOOGELAND COASTAL FARMSTEADS						
LAND USE	ZONING	ERF NO	QTY	AREA (HA)	%	
Agriculture	Agriculture Zone I	3-5; 10; 11; 14-16; 23-28; 32-34; 52-55; 70-75; 85	31	166.9614	31.54	
Agric & Conserv Split	Split Zoning: Agric I & OSZIII	1; 2; 6-8; 12; 13; 17; 19; 21; 22; 29-31; 48-51; 56-58; 65-68; 79-80	31	169.1727	31.96	
Nature Conservation	Open Space Zone III	20; 35-47; 60-64; 82;	19	110.2683	20.83	
Group Housing	General Residential Zone II	84	1	6.4078	1.21	
Place of Instruction	Community Zone I	83	1	0.6650	0.13	
Utility Service	Utility Zone	85	1	0.4240	0.08	
Private Open Space	Open Space Zone II	86-95	10	48.9514	9.25	
Private Streets	Transport Zone III	96 - 110	15	21.5398	4.07	
Public Street	Transport Zone II	111	1	5.0053	0.95	
TOTAL			111	529.3957	100	



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- NOTES
- Sizes and dimensions are approximate and subject to final survey.
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 - The area tuvw is a 6m wide right of way servitude over Portion 38 in favour of Portion 39
 - The area xyza1 is a 6m wide right of way servitude over Portion 40 in favour of Portion 39
 - The area b1;b2;b3;b4;b5;b6 is a 6m wide right of way servitude over Portion 40 in favour of Portion 39.
 - The area c1;c2;c3;c4;c5;c6;c7;c8;c9;c10;c11;c12; c13; c14;c15 is a 6m wide right of way servitude over Portion 56 in favour of Portion 57.

PORTIONS OF THE FARM HOOGEKRAAL
NO 238, DIVISION GEORGE

LAYOUT PLAN

MUNICIPAL MANAGER
DATE: _____



21 Trotter Street, PO Box 2180
KNYSNA 6570
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Annexure B: Traffic Volume Figures

2025 BASE YEAR - WEEKDAY AM PEAK BACKGROUND TRAFFIC VOLUMES (06:45 - 07:45)
Scenario 1

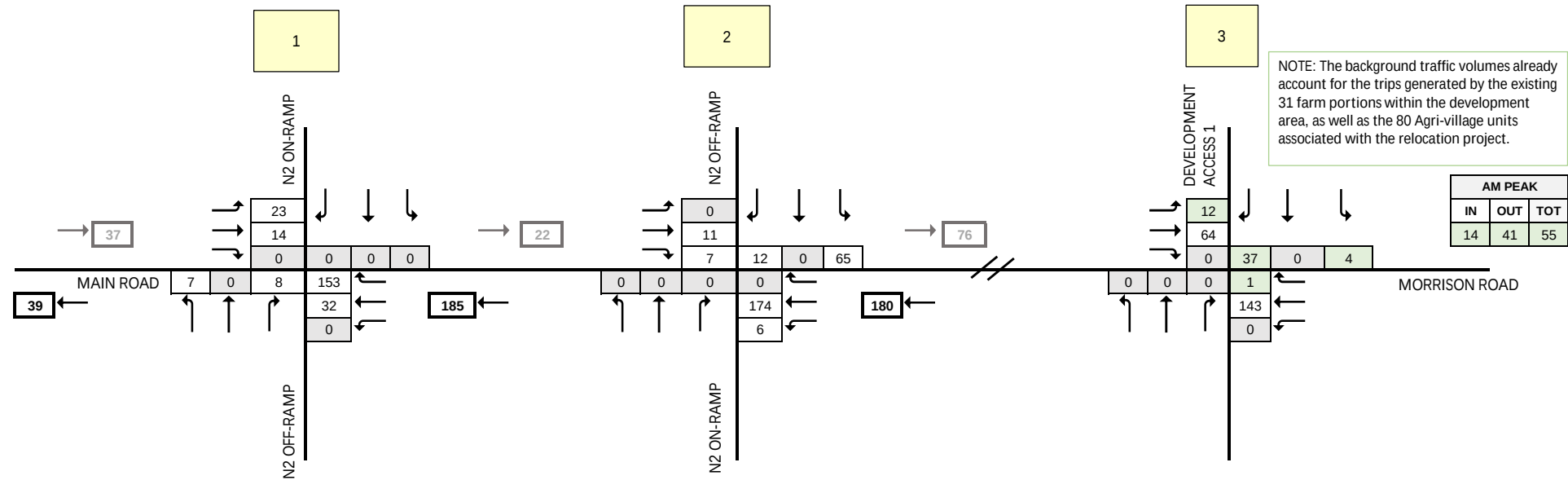


Figure B-1

2030 HORIZON YEAR - WEEKDAY AM PEAK BACKGROUND TRAFFIC VOLUMES (06:45 - 07:45)
Scenario 2

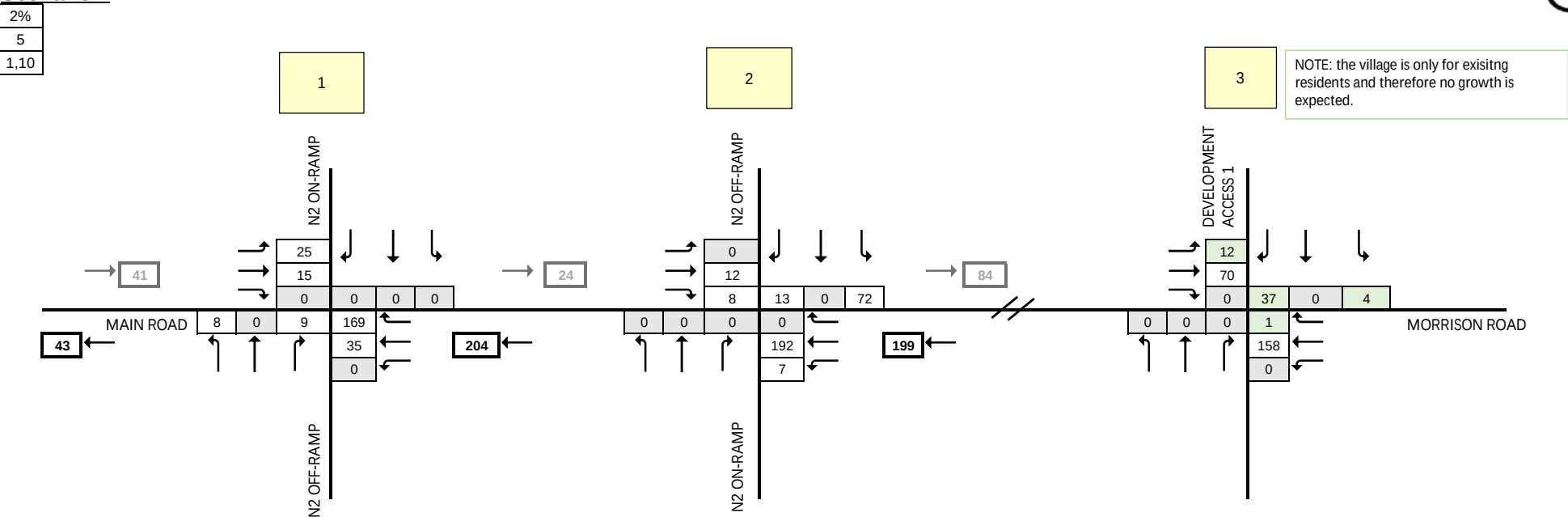


Figure B-2

TRIP DISTRIBUTION & ASSIGNMENT

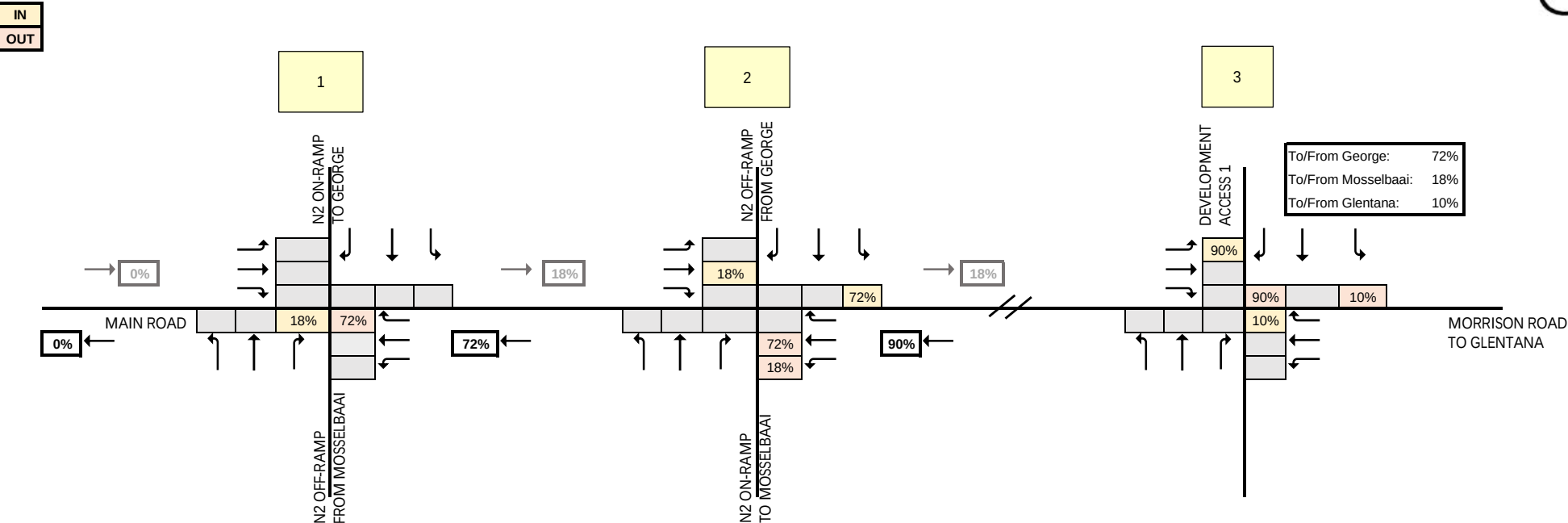


Figure B-3

WEEKDAY AM PEAK DEVELOPMENT TRIPS

15	INBOUND
44	OUTBOUND
59	

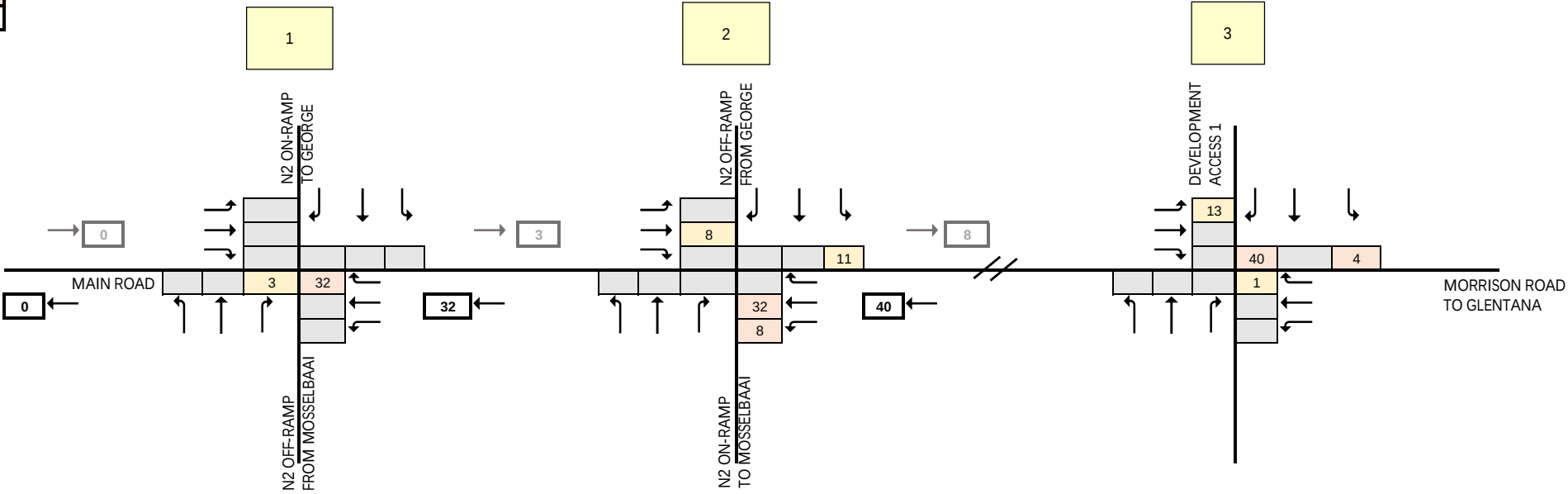


Figure B-4

2030 WEEKDAY AM PEAK HORIZON YEAR + DEVELOPMENT TRIPS
Scenario 3

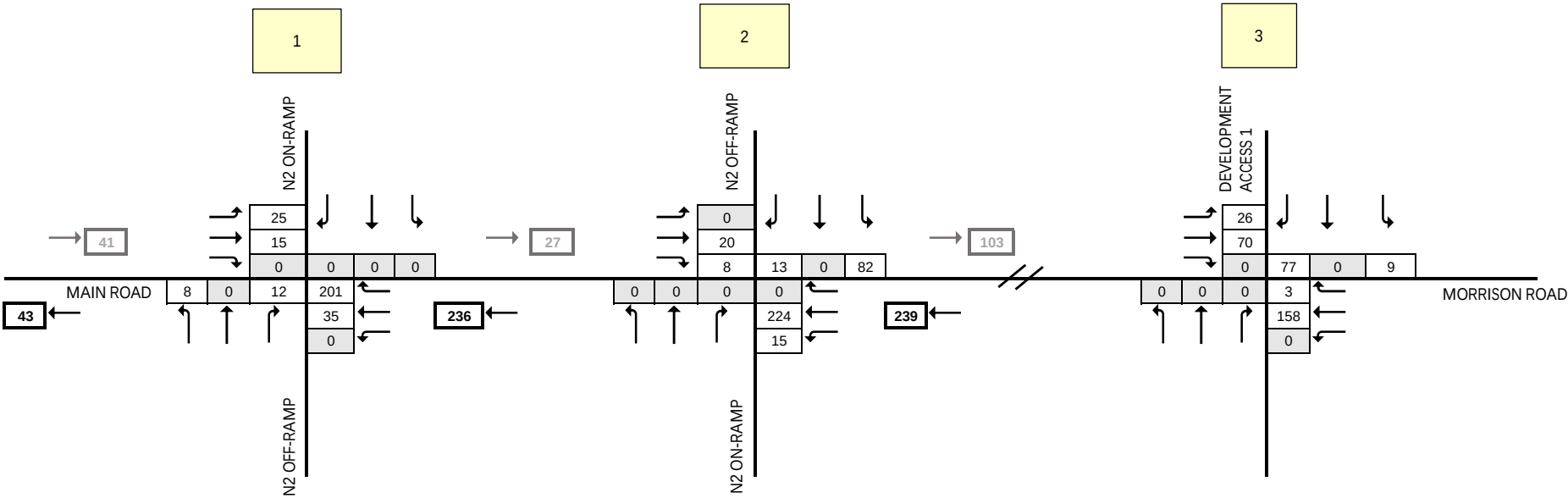


Figure B-5

2025 BASE YEAR - WEEKDAY PM PEAK BACKGROUND TRAFFIC VOLUMES (16:30 - 17:30)
Scenario 1

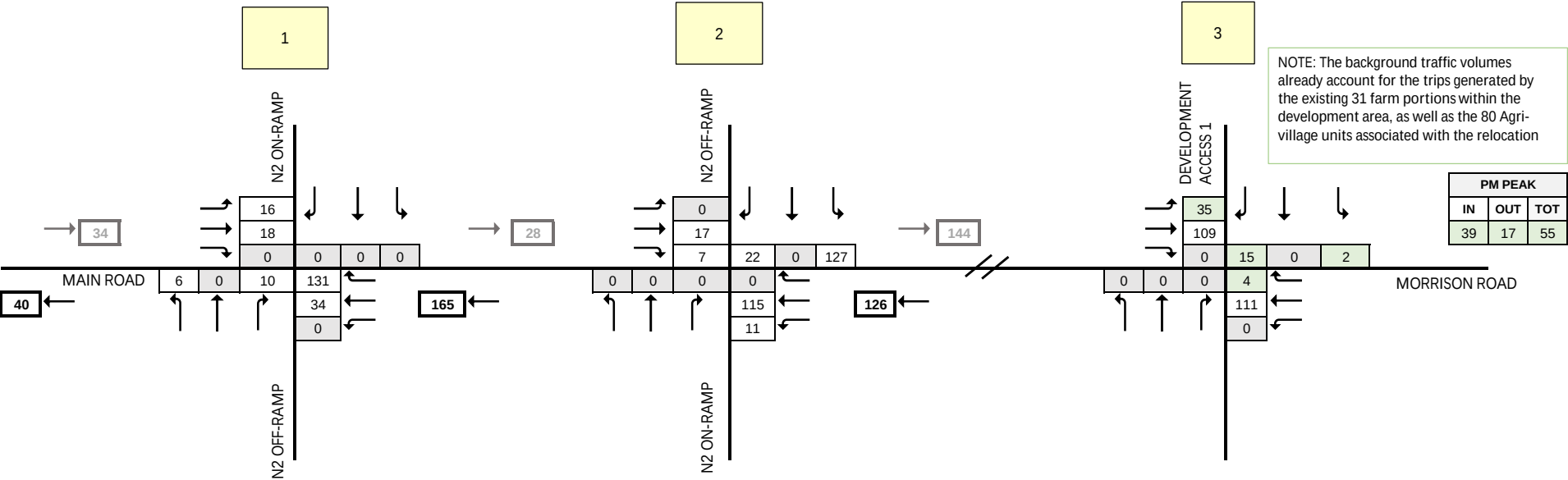


Figure B-6

2030 HORIZON YEAR - WEEKDAY AM PEAK BACKGROUND TRAFFIC VOLUMES (16:30 - 17:30)
Scenario 2

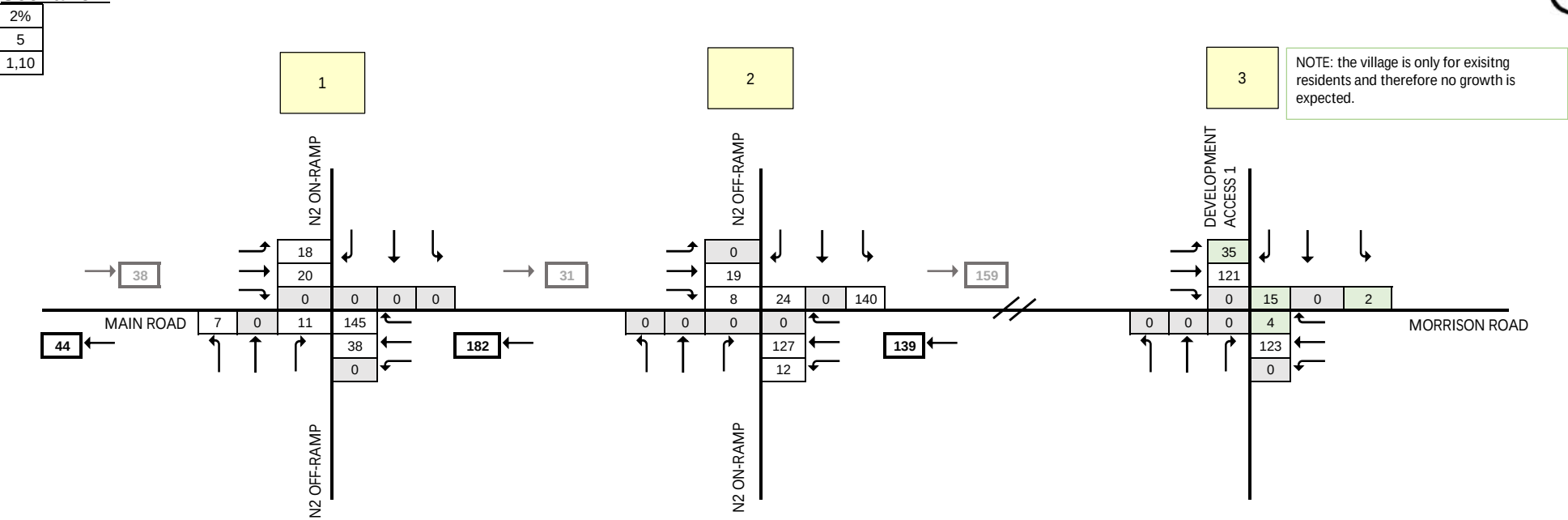


Figure B-7

TRIP DISTRIBUTION & ASSIGNMENT

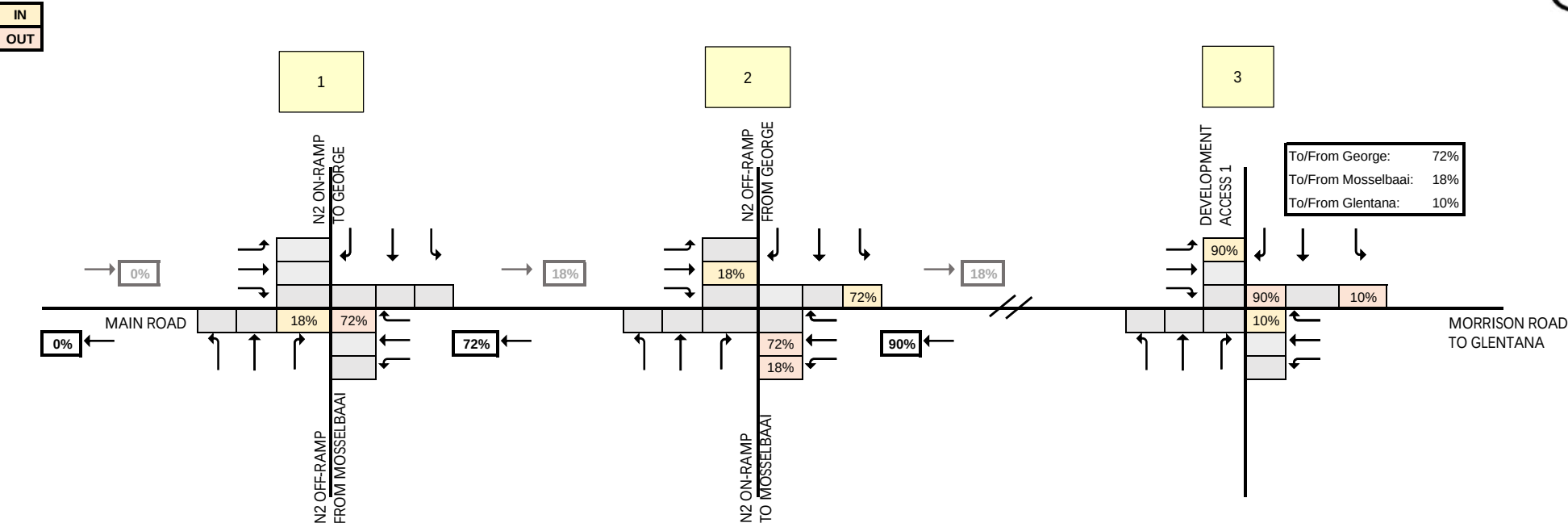


Figure B-8

WEEKDAY PM PEAK DEVELOPMENT TRIPS

41	INBOUND
18	OUTBOUND
59	

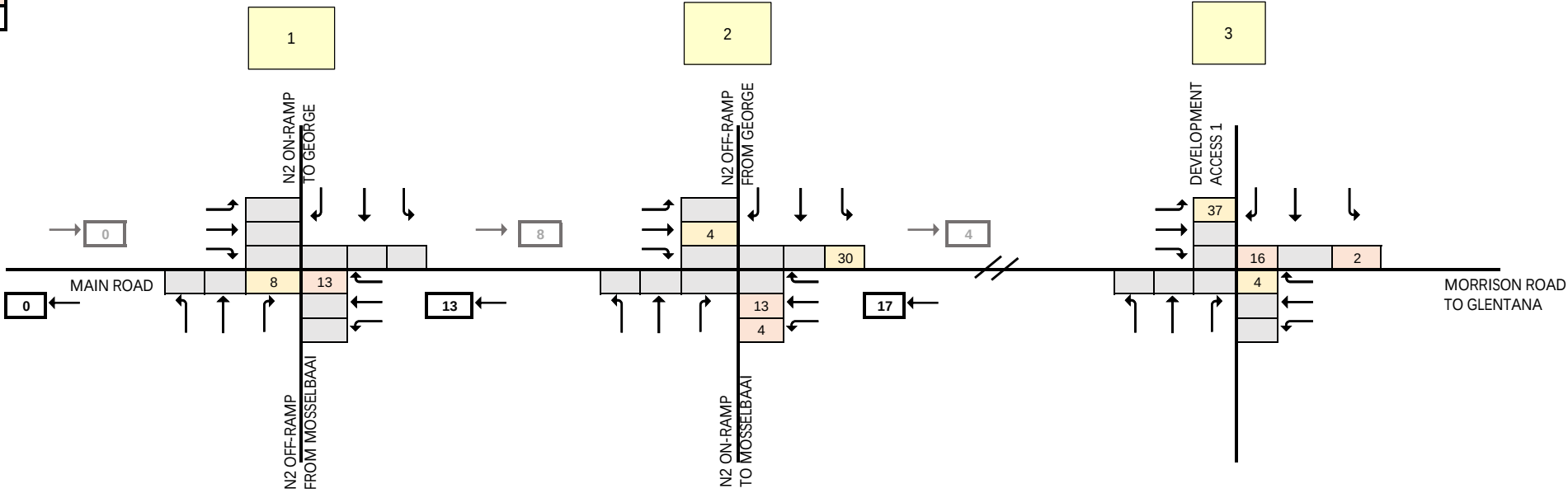


Figure B-9

2030 WEEKDAY PM PEAK HORIZON YEAR + DEVELOPMENT TRIPS
Scenario 3

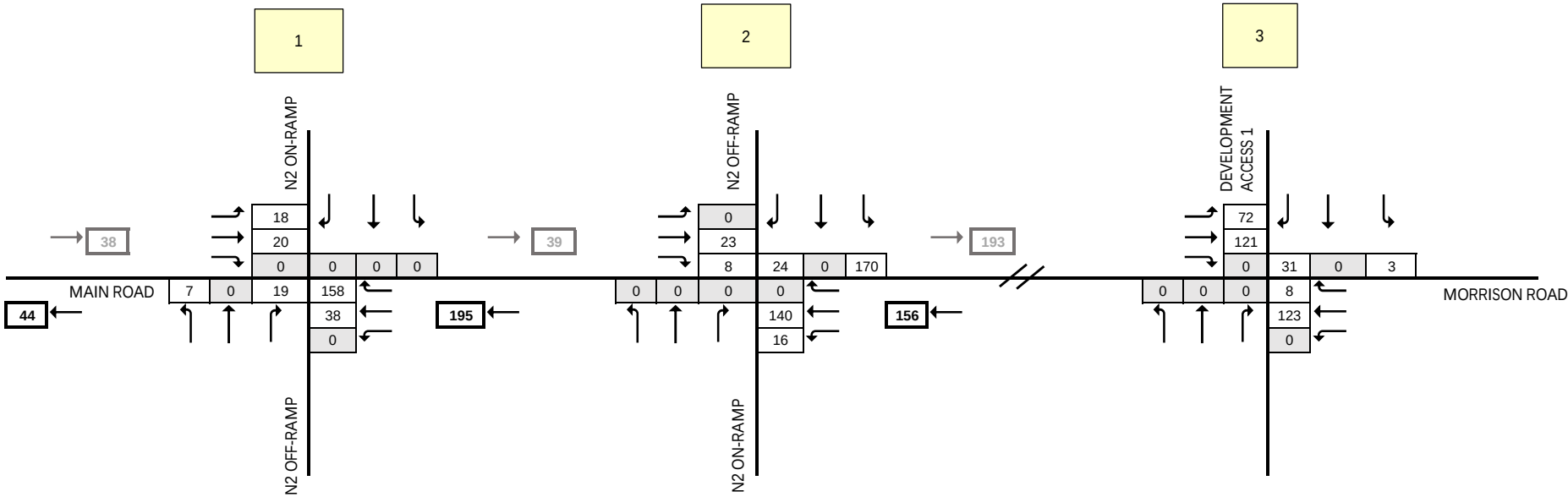


Figure B-10

Annexure C: SIDRA Analysis Extracts

MOVEMENT SUMMARY

 **Site: 101 [Int 1_S1: N2 Northern Terminal (Site Folder: AM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: N2 Off-Ramp (from Mosselbay)															
1	L2	All MCs	7	2,0	7	2,0	0,014	8,2	LOS A	0,0	0,3	0,15	0,90	0,15	50,9
2	T1	All MCs	1	2,0	1	2,0	0,014	8,9	LOS A	0,0	0,3	0,20	0,88	0,20	50,8
3	R2	All MCs	8	2,0	8	2,0	0,014	8,8	LOS A	0,0	0,3	0,20	0,88	0,20	47,1
Approach			17	2,0	17	2,0	0,014	8,5	LOS A	0,0	0,3	0,18	0,89	0,18	49,3
East: Morrison Road															
5	T1	All MCs	34	2,0	34	2,0	0,112	0,1	LOS A	0,6	3,9	0,12	0,49	0,12	53,6
6	R2	All MCs	161	2,0	161	2,0	0,112	5,8	LOS A	0,6	3,9	0,12	0,49	0,12	50,1
Approach			195	2,0	195	2,0	0,112	4,8	NA	0,6	3,9	0,12	0,49	0,12	50,7
West: Main Road															
10	L2	All MCs	24	2,0	24	2,0	0,021	5,6	LOS A	0,0	0,0	0,00	0,37	0,00	54,4
11	T1	All MCs	15	2,0	15	2,0	0,021	0,0	LOS A	0,0	0,0	0,00	0,37	0,00	55,5
Approach			39	2,0	39	2,0	0,021	3,5	NA	0,0	0,0	0,00	0,37	0,00	54,8
All Vehicles			251	2,0	251	2,0	0,112	4,8	NA	0,6	3,9	0,11	0,50	0,11	51,3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 1_S2: N2 Northern Terminal (Site Folder: AM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: N2 Off-Ramp (from Mosselbay)															
1	L2	All MCs	8	2,0	8	2,0	0,016	8,2	LOS A	0,1	0,4	0,16	0,90	0,16	50,9
2	T1	All MCs	1	2,0	1	2,0	0,016	9,0	LOS A	0,1	0,4	0,22	0,88	0,22	50,8
3	R2	All MCs	9	2,0	9	2,0	0,016	8,9	LOS A	0,1	0,4	0,22	0,88	0,22	47,0
Approach			19	2,0	19	2,0	0,016	8,6	LOS A	0,1	0,4	0,19	0,89	0,19	49,2
East: Morrison Road															
5	T1	All MCs	37	2,0	37	2,0	0,123	0,1	LOS A	0,6	4,4	0,13	0,49	0,13	53,5
6	R2	All MCs	178	2,0	178	2,0	0,123	5,8	LOS A	0,6	4,4	0,13	0,49	0,13	50,1
Approach			215	2,0	215	2,0	0,123	4,8	NA	0,6	4,4	0,13	0,49	0,13	50,7
West: Main Road															
10	L2	All MCs	26	2,0	26	2,0	0,022	5,6	LOS A	0,0	0,0	0,00	0,37	0,00	54,4
11	T1	All MCs	16	2,0	16	2,0	0,022	0,0	LOS A	0,0	0,0	0,00	0,37	0,00	55,5
Approach			42	2,0	42	2,0	0,022	3,5	NA	0,0	0,0	0,00	0,37	0,00	54,7
All Vehicles			276	2,0	276	2,0	0,123	4,9	NA	0,6	4,4	0,12	0,50	0,12	51,2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 1_S3: N2 Northern Terminal (Site Folder: AM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. Dist] veh m		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: N2 Off-Ramp (from Mosselbay)															
1	L2	All MCs	8	2,0	8	2,0	0,020	8,2	LOS A	0,1	0,5	0,16	0,90	0,16	50,9
2	T1	All MCs	1	2,0	1	2,0	0,020	9,3	LOS A	0,1	0,5	0,26	0,87	0,26	50,6
3	R2	All MCs	13	2,0	13	2,0	0,020	9,2	LOS A	0,1	0,5	0,26	0,87	0,26	46,8
Approach			22	2,0	22	2,0	0,020	8,8	LOS A	0,1	0,5	0,22	0,88	0,22	48,8
East: Morrison Road															
5	T1	All MCs	37	2,0	37	2,0	0,143	0,1	LOS A	0,7	5,2	0,13	0,50	0,13	53,4
6	R2	All MCs	212	2,0	212	2,0	0,143	5,8	LOS A	0,7	5,2	0,13	0,50	0,13	50,0
Approach			248	2,0	248	2,0	0,143	4,9	NA	0,7	5,2	0,13	0,50	0,13	50,4
West: Main Road															
10	L2	All MCs	26	2,0	26	2,0	0,022	5,6	LOS A	0,0	0,0	0,00	0,37	0,00	54,4
11	T1	All MCs	16	2,0	16	2,0	0,022	0,0	LOS A	0,0	0,0	0,00	0,37	0,00	55,5
Approach			42	2,0	42	2,0	0,022	3,5	NA	0,0	0,0	0,00	0,37	0,00	54,7
All Vehicles			313	2,0	313	2,0	0,143	5,0	NA	0,7	5,2	0,12	0,51	0,12	51,0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 2_S1: N2 Southern Terminal (Site Folder: AM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Morrison Road															
4	L2	All MCs	6	2,0	6	2,0	0,098	5,6	LOS A	0,0	0,0	0,00	0,02	0,00	57,2
5	T1	All MCs	183	2,0	183	2,0	0,098	0,0	LOS A	0,0	0,0	0,00	0,02	0,00	59,7
Approach			189	2,0	189	2,0	0,098	0,2	NA	0,0	0,0	0,00	0,02	0,00	59,6
North: N2 Off-Ramp (from George)															
7	L2	All MCs	68	2,0	68	2,0	0,049	8,1	LOS A	0,2	1,4	0,06	0,96	0,06	51,0
8	T1	All MCs	1	2,0	1	2,0	0,017	8,8	LOS A	0,1	0,4	0,30	0,88	0,30	50,9
9	R2	All MCs	13	2,0	13	2,0	0,017	8,7	LOS A	0,1	0,4	0,30	0,88	0,30	47,1
Approach			82	2,0	82	2,0	0,049	8,2	LOS A	0,2	1,4	0,10	0,94	0,10	50,5
West: Main Road															
11	T1	All MCs	12	2,0	12	2,0	0,011	0,3	LOS A	0,0	0,3	0,22	0,29	0,22	55,9
12	R2	All MCs	7	2,0	7	2,0	0,011	6,2	LOS A	0,0	0,3	0,22	0,29	0,22	52,2
Approach			19	2,0	19	2,0	0,011	2,6	NA	0,0	0,3	0,22	0,29	0,22	54,4
All Vehicles			291	2,0	291	2,0	0,098	2,6	NA	0,2	1,4	0,04	0,30	0,04	55,8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 2_S2: N2 Southern Terminal (Site Folder: AM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Morrison Road															
4	L2	All MCs	7	2,0	7	2,0	0,108	5,6	LOS A	0,0	0,0	0,00	0,02	0,00	57,2
5	T1	All MCs	202	2,0	202	2,0	0,108	0,0	LOS A	0,0	0,0	0,00	0,02	0,00	59,7
Approach			209	2,0	209	2,0	0,108	0,2	NA	0,0	0,0	0,00	0,02	0,00	59,5
North: N2 Off-Ramp (from George)															
7	L2	All MCs	76	2,0	76	2,0	0,054	8,1	LOS A	0,2	1,6	0,06	0,95	0,06	51,0
8	T1	All MCs	1	2,0	1	2,0	0,019	8,9	LOS A	0,1	0,4	0,32	0,88	0,32	50,8
9	R2	All MCs	14	2,0	14	2,0	0,019	8,9	LOS A	0,1	0,4	0,32	0,88	0,32	47,0
Approach			91	2,0	91	2,0	0,054	8,2	LOS A	0,2	1,6	0,10	0,94	0,10	50,5
West: Main Road															
11	T1	All MCs	13	2,0	13	2,0	0,012	0,4	LOS A	0,0	0,3	0,24	0,30	0,24	55,8
12	R2	All MCs	8	2,0	8	2,0	0,012	6,3	LOS A	0,0	0,3	0,24	0,30	0,24	52,1
Approach			21	2,0	21	2,0	0,012	2,7	NA	0,0	0,3	0,24	0,30	0,24	54,2
All Vehicles			321	2,0	321	2,0	0,108	2,6	NA	0,2	1,6	0,04	0,30	0,04	55,8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 2_S3: N2 Southern Terminal (Site Folder: AM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Morrison Road															
4	L2	All MCs	16	2,0	16	2,0	0,130	5,6	LOS A	0,0	0,0	0,00	0,04	0,00	57,0
5	T1	All MCs	236	2,0	236	2,0	0,130	0,0	LOS A	0,0	0,0	0,00	0,04	0,00	59,5
Approach			252	2,0	252	2,0	0,130	0,4	NA	0,0	0,0	0,00	0,04	0,00	59,2
North: N2 Off-Ramp (from George)															
7	L2	All MCs	86	2,0	86	2,0	0,062	8,2	LOS A	0,3	1,8	0,08	0,94	0,08	51,0
8	T1	All MCs	1	2,0	1	2,0	0,020	9,2	LOS A	0,1	0,5	0,36	0,88	0,36	50,6
9	R2	All MCs	14	2,0	14	2,0	0,020	9,2	LOS A	0,1	0,5	0,36	0,88	0,36	46,8
Approach			101	2,0	101	2,0	0,062	8,3	LOS A	0,3	1,8	0,12	0,93	0,12	50,5
West: Main Road															
11	T1	All MCs	21	2,0	21	2,0	0,017	0,4	LOS A	0,1	0,4	0,21	0,25	0,21	56,7
12	R2	All MCs	8	2,0	8	2,0	0,017	6,4	LOS A	0,1	0,4	0,21	0,25	0,21	52,8
Approach			29	2,0	29	2,0	0,017	2,1	NA	0,1	0,4	0,21	0,25	0,21	55,5
All Vehicles			382	2,0	382	2,0	0,130	2,6	NA	0,3	1,8	0,05	0,29	0,05	55,8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 3_S1: Development Access / Morrison Road**
(Site Folder: AM PEAK PERIOD)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Morrison Road															
5	T1	All MCs	151	2,0	151	2,0	0,077	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	60,0
6	R2	All MCs	1	2,0	1	2,0	0,001	5,7	LOS A	0,0	0,0	0,17	0,53	0,17	52,1
Approach			152	2,0	152	2,0	0,077	0,1	NA	0,0	0,0	0,00	0,00	0,00	59,9
North: Development Access															
7	L2	All MCs	4	2,0	4	2,0	0,051	8,3	LOS A	0,2	1,4	0,33	0,87	0,33	50,7
9	R2	All MCs	39	2,0	39	2,0	0,051	9,2	LOS A	0,2	1,4	0,33	0,87	0,33	50,5
Approach			43	2,0	43	2,0	0,051	9,1	LOS A	0,2	1,4	0,33	0,87	0,33	50,5
West: Morrison Road															
10	L2	All MCs	13	2,0	13	2,0	0,041	5,6	LOS A	0,0	0,0	0,00	0,09	0,00	56,6
11	T1	All MCs	67	2,0	67	2,0	0,041	0,0	LOS A	0,0	0,0	0,00	0,09	0,00	59,1
Approach			80	2,0	80	2,0	0,041	0,9	NA	0,0	0,0	0,00	0,09	0,00	58,7
All Vehicles			275	2,0	275	2,0	0,077	1,7	NA	0,2	1,4	0,05	0,17	0,05	57,9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 3_S2: Development Access / Morrison Road
(Site Folder: AM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Morrison Road															
5	T1	All MCs	166	2,0	166	2,0	0,086	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	60,0
6	R2	All MCs	1	2,0	1	2,0	0,001	5,7	LOS A	0,0	0,0	0,18	0,53	0,18	52,1
Approach			167	2,0	167	2,0	0,086	0,1	NA	0,0	0,0	0,00	0,00	0,00	59,9
North: Development Access															
7	L2	All MCs	4	2,0	4	2,0	0,053	8,4	LOS A	0,2	1,4	0,35	0,87	0,35	50,6
9	R2	All MCs	39	2,0	39	2,0	0,053	9,4	LOS A	0,2	1,4	0,35	0,87	0,35	50,4
Approach			43	2,0	43	2,0	0,053	9,3	LOS A	0,2	1,4	0,35	0,87	0,35	50,4
West: Morrison Road															
10	L2	All MCs	13	2,0	13	2,0	0,045	5,6	LOS A	0,0	0,0	0,00	0,09	0,00	56,7
11	T1	All MCs	74	2,0	74	2,0	0,045	0,0	LOS A	0,0	0,0	0,00	0,09	0,00	59,2
Approach			86	2,0	86	2,0	0,045	0,8	NA	0,0	0,0	0,00	0,09	0,00	58,8
All Vehicles			297	2,0	297	2,0	0,086	1,6	NA	0,2	1,4	0,05	0,15	0,05	58,0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 3_S3: Development Access / Morrison Road**
(Site Folder: AM PEAK PERIOD)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Morrison Road															
5	T1	All MCs	166	2,0	166	2,0	0,086	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	60,0
6	R2	All MCs	3	2,0	3	2,0	0,002	5,8	LOS A	0,0	0,1	0,20	0,54	0,20	52,1
Approach			169	2,0	169	2,0	0,086	0,1	NA	0,0	0,1	0,00	0,01	0,00	59,8
North: Development Access															
7	L2	All MCs	9	2,0	9	2,0	0,111	8,4	LOS A	0,4	3,2	0,37	0,88	0,37	50,5
9	R2	All MCs	81	2,0	81	2,0	0,111	9,6	LOS A	0,4	3,2	0,37	0,88	0,37	50,3
Approach			91	2,0	91	2,0	0,111	9,5	LOS A	0,4	3,2	0,37	0,88	0,37	50,3
West: Morrison Road															
10	L2	All MCs	27	2,0	27	2,0	0,053	5,6	LOS A	0,0	0,0	0,00	0,16	0,00	56,1
11	T1	All MCs	74	2,0	74	2,0	0,053	0,0	LOS A	0,0	0,0	0,00	0,16	0,00	58,5
Approach			101	2,0	101	2,0	0,053	1,5	NA	0,0	0,0	0,00	0,16	0,00	57,8
All Vehicles			361	2,0	361	2,0	0,111	2,9	NA	0,4	3,2	0,10	0,27	0,10	56,6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 1_S1: N2 Northern Terminal (Site Folder: PM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: N2 Off-Ramp (from Mosselbay)															
1	L2	All MCs	6	2,0	6	2,0	0,015	8,2	LOS A	0,1	0,4	0,15	0,91	0,15	51,0
2	T1	All MCs	1	2,0	1	2,0	0,015	8,8	LOS A	0,1	0,4	0,23	0,88	0,23	50,9
3	R2	All MCs	11	2,0	11	2,0	0,015	8,6	LOS A	0,1	0,4	0,23	0,88	0,23	47,2
Approach			18	2,0	18	2,0	0,015	8,5	LOS A	0,1	0,4	0,20	0,89	0,20	49,0
East: Morrison Road															
5	T1	All MCs	36	2,0	36	2,0	0,099	0,1	LOS A	0,5	3,4	0,12	0,47	0,12	53,8
6	R2	All MCs	138	2,0	138	2,0	0,099	5,7	LOS A	0,5	3,4	0,12	0,47	0,12	50,3
Approach			174	2,0	174	2,0	0,099	4,6	NA	0,5	3,4	0,12	0,47	0,12	51,0
West: Main Road															
10	L2	All MCs	17	2,0	17	2,0	0,019	5,6	LOS A	0,0	0,0	0,00	0,28	0,00	55,1
11	T1	All MCs	19	2,0	19	2,0	0,019	0,0	LOS A	0,0	0,0	0,00	0,28	0,00	56,5
Approach			36	2,0	36	2,0	0,019	2,6	NA	0,0	0,0	0,00	0,28	0,00	55,7
All Vehicles			227	2,0	227	2,0	0,099	4,6	NA	0,5	3,4	0,11	0,48	0,11	51,6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 1_S2: N2 Northern Terminal (Site Folder: PM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: N2 Off-Ramp (from Mosselbay)															
1	L2	All MCs	7	2,0	7	2,0	0,018	8,2	LOS A	0,1	0,4	0,16	0,90	0,16	50,9
2	T1	All MCs	1	2,0	1	2,0	0,018	8,9	LOS A	0,1	0,4	0,25	0,87	0,25	50,8
3	R2	All MCs	12	2,0	12	2,0	0,018	8,8	LOS A	0,1	0,4	0,25	0,87	0,25	47,1
Approach			20	2,0	20	2,0	0,018	8,6	LOS A	0,1	0,4	0,21	0,88	0,21	49,0
East: Morrison Road															
5	T1	All MCs	40	2,0	40	2,0	0,110	0,1	LOS A	0,5	3,9	0,13	0,47	0,13	53,8
6	R2	All MCs	153	2,0	153	2,0	0,110	5,8	LOS A	0,5	3,9	0,13	0,47	0,13	50,3
Approach			193	2,0	193	2,0	0,110	4,6	NA	0,5	3,9	0,13	0,47	0,13	51,0
West: Main Road															
10	L2	All MCs	19	2,0	19	2,0	0,021	5,6	LOS A	0,0	0,0	0,00	0,28	0,00	55,1
11	T1	All MCs	21	2,0	21	2,0	0,021	0,0	LOS A	0,0	0,0	0,00	0,28	0,00	56,5
Approach			40	2,0	40	2,0	0,021	2,6	NA	0,0	0,0	0,00	0,28	0,00	55,7
All Vehicles			253	2,0	253	2,0	0,110	4,6	NA	0,5	3,9	0,11	0,47	0,11	51,6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 1_S3: N2 Northern Terminal (Site Folder: PM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: N2 Off-Ramp (from Mosselbay)															
1	L2	All MCs	7	2,0	7	2,0	0,027	8,2	LOS A	0,1	0,6	0,12	0,92	0,12	51,0
2	T1	All MCs	1	2,0	1	2,0	0,027	9,0	LOS A	0,1	0,6	0,33	0,88	0,33	50,7
3	R2	All MCs	20	2,0	20	2,0	0,027	8,9	LOS A	0,1	0,6	0,33	0,88	0,33	47,0
Approach			28	2,0	28	2,0	0,027	8,7	LOS A	0,1	0,6	0,27	0,89	0,27	48,4
East: Morrison Road															
5	T1	All MCs	40	2,0	40	2,0	0,118	0,1	LOS A	0,6	4,2	0,13	0,48	0,13	53,7
6	R2	All MCs	166	2,0	166	2,0	0,118	5,8	LOS A	0,6	4,2	0,13	0,48	0,13	50,2
Approach			206	2,0	206	2,0	0,118	4,7	NA	0,6	4,2	0,13	0,48	0,13	50,9
West: Main Road															
10	L2	All MCs	19	2,0	19	2,0	0,021	5,6	LOS A	0,0	0,0	0,00	0,28	0,00	55,1
11	T1	All MCs	21	2,0	21	2,0	0,021	0,0	LOS A	0,0	0,0	0,00	0,28	0,00	56,5
Approach			40	2,0	40	2,0	0,021	2,6	NA	0,0	0,0	0,00	0,28	0,00	55,7
All Vehicles			275	2,0	275	2,0	0,118	4,8	NA	0,6	4,2	0,12	0,49	0,12	51,3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 2_S1: N2 Southern Terminal (Site Folder: PM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Morrison Road															
4	L2	All MCs	12	2,0	12	2,0	0,068	5,6	LOS A	0,0	0,0	0,00	0,05	0,00	56,9
5	T1	All MCs	121	2,0	121	2,0	0,068	0,0	LOS A	0,0	0,0	0,00	0,05	0,00	59,3
Approach			133	2,0	133	2,0	0,068	0,5	NA	0,0	0,0	0,00	0,05	0,00	59,0
North: N2 Off-Ramp (from George)															
7	L2	All MCs	134	2,0	134	2,0	0,095	8,2	LOS A	0,4	2,9	0,08	0,94	0,08	51,0
8	T1	All MCs	1	2,0	1	2,0	0,028	8,5	LOS A	0,1	0,7	0,25	0,88	0,25	51,0
9	R2	All MCs	23	2,0	23	2,0	0,028	8,4	LOS A	0,1	0,7	0,25	0,88	0,25	47,4
Approach			158	2,0	158	2,0	0,095	8,2	LOS A	0,4	2,9	0,10	0,93	0,10	50,6
West: Main Road															
11	T1	All MCs	18	2,0	18	2,0	0,014	0,2	LOS A	0,0	0,3	0,15	0,21	0,15	57,0
12	R2	All MCs	7	2,0	7	2,0	0,014	6,0	LOS A	0,0	0,3	0,15	0,21	0,15	53,1
Approach			25	2,0	25	2,0	0,014	1,9	NA	0,0	0,3	0,15	0,21	0,15	55,8
All Vehicles			316	2,0	316	2,0	0,095	4,5	NA	0,4	2,9	0,06	0,51	0,06	53,7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 2_S2: N2 Southern Terminal (Site Folder: PM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Morrison Road															
4	L2	All MCs	13	2,0	13	2,0	0,076	5,6	LOS A	0,0	0,0	0,00	0,05	0,00	56,9
5	T1	All MCs	134	2,0	134	2,0	0,076	0,0	LOS A	0,0	0,0	0,00	0,05	0,00	59,3
Approach			146	2,0	146	2,0	0,076	0,5	NA	0,0	0,0	0,00	0,05	0,00	59,0
North: N2 Off-Ramp (from George)															
7	L2	All MCs	147	2,0	147	2,0	0,105	8,2	LOS A	0,4	3,2	0,08	0,94	0,08	51,0
8	T1	All MCs	1	2,0	1	2,0	0,031	8,6	LOS A	0,1	0,7	0,27	0,88	0,27	51,0
9	R2	All MCs	25	2,0	25	2,0	0,031	8,5	LOS A	0,1	0,7	0,27	0,88	0,27	47,3
Approach			174	2,0	174	2,0	0,105	8,2	LOS A	0,4	3,2	0,11	0,93	0,11	50,6
West: Main Road															
11	T1	All MCs	20	2,0	20	2,0	0,016	0,2	LOS A	0,0	0,3	0,16	0,22	0,16	56,9
12	R2	All MCs	8	2,0	8	2,0	0,016	6,1	LOS A	0,0	0,3	0,16	0,22	0,16	53,0
Approach			28	2,0	28	2,0	0,016	1,9	NA	0,0	0,3	0,16	0,22	0,16	55,7
All Vehicles			348	2,0	348	2,0	0,105	4,5	NA	0,4	3,2	0,07	0,50	0,07	53,7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 2_S3: N2 Southern Terminal (Site Folder: PM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Morrison Road															
4	L2	All MCs	17	2,0	17	2,0	0,085	5,6	LOS A	0,0	0,0	0,00	0,06	0,00	56,9
5	T1	All MCs	147	2,0	147	2,0	0,085	0,0	LOS A	0,0	0,0	0,00	0,06	0,00	59,2
Approach			164	2,0	164	2,0	0,085	0,6	NA	0,0	0,0	0,00	0,06	0,00	58,8
North: N2 Off-Ramp (from George)															
7	L2	All MCs	179	2,0	179	2,0	0,128	8,2	LOS A	0,6	4,0	0,10	0,93	0,10	51,0
8	T1	All MCs	1	2,0	1	2,0	0,032	8,7	LOS A	0,1	0,7	0,29	0,88	0,29	50,9
9	R2	All MCs	25	2,0	25	2,0	0,032	8,6	LOS A	0,1	0,7	0,29	0,88	0,29	47,2
Approach			205	2,0	205	2,0	0,128	8,2	LOS A	0,6	4,0	0,12	0,93	0,12	50,6
West: Main Road															
11	T1	All MCs	24	2,0	24	2,0	0,018	0,2	LOS A	0,1	0,4	0,15	0,20	0,15	57,2
12	R2	All MCs	8	2,0	8	2,0	0,018	6,1	LOS A	0,1	0,4	0,15	0,20	0,15	53,3
Approach			33	2,0	33	2,0	0,018	1,7	NA	0,1	0,4	0,15	0,20	0,15	56,1
All Vehicles			402	2,0	402	2,0	0,128	4,6	NA	0,6	4,0	0,07	0,51	0,07	53,6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY



Site: 101 [Int 3_S1: Development Access / Morrison Road
(Site Folder: PM PEAK PERIOD)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Morrison Road															
5	T1	All MCs	117	2,0	117	2,0	0,060	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	60,0
6	R2	All MCs	4	2,0	4	2,0	0,003	5,9	LOS A	0,0	0,1	0,25	0,53	0,25	51,9
Approach			121	2,0	121	2,0	0,060	0,2	NA	0,0	0,1	0,01	0,02	0,01	59,7
North: Development Access															
7	L2	All MCs	2	2,0	2	2,0	0,022	8,5	LOS A	0,1	0,6	0,36	0,85	0,36	50,6
9	R2	All MCs	16	2,0	16	2,0	0,022	9,3	LOS A	0,1	0,6	0,36	0,85	0,36	50,4
Approach			18	2,0	18	2,0	0,022	9,2	LOS A	0,1	0,6	0,36	0,85	0,36	50,4
West: Morrison Road															
10	L2	All MCs	37	2,0	37	2,0	0,079	5,6	LOS A	0,0	0,0	0,00	0,14	0,00	56,2
11	T1	All MCs	115	2,0	115	2,0	0,079	0,0	LOS A	0,0	0,0	0,00	0,14	0,00	58,7
Approach			152	2,0	152	2,0	0,079	1,4	NA	0,0	0,0	0,00	0,14	0,00	58,0
All Vehicles			291	2,0	291	2,0	0,079	1,4	NA	0,1	0,6	0,03	0,14	0,03	58,2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY



Site: 101 [Int 3_S2: Development Access / Morrison Road
(Site Folder: PM PEAK PERIOD)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Morrison Road															
5	T1	All MCs	129	2,0	129	2,0	0,067	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	60,0
6	R2	All MCs	4	2,0	4	2,0	0,003	5,9	LOS A	0,0	0,1	0,27	0,53	0,27	51,9
Approach			134	2,0	134	2,0	0,067	0,2	NA	0,0	0,1	0,01	0,02	0,01	59,7
North: Development Access															
7	L2	All MCs	2	2,0	2	2,0	0,023	8,6	LOS A	0,1	0,6	0,38	0,85	0,38	50,5
9	R2	All MCs	16	2,0	16	2,0	0,023	9,5	LOS A	0,1	0,6	0,38	0,85	0,38	50,3
Approach			18	2,0	18	2,0	0,023	9,4	LOS A	0,1	0,6	0,38	0,85	0,38	50,3
West: Morrison Road															
10	L2	All MCs	37	2,0	37	2,0	0,085	5,6	LOS A	0,0	0,0	0,00	0,13	0,00	56,3
11	T1	All MCs	127	2,0	127	2,0	0,085	0,0	LOS A	0,0	0,0	0,00	0,13	0,00	58,8
Approach			164	2,0	164	2,0	0,085	1,3	NA	0,0	0,0	0,00	0,13	0,00	58,2
All Vehicles			316	2,0	316	2,0	0,085	1,3	NA	0,1	0,6	0,02	0,12	0,02	58,3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Int 3_S3: Development Access / Morrison Road
(Site Folder: PM PEAK PERIOD)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Morrison Road															
5	T1	All MCs	129	2,0	129	2,0	0,067	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	60,0
6	R2	All MCs	8	2,0	8	2,0	0,006	6,1	LOS A	0,0	0,2	0,30	0,54	0,30	51,8
Approach			138	2,0	138	2,0	0,067	0,4	NA	0,0	0,2	0,02	0,03	0,02	59,4
North: Development Access															
7	L2	All MCs	3	2,0	3	2,0	0,047	8,6	LOS A	0,2	1,3	0,41	0,87	0,41	50,4
9	R2	All MCs	33	2,0	33	2,0	0,047	9,8	LOS A	0,2	1,3	0,41	0,87	0,41	50,1
Approach			36	2,0	36	2,0	0,047	9,7	LOS A	0,2	1,3	0,41	0,87	0,41	50,2
West: Morrison Road															
10	L2	All MCs	76	2,0	76	2,0	0,106	5,6	LOS A	0,0	0,0	0,00	0,22	0,00	55,6
11	T1	All MCs	127	2,0	127	2,0	0,106	0,0	LOS A	0,0	0,0	0,00	0,22	0,00	58,0
Approach			203	2,0	203	2,0	0,106	2,1	NA	0,0	0,0	0,00	0,22	0,00	57,1
All Vehicles			377	2,0	377	2,0	0,106	2,2	NA	0,2	1,3	0,05	0,21	0,05	57,1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

ANNEXURE Q:

Terrestrial Biodiversity Report

Plants Species, Animal Species and Terrestrial Biodiversity baseline study and site sensitivity verification

prepared in accordance with the protocols for the specialist assessment and minimum report content requirements for environmental impacts on plant species, animal species, and terrestrial biodiversity.

Approximately 40 farm portions of the Farm Hoogekraal No. 238 near Glentana within the George Local Municipality, Western Cape



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Plant Species, Animal
Species, and Terrestrial
Biodiversity baseline
study and site sensitivity
verification for
approximately 40 farm
portions of the Farm
Hoogekraal No. 238 near
Glentana within the
George Local
Municipality, Western
Cape

18 May 2026

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Specialist details and declaration

This report has been prepared in accordance with the protocol for the specialist assessment and minimum report content requirements, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320, for environmental impacts on terrestrial plant and animal species (October 2020), and terrestrial biodiversity (March 2020). It has been prepared independently of influence or prejudice by any parties.

Details of the specialist:

Specialist	Qualification and accreditation
Dr David Hoare (Pr.Sci.Nat.)	<ul style="list-style-type: none">• PhD Botany• SACNASP Reg. no. 400221/05 (Ecology, Botany)

Declaration of independence

David Hoare of BioCensus (Pty) Ltd is an independent consultant and hereby declares that he does not have any financial or other vested interest in the undertaking of the proposed activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). In addition, remuneration for services provided by BioCensus (Pty) Ltd is not subject to or based on approval of the proposed project by the relevant authorities responsible for authorising the project.

Disclosure

BioCensus (Pty) Ltd undertakes to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and will provide the

competent authority with access to all information at its disposal regarding the application, whether such information is favourable to the applicant or not.

Based on information provided to BioCensus (Pty) Ltd by the client and in addition to information obtained during the course of this study, BioCensus (Pty) Ltd presents the results and conclusion within the associated document to the best of the author's professional judgement and in accordance with best practice.



18 May 2026

Dr David Hoare

Date

Executive summary

The baseline assessment of approximately 40 farm portions of the Farm Hoogekraal No. 238 near Glentana within the George Local Municipality, Western Cape, identifies biodiversity sensitivities across terrestrial themes, including threatened plant and animal species, protected forests, and Critical Biodiversity Areas (CBAs).

Confirmed Sensitivities

- There are several threatened plant species that could potentially occur on site, mostly within fynbos habitat. Based on available information, these areas will have HIGH sensitivity with respect to the Terrestrial Plant Species Theme. Further surveys are required to confirm this.
- The site is confirmed to have MEDIUM sensitivity with respect to the Terrestrial Animal Species Theme. There are two threatened animal SCC that have high habitat sensitivity in forest and riparian zones.
- The site is confirmed to have VERY HIGH sensitivity with respect to the Terrestrial Biodiversity Theme. The Terrestrial Biodiversity features that apply to the site are as follows:
 - CBAs of very high and high sensitivity are mapped on site, mostly in the southern parts, which form part of a critically important coastal corridor, and in fingers on the eastern side, that form part of a local corridor associated with the Maalgate River. These areas are of prime conservation importance for ecosystem protection and habitat for SCC.
 - The site is within a listed threatened ecosystem, namely Garden Route Granite Fynbos, listed as Critically Endangered. This vegetation type has been extensively converted to cultivation and urban areas over time, and only small patches remain. These remnants are subject to poor fire management and alien invasion, which together have caused additional degradation. All remaining patches are therefore of critical conservation importance.

- Protected forest areas and ecotone zones at the forest-fynbos interface have very high ecological sensitivity due to their functional importance for biodiversity and ecosystem stability. Forests are protected under the National Forests Act.
 - The site is within strategic water source area.
- All areas in a natural state therefore have VERY HIGH sensitivity with respect to the Terrestrial Biodiversity Theme. This also includes secondary vegetation that falls within the definition of "natural" under NEMA.

Terms of reference

This initial baseline report is prepared in compliance with the protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial biodiversity, terrestrial plant species and terrestrial animal species.

This assessment follows the requirements of The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020 for Terrestrial Biodiversity, and in GN. No. 1150 dated 30 October 2020 for Terrestrial Plant Species and Terrestrial Animal Species. As per these Regulations, the approach for assessing sensitivity with respect to Terrestrial Plant Species and Terrestrial Animal Species is in accordance with guidelines described in the latest version of the "Species Environmental Assessment Guidelines," available at <https://bgis.sanbi.org/>.

The assessment and minimum reporting requirements of these protocols are associated with a level of environmental sensitivity identified by the Department of Forestry, Fisheries and the Environment (DFFE) national web based environmental screening tool (screening tool). The screening tool can be accessed at:

<https://screening.environment.gov.za/screeningtool>.

Introduction

Site location

The site of the proposed development is approximately 40 farm portions of the Farm Hoogekraal No. 238 near Glentana within the George Local Municipality, Western Cape (Figure 1). It is located about 2.5 km to the south-west of the George International Airport and is accessed from Morrison Road, which connects the N2 national road and Glentana.



Figure 1: Location of the site (property demarcated with red border).

Aerial imagery (Figure 2) shows the boundary of the property relative to surrounding areas. The northern boundary of the site is the N2 national road between George and Mossel Bay, just to the south-west of the George International Airport. The southern boundary is the coastline just to the east of Glentana. The western boundary is Morrison Road, which connects from the N2 national road to Glentana. The eastern boundary is the Maalgate River.



Figure 2: Aerial image of the property and surrounding areas.

The proposal is to consolidate the approximately 40 farm portions into cooperative agricultural units, including the establishment of an agri-village for the occupants (Figure 3).

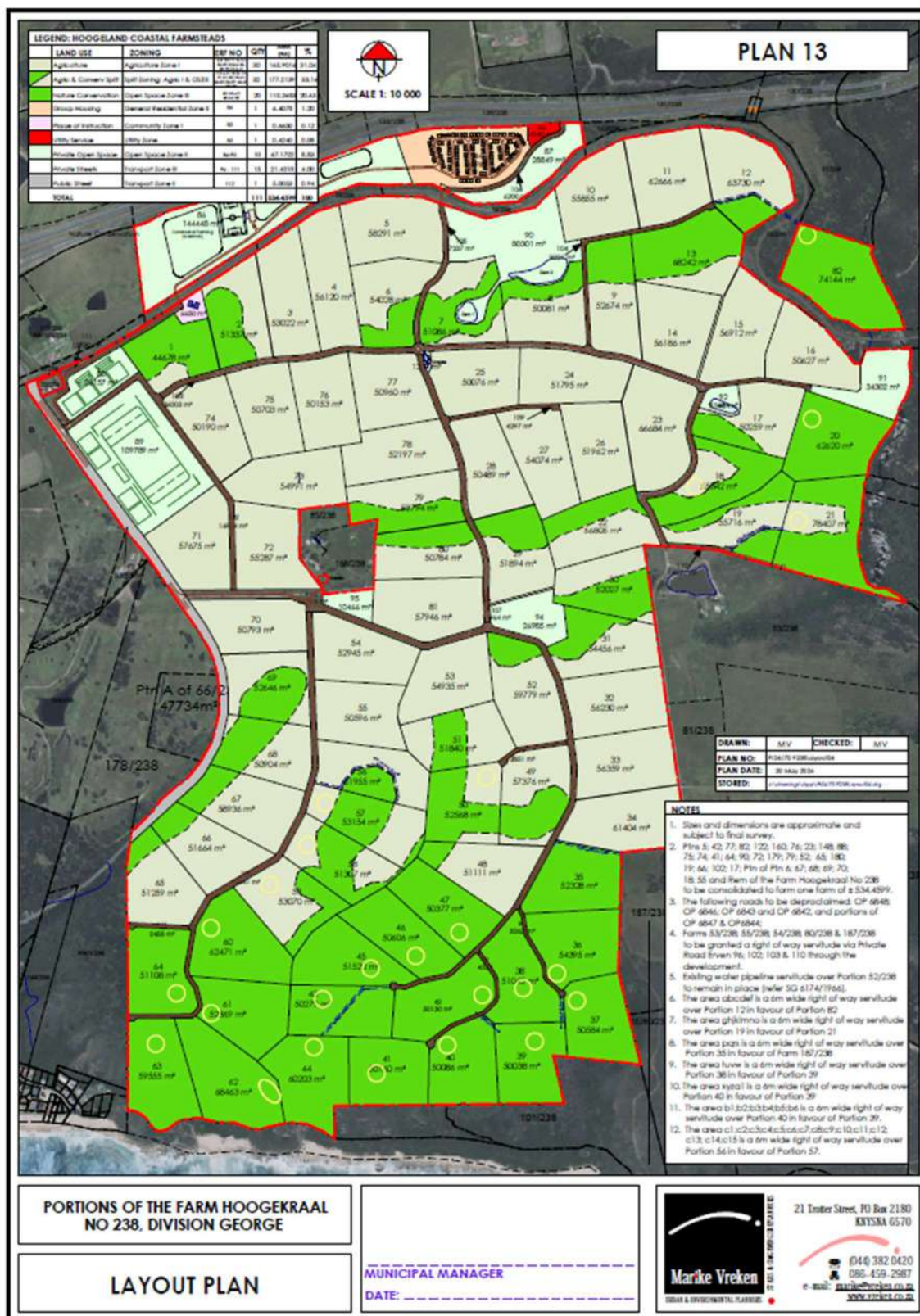


Figure 3: Development plan of the property.

Identified Theme Sensitivities

A sensitivity screening report from the DFFE screening tool was requested in the application category:

Transformation of land|Indigenous vegetation

The screening tool report for the area, dated 10/04/2025, indicates the following ecological sensitivities:

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Plant Species Theme			X	
Animal Species Theme		X		
Terrestrial Biodiversity Theme	X			

Plant species theme

Areas of different sensitivity are shown in Figure 44. Plant SCC flagged for the site are as follows:

Sensitivity	Feature
Medium	Lampranthus pauciflorus
Medium	Euchaetis albertiniana
Medium	Sensitive species 18
Medium	Sensitive species 85
Medium	Sensitive species 264
Medium	Sensitive species 642
Medium	Sensitive species 1012
Medium	Sensitive species 1121

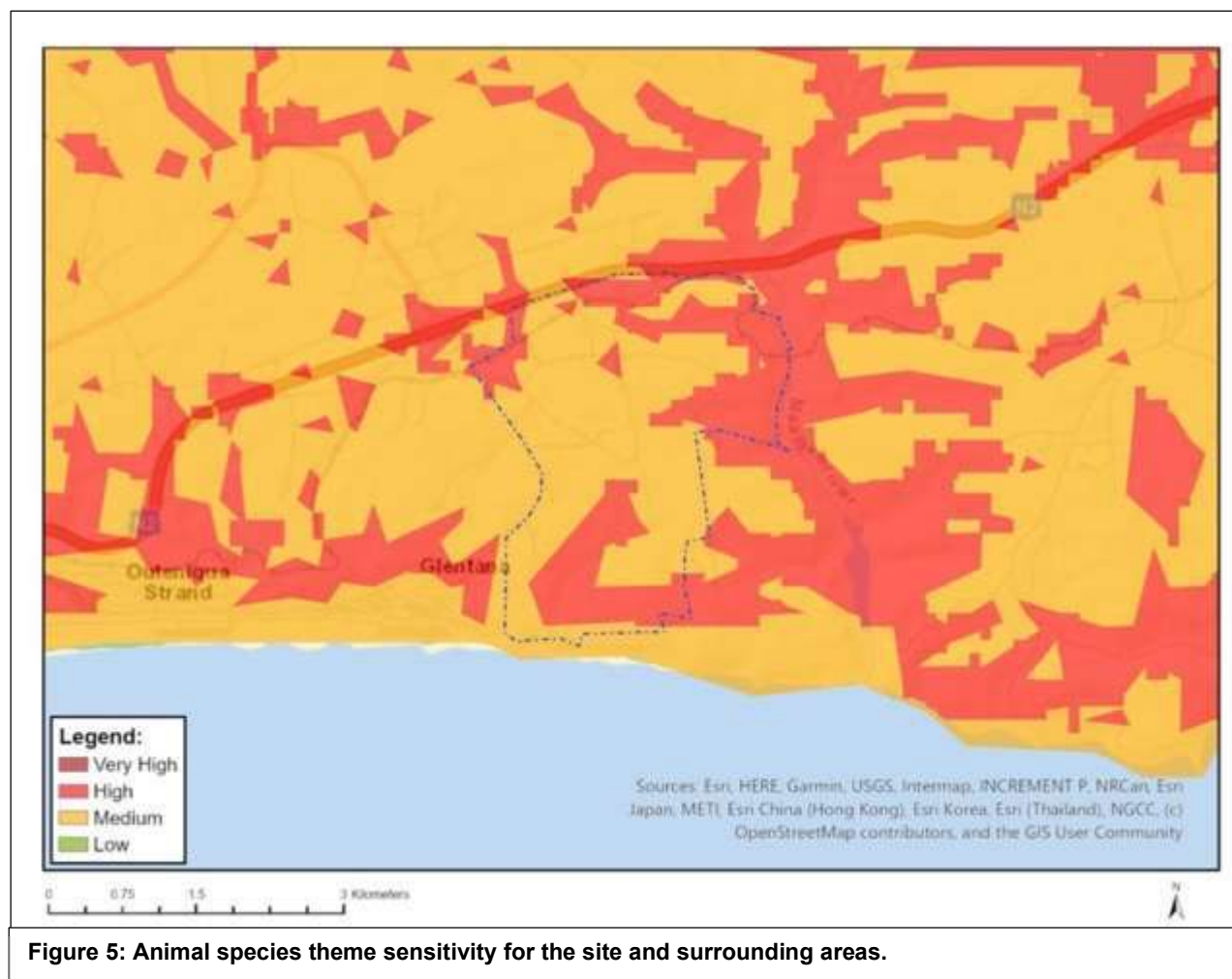


Figure 4: Plant species theme sensitivity for the site and surrounding areas.

Animal species theme

Areas of sensitivity are shown in Figure 5. Animal SCC are indicated as follows:

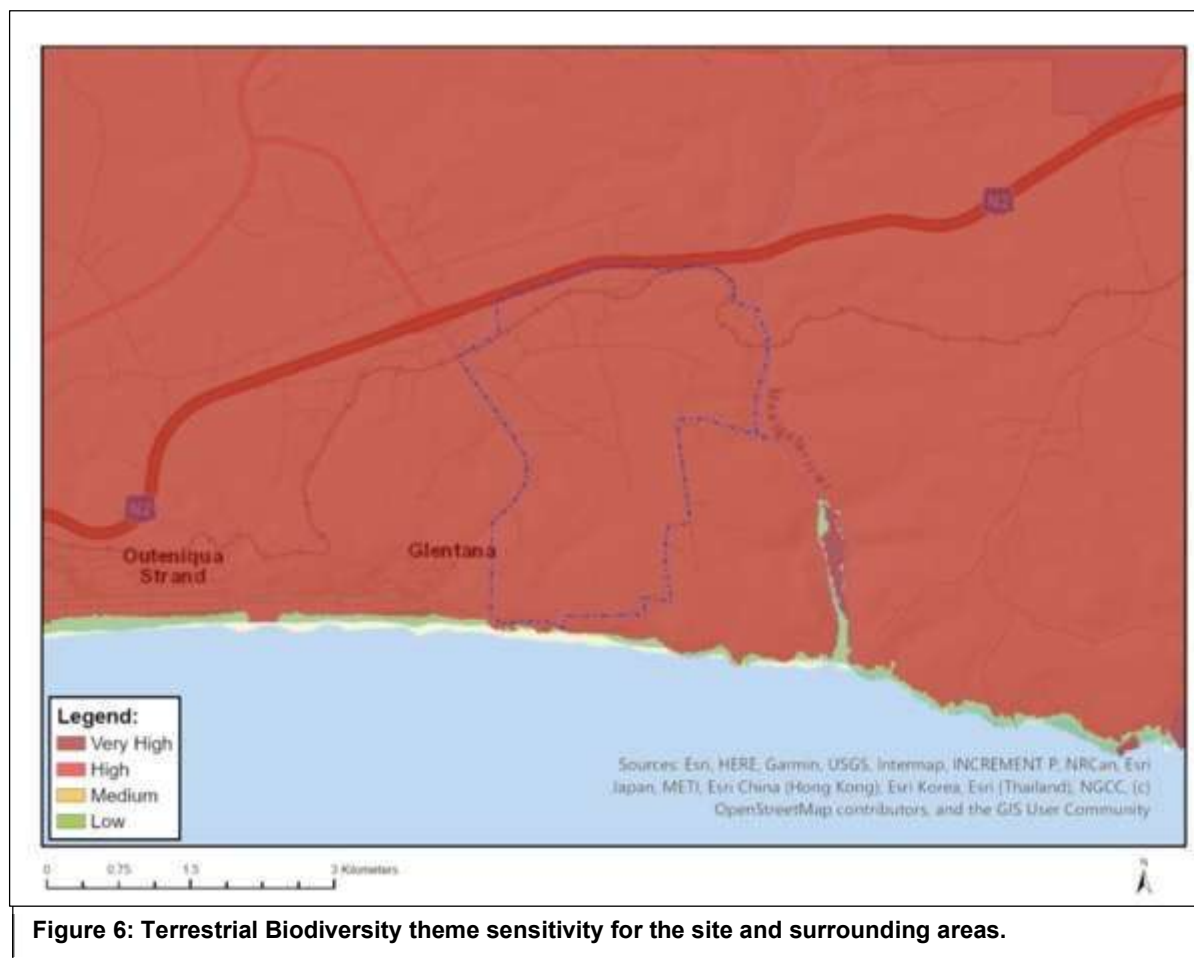
Sensitivity	Feature
High & Medium	Aves-Circus ranivorus
High	Aves-Circus maurus
High	Aves-Neotis denhami
High	Aves-Bradypterus sylvaticus
High	Aves-Polemaetus bellicosus
Medium	Aves-Stephanoaetus coronatus
Medium	Sensitive species 13
Medium	Invertebrate-Aneuryphymus montanus



Terrestrial Biodiversity theme

Areas of sensitivity are shown in Figure 6 and sensitive features are indicated as follows:

Sensitivity	Feature
Very High	CBA: Terrestrial
Very High	CBA2: Terrestrial
Very High	SWSA (sw)_Outeniqua
Very High	CR_Garden Route Granite Fynbos
Very High	EN_Cape Lowland Alluvial Vegetation

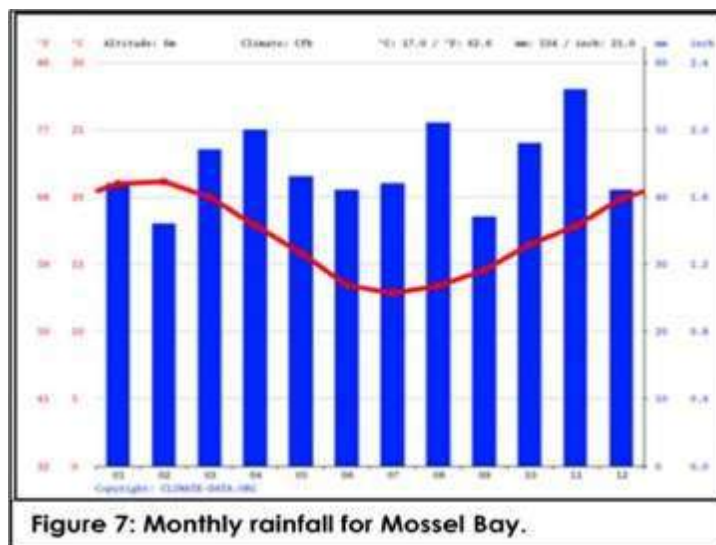


Assessment methodology

The detailed methodology followed as well as the sources of data and information used as part of this assessment are described below.

Survey timing

The study commenced as a desktop-study followed by site-specific field study on 24 January 2026. Rainfall seasonality (Figure 7) drives most ecological processes. The site is within the Fynbos Biome of the southern Cape near Mossel Bay which has an all-year rainfall season. The timing of the survey in January is therefore optimal in terms of assessing the flora and vegetation of the site. It was possible to determine the overall condition of the vegetation with a high degree of confidence.



Field survey approach

Field surveys of the site included meander searches of general areas, and active searching in habitats that were suitable for specific groups or species. Where sensitive species were encountered, co-ordinates for all individuals that occur on site were obtained as far as possible. A hand-held Garmin GPSMap 64s was used to record a track along which observations were made. Digital photographs were taken of features and habitats on site, as well as of all plant and animal species seen. Images of plants and animals recorded were uploaded to the iNaturalist website (<https://www.inaturalist.org>) and are accessible by viewing the observations for the site (use the Explore menu, zoom and pan until the study area is within the browser window, click the button "Redo search in map", and all observations for that area will be shown and listed).

Aerial imagery from Google Earth was used to identify and assess habitats on site. This included historical imagery that may show information not visible in any single dated image. Patterns identified from satellite imagery were ground-truthed. Digital photographs were taken at locations where features of interest were observed. During the field survey, particular attention was paid to ensuring that all habitat variability was ground-truthed.

Impact assessment methodology

The analysis of impact uses a detailed assessment methodology based on several factors. These factors assess the sensitivity and significance of impacts on biodiversity resources, integrating criteria for biodiversity value and impact magnitude. The details of the impact assessment methodology are provided in Appendix I.

Sources of information

Vegetation and threatened ecosystems

- South African National Biodiversity Institute (2006-2024). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, <https://bgis.sanbi.org/Projects/Detail/2258>, Version 2024.

- The description of each vegetation type includes a list of plant species that may be expected to occur.
- The conservation statuses of the vegetation types were obtained from the Revised National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004).

Conservation plans

- Information from the National Protected Areas Expansion Strategy (NPAES) was consulted for possible inclusion of the site into a protected area in future (available on <http://bgis.sanbi.org>).
- CapeNature 2024. 2023 Western Cape Biodiversity Spatial Plan and Guidelines Overview V2.0.
- South Africa Protected Areas Database (SAPAD_OR_2024_Q3) retrieved from the Department of Forestry, Fisheries and the Environment website (https://egis.environment.gov.za/data_egis/data_download/current).

Aerial imagery

- Recent satellite imagery (courtesy of Google Earth Pro). Google Earth Pro also provides historical imagery for a period up to 15 years ago, which aided in the determination of certain vegetation types and land use historically and currently present on site.
- Archive of historical aerial photography dating back to the 1930's accessed from the Department of Agriculture, Land Reform and Rural Development's (DALRRD) National Geo-spatial Information (NGI) website (<http://www.cdngiportal.co.za/cdngiportal/>).

Plant species

- Plant species information including taxonomy and distribution was obtained from the South African National Biodiversity Institute (SANBI) available on the Biodiversity Advisor website (<https://biodiversityadvisor.sanbi.org/>).

- The Red List assessments and supplementary information on habitats and distribution was obtained from SANBI's Red List (<http://redlist.sanbi.org>), World Flora Online (<https://www.worldfloraonline.org/>), Biodiversity Advisor (<https://biodiversityadvisor.sanbi.org/>), and published literature.
- Regulations published for the National Forests Act (Act 84 of 1998) (NFA) as amended, provide a list of protected tree species for South Africa. The distribution and habitat information of tree species were obtained from SANBI's Biodiversity Advisor website (<https://biodiversityadvisor.sanbi.org/>).

Animal species

- Animal species with a geographical range that includes the study area were obtained from literature (Bates et al., 2014 for reptiles, du Preez & Carruthers 2009 and <http://frogmap.adu.org.za> for frogs, Mills & Hes 1997 and Friedmann and Daly, 2004 for mammals). This was supplemented with information from the Animal Demography Unit (adu.uct.ac.za – now migrated to iNaturalist (MammalMAP)).
- Threat status, distribution, and habitat information for threatened species was obtained from the IUCN Red List (<https://www.iucnredlist.org/>).

Limitations

The following assumptions, limitations, uncertainties are listed regarding the assessment of the site:

- The assessment is based on the site visit as well as a desktop study of the available information. The time spent on site was adequate for understanding general vegetation patterns across the study area.
- Rare and threatened plant and animal species are, by their nature, usually very difficult to locate and can be easily missed. This is partially overcome by undertaking desktop research of possible species of concern. The screening tool output contains modelled distributions of all species that could occur on site, based on current knowledge of all SANBI databases.

Results

Desktop description of vegetation

The site is mapped as occurring within Garden Route Granite Fynbos (Figure 3).

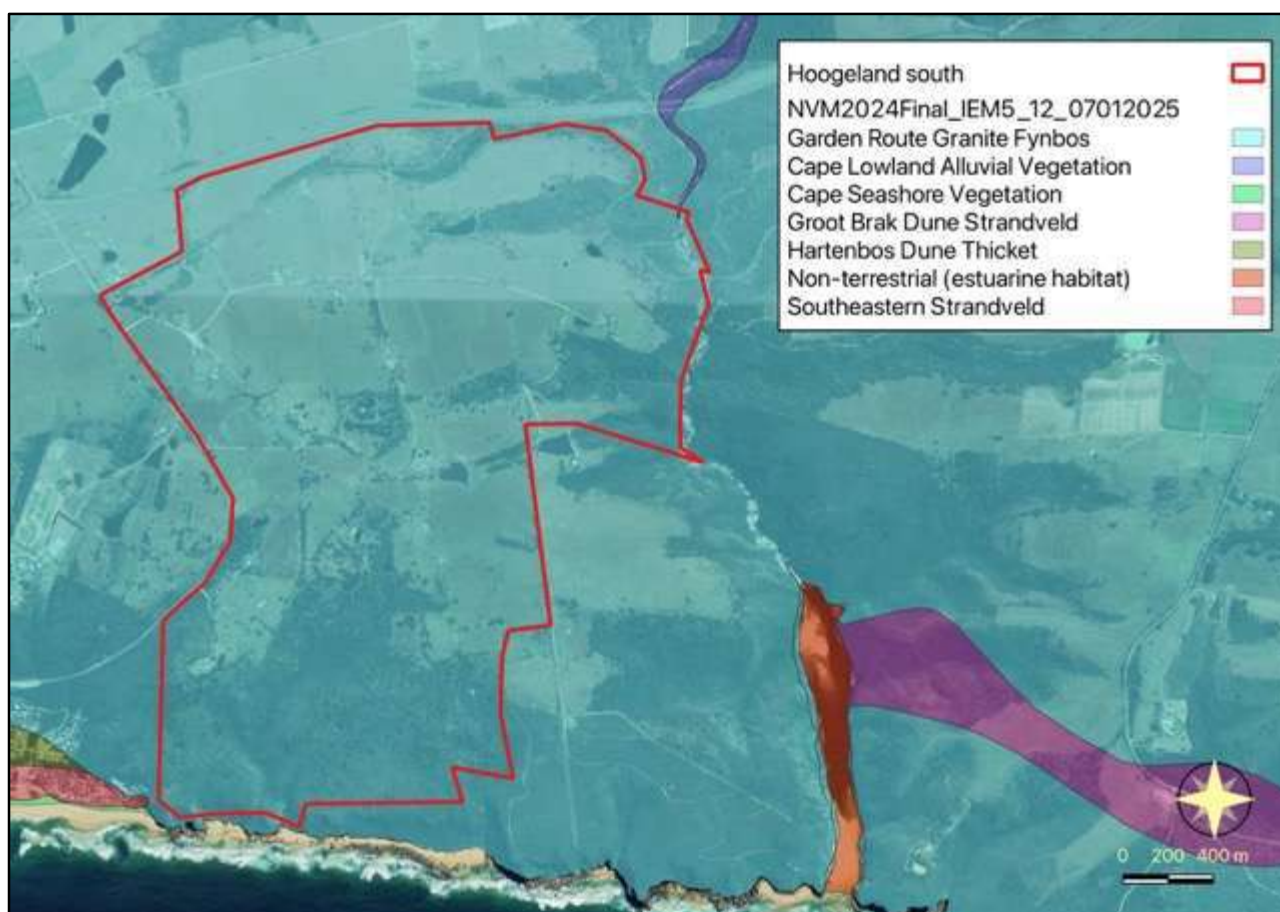


Figure 3: Regional vegetation types of the site and surrounding areas.

Garden Route Granite Fynbos

This vegetation type is found in the Western Cape Province: three main blocks south of the Outeniqua Mountains on the coastal plain from Botterberg west of Brandwaghoogte (south of Robinson Pass) to Groot Brak River; the largest block from Groot Brak River to Woodfield near the Wilderness (with a few strips along the coast from Bothastrand to the

Wilderness); lastly, north of the lakes from Woodville to Hoogekraal Pass, west of Karatara. Altitude 0–300 m.

Vegetation & Landscape Features

Moderately undulating plains and undulating hills on the coastal forelands. Dense proteoid and ericoid shrubby grassland. Proteoid and graminoid fynbos are dominant with ericaceous fynbos in seeps. In the west, most remnants of this type are dominated by proteas. Eastwards graminoid and ericaceous fynbos are dominant on the flat plateaus, with proteas confined to the steep slopes.

Geology & Soils

George Batholith of the Cape Granite Suite. Deep, prismacutanic- and pedocutanic-dominated soils typical of Db land types (mainly).

Climate

MAP 350–880 mm (mean: 600 mm), with a slight low in early winter. Mean daily maximum and minimum temperatures 27.8°C and 6.8°C for January–February and July, respectively. Frost incidence 2 or 3 days per year.

Important Taxa

Growth form	Species
Tall shrubs	<i>Passerina corymbosa</i> (d), <i>Cliffortia serpyllifolia</i> , <i>Protea coronata</i> , <i>P. lanceolata</i> , <i>P. neriifolia</i> .
Low shrubs	<i>Erica discolor</i> variant 'speciosa' (d), <i>E. peltata</i> (d), <i>Phyllica confusa</i> (d), <i>Syncarpha paniculata</i> (d), <i>Agathosma ovata</i> , <i>Anthospermum prostratum</i> , <i>Aspalathus asparagoides</i> , <i>Cliffortia falcata</i> , <i>Cullumia bisulca</i> , <i>Erica canaliculata</i> , <i>E. diaphana</i> , <i>E. formosa</i> , <i>Eriocephalus africanus</i> , <i>Hermannia angularis</i> , <i>Leucadendron salignum</i> , <i>Lobelia tomentosa</i> , <i>Metalasia pungens</i> , <i>Mimetes cucullatus</i> , <i>Pelargonium fruticosum</i> , <i>Relhania calycina</i> .
Succulent shrub	<i>Lampranthus sociorum</i> .
Semiparasitic shrubs	<i>Osyris compressa</i> , <i>Thesium virgatum</i> .
Semiparasitic epiphytic shrub	<i>Viscum capense</i> .
Geophytic herb	<i>Schizaea pectinata</i> .

Graminoid

Tetraria cuspidata (d), *Brachiaria serrata*, *Eragrostis capensis*, *Ficinia nigrescens*,
Heteropogon contortus, *Pentaschistis eriostoma*, *Restio triticeus*, *Themeda triandra*.

Conservation status of broad vegetation types

The threat status of the vegetation types in which the site is mapped is in accordance with the Revised National List of Ecosystems (Government Notice No 2747 of 18 November 2022) published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), which lists national vegetation types that are afforded protection on the basis of rates of transformation.

Vegetation Type	Conservation status
	Revised National Ecosystem List (NEM:BA) (2022)
Garden Route Granite Fynbos	Critically Endangered

The characteristics of the vegetation found on site described in the on-site habitat assessment below, determine whether vegetation of a listed ecosystem occurs on site or not. If there is no natural habitat remaining on site then the sensitivity is LOW with respect to this attribute, or, if natural habitat occurs on site then those areas would have VERY HIGH sensitivity with respect to this attribute.

Ecosystem status in accordance with Section 52(2) of National Environmental Management: Biodiversity Act (Act No. 10 of 2004):

- i. **Critically endangered** ecosystems are ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention, and are subject to an extremely high risk of irreversible transformation;
- ii. **Endangered** ecosystems are ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, and are subject to a significant risk of irreversible transformation (although to a lower extent than critically endangered ecosystems;
- iii. **Vulnerable** ecosystems are ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention; their risk of irreversible transformation is less than for critically endangered or endangered ecosystems; and
- iv. **Protected** ecosystems are ecosystems of high conservation value or of high national or provincial importance, although they are not under immediate risk of irreversible transformation, such as critically endangered, endangered or vulnerable ecosystems; and
- v. **Degraded**/sacrificial zones that could be used in support of sustainable development without impacting adversely on the environment.

Biodiversity Conservation Plans

The Western Cape Biodiversity Spatial Plan (WCBSP) classifies the habitats of the province according to conservation value in decreasing value, as follows:

1. Protected Areas (PA);
2. Critical Biodiversity Areas 1 (CBA1);
3. Critical Biodiversity Areas 2 (CBA2);
4. Ecological Support Area 1 (ESA1);
5. Ecological Support Area 2 (ESA2)

The WCBSP map shows that most of the uncultivated parts of the study area are within various designated conservation zones. These include "CBA1: Terrestrial" and "CBA2: Terrestrial" (Figure 4). The CBA1 and CBA2 areas are required for meeting biodiversity targets. The most important biodiversity areas are the natural areas in the southern part of the site that are within "CBA1: Terrestrial" areas. These are part of a larger coastal CBA1 corridor that extends from Wilderness all the way to Great Brak River. This is a critical landscape-level corridor that is essential to maintain in a natural state. The "CBA2:

Terrestrial" areas on site are fingers of valley vegetation that extend from the Maalgate River valley into the site. They are part of a coastal-inland corridor along the Maalgate River that is locally important for maintaining the ecosystem associated with this river valley.

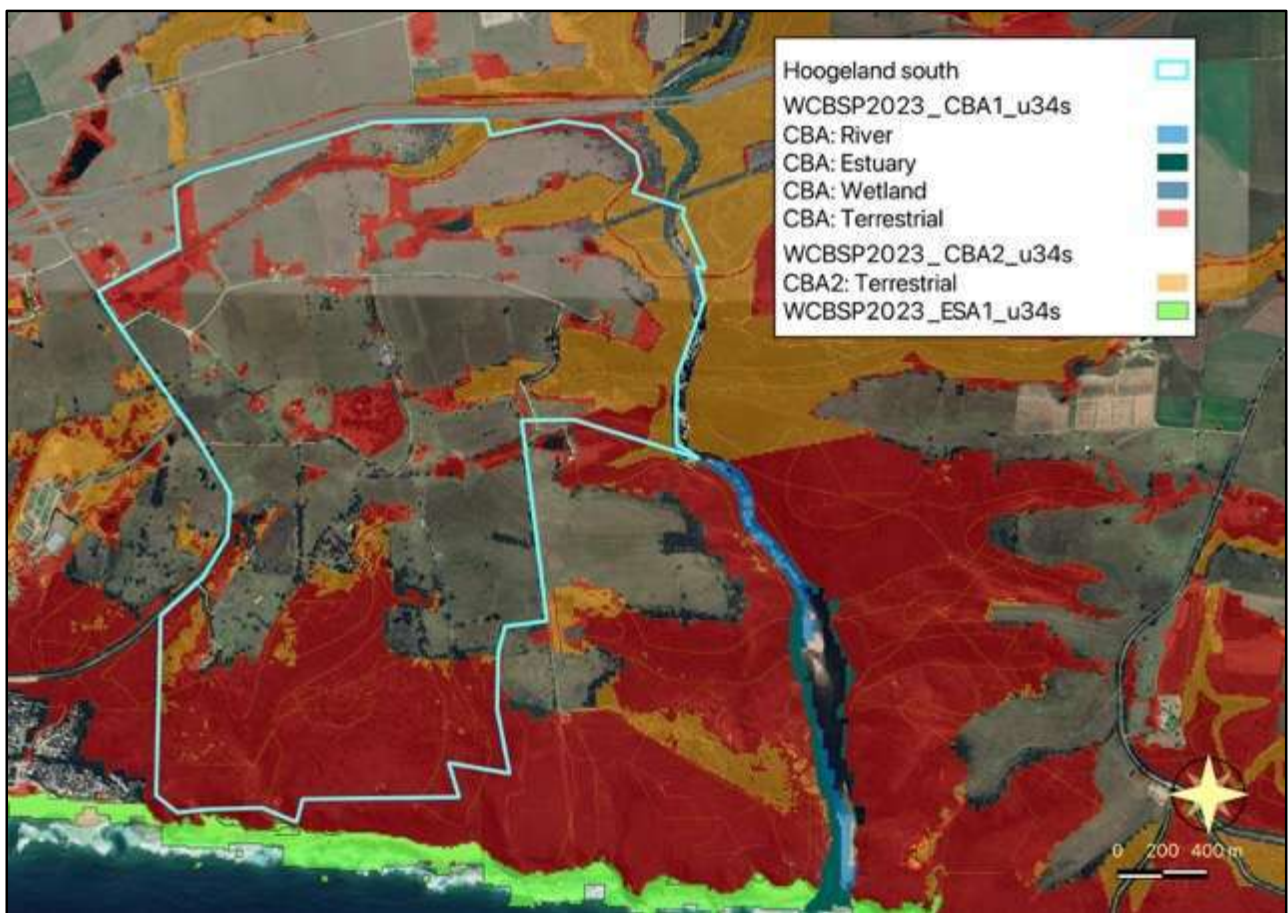


Figure 4: Western Cape Biodiversity Spatial Plan for the site.

Historical disturbance

An aerial photograph from 1958 show that the study area has been cultivated according to its current pattern for at least seventy years, probably a lot longer (see **Error! Reference source not found.**). The current extent of cultivation on site closely matches that for 1958, with the exception that there are some small local patches that were cultivated that have been left to return to a more natural state. The extent of these areas is evident in an aerial photograph from 1939 (Figure 11). The river valley and the valleys extending in from the coast have always contained forest in the valley bottoms, thicket on the midslopes and fynbos on the upper, more exposed areas, although the extent in 1958 is slightly less than at the current date - this is interpreted as invasion of the forest ecotone areas on the upper slopes by alien invasive shrubs and trees over time, which are currently still present in this zone on site.



Figure 10: Aerial photograph from 1958 showing historical extent of cultivation.

Further observations from the 1958 aerial photograph are that the current location of houses, farm dams and internal roads have remained relatively stable over this period. The overall implication is that current patterns on site have been stable for a long period of time, except for an increase in invasion by alien species, a pattern that has been observed throughout the country since the 1990s.

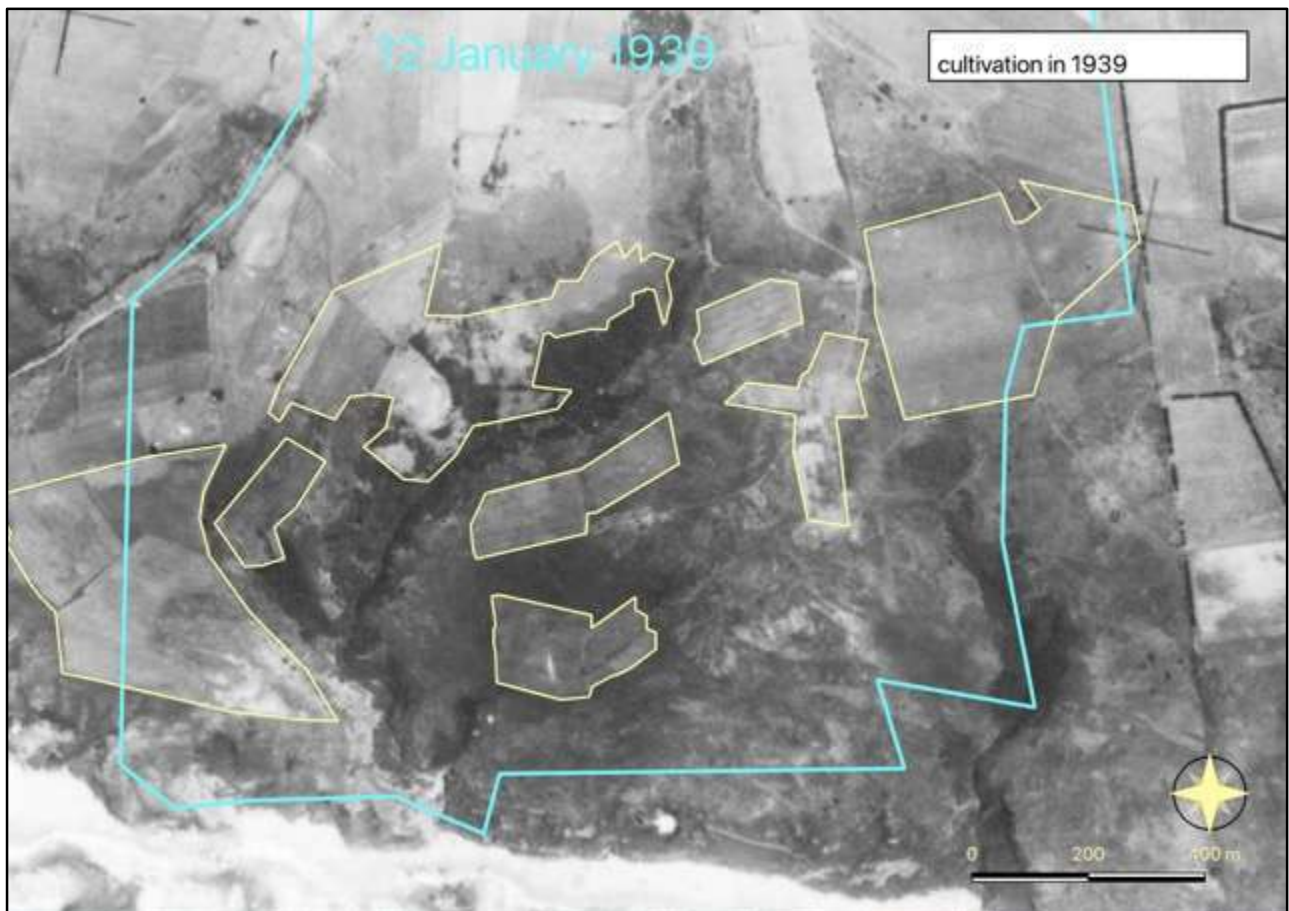


Figure 11: Aerial photograph from 1939 showing historical cultivation in the southern parts of the site. These areas now contain secondary vegetation.

Vegetation found on site

A map of habitats / landcover for the site is provided in Figure 12.

The general pattern on site is that all the upland, flatter parts of the site have been cultivated. These areas would historically have been covered by fynbos, probably with wetland vegetation in the bottom of any shallow drainage valleys. In some cases, the position of farm dams follows the line of these drainage valleys. The valley bottoms of the main valleys currently still contain intact forest, which transitions to thicket upslope, and eventually to fynbos on the summits. The only real remaining areas of fynbos are in the southern part of the site, but these are moderately to heavily invaded by alien invasive species, partly due to historical disturbance associated with cultivation.

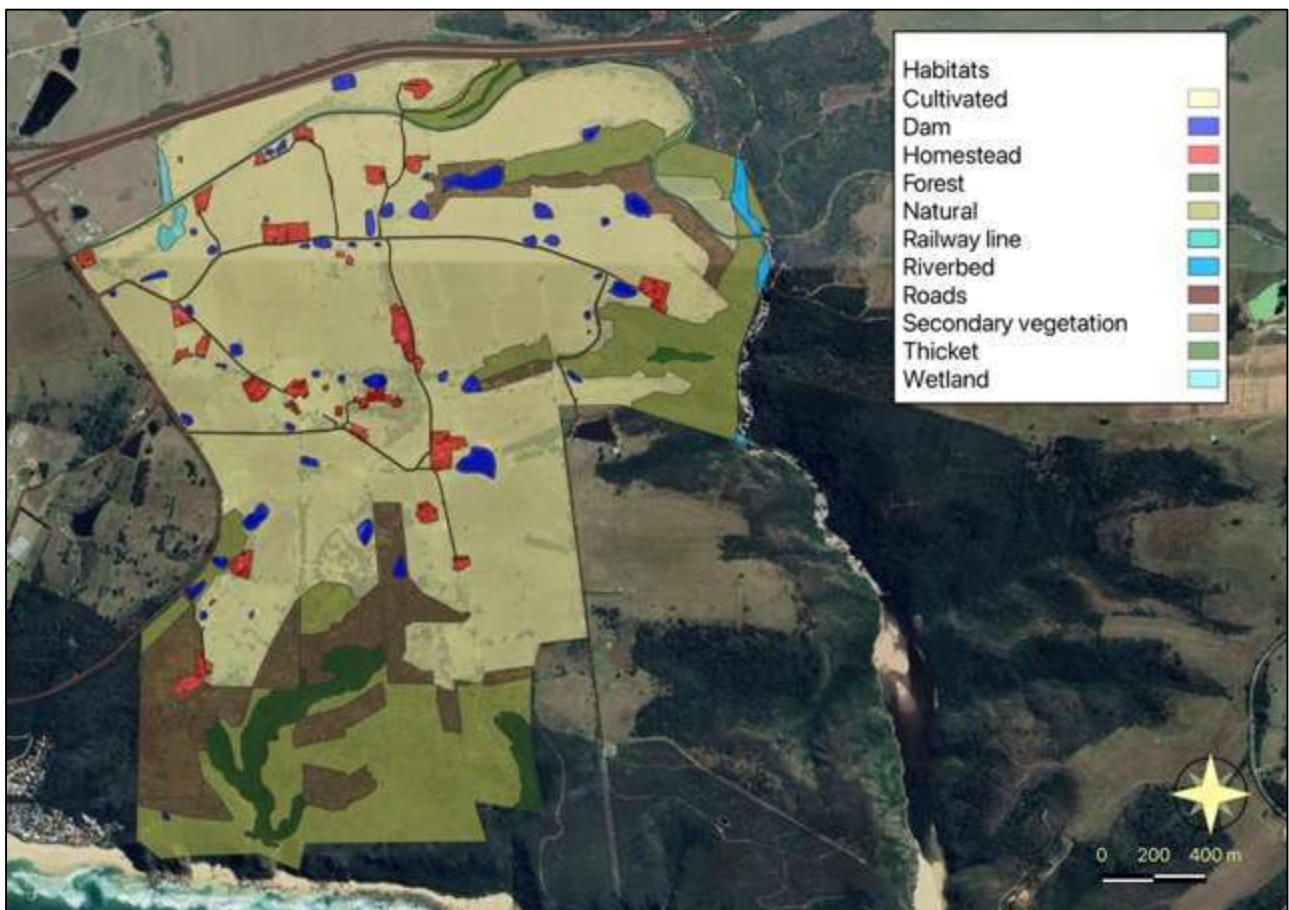


Figure 12: Habitats on site.

The definition of natural vegetation in NEMA is irrespective of the levels of alien vegetation, therefore these heavily invaded areas are also considered to be natural for the purposes of the assessment.

A full checklist of plant species found on site is provided in Appendix II. A total of 29 species were recorded in the general footprint area during the reconnaissance survey. The natural vegetation on site is expected to contain approximately 400 plant species. This is based on a checklist of plant species from a similar-sized area with similar vegetation west of Herolds Bay.

Seven of the species recorded on site are alien species. The declared alien invasive species found on site are *Acacia dealbata** (NEMBA Category 2), *Acacia decurrens** (NEMBA Category 2), *Acacia mearnsii* (Black Wattle, NEMBA Category 2), *Acacia melanoxylon* (Blackwood, NEMBA Category 2), *Agave americana** (NEMBA Category 3), *Phytolacca dioica** (NEMBA Category 3), and *Pyracantha angustifolia** (NEMBA Category 1b). It is expected that many more species are present and will be detected during detailed field surveys. It has been observed along this coastline more than 30 years ago (Hoare 1993) that *Acacia cyclops* (rooikrans) was already a persistent invasive species causing vegetation degradation, especially close to the coast.

It is confirmed that the site occurs within a Listed Ecosystem, as listed in the Revised National List of Ecosystems that are Threatened and need of protection (GN2747 of 2022) and therefore has VERY HIGH sensitivity with respect to this attribute.

Plant Species of Conservation Concern

The SCC that potentially occur on site were specifically searched for and their habitat assessed for their probability of occurrence. The probability of occurrence was rated on a scale from NEGLIGIBLE (no probability), LOW (habitat suitable but low quality; and/or conspicuous plant but not found on site during search; or out of known distribution range); MODERATE (habitat suitable but may be overlooked due to being inconspicuous); HIGH (habitat suitable and not transformed); to CONFIRMED. The results of the species assessments are recorded in the following table:

Taxon	IUCN status*	Distribution	Habitat	Probability of occurrence
<i>Euchaetis albertiniana</i>	EN	Albertinia (possibly De Hoop) to George.	Deep sandy habitats associated with limestone.	HIGH
<i>Lampranthus pauciflorus</i>	EN	Found in the Western Cape from De Hoop Cape Infanta to Keurbooms, Plettenberg Bay. Recorded frequently since the conservation status was assessed, therefore the status of this species is based on inaccurate data.	On rocky coastal slopes and clay hills.	HIGH
<i>Sensitive species 18</i>	EN	Swellendam to Little Brak River, inland to Herbetsdale.	Renosterveld-thicket mosaic in gravelly clay soil on south-facing slopes. Well drained slopes, mainly amongst grass or under Fynbos where they form large clusters.	MODERATE
<i>Sensitive species 85</i>	EN	Cape Flats to Gqeberha.	Lowland sandy flats, stabilised dunes and coastal rock promontories.	MODERATE
<i>Sensitive species 264</i>	EN	Mossel Bay to Herbetsdale and Great Brak River.	Renosterveld, on slopes of low hills. Renosterveld and sparse grasslands in valley bushveld.	LOW / MODERATE Possibly out of range, small inconspicuous plant)
<i>Sensitive species 642</i>	CR	Western Cape near Great Brak River	It grows in Renosterveld with karroid elements, in sandy soil, completely under the protection of small shrubs, well hidden in fallen leaf debris or among moss and lichen.	LOW / MODERATE Possibly out of range, small inconspicuous plant)

Taxon	IUCN status*	Distribution	Habitat	Probability of occurrence
<i>Sensitive species 1012</i>	EN	Riversdale to Knysna and northern slopes of Langeberg Mountains.	Relatively dry to moist slopes, up to 200 m.	HIGH
<i>Sensitive species 1121</i>	VU	George to Port Alfred.	On stabilised (fixed) dunes close to the shoreline. 0-150 m.	MODERATE

A plant species list from west of Herold's Bay (similar-sized area with similar habitats and about 3 km away) contained the following listed species - these species all have a high likelihood of occurring on site within untransformed habitats:

1. *Euchaetis albertiniana* (Endangered)
2. *Cullumia carlinoides* (Near threatened)
3. *Lampranthus pauciflorus* (Endangered)
4. *Muraltia knysnaensis* (Endangered)
5. *Oxalis pendulifolia* (Near threatened)
6. *Erica glandulosa* subsp *fourcadei* (Vulnerable)
7. *Hermannia lavandulifolia* (Vulnerable)
8. *Gladiolus vaginatus* (Vulnerable)
9. *Freesia leichtlinii* ssp. *alba* (Near threatened)
10. *Asparagus lignosus* (Near threatened)
11. *Gnidia chrysophylla* (Near threatened)
12. *Acmadenia tetragona* (Near threatened)
13. *Agathosma muirii* (Vulnerable)
14. *Freesia caryophyllacea* (Near threatened)
15. *Freesia fergusoniae* (Vulnerable) (July-September)

Based on the high probability of occurrence of several SCC, the natural habitat on site has at least MEDIUM sensitivity with respect to the Plant Species Theme (suspected habitat for SCC listed as as Critically Endangered, Endangered or Vulnerable). The following applies to the site:

1. The MEDIUM sensitivity of the site for the Terrestrial Plant Species Theme is confirmed (suspected habitat for SCC listed as as Critically Endangered, Endangered or Vulnerable).
2. Based on the desktop assessment and reconnaissance of the site, it is probable that the natural areas on site will be confirmed habitat for more than one of these species.

Where SCC are found on site or confirmed suitable habitat exists, a Terrestrial Plant Species Specialist Assessment must be submitted in accordance with the requirements specified for VERY HIGH and HIGH sensitivity (GN 1150: PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL PLANT SPECIES). Where no SCC are found on site during the site inspection or the habitat is confirmed to be unlikely to support SCC, a Terrestrial Plant Species Compliance Statement must be submitted.

Animal Species of Conservation Concern

According to the screening tool, six animal species are flagged for the site. These are described in more detail below, including an assessment of the likelihood of occurring on site. The probability of occurrence on site was rated on a scale from NEGLIGIBLE (no probability), LOW (habitat suitable but low quality and conspicuous but not found on site during search), MODERATE (habitat suitable but may be overlooked due to being inconspicuous or mobile), HIGH (habitat suitable and not transformed, distribution within wandering range) to CONFIRMED.

Taxon	IUCN Status	Distribution	Habitat	Probability of occurrence
<i>Aves-Circus maurus</i> (Black harrier)	EN	South Africa and Namibia	Cool, dry-country, frequenting coastal and montane fynbos, highland grasslands, Karoo subdesert scrub, open plains with low shrubs and croplands. It often breeds close to coastal and upland marshes with tall shrubs or reeds, occurring in dry steppe and grassland areas further north in the non-breeding season. In the Western Cape of South Africa it is most abundant in coastal and montane fynbos. It prefers open ground with low vegetation for hunting, where it feeds on a diet comprising mainly of small	MODERATE

			mammals and birds. Damp sites, near vleis, marshes or streams, are preferred for breeding, while south-facing slopes are preferred in montane areas.	
Aves- <i>Circus ranivorus</i> (African marsh harrier)	EN	Widespread but sparsely distributed throughout central, eastern and southern Africa.	It is dependent on permanent wetlands for breeding, feeding and roosting, and is found in marshes and reedbeds. The main threat to this species is loss and degradation of wetlands. It also hunts over drier floodplains, grasslands, croplands, and Fynbos, where it preys mainly on small rodents, as well as birds, reptiles, frogs and insects.	LOW
Aves- <i>Polemaetus bellicosus</i> (Martial eagle)	EN	Extensive range across much of sub-Saharan Africa, and south to southern and South Africa.	They nest in large trees or pylons often located on hill sides. Spend most of the time hunting or soaring high above the ground (generally invisible to the naked eye). They often perch on dead branches and trees that give a wide view of the areas and generally return to these perches when resting.	MODERATE
Aves- <i>Neotis denhami</i> (Denham's bustard)	VU	Wide but fragmented Afrotropical range. It occurs widely but sparsely over much of the mesic eastern half of South Africa.	In the Western Cape, it can be locally numerous in mosaics of cultivated pastures, agricultural croplands and natural vegetation with seasonal differences in the use of each habitat.	HIGH
Aves- <i>Bradypterus sylvaticus</i> (Knysna warbler)	VU	Restricted and fragmented distribution in Eastern and Western Cape. One sub-population occurs in the Garden Route between Tsitsikamma and Stilbaai.	It occurs along the edges of Afrotemperate forests and in thick, tangled vegetation along the banks of watercourses or drainage lines in forest patches in the Fynbos Biome.	HIGH, possibly confirmed
Aves- <i>Stephanoetus coronatus</i> (Crowned Eagle)	VU	Sub-Saharan Africa and eastern parts of southern Africa, as far west as Gqebehra. West of this there are only incidental records.	Riparian woodlands and forests.	MODERATE
Invertebrate- <i>Aneuryphymus montanus</i> (Yellow-winged agile grasshopper)	VU	Historically known from localities in the Cape, but recently from Betty's Bay to Swellendam. Type locality from	Rocky arid environments with fynbos vegetation (Brown, 1960). It has been collected "amongst partly burnt stands of evergreen Sclerophyll in rocky foothills". It is a medium-sized, robust, active geophilous insect which readily flies off when disturbed and is easily distinguished in flight. When observed, occurs in obvious numbers.	NEGLIGIBLE

		Langkloof Valley west of Kareedouw.	The type locality and two recent observations are all associated with major Cape Fold mountain ranges.	
Sensitive species 13	VU	Widely distributed across central, western and southern Africa. In South Africa ranges coastally and inland from Umfolozi River System in KwaZulu-Natal to the Eastern Cape to as far as George in the Western Cape.	Thrives in a wide range of forested and wooded habitats, including primary and secondary forests, gallery forests, dry forest patches, coastal scrub and farmlands. The South African population prefers coastal forest, thick coastal bushes and thicket where they can hide from predators and rest; the species requires permanent concealment. There are several records of the species in areas around George, all within thicket or forest areas.	HIGH

Based on the high probability of occurrence of several SCC, the natural habitat on site has at least MEDIUM sensitivity with respect to the Animal Species Theme (suspected habitat for SCC listed as Critically Endangered, Endangered or Vulnerable). The following applies to the site:

1. The MEDIUM sensitivity of the site for the Terrestrial Animal Species Theme is confirmed (suspected habitat for SCC listed as Critically Endangered, Endangered or Vulnerable).
2. Based on the desktop assessment and reconnaissance of the site, it is probable that the natural areas on site will be confirmed habitat for at least one of these species.

Where SCC are found on site or confirmed suitable habitat exists, a Terrestrial Animal Species Specialist Assessment must be submitted in accordance with the requirements specified for VERY HIGH and HIGH sensitivity (GN 1150: PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL ANIMAL SPECIES). Where no SCC are found on site during the site inspection or the habitat is confirmed to be unlikely to support SCC, a Terrestrial Animal Species Compliance Statement must be submitted.

Outcome of the assessment

Site ecological importance

The Species Environmental Assessment Guidelines require that a Site Ecological Importance is calculated for each habitat on site, and provides methodology for making this calculation.

As per the Species Environmental Assessment Guidelines, Site Ecological Importance (SEI) is calculated as a function of the Biodiversity Importance (BI) of the receptor and its resilience to impacts ($SEI = BI \times RR$). The Biodiversity Importance (BI) in turn is a function of Conservation Importance (CI) and Functional Integrity (FI), i.e. $BI = CI \times FI$.

Sensitivity scores provided in the Species Environmental Assessment Guidelines allow evaluation relative to ecosystem status and/or presence of sensitive species.

Habitat	Conservation importance (CI)	Functional integrity (FI)	Biodiversity Importance (BI = CI x FI)	Receptor resilience (RR)	Site Ecological Importance SEI = BI x RR)
Degraded ecotone areas (mixed with alien trees)	High Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km ² . IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A: <i>Bradypterus sylvaticus</i> (Vulnerable A3c; B2b(ii,iii,v); C1+2a(i)), <i>Stephanoaetus coronatus</i> (Vulnerable D1C1),	Medium Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.	Medium	Medium Based on <u>current</u> condition, will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.	Medium

	Sensitive species 8 (Vulnerable C1, C2a(i)).				
Transformed areas (roads, buildings, arena)	Very low No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very low	Very High Habitat that can recover rapidly.	Very low

The calculation of Site Ecological Importance includes an explicit recognition of the ability of each ecosystem to tolerate and recover from disturbance. Guidelines for development activities within different importance levels are given in the table below.

Site ecological importance	Interpretation in relation to proposed development activities
Very high	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/ not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/ unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities
Very low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

Habitat sensitivity

Terrestrial Biodiversity Theme

According to the "PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL BIODIVERSITY", there are two sensitivity classes for Terrestrial Biodiversity Theme: VERY HIGH or LOW. The VERY HIGH category includes any area of natural vegetation that falls within one of the following categories:

1. terrestrial Critical Biodiversity Areas (CBAs).
2. terrestrial Ecological Support Areas (ESAs).
3. protected areas as defined by the National Environmental Management: Protected Areas Act, 2004.
4. priority areas for protected area expansion.

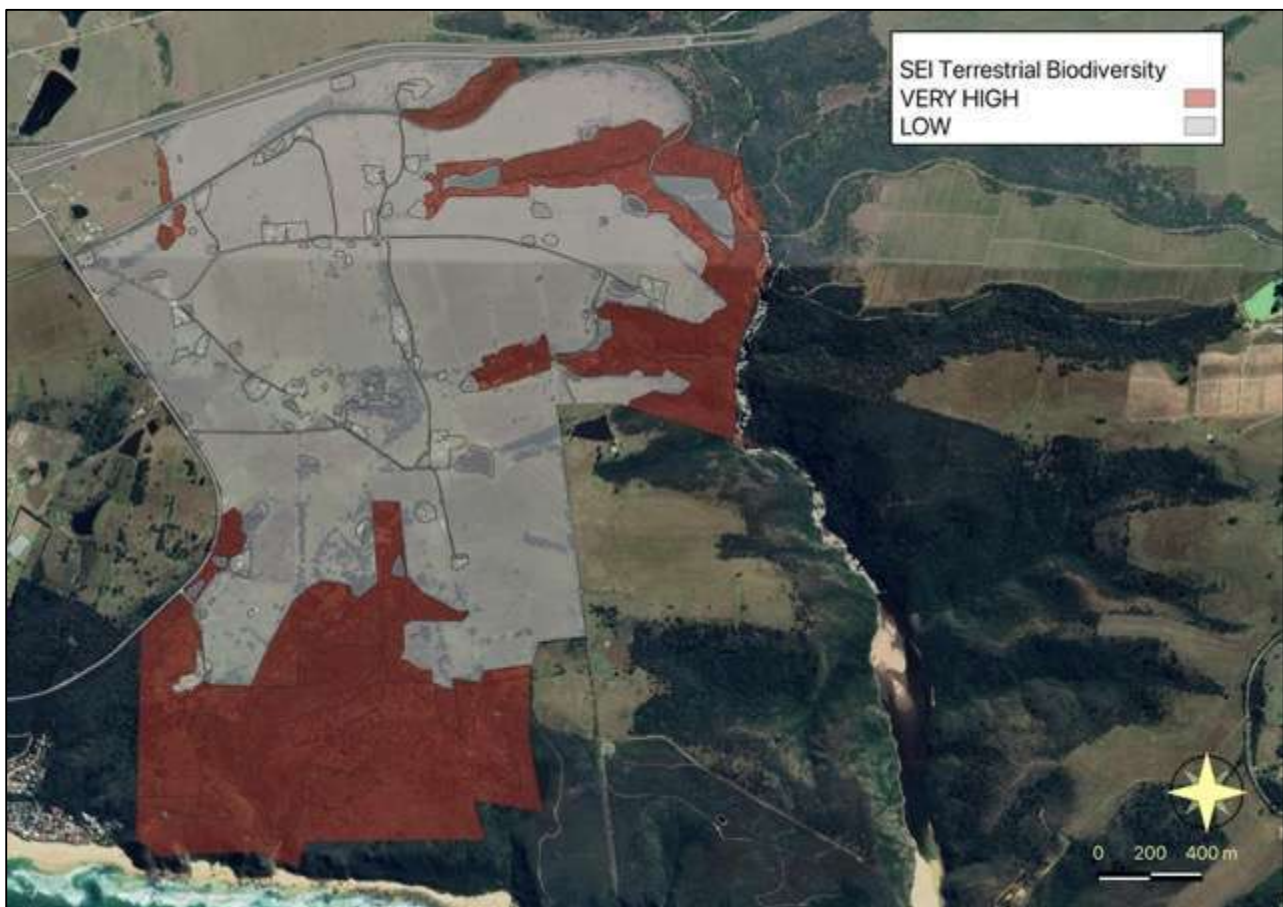


Figure 5: Site Ecological Importance for Terrestrial Biodiversity Theme.

5. Strategic Water Source Areas (SWSAs).
6. Freshwater Ecosystem Priority Areas (FEPA) subcatchments.
7. indigenous forests.

Any area that is in a natural state and that falls within one of these categories is therefore automatically assigned a sensitivity class of VERY HIGH and requires a Terrestrial Biodiversity Specialist Assessment. Areas that do not fall into one of these categories are automatically assigned a sensitivity class of LOW. For the current site, the entire site is mapped within the VERY HIGH category.

The definition of natural vegetation, according to the National Environmental Management Act, 1998 (Act No. 107 of 1998) is "*vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding 10 years.*" According to this definition, the vegetation on site (including secondary vegetation) is legally in a natural state.

The entire site is within a Strategic Water Source Area (SWSA). Significant parts of the site are within CBA1 or CBA2 areas, and there is natural forest on site. It is confirmed from the site visit that areas mapped as "Natural," comprising Fynbos, Forest and Ecotone areas, are in a natural state. They therefore have VERY HIGH sensitivity according to the Terrestrial Biodiversity Theme, which applies to all natural habitats on site, as well as secondary vegetation (Figure 14).

Terrestrial Plant Species Theme

A desktop assessment identified a list of terrestrial plant SCC that have a geographical distribution that includes the site and habitat requirements that are met by those that occur on site. Many of these are species that are flagged for the site in the Screening Tool report.

There are also several additional terrestrial plant SCC that are confirmed to occur on a site less than 3 km away with almost identical habitat conditions. It is therefore assumed

that these species have a high likelihood of being able to occur on in the current study area.

A map of Site Ecological Importance (SEI) for the Plant Species Theme is provided in Figure 15. The most important habitat for plant SCC is fynbos and areas transitional to thicket.

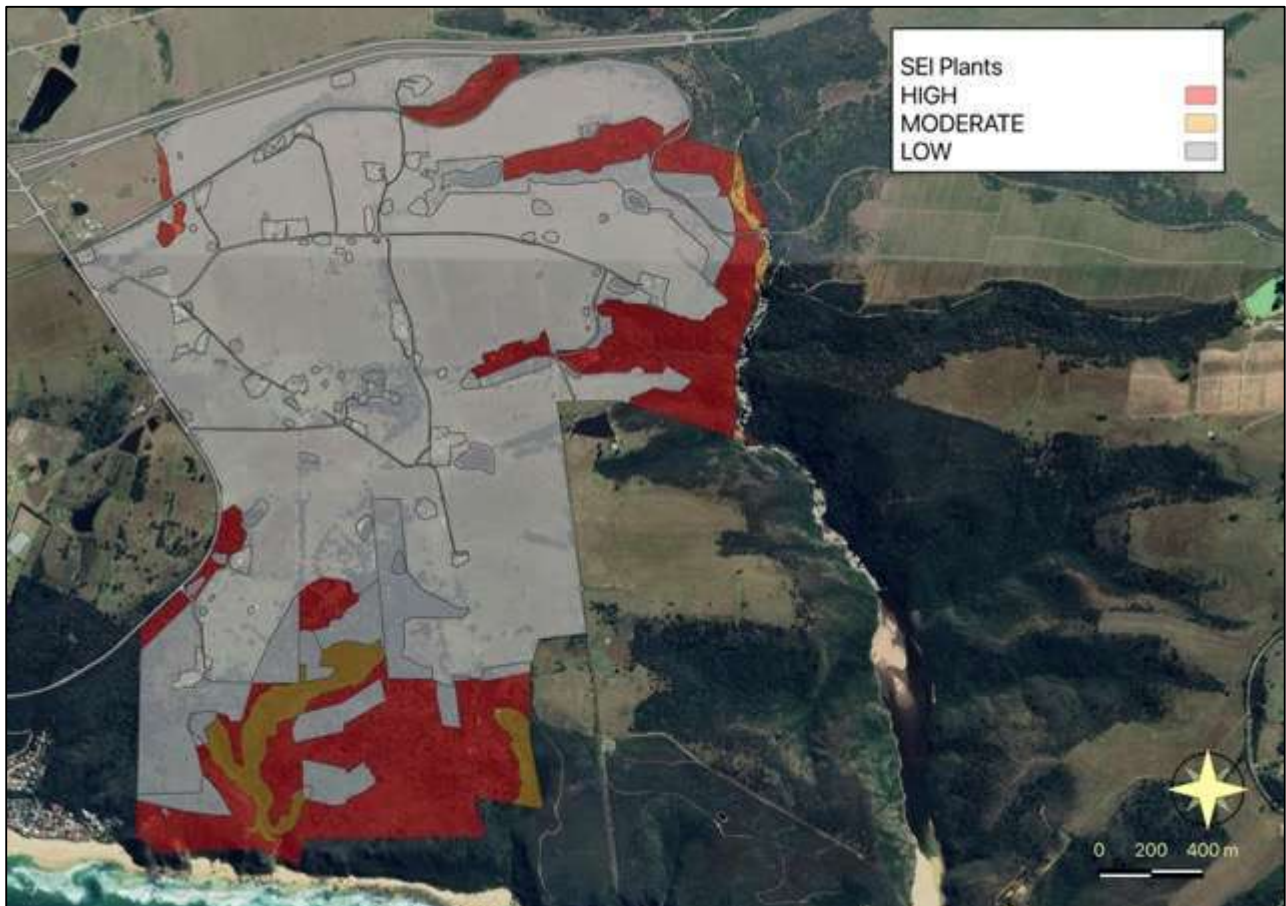


Figure 15: Site Ecological Importance for Plant Species Theme.

Terrestrial Animal Species Theme

A map of Site Ecological Importance (SEI) for the Animal Species Theme is provided in Figure 16. The most important habitat for animal SCC is forest and thicket. All remaining areas, including cultivated and fallow lands, are potential habitat for SCC that are foraging birds.

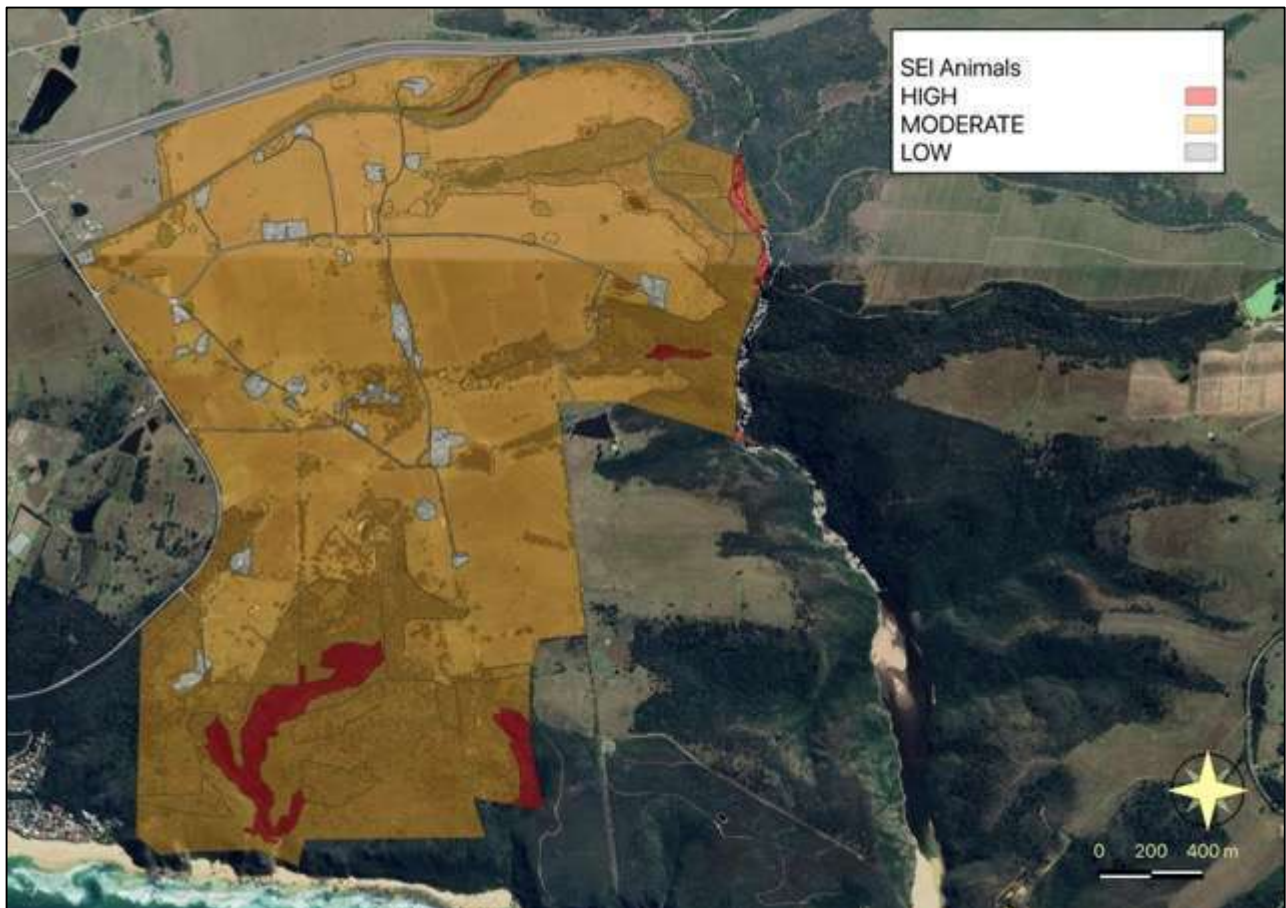


Figure 6: Site Ecological Importance for Animal Species Theme.

Conclusion

Desktop information, field data collection and mapping from aerial imagery provides the following verifications of patterns for various themes:

PLANT SPECIES THEME:

1. The site was flagged as having MEDIUM sensitivity with respect to the Terrestrial Plant Species Theme.
2. The site inspection and desktop research ascertains that the site sensitivity is MEDIUM (suspected habitat for SCC listed as Critically Endangered, Endangered or Vulnerable). Based on available information, it is likely that the sensitivity is HIGH. This needs to be by detailed field assessments.
3. The most important habitat for plant SCC is fynbos.

ANIMAL SPECIES THEME:

1. The site was flagged as having MEDIUM sensitivity with respect to the Terrestrial Animal Species Theme.
2. The site inspection and desktop research confirms this MEDIUM sensitivity (suspected habitat for SCC listed as as Critically Endangered, Endangered or Vulnerable).
3. The most important habitat for animal SCC is forest (and thicket).

TERRESTRIAL BIODIVERSITY THEME:

1. The site consists of a mosaic of natural habitat and historically cultivated areas, including some areas where cultivation was abandoned and have recovered to a secondary habitat state.
2. The site was flagged as having VERY HIGH sensitivity with respect to the Terrestrial Biodiversity Theme. The site inspection and desktop research confirms this sensitivity for all areas that are in a natural state, as well as areas that meet the legal definition for "natural".

Recommendations

Possible mitigation and avoidance

Planning avoidance and minimisation measures

- This baseline study has mapped sensitive receptors that should be treated as exclusion zones for project design. Where appropriate, depending on the nature of proposed activities, the exclusion zones will need to include a buffer zone surrounding sensitive habitats.
- Adjust development layout to avoid very high sensitivity CBAs and known habitat of threatened species.
- Employ construction best practices to minimise soil disturbance, runoff, and vegetation clearing within buffers.

A layout taking these into account will allow for maintaining the ecological integrity and reducing landscape interference overall.

Restoration/rehabilitation measures

- Develop and implement comprehensive Alien Invasive Species Management Plans pre- and post-construction.
- Plan and monitor phased ecological restoration of disturbed areas, including native species replanting and erosion control.
- Integrate long-term monitoring to assess effectiveness of mitigation and enable adaptive management.

Requirements for EIA

Once a draft layout / project proposal has been compiled, it will be necessary to undertake a detailed assessment to determine potential impacts on sensitive biodiversity receptors. For any infrastructure that is proposed within natural areas, it will be necessary to undertake detailed field surveys within those footprint areas to characterise the biodiversity that may be affected.

In addition to the required field surveys of footprint areas, it is required that baseline data within different habitats is collected for sensitivity verification. This should cover all main habitats that occur on site, namely forest, thicket and fynbos, as well as any secondary vegetation. The outcome will additionally provide information on the alien invasive species that occur in the study area, as well as their relative abundance. This is important information for compiling an alien invasive management plan.

There are several threatened plant species that could occur on site. It is recommended that suitable habitat is carefully searched to determine whether they occur there or not. This is irrespective of whether project components are proposed to be placed there or not. The rationale is to provide information for overall ecological management of the project area, including management of upslope and secondary impacts associated with the proposed development.

There are two animal species with a high probability of occurring within thicket/forest habitat on site, namely Knysna Warbler and Sensitive species 13. To adequately confirm the presence of these two species, the use of camera traps should be recommended to detect them. This is required to confirm the sensitivity of habitats for the Animal Species Theme.

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Appendix I

Plant species recorded in coastal habitats that include the site

*Acacia dealbata** (NEMBA Category 2)
*Acacia decurrens** (NEMBA Category 2)
*Acacia mearnsii** (NEMBA Category 2)
*Agave americana** (NEMBA Category 3)
*Phytolacca dioica** (NEMBA Category 3)
*Pyracantha angustifolia** (NEMBA Category 1b)

ANNEXURE R:

Aquatic Site Sensitivity Report



Aquatic Site Sensitivity and Baseline Report

Hoogekraal Project: Agricultural Land Rationalisation and
Agri-Village Development on the Hoogekraal Farms



Date:

19th April 2026

Prepared For:

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Executive Summary

Upstream Consulting was appointed by Hilland Environmental to undertake a site sensitivity verification, baseline aquatic assessment, for a proposed development area comprising approximately 40 farm portions of Farm Hoogekraal No. 238 near Glentana within the George Local Municipality, Western Cape. The proposal involves the rationalisation of multiple farm units into cooperative agricultural units, including the establishment of an agri-village for farm occupiers.

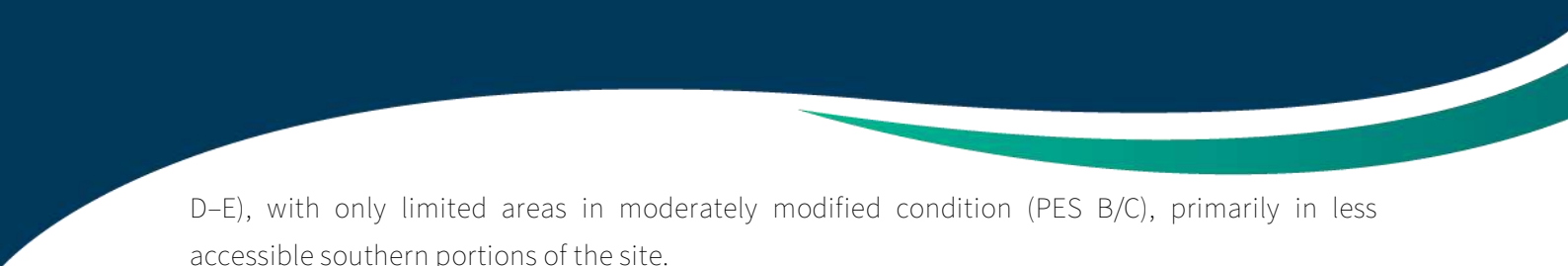
The primary objective of this study was to characterise the spatial extent, ecological condition, hydrogeomorphic classification, and sensitivity of aquatic ecosystems within the study area to inform environmental planning and future land-use decision-making. The assessment combined desktop GIS-based analysis with rapid field verification conducted on 17 April 2026, supported by national biodiversity, hydrological, and conservation datasets.

The National Web-based Environmental Screening Tool identified the site as containing areas of both Very High and Low aquatic sensitivity. The Very High sensitivity classification is largely driven by the presence of Strategic Water Source Areas, Critical Biodiversity Areas, Ecological Support Areas, and mapped watercourses. These findings were confirmed through site verification, although the sensitivity reflects both local aquatic features and broader catchment-scale ecological importance.

The study area is located within a coastal plateau environment characterised by moderate rainfall, sandy soils derived from Cape Supergroup geology, and a gently sloping topography that supports multiple non-perennial drainage lines feeding the Maalgate River system. Hydrological conditions are strongly seasonal, with seepage zones, valley bottom wetlands, and episodic streamflow influenced by rainfall, soil permeability, and subsoil restrictions. The western portion of the site falls within the Outeniqua Strategic Water Source Area, highlighting its role in regional water yield regulation and downstream ecological support.

From a biodiversity perspective, the site occurs within the critically endangered Garden Route Granite Fynbos vegetation type, with localised transitions into Southern Afrotemperate Thicket in moister areas. Although largely transformed by agriculture, remaining fragments of indigenous vegetation and associated aquatic systems retain conservation significance within a highly fragmented landscape.

Hydrogeomorphically, the aquatic environment comprises a continuum of hillslope seep wetlands, valley bottom wetlands, and non-perennial streams. These systems are variably modified due to long-term livestock grazing, dam construction, invasive alien vegetation, and agricultural infrastructure. As a result, most aquatic systems are classified as largely to critically modified (PES



D–E), with only limited areas in moderately modified condition (PES B/C), primarily in less accessible southern portions of the site.

Despite their degraded condition, the aquatic systems continue to perform important residual ecological functions, including flow attenuation, sediment transport regulation, and connectivity between inland and coastal environments. Their role in maintaining downstream hydrological integrity and supporting catchment-scale processes remains relevant, particularly within the Maalgate River system and associated coastal discharge zones.

Key impacts identified include hydrological alteration from farm dams, channel incision, loss of wetland extent, soil compaction from grazing, and widespread invasion by alien plant species such as *Acacia* and *Eucalyptus*. These cumulative pressures have significantly reduced ecological integrity and habitat quality across most of the study area.

Given the sensitivity and functional importance of remaining aquatic features, a precautionary management approach is recommended. This includes the implementation of conservative buffer zones (provisionally 35 m for general watercourses and 42 m for the Maalgate River riparian zone), control of invasive alien vegetation, restriction of livestock access to sensitive areas, and protection of remaining wetland and riparian habitats. Buffer requirements should be refined once detailed development layouts are available, in accordance with applicable national buffer guidelines and impact assessment protocols.

In conclusion, although the aquatic ecosystems within the Hoogekraal study area are generally of low to moderate ecological condition due to historical and ongoing transformation, they remain functionally connected and ecologically relevant within a broader catchment and coastal landscape context. Their protection is important to prevent further cumulative degradation and to maintain downstream ecological and hydrological processes.

Declaration of Independence

SPECIALIST REPORT DETAILS

This report has been prepared as per the requirements of the Environmental Impact Assessment Regulations and the National Environmental Management Act (Act 107 of 1998), any subsequent amendments and any relevant National and / or Provincial Policies related to biodiversity assessments. This also includes the minimum requirements as stipulated in the National Water Act (Act 36 of 1998), as amended in Water Use License Application and Appeals Regulations, 2017 Government Notice R267 in Government Gazette 40713 dated 24 March 2017, which includes the minimum requirements for an Aquatic Compliance Statement.

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Co- author: Debbie Fordham (SACNASP No. 119102)

Expertise / Field of Study: Debbie Fordham is an aquatic ecologist and Professional Wetland Scientist, registered with the SWSPCP (No. 3683) and SACNASP (No. 119102). Debbie was awarded her Master of Science degree, by thesis, in Wetland Science, entitled: The origin and evolution of the Tierkloof Wetland, a peatland dominated by *Prionium serratum* in the Western Cape. She has been consulting since 2010, producing numerous aquatic habitat impact assessment reports. She is a certified Professional Wetland Scientist (PWS certification number 3683) by the Society for Wetland Scientists (SWS) Professional Certification Program, which is internationally accredited by the Council of Engineering and Scientific Specialty Boards (CESB). She also holds a committee portfolio position with the SWS. She is a member of the Society for Wetland Scientists, the South African Wetland Society, the Southern African Association of Geomorphologists, the South African Hydrological Society (SAHS) and SACNASP.

Colin Fordham is a SACNASP registered Professional Natural Scientist (Pr. Sci. Nat.) Ecologist with 14 years of experience in the environmental and conservation sectors. He began his career in environmental consulting, spending six years compiling botanical and aquatic specialist reports for diverse development applications across Southern Africa. He then joined CapeNature as a Land Use Scientist, where he reviewed specialist reports to ensure compliance with best practices and legislation. In 2025 Colin joined Upstream Consulting as a professional aquatic ecologist. Amongst other qualifications, Colin holds a M.Sc. degree in Entomology (Biological Control of Aquatic Plants) from Rhodes University.

I, Colin Fordham, declare that this report has been prepared independently of any influence or prejudice as may be specified by the National Department of Environmental Affairs Fisheries and Forestry and or Department of Water and Sanitation.

Signed:.....



.....

Date: ...19th April 2026

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1 INTRODUCTION

Upstream Consulting was appointed by HilLand Environmental to undertake an aquatic site sensitivity verification, baseline assessment for a project area consisting of numerous farms near Glentana, George Local Municipality. The purpose of this assessment is to rapidly determine the condition of the aquatic habitat on the property and to evaluate how proposed development may affect these freshwater features.

As per the information supplied, the proposal encompasses the rationalisation of the 40 different farms into co-operative units, with an agri-village for the current farm workers and occupiers. The Department of Agriculture has agreed to dividing the farms into smaller farming units in principle. The 40 different farm portions of Farm Hoogekraal No 238, are located adjacent to Glentana within the George Local Municipality

1.1 Purpose of the report

The study area is located on the coastal platform less than 2km from the centre of Glentana in George Local Municipality (Figure 2). It is bordered (and accessed) by the N2 and Morrison Road. The purpose of this assessment is to characterise freshwater ecosystems within the study area, including their spatial extent, hydrogeomorphic (HGM) classification, ecological condition, and sensitivity, in support of future planning and land-use decision-making.

This assessment integrates desktop delineation with rapid field verification conducted on 17 April 2026. The study represents a planning-level assessment across a relatively large area with constrained time and access, and is therefore not intended to reflect a fine-scale ecological survey.

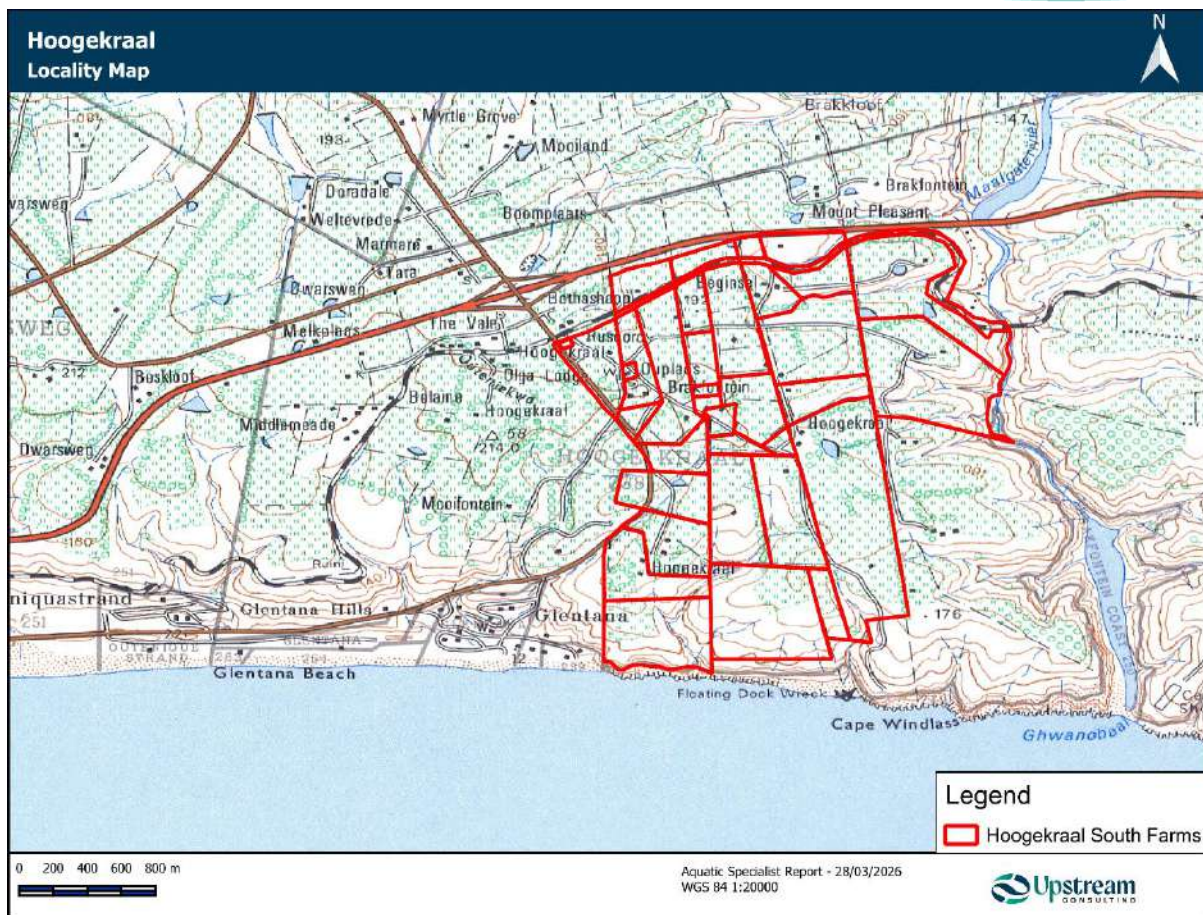


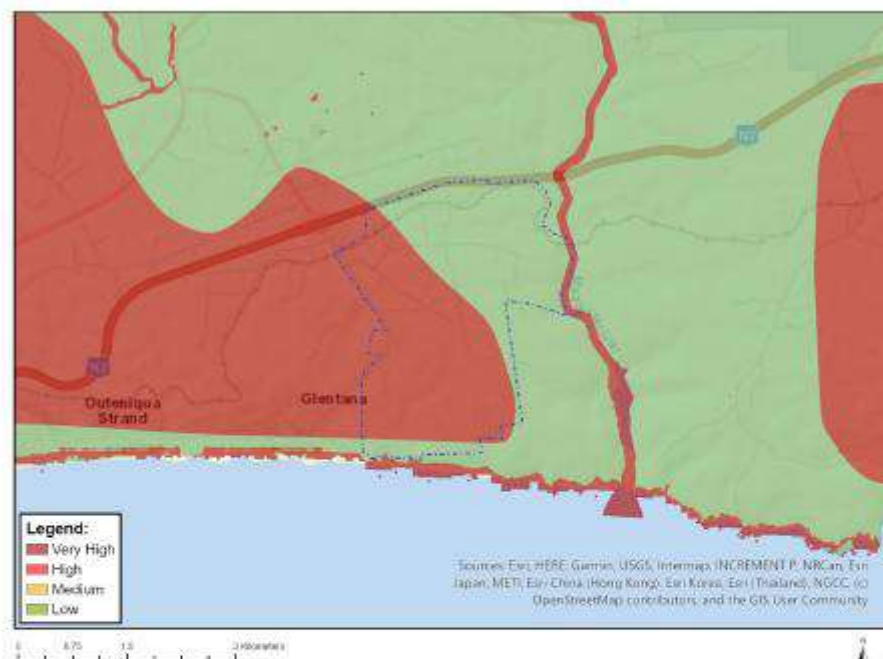
Figure 1: Locality map of the forty farm portions in relation to Glentana

1.2 Screening Tool Results

The National Web based Environmental Screening Tool was utilised for this proposal in terms of the Environmental Impact Assessment (EIA) Regulations 2014, as amended, to screen the proposed site for any environmental sensitivity. The Screening Tool identifies related exclusions and/ or specific requirements including specialist studies applicable to the proposed site. The Screening Tool allows for the generating of a Screening Report referred to in Regulation 16 (1) (v) of the Environmental Impact Assessment Regulations 2014, as amended whereby a Screening Report must go with any application for Environmental Authorisation. Requirements for the assessment and reporting of impacts of development on aquatic biodiversity are set out in the 'Protocol for the assessment and reporting of environmental impacts on aquatic biodiversity' published in Government Notice No. 648, Government Gazette 45421, on the 10 of May 2020.

According to the Screening Report, the study area is classified as 'Very High' and 'Low' aquatic sensitivity habitat, which was confirmed in the Baseline Aquatic and Site Sensitivity and Verification Report (Figure 2). The very high sensitivity rating from the SSV is due to the presence of Strategic Water Source Areas, Critical Biodiversity Areas, Ecological Support Areas and watercourses.

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	CBA: River
Very High	ESA 1: Aquatic
Very High	Rivers
Very High	SWSA (sw), Outeniqua

Figure 2: DFFE Screening Tool map of aquatic biodiversity theme sensitivity indicating very high and low sensitivity for the survey area.

1.3 Relevant Legislation

The protection of water resources is essential for sustainable development and therefore many policies and plans have been developed, and legislation promulgated, to protect these sensitive ecosystems. The proposed project must abide by the relevant legislative requirements. Table 2 below shows an outline of the environmental legislation relevant to the project.

Table 1: Relevant environmental legislation

Legislation	Relevance
South African Constitution 108 of 1996	The constitution includes the right to have the environment protected

National Environmental Management Act 107 of 1998	Outlines principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state.
National Environmental Management Protected Areas Act 57 of 2003	Provides for the protection and management of protected areas, buffer zones, and conservation areas. Relevant for offsets and where developments are near or adjacent to nature reserves, marine protected areas, or conservation corridors.
Environmental Impact Assessment (EIA) Regulations	The 2014 regulations have been promulgated in terms of Chapter 5 of NEMA and were amended on 7 April 2017 in Government Notice No. R. 326. In addition, listing notices (GN 324-327) lists activities which are subject to an environmental assessment.
The National Water Act 36 of 1998	Chapter 4 of the National Water Act addresses the use of water and stipulates the various types of licensed and unlicensed entitlements to the use of water. Any uses of water which do not meet the requirements of Schedule 1 or the GAs, require a license which should be obtained from the Department of Water and Sanitation (DWS).
National Environmental Management: Biodiversity Act No. 10 of 2004	This is to provide for the management and conservation of South Africa's biodiversity through the protection of species and ecosystems; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; and the establishment of a South African National Biodiversity Institute.
Conservation of Agricultural Resources Act 43 of 1967	To provide for control over the utilization of the natural agricultural resources to promote the conservation of the soil, water sources and vegetation and the combating of weeds and invader plants.
Western Cape Biodiversity Act 6 of 2021 (WCBA)	The Western Cape Biodiversity Act 6 of 2021 guides land use planning by requiring that developments avoid or minimise impacts on sensitive ecosystems, ecological corridors, wetlands, and species of concern. It ensures that provincial biodiversity layers and municipal spatial plans are considered in all land use decisions. The Act also requires the control of invasive species and places added responsibility on developments near conservation or ecological support areas. Overall, it ensures that biodiversity sensitivities are integrated into responsible planning and development.

1.4 Scope of Work

To ensure compliance with the specialist protocols this report will ensure to meet the Terms of Reference supplied in this section. This report therefore fulfils the DFFE Protocol requirements for an aquatic biodiversity impacts assessment report.

- ✓ Contextualization of the study area in terms of important biophysical characteristics and the latest available aquatic conservation planning information (including but not limited to vegetation, CBAs, NWM5, Threatened ecosystems, any Red data book information, NFEPA data, broader catchment drainage and protected areas).
- ✓ Mapping within and surrounding the study area utilising available site-specific data such as aerial photography, contour data and water resource data.
- ✓ Analysis of desktop data to determine opportunities and constraints of development on aquatic ecosystems and the associated legislative requirements of development related to aquatic ecosystems.
- ✓ Recommend actions that should be taken to avoid impacts on aquatic habitat, in alignment with the mitigation hierarchy, and any measures necessary to restore disturbed areas.
- ✓ Mapping of any necessary conservative buffer zones with consideration to the Buffer zone guidelines for rivers, wetlands and estuaries (Macfarlane & Bredin, 2016).

2 APPROACH AND METHODS

This study followed the approaches of the provided method of assessment as well as several national guidelines with regards to wetland/ riparian identification and delineation.

2.1 Desktop Assessment Methods

- The contextualization of the study area was undertaken in terms of important biophysical characteristics and the latest available aquatic conservation planning information in a Geographical Information System (GIS). It is imperative to develop an understanding of the regional drainage setting and longitudinal dynamics of the watercourses. The conservation planning information aids in the determination of importance and sensitivity, management objectives, and the significance of potential impacts.
- Following this, desktop delineation and illustration of all potential watercourses within the study area was undertaken using available site-specific data such as aerial photography, contour data and water resource data. Digitization and mapping were undertaken using QGIS 3.43 GIS software.
- These results, as well as professional experience, allowed for the identification of specific areas that could potentially be impacted by the activities and therefore required groundtruthing and detailed assessment. The following data sources listed within Table 2 assisted with the assessment.

Table 2: References for spatial data used for map compilation

Data	Source
Google Earth Pro™ Imagery	Google Earth Pro™
DWS Eco-regions (GIS data)	DWS (2005)
South African Vegetation Map (GIS Coverage)	Mucina & Rutherford (2006-2018)
National Biodiversity Assessment Threatened Ecosystems (GIS Coverage)	SANBI (2018)
Geology	Council for Geoscience (2019)
Contours (elevation) - 5m intervals	Surveyor General
NBA river and wetland inventories (GIS Coverage)	CSIR (2011)
NBA river, wetland and estuarine FEPAs (GIS Coverage)	CSIR (2011) and Skowno <i>et al.</i> (2019)
Western Cape Biodiversity Conservation Plan	CapeNature (2023)
National Wetland Map 5	Van Deventer, <i>et al.</i> (2018)

2.2 Site Assessment Methods

Infield site assessment was conducted on the 17th of April 2026 to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity as identified on the national web based environmental verification tool, such as new developments, infrastructure, indigenous/pristine vegetation, etc. This rapid in field assessment was undertaken with a hand-held GPS, for mapping. Due to restricted access to several privately owned properties (primarily in the southern portion), field coverage was incomplete but still deemed sufficient for the purposes of this project. Observations were therefore concentrated in accessible areas, with extrapolation applied where appropriate.

3 ASSUMPTIONS AND LIMITATIONS

Within the realm of specialist assessments, there are often assumptions and limitations, which can influence the determination of specialist outcomes. Sometimes these can result in the project being fatally flawed, however frequently these are simply gaps of knowledge that will not have a significant impact on the findings of the specialist report. Therefore, specialists proceed and list the known assumptions and limitations associated with the project, such as these outlined below:

- Aquatic ecosystems vary both temporally and spatially. Once-off surveys such as this can miss certain ecological information due to seasonality, thus limiting accuracy and confidence. It is recommended that another site assessment be undertaken should there be any future development proposed on the properties which requires environmental authorisation or water use authorisation.
- The scope of work is restricted to contextualisation of the study area in relation to water resource management, watercourse identification, and delineation of aquatic habitat within the survey area only.
- While disturbance and transformation of habitats can lead to shifts in the type and extent of aquatic ecosystems, it is important to note that the current extent is reported on here.
- All soil/vegetation/terrain sampling points were recorded using a Garmin Global Positioning System (GPS) and captured using Geographical Information Systems (GIS) for further processing.
- Conditions on the day were clear and no significant rainfall had been recently recorded in the area. Unfortunately, site access was restricted and there is incomplete field coverage of the southern portion of the study area due to access restrictions. As a result, the classification and condition of aquatic systems in this area remain provisional.
- Infield soil and vegetation sampling was only undertaken within a specific focal area around the proposed activities, while the remaining watercourses were delineated at a desktop level with limited accuracy.
- No detailed assessment of aquatic fauna/biota (e.g. fish, invertebrates, microphytes, etc.) was undertaken and not deemed necessary.
- The vegetation information provided is based on observation not formal vegetation plots. As such species documented in this report should be considered as a list of dominant and/or indicator wetland/riparian species.
- The scope of work did not include water quality sampling, and there was no surface water to sample.
- The assessment of impacts and recommendation of mitigation measures was informed by the site-specific ecological concerns arising from the field survey and based on the assessor's working knowledge and experience with similar projects. The degree of confidence is considered high.

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT

4.1 Topography and Drainage

The majority of study area is located on a plateau with a gentle seaward-sloping gradient, ascending from approximately 13 m amsl at the southern boundary on the coastline to roughly 192 m amsl at the northern perimeter. This topographic profile defines several a localised catchments that feeds 14 non-perennial drainage lines and the Maalgate River on the eastern boundary. The hydrological regime of these features vary from perennial, non-perennial to episodic. There are also numerous dams on the farms and systems mapped by the NBA data. Refer to Figure 3 indicating the desktop-mapped location of these features by the national 1: 50 000 river line data (NGI, 2007).

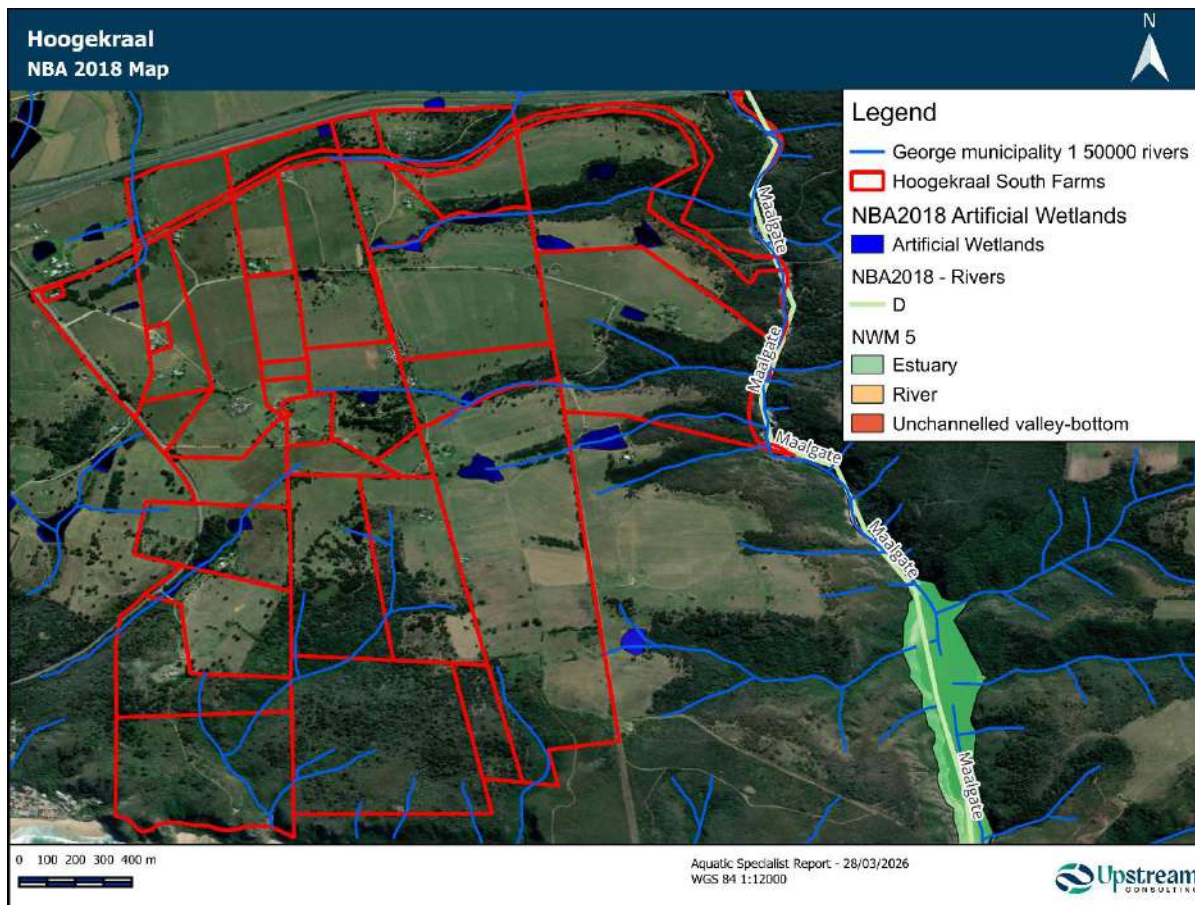


Figure 3: Map of the study area in relation to the national wetland and river desktop data inventories

4.2 Geology and Soils

The study area occurs on the southern Cape coastal platform and is underlain by sedimentary rocks of the Cape Supergroup associated with the Cape Fold Belt. In the broader region, these units are dominated by quartzitic sandstones of the Peninsula Formation of the Table Mountain Group, which form the resistant basement underlying much of the coastal plateau inland of the shoreline (Johnson *et al.*, 2006; Council for Geoscience, 2010). In the immediate coastal zone surrounding the study area, the bedrock surface is commonly mantled by unconsolidated Quaternary sediments including marine sands, colluvial materials and windblown aeolian dune sands associated with coastal depositional processes and late Quaternary sea-level fluctuations (Roberts *et al.*, 2006; Marker, 2008).

Soils within the study area are typically sandy and moderately well drained, reflecting their derivation from weathered sandstone and coastal dune deposits. Surface horizons generally comprise sandy to loamy sand topsoils with moderate organic content, underlain by deeper sandy subsoils with variable clay accumulation at depth. In localized areas, ferruginous concretions and weakly developed ferricrete horizons may occur within the subsoil profile as a result of iron mobilisation and precipitation associated with periodic wetting and drying cycles (Fey, 2010).

The sandy soil matrix generally promotes moderate infiltration; however, localised clay enrichment and ferricrete development within the subsoil can reduce permeability and impede vertical drainage. These conditions may result in perched water tables and the seasonal accumulation of soil moisture in topographic depressions or along gentle slopes. Such hydrological conditions contribute to the development of wetlands and seasonally saturated soils within the landscape. Surface runoff generated during rainfall events is typically conveyed along shallow drainage lines and ephemeral channels that ultimately discharge toward the Maalgate River and its associated tributaries. The interaction between sandy surface soils, locally restrictive subsoil horizons and the gently undulating coastal topography therefore plays an important role in the formation and maintenance of wetlands, seepage zones and drainage features within the study area.

4.3 Climate

The regional climate is temperate and strongly influenced by maritime conditions associated with the southern Cape coastal belt. The area experiences a relatively moderate climate with rainfall distributed throughout the year, although peak precipitation typically occurs during late winter and spring associated with frontal systems moving across the southern Cape. Mean Annual Precipitation in the George coastal region generally ranges between approximately 700 and 900 mm, while mean annual potential evaporation is typically in the order of 1100–1300 mm (DEA, 2014; Schulze, 2007).

Although evaporation slightly exceeds rainfall on an annual basis, the relatively high and seasonally distributed precipitation supports the persistence of surface water features and shallow groundwater systems within the landscape. Rainfall events associated with frontal systems and occasional convective storms can generate rapid surface runoff responses, particularly where soils become saturated during wetter winter months. As a result, drainage features within the study area, including tributaries and minor drainage lines that discharge toward the Maalgate River, may display seasonal or episodic flow characteristics.

The interaction between relatively high coastal rainfall, gentle topography and locally restrictive subsoil horizons contributes to the development of wetlands, seepage zones and seasonally saturated soils within low-lying portions of the landscape. These conditions support the persistence of wetland habitats and hydrologically connected drainage features within the study area, particularly along valley bottoms and areas receiving subsurface flow from surrounding slopes.

4.4 Vegetation

Based on national vegetation mapping and biodiversity assessment frameworks, the study area falls within the Garden Route Granite Fynbos vegetation type, with localised transitional influence toward Southern Afrotemperate Thicket in more mesic and sheltered positions (Mucina & Rutherford, 2006). According to the National Biodiversity Assessment (NBA 2024), this vegetation unit is classified as Critically Endangered, with only small, highly fragmented remnants remaining in a largely transformed landscape, particularly along the southern Cape coastal corridor where agricultural and peri-urban land uses have resulted in substantial habitat loss and fragmentation (SANBI, 2024).

Vegetation patterning across the site is strongly governed by substrate, soil depth, and topographic position, with hydrology acting as a key secondary driver. The more elevated and freely drained areas are typically characterised by fynbos vegetation comprising sclerophyllous shrub communities adapted to nutrient-poor, acidic soils derived from weathered granite and associated colluvial and aeolian deposits. These areas form the remaining matrix vegetation where intact patches persist, although these are now generally small and fragmented within the broader landscape context described by the NBA 2024.

In contrast, lower-lying areas, valley bottoms, and zones adjacent to drainage lines associated with the Maalgate River exhibit a transition toward denser woody vegetation, including elements of Southern Afrotemperate Thicket. These areas are influenced by higher soil moisture availability, periodic saturation, and the accumulation of finer sediments and organic material, which create more favourable conditions for woody species and mesic vegetation elements. Drainage lines and

seepage zones therefore function as important ecological gradients and refugia for moisture-dependent species within a largely fynbos-dominated system.

The interaction between geology-driven soil development, localised hydrological accumulation, and topographic variability results in a heterogeneous vegetation mosaic across the study area. This mosaic reflects both natural ecotonal processes and the constrained distribution of remaining intact Garden Route Granite Fynbos remnants, which are of high conservation significance given their Critically Endangered status under the NBA 2024 classification framework (SANBI, 2024).

4.5 Strategic Water Source Areas

The western portion of the study area is formally identified as part of the Outeniqua Strategic Water Source Area (SWSA) for surface water (Lötter, M.C., and Le Maitre, 2021). Refer to Figure 4. This map resulted in the DFFE Screening Tool having a "Very High" sensitivity for the Aquatic Biodiversity Theme. It is important to note that the SWSA mapping is conducted at a national desktop scale and often identifies broad catchment areas based on modeled hydrological contribution rather than the presence of discrete on-site aquatic features.

Site-specific ground-truthing confirmed surface watercourses are located within this specific northwestern corner. SWSAs are identified in recent South African water resource and biodiversity literature as priority catchments that contribute a disproportionate share of reliable surface water yield to downstream users. These areas are important because intact vegetation and soil systems regulate runoff, sustain dry-season baseflows, and reduce the severity of flood peaks during high rainfall events. The regions also play a key role in maintaining water quality by limiting erosion, sediment transport, and nutrient loading into rivers and wetlands. In addition, SWSAs are increasingly recognised as critical ecological infrastructure that supports climate resilience by buffering hydrological extremes and maintaining catchment functioning under variable rainfall conditions.

The site also falls within the K30A DWS quaternary catchment, which primarily drains into the Maalgate River and estuary. The drainage lines on the property play a critical role in feeding that system and perform a critical role in regional catchment-to-coast regulation and landscape connectivity. The smaller drainage lines serve as essential longitudinal corridors, providing natural pathways for the movement of biota between the inland fynbos plateaus and the coastal zone. Consequently, the conservation value of the site is not derived from perennial "high flow" river dynamics, but from its functional role as a biological and hydrological link within the coastal landscape.

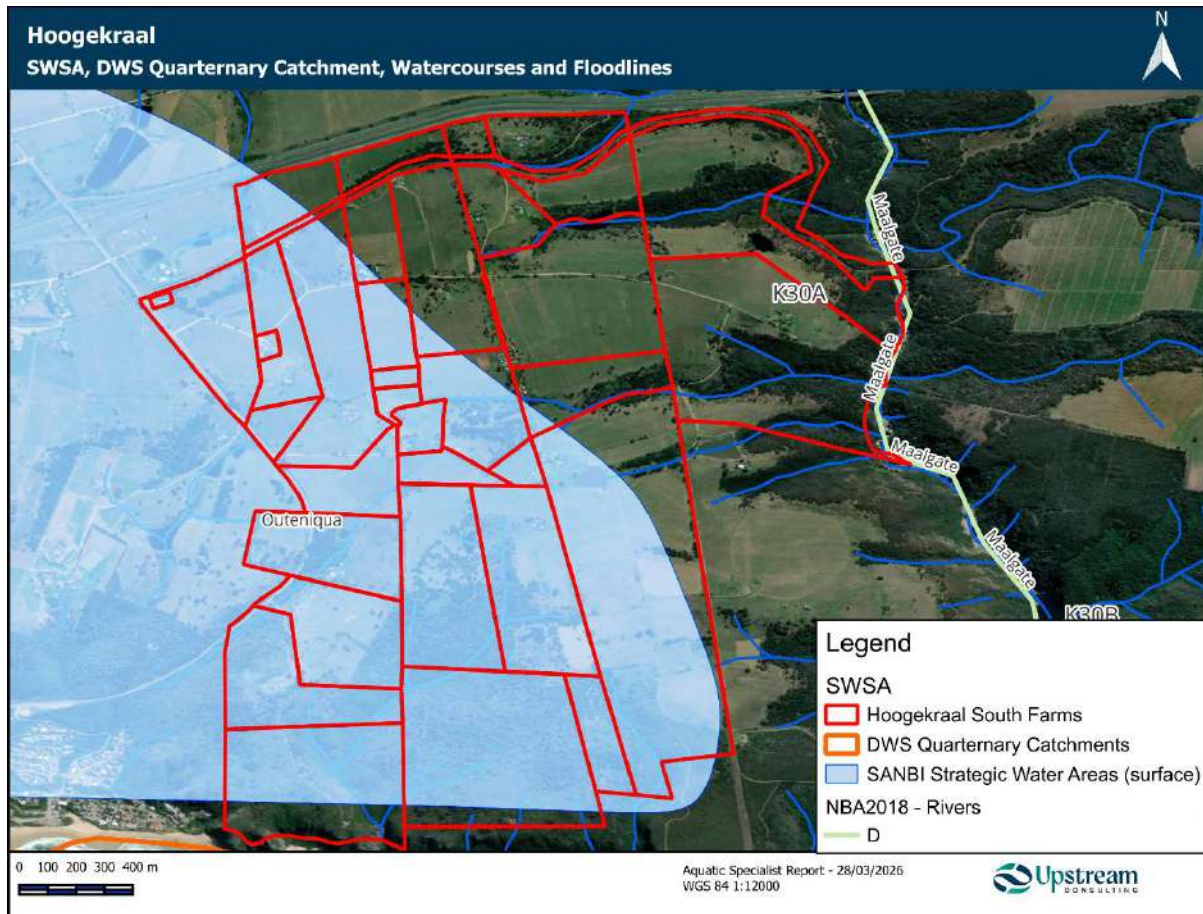


Figure 4: Map of the study area in relation to the South African Strategic Water Source Areas map

4.6 Critical Biodiversity Areas

According to the 2023 Western Cape Biodiversity Spatial Plan (WCBSP) (CapeNature, 2023), significant portions of the study area are mapped as a Terrestrial Critical Biodiversity Area (CBA 1). No Aquatic CBAs are indicated within the site, and the non-perennial drainage features present on the property are not explicitly captured in the provincial spatial dataset. Refer to Figure 5.

Although no Aquatic CBAs are mapped within the study area, the presence of extensive Terrestrial CBA 1 areas remains highly relevant to the integrity and functioning of freshwater ecosystems within those areas. Terrestrial CBAs are designed not only to conserve biodiversity in a terrestrial sense, but also to maintain key ecological processes such as hydrological regulation, soil stability, and landscape connectivity. In this context, they form part of the broader catchment system that supports the formation, persistence, and functioning of the potentially non mapped aquatic ecosystems on site.

Within the study area, terrestrial CBAs play an important role in regulating surface runoff and groundwater recharge across the gently sloping coastal plateau. Intact vegetation and soils within



these areas slow overland flow, enhance infiltration, and reduce erosion and sediment transport into downstream aquatic systems, including the Maalgate River. They also support subsurface hydrological processes that sustain wetlands and maintain seasonal baseflow to streams. Where these terrestrial systems are intact, they effectively act as a buffer that stabilises aquatic ecosystem function.

Accordingly, even in the absence of mapped aquatic CBAs, terrestrial CBAs indirectly underpin the ecological integrity of all freshwater features within the study area. Their conservation is therefore essential for maintaining hydrological connectivity, water quality, and the long-term resilience of aquatic ecosystems in a landscape already subject to historical agricultural transformation and fragmentation.

In terms of the WCBSP, field verification is a critical component in refining and validating desktop-derived CBA and ESA mapping layers. The BSP is produced at a broad spatial scale and is inherently conservative, requiring site-specific ground-truthing to confirm habitat condition, ecological functionality, and the presence or absence of aquatic and terrestrial features. The field assessment undertaken for this study therefore served to verify whether mapped CBAs corresponded with on-the-ground conditions, particularly in relation to land transformation, hydrological connectivity, and the extent of intact vegetation. This approach ensures that the BSP framework is correctly interpreted at a site level and that development planning is informed by both regional conservation priorities and verified ecological realities.

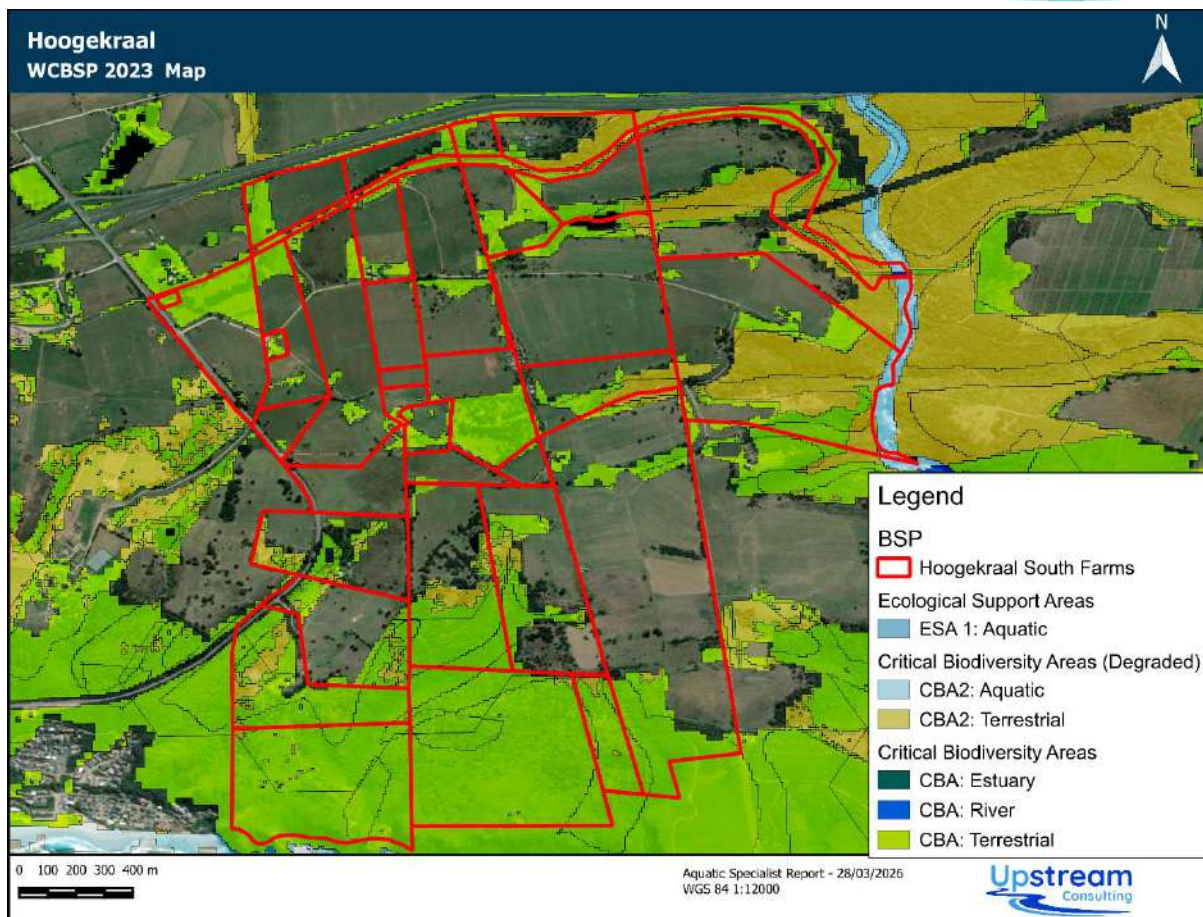


Figure 5: Map of the study area in relation to the conservation priority area mapped by the Western Cape Biodiversity Spatial Plan (CapeNature 2023)

4.7 Historic Land Use

The current ecological and hydrological condition of the study area reflects a long and sustained history of agricultural land use, with evidence of transformation dating back to at least 1957 and likely earlier. Review of historical aerial imagery (Figures 6), together with site observations, indicates that large portions of the landscape were already under active cultivation or grazing at that time, with only limited remnants of natural vegetation structure remaining in more marginal or inaccessible areas. Over subsequent decades, this agricultural footprint has persisted and expanded in intensity in places, resulting in cumulative alterations to vegetation composition, soil structure, and natural drainage patterns.

The 1957 aerial imagery in particular illustrates an already highly patterned landscape, with clear signs of field subdivision, grazing infrastructure, and early forms of hydrological modification such as drainage lines and water storage features. This indicates that many of the processes currently observed on site, including soil compaction, channel modification, and fragmentation of wetland and riparian systems are not recent impacts, but rather the outcome of long-term, incremental



change over several land-use cycles. The persistence of these pressures over time has likely led to a gradual reduction in ecosystem resilience and a simplification of both terrestrial and aquatic habitat structure.

Despite this historical transformation, the landscape is not uniformly degraded. Site observations and more recent aerial interpretation indicate a mosaic of disturbance intensity, with certain portions particularly in more marginal topographic positions or less intensively managed areas retaining comparatively higher levels of natural vegetation cover and ecological function. These areas are important as residual ecological patches within a largely modified matrix, and may still support remnant hydrological processes such as seepage and diffuse surface flow. However, their integrity is spatially fragmented and closely interwoven with transformed agricultural lands.

Overall, the long-term agricultural history of the study area has resulted in a landscape where ecological and hydrological processes are largely shaped by cumulative anthropogenic influence rather than purely natural drivers. This historical context is critical in interpreting current aquatic system condition, as many of the observed wetland and drainage features represent modified or relict systems embedded within a highly transformed agricultural matrix.



Figure 6: Historic aerial imagery from 1957, showing extensive agricultural activities (approximate study area given in red polygon).

5 RESULTS

5.1 Identification And Delineation

The study area is situated within a coastal hinterland landscape characterised by moderately undulating topography, where local relief is expressed through a series of low-gradient interfluvies that transition into progressively incised valley systems. The terrain facilitates a radial drainage pattern, with surface and near-surface flows diverging outward from central elevated areas toward both coastal discharge points and inland river systems.

Land use within the study area has been dominated by livestock grazing for several decades, resulting in a landscape that is largely anthropogenically modified (Plate 1). The persistence of this land use has led to widespread alteration of natural vegetation structure, soil compaction, and hydrological modification. The presence of multiple farm dams, informal drainage alterations (e.g. furrows), and a network of gravel roads has further influenced surface water characteristics.

Despite this transformation, the underlying geomorphic template remains evident. The spatial distribution of aquatic features is strongly controlled by topographic position, with diffuse saturation zones occurring on upper slopes, transitioning into valley bottom systems and ultimately into confined drainage channels. This continuum reflects a classic hillslope-to-channel hydrological gradient, albeit one that has been substantially altered in terms of both structure and function.



Plate 1: Photograph showing typical land use of the study area

5.2 Hydrogeomorphic Classification

The delineated aquatic systems within the study area were classified according to hydrogeomorphic (HGM) principles, which recognise the interaction between geomorphic setting, hydrological processes, and resultant wetland form and function. The systems observed represent a continuum rather than discrete units (Figure 7), with gradual transitions between HGM types influenced by slope, soil characteristics, and degree of confinement. .

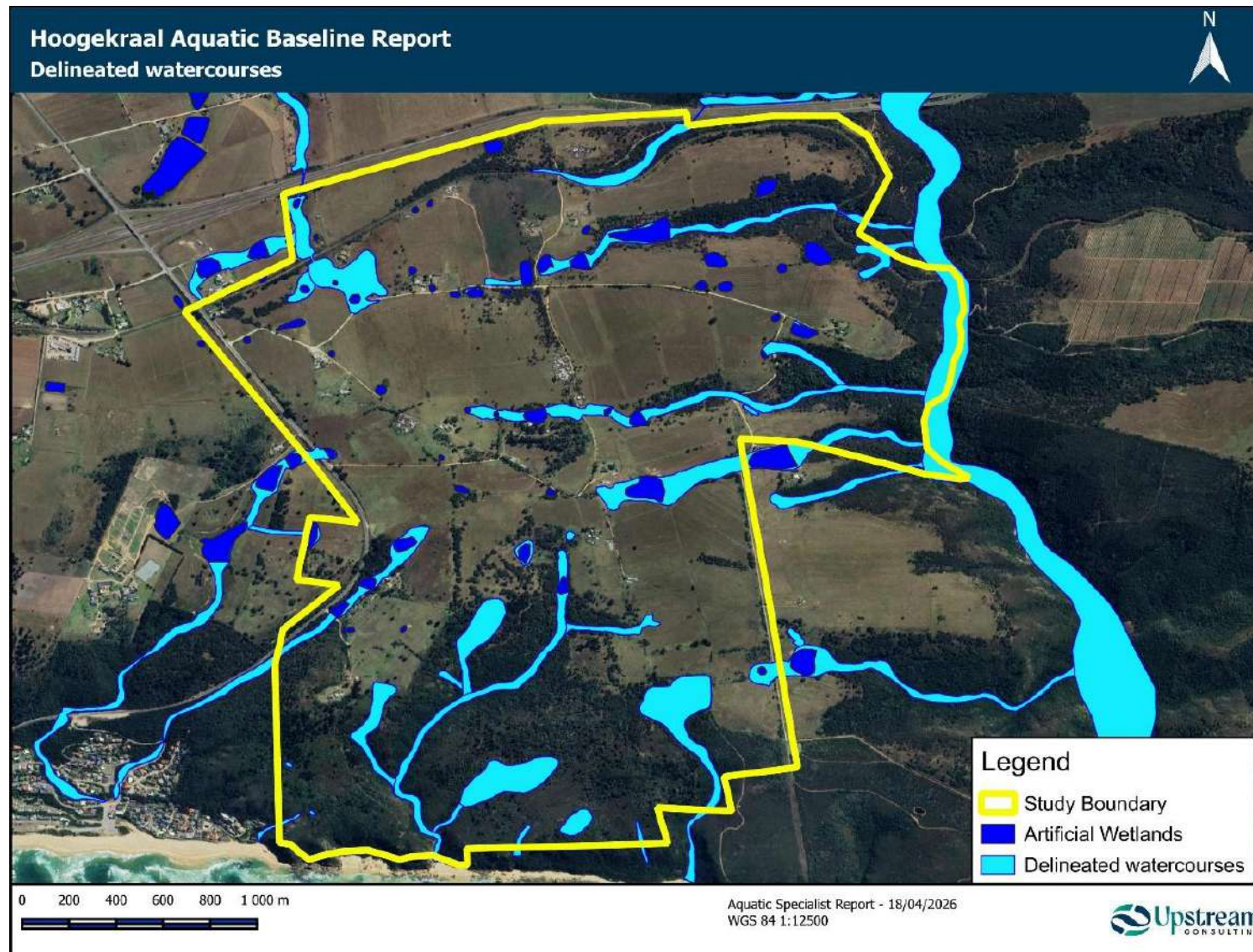


Figure 7: Delineated Aquatic Ecosystems and artificial wetlands

5.2.1 Hillslope Seep Wetlands

Hillslope seep wetlands within the study area occur predominantly on gentle upper slopes where subsurface water movement intersects the ground surface. These systems are driven by lateral throughflow within the soil profile, typically associated with perched or shallow groundwater conditions. The hydrological regime is characterised by seasonal saturation, with surface expression dependent on rainfall inputs and antecedent moisture conditions.

Vegetation within these seep systems is relatively uniform and indicative of hydric or mesic conditions, comprising primarily sedges (Cyperaceae) and *Juncus* spp., interspersed with pasture grasses introduced through agricultural activities (Plate 2).

Soils within these areas exhibit characteristics consistent with periodic saturation, although clear hydromorphic indicators may be subdued due to seasonal dryness at the time of assessment and disturbance-related mixing. The structural integrity of these wetlands appears compromised in places, with trampling and grazing leading to localised compaction and disruption of natural microtopography.

From a functional perspective, these seep wetlands play a role in regulating downslope hydrological inputs by moderating the release of subsurface water into valley bottom systems. However, this function is likely attenuated due to the cumulative effects of land use



Plate 2: Photographs showing two typical Hillslope Seep wetlands found within the study area

5.2.2 Valley Bottom Wetlands

Valley bottom wetlands occur along primary drainage axes in areas where topographic gradients decrease and lateral flow convergence promotes sustained saturation. Within the study area, these systems are extensively modified and often difficult to distinguish in their original form due to historical and ongoing anthropogenic impacts (Plate 3).

Hydrologically, these wetlands would naturally function as zones of flow attenuation and sediment deposition, with diffuse flow paths and shallow groundwater interactions. However, the installation of multiple farm dams along these systems has fundamentally altered flow regimes, introducing artificial storage, modifying hydroperiods, and disrupting longitudinal connectivity.

Geomorphologically, many of these valley bottoms exhibit signs of incision and channelisation, indicative of altered hydrological dynamics and increased flow energy. This has likely resulted from a combination of vegetation removal, concentrated runoff pathways, and reduced soil stability. In some areas, infilling and sediment redistribution have further obscured original wetland morphology.

Vegetation within these systems reflects a degraded state, with a mix of remnant hydrophilic species and invasive taxa such as *Rubus* spp. and *Solanum mauritianum*. The presence of these species is indicative of disturbance and nutrient enrichment, as well as reduced competition from indigenous vegetation.

Overall, the valley bottom wetlands represent a transitional HGM unit that has lost much of its natural structure and function, though residual wetland characteristics remain detectable through vegetation patterns, soil moisture conditions, and landscape position.



Plate 3: Photographs showing a Valley Bottom wetland found within the study area

5.2.3 Non-Perennial Streams (Riparian Systems)

Further downslope, valley bottom systems transition into more confined, channelled systems that function as non-perennial streams. These systems are characterised by defined channels with episodic flow, typically driven by rainfall events and seasonal groundwater contributions.

The channels exhibit varying degrees of incision, with many showing clear signs of active erosion, bank instability, and sediment transport. These processes are exacerbated by upstream modifications, including altered flow regimes and reduced vegetative buffering capacity.

Riparian zones associated with these channels are heavily invaded by alien tree species, including *Acacia mearnsii*, *Acacia melanoxylon*, and *Eucalyptus* spp (Plate 4). These species have displaced indigenous riparian vegetation. While steeper sections of these systems appear somewhat less impacted by direct agricultural activities, they remain in a degraded state due to cumulative upstream effects and invasive species encroachment.



Plate 4: Photographs showing a heavily invaded riparian system within the study area

The southern portion of the study area, which was not comprehensively accessed during fieldwork, appears to support wetland habitat that may include depression wetlands and less degraded seeps. Preliminary observations suggest that these areas retain a higher degree of natural vegetation cover and have experienced less intensive agricultural modification. As such, they may exhibit improved ecological integrity relative to the more disturbed northern systems. However, without detailed field verification, the classification and condition of these systems remain provisional.

5.3 Present Ecological State

The ecological condition of aquatic systems within the study area was assessed qualitatively using the Present Ecological State (PES) framework, which evaluates the degree of deviation from natural reference conditions.

Across the majority of the study area, aquatic systems are considered to be in a largely to critically modified state (PES categories D to E). This assessment is based on the extent and intensity of anthropogenic disturbances observed, including hydrological alteration, vegetation transformation, and geomorphic instability.

Key indicators of degradation include widespread channel incision, loss of wetland extent, dominance of invasive plant species, and evidence of sustained grazing pressure. These factors collectively contribute to reduced ecological integrity, diminished habitat quality, and impaired ecosystem functioning.

In contrast, the southern portion of the study area appears to retain systems in moderately modified condition (PES B/C), with better preservation of natural vegetation and reduced disturbance intensity. These areas likely represent important refugia within the broader landscape, although confirmation through detailed assessment is required.

5.4 EIS

The aquatic systems within the Hoogekraal study area are, at a site scale, of low to moderate ecological importance, reflecting their largely transformed condition. Most systems (particularly within the northern and central portions) are structurally and functionally degraded, with reduced habitat diversity, altered hydrology, and widespread dominance of disturbance-tolerant and invasive species. Hillslope seep wetlands are present but simplified and embedded within grazed pasture, while valley bottom wetlands and riparian systems have been substantially modified through incision, impoundment, and vegetation transformation. As a result, these systems exhibit reduced ecological sensitivity in terms of their capacity to support biodiversity and their resilience to disturbance.

However, their importance increases when considered within the broader landscape context. All delineated systems remain hydrologically connected and contribute to downstream environments, including coastal discharge areas near Glentana and the Maalgate River system. Despite their degraded state, they continue to influence flow regulation, sediment transport, and water quality. Further deterioration would therefore have cumulative downstream impacts, particularly in relation to sedimentation, reduced water quality, and increased flood risk.

The southern portion of the study area appears to support aquatic features in comparatively better condition, with greater retention of natural vegetation and lower levels of disturbance. These systems are likely to be more sensitive and may represent locally important refugia, although this requires confirmation through additional field assessment.

Ecosystem service provision is present but diminished. The systems continue to supply water for livestock and contribute, to a limited extent, to flow attenuation and sediment retention. However, these functions are compromised by channel incision, reduced wetland extent, and vegetation

degradation. Overall, while the intrinsic ecological value of the systems is low, their functional role within the catchment remains relevant, and further degradation should be avoided.

5.5 Existing Impacts

The observed ecological condition of aquatic systems within the study area is the result of multiple interacting drivers, operating over extended temporal scales.

Primary among these is sustained livestock grazing, which has led to vegetation removal, soil compaction, and physical disturbance of wetland and riparian areas. The construction of farm dams has significantly altered natural hydrological regimes, affecting flow timing, magnitude, and connectivity (Plate 5).

Additional impacts include the proliferation of invasive alien plant species, which have displaced indigenous vegetation and altered ecosystem processes. Infrastructure such as roads and informal drainage modifications have further disrupted natural flow paths and contributed to erosion and sedimentation.

In some cases, the cumulative effect of these pressures has resulted in the complete loss or severe transformation of aquatic features, complicating delineation and ecological interpretation.



Plate 5: Photographs showing one of several dams on the various properties impacted freshwater resources.

6 MANAGEMENT AND MITIGATION CONSIDERATIONS

Given the current condition and context of the aquatic systems, management efforts should focus on preventing further degradation and, where feasible, enhancing residual ecological function.

The protection of delineated aquatic features through the implementation of buffer zones is critical to maintaining their integrity. Such buffers would reduce direct disturbance, limit pollutant inputs, and support the recovery of indigenous vegetation.

The control and removal of invasive alien species is a priority intervention, particularly within riparian zones where these species exert significant ecological pressure. Similarly, the exclusion or management of livestock access to sensitive areas would reduce trampling and allow for vegetation recovery.

While large-scale restoration may be constrained by the extent of historical modification, targeted interventions could yield incremental improvements in ecosystem function and resilience.

6.1 Buffer Determination

The determination of an appropriate buffer for aquatic features within the Hoogekraal study area is dependent on the nature, extent, and layout of any proposed land use. In the absence of this information, it is not possible to formally apply the Buffer Tools, as these require inputs related to impact type, intensity, and risk.

For the purposes of this baseline and to inform forward planning, a provisional buffer of 35 m from the delineated edge of all watercourses is recommended. In addition, a more conservative buffer of 42 m is recommended from the edge of the riparian zone of the Maalgate River, given the broader importance and sensitivity of this system (Figure 8).

Once the details of any proposed development are defined (specifically the type of activity) the buffer determination should be reassessed using the appropriate tools and guidelines. At that stage, buffers may need to be refined and adjusted.

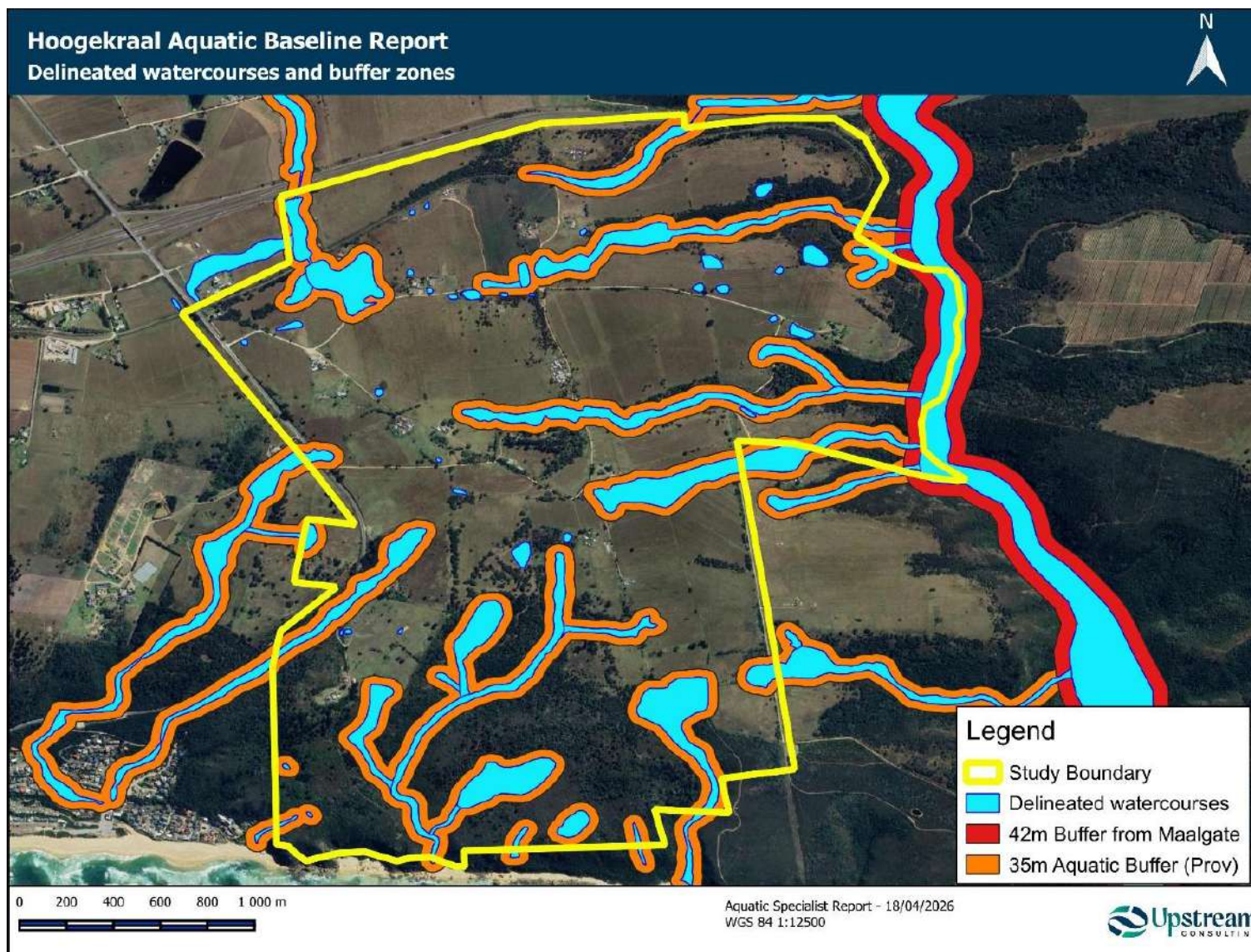


Figure 8: Delineated Aquatic Ecosystems and associated recommended buffers

7 CONCLUSION

The aquatic systems within the Hoogekraal study area reflect a landscape that has undergone extensive and sustained anthropogenic modification. Despite this, a discernible network of seep wetlands, valley bottom systems, and non-perennial streams persists, retaining elements of their original hydrogeomorphic structure.

While these systems are generally of low to moderate ecological importance, they continue to contribute to landscape-level processes and downstream ecological integrity. Their conservation is therefore warranted, not only to preserve remaining ecological function but also to prevent further degradation that could have broader environmental consequences.

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ANNEXURE S:

Agricultural Impact Statement

AGRICULTURAL AGRO- ECOSYSTEM REPORT

HOOGELAND DEVELOPMENT:
PROPOSED DEVELOPMENT ON
HOOGEKRAAL AND BUFFELS DRIFT
FARMS-

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**AGRICULTURAL AGRO-ECOSYSEM REPORT:
THE PROPOSED DEVELOPMENT ON HOOGEKRAAL AND BUFFELS DRIFT
FARMS, GEORGE, WESTERN CAPE.**

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1. DECLARATION OF THE SPECIALIST

This agricultural impact assessment has been prepared by Gert Jacobus Malan, a registered SACNASP Soil Scientist (128697). In terms of the National Environmental Management Act (Act No 107 of 1998) (NEMA) and the National Web based Environmental Screening Tool (Agricultural Resources sensitivity, gazetted on 20 March 2020) and Site Sensitivity Verification Report, an Agriculture Impact Assessment is required.

Details of Specialist:

Specialist	Qualification and accreditation
Gert Malan (Pr.Sci.Nat.)	<ul style="list-style-type: none">• BSc-Agric Soil Science & Agronomy• MSc Agric – Soil Science• SACNASP Reg. no. 128697/21 (Soil Science)

I, Gert Jacobus Malan, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that:

- In terms of the general requirement to be independent:
 - other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity; or
 - am not independent, but another specialist (the "Review Specialist") that meets the general requirements set out in Regulation 13 of the NEMA EIA Regulations has been appointed to review my work (Note: a declaration by the review specialist must be submitted)
- In terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- I have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any Report, plan or document prepared or to be prepared as part of the application; and
- I am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations.

Signature of the EAP:_____

Date:_____

2. INTRODUCTION

Environmental authorisation is being sought for a proposed development on the farm Hoogekraal. The site is located on the Maalgateriver and Outeniqua Strand. (Fig. 2.1.) The development will subdivide agricultural land into 87 portions of +5 ha each with some larger portions to the north. These plots will remain zoned for agriculture. The total area of the site is 619 hectares, which is made up mostly by agriculture (+419ha) and veld (disturbed and fynbos) (+200ha)



Figure 2.1. Site Location, near Glentana.

The objective of this study is to identify and assess the potential impacts of the proposed development on agricultural resources and production potential. Mitigation measures, impact management outcomes and monitoring requirements where necessary will be identified.

3. TERMS OF REFERENCE

The terms of reference for this study are to be a specialist report that fulfils the requirements of the *Protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources*, gazetted on 20 March 2020 in GN 320.

In terms of the protocol, the level of agricultural assessment required for this site, which is rated by the national web-based environmental screening tool as including land of **very high** sensitivity for impacts on agricultural resources, is an Agricultural Agro-Ecosystem Specialist Assessment. The terms of reference for such an assessment, as stipulated in the protocol, are listed below, and the section number of this report which fulfils each stipulation is given after it in brackets:

The Agricultural Screening Tool classifies the site as having very high agricultural sensitivity. (Fig.3.1)

1. The assessment must be undertaken by a soil scientist or agricultural specialist registered with the South African Council for Natural Scientific Professions (SACNASP).
2. The assessment must be undertaken on the preferred site and within the proposed development footprint.
3. The assessment must be undertaken based on a site inspection as well as an investigation of the current production figures, where the land is under cultivation or has been within the past 5 years, and must identify:
 - a. The extent of the impact of the proposed development on the agricultural resources;
 - b. Whether or not the proposed development will have an unacceptable negative impact on the agricultural production capability of the site, and in the event where it does, whether such a negative impact is outweighed by the positive impact of the proposed development on agricultural resources.
4. The status quo of the site must be described, including the following aspects which must be considered as a minimum in the baseline description of the agro-ecosystem:
 - a. The soil form/s, soil depth (effective and total soil depth), top and sub-soil clay percentage, terrain unit and slope (Section 6.1);
 - b. Where applicable, the vegetation composition, available water sources as well as agro climatic information (Section 6.1-6.5);
 - c. The current productivity of the land based on production figures for all agricultural activities undertaken on the land for the past 5 years, expressed as an annual figure and broken down into production units (Section 6.7);
 - d. The current employment figures (both permanent and casual) for the land for the past 3 years, expressed as an annual figure (Section 6.8);
 - e. Existing impacts on the site, located on a map where relevant (e.g. erosion, alien vegetation, non-agricultural infrastructure, waste, etc.)

5. Assessment of Impacts, including the following which must be considered as a minimum in the predicted impact of the proposed development on the agro-ecosystem:
 - a. Change in productivity for all agricultural activities based on the figures of the past 5 years, expressed as an annual figure and broken down into production units (Section 7.1);
 - b. Change in employment figures (both permanent and casual) for the past 5 years expressed as an annual figure (Section 7.2);
 - c. Any alternative development footprints within the preferred site which would be of "medium" or "low" sensitivity for agricultural resources as identified by the screening tool and verified through the site sensitivity verification.

4. METHODOLOGY OF STUDY

This report adheres to the process and content requirements of the gazetted agricultural protocol as outlined in Section 3 above.

The assessment was based on on-site investigation of soils and agricultural conditions and was also informed by existing soil and agricultural potential data for the site. The following existing information was used:

- Soil data was sourced from the land type data set, of the Department of Agriculture, Forestry and Fisheries. This data set originates from the land type survey that was conducted from the 1970's until 2002. It is the most reliable and comprehensive national database of soil information in South Africa and although the data was collected some time ago, it is still entirely relevant as the soil characteristics included in the land type data do not change within time scales of hundreds of years.
- Detailed soil survey prepared by B. Schloms & J Lambrechts in 2005.
- Land capability data was sourced from the 2017 National land capability evaluation raster data layer produced by the Department of Agriculture, Forestry and Fisheries, Pretoria.
- Climate data was sourced from the SA Atlas of Climatology and Agro hydrology, available on Cape Farm Mapper.
- Satellite imagery of the site and surrounds was sourced from Google Earth.

A site investigation was performed by evaluating the current agriculture activities, surface conditions and topography.

Given that the soils were already classified by B. Schloms & J Lambrechts no additional classification was done.

5. ASSUMPTIONS, UNCERTAINTIES OR GAPS IN KNOWLEDGE OR DATA

The assessment rating of impacts is not an absolute measure. It is based on the subjective considerations and experience of the specialist, but is done with due regard and as accurately as possible within these constraints.

There are no other assumptions, uncertainties or gaps in knowledge or data that affect the findings of this assessment.

6. BASELINE DESCRIPTION OF THE AGRO ECOSYSTEM

Site conditions and soils are shown in Table 6.1, Figure 6.1, Figure 6.3, and Figure 6.4.

6.1. SOILS

Soils of the area have developed mainly from gneissic granite and granodiorite which gave rise to shallow duplex soils. (Table 4.1). These soils are characterized by having a light texture topsoil (3-10% clay) on a heavy textured subsoil layer (35-60% clay). The term Duplex therefore refers to the levelled (Multi story) nature of the profile. Although duplex soils can have substantial depth, this depth is often compromised after rain events, where water builds up on the underlying clay material. A build-up of water in the soil profile is a limiting factor to crop production. Land Types Db1 14 (Full Land Type Memoir in Annex).

Table 6.1. Summarized Land Type Db1 14 soil distribution.

Soil Type	Depth (mm)	Percentage Occurrence	Soil Capability (1-8)	Land Capability Rating (1-15)
Mispah	50-200	2.6	Grazing (Class VII)	4
Estcourt	400-700	51.4	Arable (Class V)	7
Sterkstroom	250-500	12.3	Grazing (Class VI)	5
Kroonstad	500-800	8.7	Arable (Class IV)	8
Swartland	200-500	3.7	Arable (Class IV)	8
Glenrosa	250-600	3.3	Grazing (Class V)	7
Longlands	600-800	2.8	Arable (Class IV)	8
Dundee	>1200	2.4	Arable (Class II)	13
Hutton	600-1200	2.3	Arable (Class I)	14
Wasbank	400-600	2.0	Arable (Class V)	6
Westleigh	500-700	1.6	Arable (Class IV)	8
Lamotte	>1200	1.1	Arable (Class II)	12
Fernwood	>1200	1.1	Arable (Class II)	13

The land Capability classes as described by Scotney *et al.* (1987) gives some insight into the classification of limiting factor with regards to soil. Due to the high erosion risk of duplex soils, most of these duplex soil types will be categorized as IV: Low potential, high erosion hazard. High potential soil forms such as Hutton, Dundee, Lamotte and Fernwood makes up a small amount (4.5%) in this land type.

Table 6.2. Land Capability Classification as per Scotney et al. (1987)

LAND CAPABILITY CLASS	GROUP	DESCRIPTION
CLASS I	Arable	Very high potential; no or few limitations; very low erosion hazard.
CLASS II	Arable	High potential; slight limitations; low erosion hazard.
CLASS III	Arable	Moderate potential; moderate limitations; some erosion hazard.
CLASS IV	Arable	Low potential; severe limitations; high erosion hazard.
CLASS V	Grazing	Not suitable for cultivation; suitable for light grazing; wetness limitations.
CLASS VI	Grazing	Not suitable for cultivation; suitable for perennial vegetation.
CLASS VII	Grazing	Very severe limitations; suitable only for natural vegetation.
CLASS VIII	Wilderness	Extremely severe limitations; not suitable for grazing or afforestation.

A detailed soil survey has been carried out by B Schloms & J Lambrechts in 2005. The suitability of the soils are summarized below.

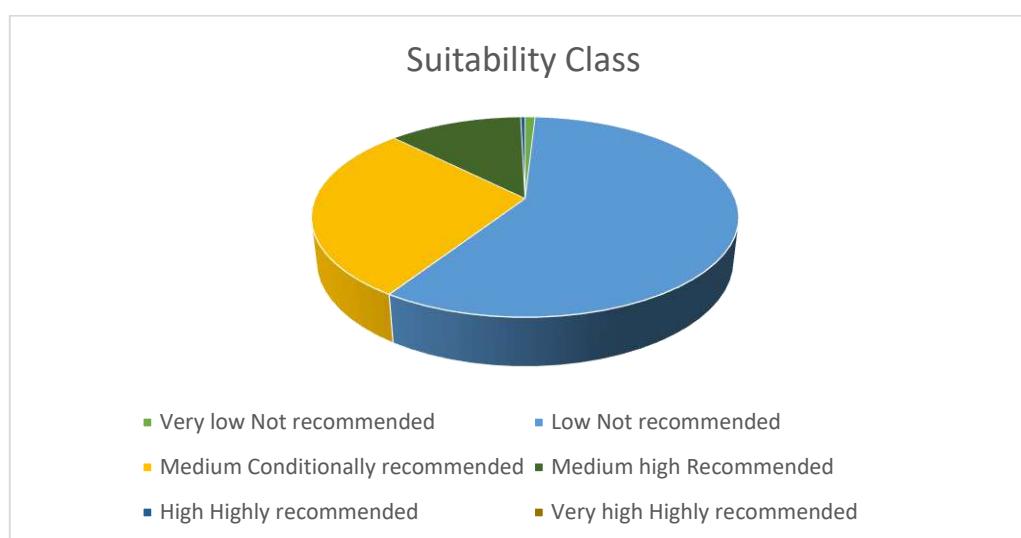


Figure 6.1. Soil Suitability distribution of Hoogekraal Farm.

Table 6.3. Suitability and Activity summarized for Hoogekraal Farm

. Percentage Class (Permanent Crops)	Proposed Agricultural Activity
Not Recommended 59%	Grazing / Planted Pastures / Dryland Bale production. Vegetables(i)
Conditionally Recommended 28.3%	Potential for Permanent crops – Avocado, Macadamia, Wine Grapes
Recommended 12.1%	High Potential for Permanent Crops - Avocado, Macadamia, Wine Grapes
Highly Recommended 0.4%	High Potential for Permanent Crops - Avocado, Macadamia, Wine Grapes

6.2. Terrain and Slope

The site has multiple aspects and slopes, however agriculture is currently only practiced on gentle slopes (<15%). Large portions of the site will remain non agriculture and re-habilitated to natural fynbos vegetation.

6.3. AVAILABLE WATER SOURCES

The property has irrigation rights out of the Maalgateriver, and has been used to fill some of the dams on the property. Total water rights amounts to roughly 100000m3 per annum. In total 13 dams was developed on the property for irrigation and cattle water needs. These dams will stay in place and be used for future agricultural production.

6.4. AGRO-CLIMATIC INFORMATION

The climate of the study area has a Mediterranean climate. The Koppen Geiger classification system categorizes the climate as Cfb (Warm Summer, Dry Winter) or Cfb (Oceanic). The area is not prone to frost or extreme temperature ranges. Rainfall is distributed relatively uniformly throughout the year. Average annual rainfall is 650mm.



Figure 6.2. Climograph of George, Western Cape. (Climate Data.org)

Average, maximum and minimum temperatures are important when considering permanent crop production such as citrus and macadamia nuts. The temperature range between 5.6-26.5°C which makes the area suitable for evergreen crops. Since

evergreen crops does not lose their leaves in the winter, they are susceptible to cold damage in the winter months. The high annual rainfall makes it also ideal for dry land crops where irrigation water is not available.

Table 6.4. Climate Table for George, Western Cape (*Climate Data.org*)

	January	February	March	April	May	June	July	August	September	October	November	December
vg. Temperature °C	21.7 °C	21.7 °C (	20.9 °C	18.4 °C	15.8 °C	13.3 °C	13 °C	15.4 °C	17.9 °C	19.3 °C	20.2 °C	21.4 °C
Min. Temperature °C	17.6 °C	17.6 °C	16.4 °C	13.4 °C	9.3 °C	6.2 °C	5.6 °C	7.9 °C	10.8 °C	13.4 °C	15.3 °C	17 °C
Max. Temperature °C	26.4 °C	26.6 °C	26 °C	23.9 °C	22.6 °C	20.9 °C	20.7 °C	23.1 °C	25.1 °C	25.4 °C	25.7 °C	26.5 °C
Precipitation / Rainfall mm	162	138	113	57	21	10	14	20	36	77	127	159
Humidity(%)	76%	76%	74%	73%	66%	62%	59%	55%	57%	65%	72%	75%
Rainy days (d)	13	12	11	7	3	2	2	3	5	10	12	14
avg. Sun hours	6.5	6.7	7.1	7.0	8.1	8.2	8.0	8.2	7.8	6.8	6.6	6.9

6.5. LANDUSE AND SURROUNDING AREAS

The current land use is grazing for cattle (Fig6.1). Historically planted pastures was established (kikuyu, perdekweek and buffelkweek) for cattle to graze. Alien trees can be found throughout the property and is cut for firewood by local residents (Fig 6.2).



Figure 6.3. Fields used for grazing. View to the South



Figure 6.4 Cutting of alien vegetation for firewood.

The site is bordered by Glentana, a suburb to the south-west. On the northern side the site is bordered by farms whilst the eastern border is on the Maalgateriver.

6.6. AGRICULTURAL POTENTIAL

The soil, landscape and climate combination of the site is suitable for various crop production systems. A summary is provided below:

Grazing / Planted Pastures (**Dryland -59%**):

- Horses (Breeding, Stabling etc.)
- Cattle (Meat)
- Sheep (Meat)
- Game (Breeding) – Only species that are adaptable to supplemental feeding.
- Winter grains for baling (Oats)

Although supplemental feeding might be required for large stock animals, other small holdings might produce and supply neighbouring plots.

Potential for Permanent Crops (**Supplemental Irrigation 40%**)

- Protea and Fynbos cut flower production.
- Wine grape production (Micro winery)
- Blueberry production
- Kiwi (low chill unit requirement)

- Avocado & Macadamia (Subtropical)
- Vegetable gardening (Village + Plots)

With an average annual rainfall of 600mm only supplemental irrigation will be needed in the dryer summer months.

Most vegetable production in the George area is done on shallow duplex soils, which is abundant on this property. This might also be the activity that is mostly practised by land owners for own use.

6.7. AGRICULTURAL PRODUCTIVITY

Current land use is grazing of cattle. The Grazing capacity (2018-Cape Farm Mapper) is 71-80ha/LSU (Large Stock Unit). This puts the possible herd size for the site at 5-6 stock units for the 419ha of agricultural land.

Grazing capacity can be increased with pasture management and supplementary feeding.



Figure 6.5 Grazing Capacity (2018) as per Cape Farm Mapper.

6.8. AGRICULTURAL EMPLOYMENT

Current agricultural employment is linked to the head of cattle grazing the area. Staff moves the cattle between grazing camps and ensures fencing and potable water is available. Seasonal workers are not employed on the property.

Table 6.5. Agricultural Employment.

Farm Name	Permanent Employment
Glentana	2
Brakfontein	2
Hoogekraal	5
Buffelsdrift	3
TOTAL	12

6.9. EXISTING IMPACTS ON THE SITE

There is a number of existing buildings on site. Various parts of the site are infested with alien invasive trees mostly along the borders of the properties (Fig. 6.2).

6.10. SITE SENSITIVITY VERIFICATION

Agricultural sensitivity, as classified by the national web-based screening tool, is directly linked to the capability of the land for agricultural production. The loss of high agricultural capability land will have a larger effect than the same area of low agricultural capability land. The conservation of agricultural land is a national priority since agriculture contributes a large portion to the South African domestic produce and food security. For this reason the gain of productive agriculture land is viewed as a priority as well.

Cultivated land is classified according to the national screening tool as high sensitivity, taking into account the fact that the cultivated land is currently being utilized. This does not take into account the soil, climate and topography. On the other side, uncultivated land is categorized by land capability (DAFF 2017) which takes into account soil, climate and terrain.

Protected agricultural areas are defined in Gazette No. 52009 as "...a national or provincial protected agricultural area, contemplated in Part 4 of Chapter 2, which is a cartographically delineated area of agricultural land— (a) which is preserved for purposes of ensuring that agricultural land is protected against non-agricultural land uses in order to promote long-term agricultural production and food security; and (b) which includes all areas demarcated as such in accordance with section 11"

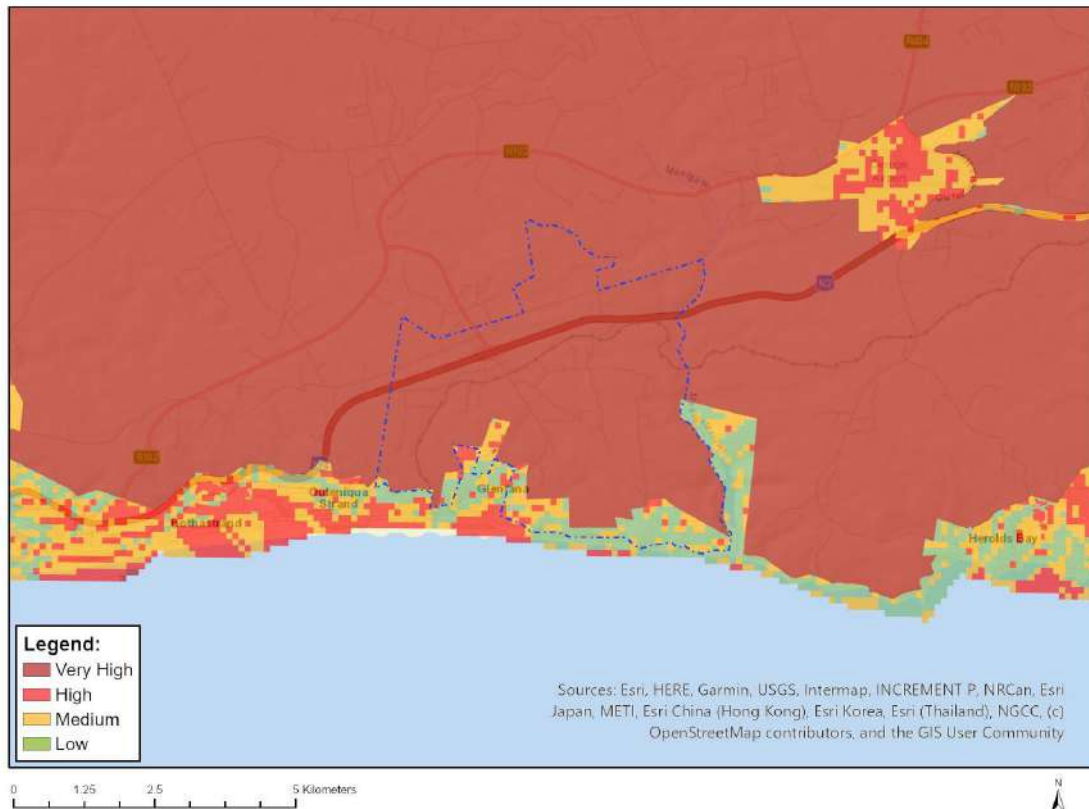


Figure 6.7. Agriculture Themed sensitivity map.

VERY HIGH sensitivity	HIGH sensitivity	MEDIUM sensitivity	LOW sensitivity
X			

Table 6.6: Sensitivity features indicated below:

Sensitivity	Feature(s)
High	Rainfed Annual Crop Cultivation / Planted Pastures
High	Shadenet
High	08. Moderate
High	09. Moderate-High
Low	03. Low-Very low
Low	04. Low-Very low
Low	05. Low
Medium	06. Low-Moderate
Medium	07. Low-Moderate
Very High	Non-pivot Irrigated Annual Crop Cultivation / Planted Pastures
Very High	Pivot Irrigation
Very High	Groot Brak-George PAA

The agricultural sensitivity, as identified by the national screening tool, is Very High. This is due to the Groot Brak George Protected Agricultural Area.

The agricultural sensitivity, as identified by the screening tool, is confirmed by this assessment. The motivation for confirming the sensitivity is that the land of the site, although not the entire property, includes areas of high land capability. Cultivation suitable climate plus cultivation suitable soils gives a high to very high sensitivity. Although only 12% is recommended for permanent crop production, site sensitivity is based on the highest potential within the boundaries of the site.

7. IDENTIFICATION AND ASSESSMENT OF IMPACTS ON AGRICULTURE

The proposed development will subdivide the agricultural land into small agricultural plots. Plot sizes range between 5-57ha per plot, with a average plot size of 7 ha. These plots will be marketed as an agricultural lands within a secure estate. The fynbos plots will be marketed as natural conservation plots.

The key factor in understanding the impact on the agricultural output of the plot is these plots will be marketed as lifestyle farming. Lifestyle agricultural land is appealing for potential buyers for reasons such as recreational opportunities provided by the property and its aesthetic beauty including natural scenery. In the Western Cape more than half of all agricultural land purchases are done for lifestyle reasons (Reed *et.al.* 2009).

Clients purchasing these farming units will in effect purchasing a lifestyle farming unit. Lifestyle buyers mostly rely on income from outside the agricultural sector for their livelihoods and financing of purchased properties, not the commercial agricultural production of the property (Reed *et.al.* 2009). Each 5ha plot will receive roughly 10m³ water per day (300m³/month), for both household and irrigation use. Various productive activities can be done on the property.

Supplemental irrigation for each plot will allow for the following agricultural practises as an example

Table 7.1. An example of water use for various small scale farming activities:

Water Use	Monthly Usage Low (m3)	Monthly Usage High (m3)
Household <small>(Booyesen <i>et.al.</i> (2019)</small>	8.4	16.2
Vegetable garden (500m ²)	45	89
Poultry (10x)	0.06	0.12
Sheep (5x)	0.75	3
Cattle	1.5	3
Game	0.45	3
TOTAL USAGE / MONTH	56.1	114

Detailed calculations can be found in the Annexure.

7.1.CHANGE IN AGRICLTURAL PRODUCTION

Due to the nature of the development, it is not possible to calculate the final agricultural output of the property after development due to the following factors:

- New property owners will decide what kind of agricultural activities will be done on site.
- Financial viability will not be taken into account because lifestyle buyers rely on income from outside the agricultural output of the property (Reed *et.al.* 2009).
- George Riding club will be moving their stables if the development is approved. This will also create a demand for hay bales.

According to STATS SA 26% of agricultural households practise fruit and vegetable production, whilst 39% practises livestock and poultry production. It can be argued

that most of the potential buyers will at least have some sort of vegetable garden and keep some livestock.

7.2. CHANGE IN AGRICULTURAL EMPLOYMENT

Demand for unskilled labour will increase due to the amount of farming units that will have to be managed. In this case the sub division of agricultural land will have a positive impact on employment. Each plot will need some attending to, if it's only for grounds keeping (1 labourer between 3 plots) making for 30 permanent employees between the 90 plots. Vegetables are labour intensive and if 26% (STATSA) of buyers decide to farm with vegetables 1x per plot will add another 23 employees, although this might be seasonal. Livestock uptake is around 39% for agricultural households (STATSA) and will further add 1 employee shared between two plots for 17 permanent employees.

Table 7.2. Employment calculated based of STATSA agricultural household activities.

Activities	Permanent	Seasonal
Horses (George Riding Club)	7	
Agri Plots (90)	30	
Vegetable gardens (26%)		23
Livestock (39%)	17	
Estate Terrain keeping	5	
TOTAL	59	23

7.3. ADDITIONAL ASPECTS OF AGRICULTURAL IMPACT

The gazetted agricultural protocol requires that the following agricultural impact aspects be considered.

7.3.1. DEVELOPMENT BENEFETS VERSUS AGRICULRUAL BENEFITS

The development will permanently remove some agricultural land (10%) for a primary dwelling, access roads and fence lines (Table 7.3). The remainder of the agricultural land will remain in agricultural production. This production might be different than traditional agricultural activities. Small scale niche farming can be practised on a lifestyle farm that would not have been feasible for a commercial farmer. Furthermore the amount of unskilled labour that will be employed to manage 90 Agriculture and 34 Nature Conservation plots will be higher than the current employment. A group housing scheme s also integrated in the development for current labourers and family to move to.

Table 7.3 Loss of agricultural land due to development

Item	m ²	Comment
Average plot size m2	50000	5-7 hectare per plot
Erf size (m2)	2500	Limited to by developer
Road (50mx5m)	555	Distance to centre of 5ha square.
Fencing (2 meters)	1789	Perimeter of 5ha square 2m width.
Available for Agriculture	45461	
Lost Area	9.7%	

7.3.2. ADDITIONAL ENVIRONMENTAL IMPACTS

There are no additional environmental impacts of the proposed development that are relevant to agriculture

7.3.3. NO-GO AREAS

It is not desirable, practical or possible to retain any parts of the site for agricultural production. The Conservation plots are already demarcated and does not fall under the agricultural land for this study.

Therefore, it is not necessary to demarcate any agricultural no-go areas or buffers.

7.3.4. MICROSITING TO MINIMIZE FRAGMENTATION AND DISTURBANCE OF AGRICULTURAL ACTIVITIES

The agricultural protocol requires confirmation that all reasonable measures have been taken through micro-siting to minimize fragmentation and disturbance of agricultural activities. However, for the same reasons that justify the section above, micro-siting of the development infrastructure will have absolutely no effect on agricultural impacts.

7.4. AGRICULTURAL ASSESSMENT

The focus and defining question of an agricultural impact assessment is to determine to what extent a proposed development will compromise (negative impacts) or enhance (positive impacts) current and/or potential future agricultural production. The significance of an impact is therefore a direct function of the degree to which that impact will affect current or potential future agricultural production. If there will be no impact on production, then there is no agricultural impact.

Due to the nature of this development, some portions of the site will be permanently taken out of agricultural production. The aspect of lifestyle farming does bring a different dynamic to the remainder of the agricultural land which difficult to quantify.

The impact is summarised in table 7.4.

7.4.1. CUMULATIVE IMPACT

Cumulative impact refers to the combined effect of a proposed development when added to the incremental impacts of past, present, and reasonably foreseeable future activities within the same environment. It is important to distinguish this from an assessment of all surrounding projects. In this case, the cumulative impact assessment focuses solely on the impacts of this project, viewed in the context of other existing and potential influences. The purpose is to understand this project's contribution to the overall impact, rather than to define the total impact itself.

7.4.2. COMPARATIVE ASSESSMENT OF ALTERNATIVES

No final layout for dwellings can be provided since each owner will decide where the erf will be placed on the 5ha plot. As a result, regardless of their configuration—will have the same agricultural impact: the partial loss of the site's potential for future agricultural use. Therefore, any alternative layouts are identical in terms of agricultural impact.

7.4.3. IMPACTS OF THE NO-GO ALTERNATIVE

The no-go alternative considers impacts that will occur to the agricultural environment in the absence of the proposed development. There will be no agricultural impact of the no-go alternative. There is also no real agricultural impact of the development. Because of this, there is no real difference in agricultural impact between the proposed development and the alternative of a no-go for the development.

7.5. MITIGATION MEASURES

There are no measures required to mitigate agricultural impact other than standard good practises during the construction phase that can be summarized as follows:

- **Dust and Erosion Control**
 - Use water spraying to suppress dust during dry periods.
 - Implement erosion control structures (e.g., berms, silt fences).
 - Vegetate exposed areas with indigenous grass mixes to stabilize soil.
 - Evaluate irrigation main line locations before excavations, pressurised pipes can unexpected erosion hazards.
- **Drainage and Runoff Management**
 - Maintain natural drainage patterns.
 - Avoid creating waterlogged zones near orchards. Compacted roads often lead to subsoil drainage complications.
 - Use diversion channels to prevent runoff from construction zones entering productive fields.
- **Compaction Prevention**
 - Restrict heavy machinery movement to designated paths. This will also assist in dust control.
 - Rip compacted areas post-construction to restore soil structure where natural or agricultural areas are to be re-planted.
- **Contamination Prevention**
 - Implement spill response plans for fuel and chemicals.
 - Store hazardous materials away from sensitive agricultural zones.
 - Regularly inspect machinery for leaks.

7.6. PROPOSED IMPACT MANAGEMENT OUTCOMES AND MONITORING

Because the impact is the partial loss of agricultural land use, the remainder of agricultural land should be preserved during construction of the development. This will insure that the only impact is the construction of roads, dwellings, which should leave the remainder of the agricultural land available for production once construction is concluded.

Following above mentioned good practises, no additional outcomes and monitoring is stipulated.

Table 7.4. Table of impact assessment for the impact: Subdivision & Loss of agricultural land.

DESCRIPTION OF IMPACT / RISK	CURRENT LAYOUT	COMMENTS
	1. LOSS OF PORTIONS OF AGRICULTURE LAND 2. SUBDIVISION OF AGRICULTURAL LAND 3. DIVERSIFICATION OF AGRICULTURAL ACTIVITIES	
NATURE OF IMPACT	1. NEGATIVE 2. NEGATIVE 3. POSITIVE	1. +-10% AGRICULTURAL LOSS PER 5HA PLOT. (TABLE 7.3) 1. LOSS OF AGRICULTURAL LAND 2. SUBDIVISION OF AGRICULTURAL LAND 3. POSSIBLE INCREASE IN NICHE AGRICULTURE PRODUCTION
CONSEQUENCE OF IMPACT OR RISK	LOW	
PROBABILITY OF OCCURANCE:	DEFINITE	
DEGREE TO WICH THE IMPACT MAY CAUSE IRREPLACEABLE LOSS OF RESOURCES	VERY LOW	
DEGREE TO WHICH THE IMPACT CAN BE REVERSED	IRREVERSIBLE	
INDIRECT IMPACTS	INCREASED UNKSILLED LAYBOUR EMPLOYMENT	DUE TO THE SUBDIVISION AND LABOUR NEEDED. (TABLE 7.2)
CUMULATIVE IMPACT PRIOR TO MITIGATION	VERY LOW	
INTENSITY OF IMPACT	VERY LOW	
SIGNIFICANCE RATING OF IMPACT PRIOR TO MITIGATION	VERY LOW	
DEGREE TO WHICH THE IMPACT CAN BE AVOIDED	VERY LOW	
DEGREE TO WHICH THE IMPACT CAN BE MANAGED	VERY LOW	
DEGREE TO WHICH THE IMPACT CAN BE MITIGATED	VERY LOW	
PROPOSED MITIGATION	NONE DESIRABLE OR POSSIBLE	
RESIDUAL IMPACT	PERCENTAGE LOSS OF AGRICULTURAL LAND	
CUMULATIVE IMPACT POST MITIGATION	VERY LOW	
SIGNIFICANCE RATING OF IMPACT AFTER MITIGATION	VERY LOW	

8. CONCLUSIONS

After the site sensitivity is verified, the assessment must be undertaken based on the site inspections as well as production figures. Assessor must identify:

- The extent of the impact of the proposed development on the agricultural resources; and
- whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site, and in the event where it does, whether such a negative impact is outweighed by the positive impact of the proposed development on agricultural resources.

The conclusion of the assessment is that the agricultural impact of the proposed subdivision and development which is a partial loss of agricultural land, will be of very low significance. This is due to the following contributing factors:

- o Only a portion(<10% per plot) of the agricultural land will be removed from agriculture production
- o Current land use (Grazing) does not produce high amounts of agricultural output (5 LSU / 419ha)
- o Establishment of lifestyle farms, marketed as such, will attract clients that are specifically looking for a farming plot, where they can practise various agricultural activities.

Therefore the proposed development will not have an unacceptable negative impact on the agricultural production capability of the site. From an agricultural impact point of view it is recommended that the development be approved.

The conclusion of this assessment on the acceptability of the proposed development and the recommendation for its approval is not subject to any conditions.



29th March 2026

GJ Malan

9. REFERENCES:

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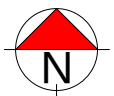
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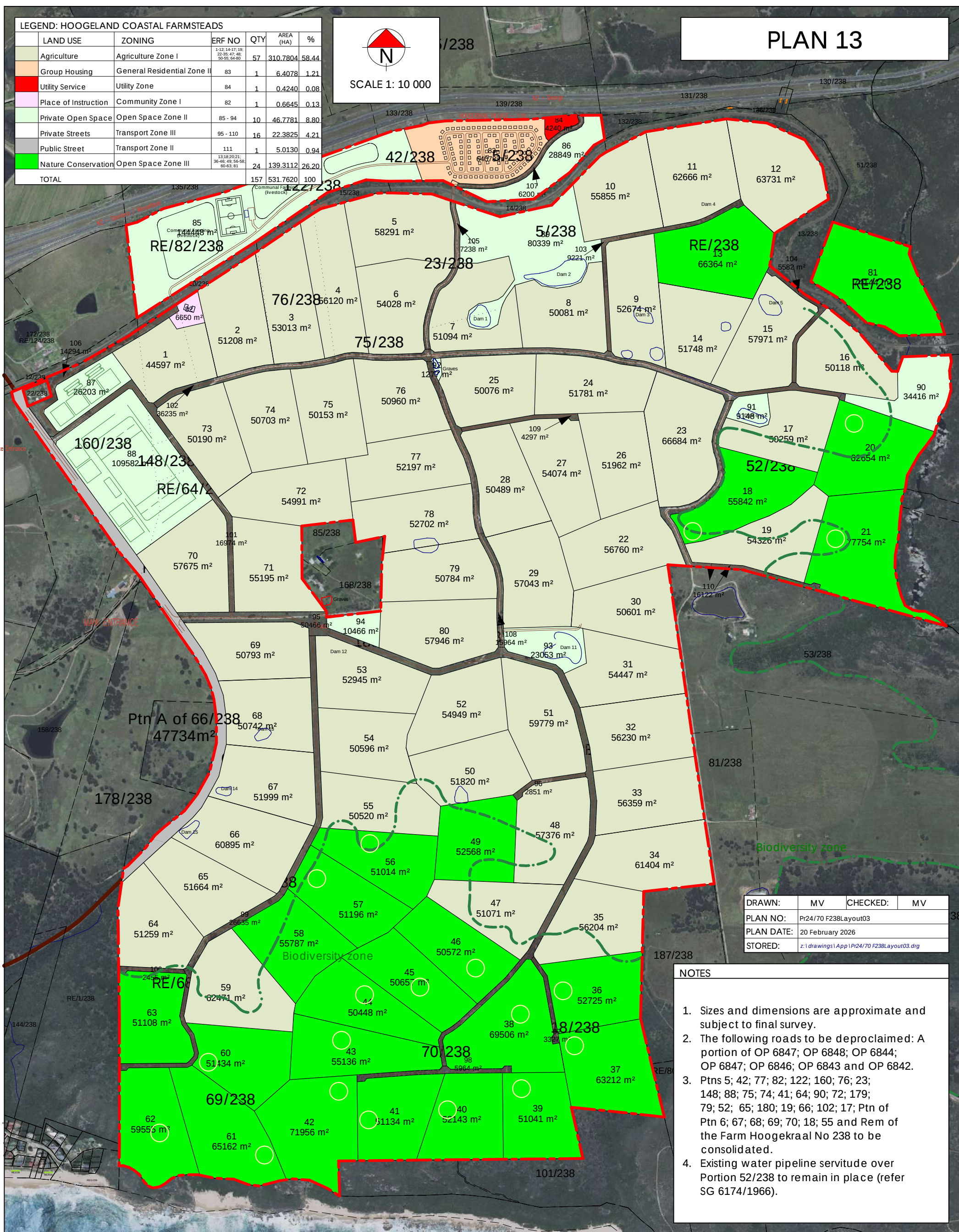
LEGEND: HOOGELAND COASTAL FARMSTEADS

	LAND USE	ZONING	ERF NO	QTY	AREA (HA)	%
	Agriculture	Agriculture Zone I	1-12; 14-17; 19; 22-35; 47; 48; 50-55; 64-69	57	310.7804	58.44
	Group Housing	General Residential Zone II	83	1	6.4078	1.21
	Utility Service	Utility Zone	84	1	0.4240	0.08
	Place of Instruction	Community Zone I	82	1	0.6645	0.13
	Private Open Space	Open Space Zone II	85 - 94	10	46.7781	8.80
	Private Streets	Transport Zone III	95 - 110	16	22.3825	4.21
	Public Street	Transport Zone II	111	1	5.0130	0.94
	Nature Conservation	Open Space Zone III	13-18; 20-21; 36-46; 49; 56-58; 60-63; 81	24	139.3112	26.20
	TOTAL			157	531.7620	100



SCALE 1: 10 000

PLAN 13



PORTIONS OF THE FARM HOOGEKRAAL NO 238, DIVISION GEORGE

LAYOUT PLAN

MUNICIPAL MANAGER

DATE:



21 Trotter Street, PO Box 2180
KNYSNA 6570

' (044) 382 0420
7 086-459-2987
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-

PROPOSED LAGOONBAY LIFESTYLE ESTATE DEVELOPMENT

-

ENVIRONMENTAL IMPACT ASSESSMENT

Undertaken in terms of in terms of
SECTION 21, 22 & 26 of the Environment Conservation Act
(Act 73 Of 1989), Government Notice No R1182 (As Amended)

-

IMPACT OF THE PROPOSED DEVELOPMENT ON AGRICULTURE

Prepared by B Schloms & J Lambrechts
November 2005

1 ASPECT ASSESSED

-

The aspect identified during the Scoping Process and assessed below is *'the loss of agricultural land and the subsequent loss of associated benefits and opportunities'*.

-

2 BASIS FOR THE ASSESSMENT

-

The assessment is based on the findings of the detailed soil survey carried out by Schloms & Lambrechts during July 2005. The findings of the soil survey were based on the standard assessment criteria used throughout the Western Cape, and accepted by the Department of Agriculture, namely that soil potential is based on its suitability for ***perennial crops*** rather than ***annual crops***.

3 ALTERNATIVES ASSESSED

The alternatives that were the subject of this assessment are as follows:

Alternative 1: Original proposal put forward by Dennis Moss Partnership (April 2005).

Alternative 2: Modified design to be developed to incorporate comments received during the Scoping Process.

Alternative 3: No-go option, which is the continuation of the status quo (namely as ownership existed prior to the involvement of Lagoon Bay Lifestyle Estate).

4 ASSESSMENT OF ALTERNATIVE 1

As confirmed by the soils survey, the soils of the study area have a low to low medium potential for perennial crops. In this regard, reference is made to the conclusion of the soil survey report, namely:

As is indicated by the soils map, the soils that fall in the “conditionally recommended” and “recommended” classes are distributed over the entire property, which implies that there is no single unit of meaningful extent that is suitable for cultivation of perennial crops.

In order to enable cultivation of perennial plants on those units falling into the latter two classes, intensive irrigation will be required during dry periods, and amelioration measures such as the following will be imperative:

- a) Mixing of topsoil and upper subsoil layers, provided that the upper subsoil is not clay.*
- b) Breaking up of dense subsoil clay layers and underlying hard weathering rock.*
- c) Cutoff drainage.*
- d) Ridging of soils with shallow clay layers.*
- e) Judicious irrigation.*
- f) Creating and maintaining an adequate organic surface mulch.*

The soil map is extremely important for general planning, selection of amelioration measures to alleviate some of the physical soil limitations and selection of plants adapted to the soil restraints. Expert advice from an experienced plant specialist who can interpret the soils information and translate this into a comprehensive agricultural plan will be imperative if cultivation were to be undertaken on those limited areas falling in the “conditionally recommended” and “recommended” classes.

Such measures may prove to be prohibitively expensive and impractical for individual landowners and are therefore not recommended in the long-term. There is conclusive evidence that the viability of crop cultivation has been explored over time throughout the study area (including the successional fynbos areas on the coastal ridge along the eastern boundary of the study area). Such practices have been terminated more than ten years ago, primarily due to a lack of irrigation water and low potential of the soil.

Small-scale cattle farming and a dairy were practiced on irrigated pastures comprising inter alia kikuyu, perdekweek and buffelkweek. Water for the irrigation was abstracted from the Maalgate River and small irrigation dams. Due to their small scale, such practices are not considered a financially viable land-use.

In conclusion, it is stated that, due to the lack of suitable soils, commercial agriculture, with specific reference to crop cultivation, is not a financially viable land-use in the study area.

In accordance with the above conclusion, the potential environmental impact of Alternative 1 was assessed as follows:

Criteria	Assessment
<u>Spatial extent</u>	<ul style="list-style-type: none"> • Site specific • Local • Regional • National
<u>Intensity</u>	Low to very low
<u>Duration</u>	Permanent
<u>Probability</u>	Definite
<u>Significance</u>	Low to very low
<u>Status</u>	Positive
<u>Confidence</u>	High

5 ASSESSMENT OF ALTERNATIVE 2

It is submitted that the aspects that were raised during the Scoping Process pertaining to agriculture in the study area, do not justify any changes to the original design for the development (i.e. Alternative 1). From an agricultural perspective, it is therefore not necessary to assess Alternative 2 or to submit any inputs in this regard.

6 ASSESSMENT OF ALTERNATIVE 3

The current situation is characterized by the following:

- A lack of any sustainable agriculture in the form of perennial crop cultivation due to low soil potential, lack of irrigation water and infrastructure.
- Only current agricultural activities are a dairy, small-scale stock farming (cattle and horses).

- c) Plethora of uneconomical units (total of 37) (i.e. smaller than the prescribed 40 ha per unit), currently primarily used as residential small-holdings.
- d) Serious infestation of alien vegetation, primarily wattle and kikuyu.
- e) Evident high level of poverty throughout the study area with specific reference to the previously disadvantaged. In this regard it is evident that agriculture has not been, and will probably not be, able to sustain an acceptable livelihood for the former owners and farm workers in the study area.

Considered in this context, it is concluded that Alternative 3 is not desirable and will lead to further deterioration of the environment and the socio-economic status of the study area.

The assessment of the potential environmental impact in this regard is as follows:

Criteria	Assessment
<u>Spatial extent</u>	<ul style="list-style-type: none"> • Site specific • Local • Regional • National
<u>Intensity</u>	High
<u>Duration</u>	Permanent
<u>Probability</u>	Definite
<u>Significance</u>	High
<u>Status</u>	Negative
<u>Confidence</u>	High

B. SCHLOMS

UNIVERSITY OF STELLENBOSCH

-
PROPOSED LAGOONBAY LIFESTYLE ESTATE DEVELOPMENT

-
ENVIRONMENTAL IMPACT ASSESSMENT

Undertaken in terms of in terms of
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-
IMPACT OF THE PROPOSED DEVELOPMENT ON AGRICULTURE

Prepared by B Schloms & J Lambrechts
November 2005

RESPONSE TO COMMENT OF DEPARTMENT OF AGRICULTURE

-
Reference is made to the comments of the Department of Agriculture on the soils study report (their reference 20/9/2/4/3/10 dated 14 November 2005).

The assessment criteria upon which the soil potential assessment in the soils report were based, namely suitability for **perennial crops** rather than **annual crops**, are the standard criteria used throughout the Western Cape and have been accepted and approved by the Department of Agriculture.

It is stated in the soils report that dispersed pockets of soils occur that are suitable for vegetable cultivation. However, in this regard, we reiterate our opinion put forward in the soils report, namely that:

In order to enable crop cultivation, intensive irrigation will be required during dry periods, and amelioration measures such as the following will be imperative:

- g) Mixing of topsoil and upper subsoil layers, provided that the upper subsoil is not clay.*
- h) Breaking up of dense subsoil clay layers and underlying hard weathering rock.*
- i) Cutoff drainage.*
- j) Ridging of soils with shallow clay layers.*
- k) Judicious irrigation.*
- l) Creating and maintaining an adequate organic surface mulch.*

Expert advice from an experienced plant specialist who can interpret the soils information and translate this into a comprehensive agricultural plan will be imperative if cultivation were to be undertaken on those limited areas falling in the “conditionally recommended” and “recommended” classes.

Such measures may prove to be prohibitively expensive and impractical for individual landowners and are therefore not recommended in the long-term. There is conclusive evidence that the viability of crop cultivation has been explored over time throughout the study area (including the successional fynbos areas on the coastal ridge along the eastern boundary of the study area). Such practices have been terminated more than ten years ago, primarily due to a lack of irrigation water and low potential of the soil.

We, therefore, confirm our opinion that crop farming, both perennial and annual, is not commercially viable option on the small units that characterize the study area.

With regard to the department's reference to the suitability of the soils for 'pastures under irrigation', we wish to note that the current situation provides conclusive evidence is not commercially viable option. None of the properties involved represents a commercial unit in terms of the criteria of the Department of Agriculture.

B. SCHLOMS

UNIVERSITY OF STELLENBOSCH



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3	TERRAIN AND PARENT MATERIAL	3
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APPENDIXES

Appendix 1:

Table 1	SOIL FORMS AND FAMILIES RECOGNIZED DURING THE SOIL SURVEY LISTED ALPHABETICALLY ACCORDING TO SOIL FORM ABBREVIATION SYMBOL
Table 2	SOIL MAP LEGEND
Table 3	MAP UNITS WITH COMPLETE LIST OF PROFILES AND SOIL CODES
Table 4	SOIL LIMITATIONS OF MAP UNITS
Table 5	SOIL AMELIORATION MEASURES AND SUITABILITY OF MAP UNITS

Appendix 2: STRUCTURE OF SOIL CODE AND EXPLANATION OF SYMBOLS

1	TERMS OF REFERENCE
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Messrs. LagoonBay Lifestyle Estate (Pty) Ltd during March 2005 instructed a soil survey of the portions of the farm Hoogekraal 238, George, that have been purchased by them for the purpose of undertaking a tourism-related development. The relevant portions of the farm (further referred to as the study area) are indicated on the attached soils map.

The terms of reference regarding the form of the survey and report were as follow:

- A semi-detail soil survey of the farm to determine the inherent properties, mainly physical and morphological, of the soils.
- Compilation of a soils map at a scale of 1 : 5 000 to describe the natural distribution of the soils.
- Description of the soils in the different map units in terms of their physical and morphological properties.
- To evaluate the soil suitability for agricultural use with specific reference to perennial crops and for estate planning purposes.

2 ALLOCATION OF RESPONSIBILITIES

The following individuals and organizations were responsible for the different actions:

- Mr. SW van der Merwe Junior for siting of soil profiles in the field on a grid of approximately 100 m x 200 m.

Due to ecological restraints profile pits were prohibited in certain areas with fairly pristine indigenous vegetation near the coast. No pits were also made in a section of land that is presently used by the lessee for cattle grazing.

- Management in the study area for excavation of the soil pits.
- Dennis Moss Partnership for the compilation of a base map with a colour photo background and contour lines on a scale of 1 : 5 000 and plotting of the profile positions. This map will be used as base map for the soil survey.
- The surveyors (soil specialists and compilers of this report) for describing and classifying the soil profiles.
- The surveyors will be responsible for compilation of the soils map and a report on the properties, limitations, and relative suitability of the soils for agricultural purposes, with specific reference to perennial crops.

3 TERRAIN AND PARENT MATERIAL

According to the 1 : 250 000 geological map 3322 Oudtshoorn dated 1979, the dominant underlying geological throughout the survey area is the so called Maalgate gneissic granite and granodiorite. A fairly narrow east-west zone of Pre-Cape or Malmesbury formation sediments, mainly quartz schists and phyllites, is found near the coast. In the south-western corner of the survey a small area of recent aeolian sands occurs.

Near the coast the aeolian sands are fairly deep and no underlying bedrock was found in the soil pits. Inland the sand cover gets thinner and generally overlies clay. The predominantly fine to medium sand grade of the overlying sand material might be an indication that aeolian sands have been reworked and mixed with fine sandy colluvial material that either developed from gneissic granite or even Table Mountain sandstone weathering products. Duplex soils are the dominant soil type in the areas with sand on clay. In higher lying, fairly level areas the clay is most probably old marine sediments while in more dissected areas the clay has developed directly from weathering of the underlying gneissic granite, schist or phyllite. In the well-drained incised areas with fairly steep slopes podzolic soils are dominant.

The eastern boundary of the survey area is the Maalgate River, with the N2 road the northern and the road from Glentana the eastern boundary. In the south-western corner the southern boundary extends to the coast. To the east the southern boundary shifts inland and is approximately 259 m to 500 m away from the coast.

The slopes along the eastern and southern sections of the farm are very steep due to dissection by numerous small streams that drain into the Maalgate River or flow towards the coast. The central and northern sections of the farm have an undulating terrain with slopes that range from as low 2.5 % to about 6 %. The crest height of the undulating hills increase from approximately 180 m near the coast to 205 m in the northeast.

4 DESCRIPTION AND CLASSIFICATION OF SOIL PROFILES

During the soil survey a total of 223 soil pits were made on the farm. The soils were investigated in the field and the more important properties described following standard procedures.

Based on recognizable, as well as inferred properties, the soils were classified according to the South African soil classification system (**Soil Classification Working Group, 1991**) into soil forms and soil families. This system is based on the recognition of diagnostic soil horizons and materials.

Soil forms are defined in terms of the type and vertical sequence of diagnostic horizons or materials. For communication, soil forms are given locality names, e.g. Estcourt or Kroonstad. These names are abbreviated to two-letter symbols, e.g. Es for the Estcourt form. Soil forms are subdivided into soil families using properties that are not used in the definition of diagnostic horizons or materials. Reference to a soil family is by combining the soil form abbreviation and a four-digit symbol, e.g. Es 1200 is family number 1200 of the Estcourt form. In **Appendix 1: Table 1** all the soil forms and families recognized during the soil survey is listed alphabetically according to the soil form abbreviation symbol.

Depending on the purpose of the soil survey, soil families can be subdivided on an *ad hoc* basis into soil phases using properties such as soil and horizon depths, stoniness etc. Phase subdivision is achieved by detail coding of individual soil profiles (refer to **Appendix 3: Structure of Soil Code and Explanation of Symbols** for the symbols used during this survey). Codes of all the profiles described are listed alphanumerical according to the Map legend abbreviations in **Appendix 1: Table 2**.

.....
Soil Classification Working Group, 1991. Soil Classification: A Taxonomic System for South Africa. Mem. Natural Agric. Resources for S.A. No. 15.

5 MAP LEGEND AND SOIL MAP

The aim of a soils map is to reflect the natural distribution of soil types and spatial variation in soil properties on any particular farm or area. Depending on the relationship between soil parent material, soil types and terrain, the spatial variation in soil properties and the influence of these variations on land use and soil suitability for specific agricultural activities, different approaches could be followed to develop a map legend according to which a soils map is compiled.

The approach that was followed for the study area, was to develop a map legend that will accommodate most of the variations in soil properties that might have an effect on soil suitability, amelioration measures and potential land use. In **Appendix 1: Table 2** the map legend that was developed for the study area is explained. The properties and features of the different map units are defined in terms of *inter alia*:

- soil form,
- diagnostic horizon(s),
- relevant family criteria,
- degree of wetness of the upper and lower subsoil horizons,
- density of upper and lower subsoil horizons,
- depth to limiting horizons/materials,
- coarse fragments in top- and/or upper subsoil horizons, and
- sand grade and clay content of the topsoil.

With reference to the accuracy of the soil map, the following aspects should be kept in mind:

- The most important factor that determines the accuracy of the soils map is the accuracy of the base map itself and in particular the positioning of the soil pits with reference to land features such as roads, fences, lands and streams.
- According to the terms of reference the profile pits were made on a grid of approximately 100 m x 200 m. This means that the minimum size of a map unit is approximately 2.0 ha. Map units smaller than 2.0 ha could therefore be included in larger soil units on the map.
- In situations where the boundaries between map units coincide with fairly prominent changes in slope, the soil boundaries are usually relatively accurate within the 100 – 200 m spacing between soil pits. In cases where slope changes are gradual, the soil boundaries are only approximate divisions.

The final soil map units are shown on the 1 : 5 000 base map. Map units are identified by means of a symbol that consists of the abbreviation for the soil form followed by an Arabic number (e.g. Es 1). The number suffix has no intrinsic meaning. It only serves as an identifier for different map units that consist of soils belonging to the same soil form, but differ in one or more important soil properties.

The map units are listed alphanumerical according to the soil form symbol in **Appendix 1: Table 2**. All the profiles and codes in the different map units are listed alphanumerical in **Appendix 1: Table 3** (also see **SOIL MAP**).

Certain properties (e.g. horizon/soil depth, coarse fragments, etc.) of the soils in map unit individuals are specified in **Appendix 1: Table 2**. Additional properties can be abstracted from the:

- definition of the soil form in terms of diagnostic horizons and materials,
- properties of diagnostic horizons and materials,
- differentiating family criteria, and
- additional information specified in the soil code.

Due to their genetic composition the lateral and vertical root growth pattern may vary significantly between different types of plants. The minimum useable soil depth required for good root development and water and nutrient uptake to ensure healthy and productive plants can therefore differ greatly between different plant types. In addition, the tolerance of different plants to soil wetness and soil borne diseases may also vary greatly.

In the following paragraphs the most important soil properties that may directly affect root development and nutrient and water uptake, and indirectly the potential for infestation with soil borne diseases will be discussed.

6.1 Dense subsoil clay layers

In most soil forms dense clay layers occur as gleyed (wet), weakly to moderately structured G horizons (e.g. Kroonstad form), relatively dry well structured B horizons, (e.g. Estcourt and Sterkspruit Swartland form), or as unspecified material below a non-structured diagnostic B horizon (e.g. Lamotte, Pinedene and Tukulu form)

If the clay increase from the overlying horizon to the clay layer is clear or abrupt (sharp), free water generally accumulates in the overlying, lighter textured horizon during the rainy season or as a result of over-irrigation. Under conditions of water saturation, reduction and loss of iron leads to the development of a bleached E horizon in the overlying sandy material (e.g. Estcourt and Kroonstad form). Such horizons can set hard when they dry out and have a high soil density.

The effective depth of soils with structured subsoil clay layers is therefore limited by the clay layer itself and indirectly by the periodic wetness in the overlying layer with less clay.

If the clay layer is thin enough (<30 cm) and occurs on material that is more porous and/or that can be loosened (e.g. weathering gneissic granite), all attempts must be made to destroy the clay layer as a horizontally continuous horizon. If it cannot be improved mechanically because of its depth or thickness, then ridging or mounding the topsoil is the only way to increase effective soil depth.

6.2 Wetness

This refers to the presence of free water at varying depths in a soil profile.

In the study area wetness occurs mostly as a ***perched water table***. This refers to the accumulation of free water in E horizons that may develop above a G horizon (Kroonstad form) and prismaeutanic B horizon (Estcourt form). Soil families with a "yellow" E horizons are generally less hydromorphic and show a more friable consistency than families with a "grey" E. Perched water tables are also present in deep, gleyed layers with a loamy to clayey texture below neoeutanic B horizons (e.g. Lamotte, Pinedene and Tukulu form).

Another form of wetness develops as a result of low permeability in G horizons and in weathering gneissic granite that is present in the majority of soil profiles described.

During the field survey the soil water condition in individual soil profiles was evaluated according to the wetness classification that was developed for soils in the winter rainfall region (refer to **Appendix 3**). This wetness classification is based on the number of days during the year and depth of saturation with water. Profile morphology is used to determine the depth of water saturation and the maximum height of signs of hydromorphy is used as depth limit. Climate, locality, aspect, vegetation and water conditions during the survey as well as profile morphology are used to evaluate the duration of water saturation. The expected number of days of saturation during the rainy season in "wet" years is used to determine duration. It is essential for free water to occur in the profile continuously for at least seven (7) days. However, the total number of days with free water need not be continuous. The wetness rating for the individual profiles are listed in **Appendix 1: Table 3**.

Wetness during active root respiration results in a low oxygen concentration with an increased carbon dioxide concentration. This causes reduction of iron oxides/hydroxides and leaching of the reduced iron. As the iron content decreases soil density increases and very large soil strengths can develop when the soil dries out.

Other adverse effects of wetness are:

- Toxic concentrations iron (Fe^{2+}), manganese (Mn^{2+}), sulfides, nitrites, ethylene and volatile organic acids can develop. In certain plants a moderate degree of wetness will only have a negative influence on

growth without dieback of the plants. Sensitive plants, however, can dieback.

- Various diseases can become epidemic under wet conditions. *Phytophthora* in particular can wipe out sensitive crops/plants.
- As a result of limited volumes of non-wet soil that is available for root growth, plants have a restricted root system during the wet season. Crops with a high water requirement may show drought stress during warm and/or dry spells if water content becomes very low.

If the surveyed area is going to be planted with wetness sensitive plants special attention should be given to drainage. It is recommended that a drainage expert is consulted to develop an integrated drainage plan for the total area intended for agricultural development.

6.3 Underlying weathering rock

Gneissic granite in different stages of weathering (it varies from soft, highly weathered to hard, unweathered) occurs in most soils described in the study area as a deep subsoil material (saprolite or hard rock) below the diagnostic horizon sequences characteristic of the different soil forms.

Although such materials are always denser and more impervious to air, water and plant roots than the overlying horizons, the degree of weathering and original structure has a great influence on the intensity of the limitation. Non-hard, fairly highly weathered gneissic granite is reasonably open and porous. The shallower the rock, the less weathered and the harder it is, the greater is the negative influence on root development and water infiltration.

As a result of its dense, impermeable nature, weathering rock normally shows signs of wetness in humid environments, on fairly flat hill crests and concave lower positions.

Other limitations associated with weathering rock are the presence of soluble salts as well as varying quantities of coarse fragments.

Hard, weathering rock that has been loosened has a rapid hydraulic conductivity and free water flows freely through the profile. It is therefore essential that cutoff drains are installed.

6.4 Low clay content in upper part of the profile

In addition to the soils in the study area that have developed from aeolian sands, all the soils are characterized by a fairly sandy colluvial surface horizon (topsoil). Depending on the terrain position where a particular soil might occur, the surface colluvial layer was subjected to varying degrees of sorting and removal of the silt and clay fractions, and accumulation of the sand fraction. Depending on the degree of sorting and silt and clay removal the clay content of the topsoil layers may range from as low as < 5 % to a maximum of about 10 %.

In addition the colour of the topsoil of most soils in the study area is bleached (pale) in the dry state. This is an indication of a low organic matter content.

The ability of soils to retain water and plant nutrients for use by plants is determined mainly by the clay and organic matter content. A clay content of less than 8 - 10 % is generally associated with a water storage capacity that is low enough to be considered as a growth limiting factor. A low clay content is regarded as a limitation because sandy soils dry out fairly quickly and can become very warm during the summer. It is therefore difficult to maintain the plant available water at an optimal level during warm summer months and when plants are young with a small leaf canopy. Another limitation of sandy topsoil with low a organic matter content is their susceptibility for water erosion.

It is therefore important that plants should be irrigated during dry periods to ensure minimum water stress and maximum growth.

6.5 Course fragments in top- and/or subsoils

Certain soils in the study area contain coarse material that ranges from predominantly fine (2 - 25 mm) to coarse gravel (25 - 75 mm) and rarely stones (75 - 250 mm).

The main limitation of coarse fragments is that with an increase in the volume-content of coarse fragments, the fraction of fine soil material (<2 mm) becomes smaller and the water holding capacity decreases. The nutrient retention capacity is similarly influenced.

Coarse fragments results in an increase in the total, as well as macro-porosity of the soil. Gravelly soils are better aerated, with a rapid hydraulic conductivity compared to similar non-gravelly soils. Dry, gravelly soils, therefore, require

less water to reach field water capacity but require more regular and lighter irrigations than similarly textured, non-gravelly/stony soils. Fertilizer programs should also be adjusted.

In **Table 1** the classes and symbols that are used in **Appendix 1: Table 4** to qualify the physical limitations of the soils in the different map units are explained.

Table 1 **Classes used to qualify the physical limitations of soils in the different map units.**

Abbreviation	Limitation class
(no symbol)	None
Low	Low
Mod	Moderate
Sev	Severe

7 AMELIORATION OF PHYSICAL SOIL LIMITATIONS

Except for the low clay content, the physical limitations can be improved or alleviated by means of drainage, ridging, mixing of top- and upper subsoil (except in cases where clay directly underlies the topsoil) and breaking up of the subsoil clay layer or underlying rock. Specific recommendations can, however, only be made on a soil type – plant type basis.

In **Table 2** the classes that are used **Appendix 1: Table 5** to specify the necessity of a specific amelioration measure is explained.

Table 2 **Classes used to specify the necessity of specific amelioration measures.**

Necessity for amelioration measure	Abbreviation
Measure unnecessary	(none)
Measure recommended but not essential	Recom
Measure essential	Essen

The recommended amelioration practices for the soils in the different map units are listed in **Appendix 1: Table 5**.

8 SOIL SUITABILITY WITH SPECIAL REFERENCE TO PERENNIAL CROPS

The most common limitations of the soils in the study area are dense subsoil clay layers, wetness, underlying hard to very hard weathering gneissic granite and locally fine and coarse gravel in the top- and upper subsoil. The general suitability of individual soil profiles for the commercial production of perennial crops was accordingly evaluated in the field by the soil surveyors.

The suitability rating ranges from 1 to 10, with 1 the lowest and 10 equal to the highest or best suitability. These ratings are listed in **Appendix 1: Table 3** for each profile, and the average rating for each map unit in **Appendix 1: Table 5**. The average suitability rating for map units was calculated from the individual profile ratings.

These ratings can be interpreted according to the guidelines in **Table 3**.

Table 3 Interpretation of suitability ratings and percentage of soil profiles in each rating class.

Rating	General suitability		Percent of class
≤2	Very low	Not recommended	0.9
>2 - ≤4	Low	Not recommended	58.3
>4 - ≤5	Medium	Conditionally recommended	28.3
>5 - ≤6	Medium high	Recommended	12.1
>6 - ≤8	High	Highly recommended	0.4
>8	Very high	Highly recommended	0.0

From **Table 3** above it is evident that most of the soils in the study area have a low suitability rating for perennial plants. Approximately 60 % of the soils are not recommended for perennial plants, while about 28 % falls in the class “conditionally recommended” and 12 % in the class “recommended”.

9 CONCLUSION

As is indicated by the soils map, the soils that fall in the “conditionally recommended” and “recommended” classes are distributed over the entire property, which implies that there is no single unit of meaningful extent that is suitable for cultivation of perennial crops.

In order to enable cultivation of perennial plants on those units falling into the latter two classes, intensive irrigation will be required during dry periods, and amelioration measures such as the following will be imperative:

- a) Mixing of topsoil and upper subsoil layers, provided that the upper subsoil is not clay.
- b) Breaking up of dense subsoil clay layers and underlying hard weathering rock.
- c) Cutoff drainage.
- d) Ridging of soils with shallow clay layers.
- e) Judicious irrigation.
- f) Creating and maintaining an adequate organic surface mulch.

The soil map is extremely important for general planning, selection of amelioration measures to alleviate some of the physical soil limitations and selection of plants adapted to the soil restraints. Expert advice from an experienced plant specialist who can interpret the soils information and translate this into a comprehensive agricultural plan will be imperative if cultivation were to be undertaken on those limited areas falling in the “conditionally recommended” and “recommended” classes.

Such measures may prove to be prohibitively expensive and impractical for individual landowners and are therefore not recommended in the long-term. There is conclusive evidence that the viability of crop cultivation has been explored over time throughout the study area (including the successional fynbos areas on the coastal ridge along the eastern boundary of the study area). Such practices have been terminated more than ten years ago, primarily due to a lack of irrigation water and low potential of the soil.

Small-scale cattle farming and a dairy were practiced on irrigated pastures comprising *inter alia* kikuyu, perdekweek and buffelkweek. Water for the irrigation was abstracted from the Maalgate River and small irrigation dams. Due to their small scale, such practices are not considered a financially viable land-use.

In conclusion, it is stated that, due to the lack of suitable soils, commercial agriculture,

with specific reference to crop cultivation, is not a financially viable land-use in the study area.

B. SCHLOMS

SOIL SPECIALIST

LAND TYPE / LANDTIP : **Db114**

CLIMATE ZONE *KLIMAATZONE* : 697H

Area / *Oppervlakte* : 8597 ha

Estimated area unavailable for agriculture

Beraamde oppervlakte onbeskikbaar vir landbou : 200 ha

Occurrence (maps) and areas *Voorkoms (kaarte) en oppervlakte* :

3322 Oudtshoorn (8597 ha)

Inventory by *Inventaris deur* :

B H A Schloms

Modal Profiles *Modale profiele* :

None / Geen

Terrain uni <i>Terreineenhei</i>	:	1	2	3	4	5
% of land type <i>% van landtipe</i>	:	37	1	52	4	6
Area <i>Oppervlakte (ha)</i>	:	3181	86	4470	344	516
Slope / <i>Helling (%)</i>	:	0 - 3	>100	3 - 10	2 - 4	0 - 3
Slope length <i>Hellingslengte (m)</i>	:	800 - 1500	50 - 100	300 - 800	200 - 300	100 - 200
Slope shape <i>Hellingsvorm</i>	:	Y	Y	Y	X	X
MB0, MB1 (ha)	:	3022	0	4247	344	361
MB2 - MB4 (ha)	:	159	86	224	0	155

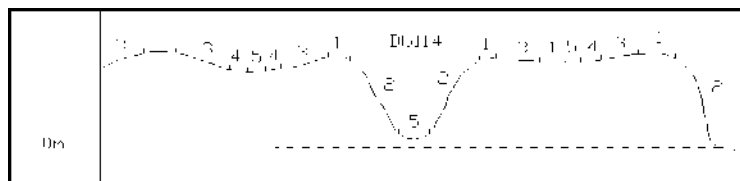
**Depth
limiting
material**

Soil series or land classes <i>Grondseries of landklasse</i>	Depth <i>Diepte</i>		ha	%	ha	%	ha	%	ha	%	Total <i>Totaal</i>		Clay content % <i>Klei-inhoud %</i>			Texture <i>Tekstuur</i>		<i>Diepte- beperkende materiaal</i>
	(mm)	MB :									ha	%	A	E	B21	Hor	Class / Klas	
<i>Soil-rock complex</i>		:																
<i>Grond-rotskompleks:</i>		:																
Rock/Rots		4 :	64	2	52	60	134	3			249	2.9						
Mispah Ms10	50-200	3 :	95	3	34	40	89	2			219	2.6	6-12			A	meSa-LmSa	R
Dohne Es13, Langkloof Es21	400-700	0 :	1909	60			2458	55	52	15	4419	51.4	3-10	3-12	40-60	E	meSa-LmfiSa	pr
Stanford Ss23	250-500	0 :	477	15			581	13			1058	12.3	6-15		35-55	A	LmfiSa	pr
Kroonstad Kd13, Mkambati Kd14,		:																
Bluebank Kd16, Umtentweni Kd21	500-800	0 :	159	5			447	10	138	40	744	8.7	3-12	3-18	40-55	E	meSa-fi/meSaLm	gc
Swartland Sw31, Hogsback Sw32	200-500	0 :	95	3			224	5			319	3.7	10-20		35-60	B	fiSaClLm-Cl	vp
Oribi Gs11, Kanonkop Gs13,		:																
Platt Gs14	250-600	0 :	64	2			224	5			287	3.3	3-12		10-25	A	meSa-Lmfi/meSa	so
Waisand Lo11, Longlands Lo21	600-800	0 :	64	2			89	2	34	10	239	2.8	6-10	6-10	10-15	E	Lmfi/meSa	sp
Dundee Du10	>1200	0 :								206	2.4	10-15				A	LmfiSa	
Shorrocks Hu36	600-1200+	0 :	64	2			134	3			198	2.3	15-20		20-35	B	fiSaClLm	R
Rondevlei Wa20	400-600	0 :	64	2			89	2	17	5	170	2.0	3-6	3-6		E	meSa	hp
Westleigh We11, Rietvlei We12	500-700	0 :							34	10	138	1.6	8-15		10-35	B	LmfiSa-SaClLm	sp
Laparis Lt11	>1200	0 :	64	2					34	10	98	1.1	3-6	3-6	8-12	E	meSa	
Fernwood Fw11	>1200	0 :	64	2					34	10	98	1.1	3-6			A	meSa	
Stream beds/Stroombeddings		4 :							155	30	155	1.8						

LAND TYPE / LANDTIP : **Db114** Continued *Vervolg*

Terrain type *Terreintipe* : A4

Terrain form sketch *Terreinvormskets*



For an explanation of this table consult LAND TYPE INVENTORY (table of contents)

Ter verduideliking van hierdie tabel kyk LANDTIPE - INVENTARIS (inhoudsopgawe)

Geology: Mainly gneissic granite and granodiorite.

Geologie Hoofsaaklik gneisige graniet en granodioriet.

WATER USE CALCULATIONS

Vegetable Type	Period	Growing Period	Rainfall in growing period (mm)	Maximum Supplemental Irrigation* (mm)	Monthly Water Use* (m3)	Area per crop (m2)
Cabbage	2-3 months	Year round	25-300	550	18	100
Tomato	3-6 months	Year round	120-530	580	19	100
Onion	6 months	Sept-Feb	700	150	5	100
Green Peppers	3-6 months	Year round	120-530	1230	41	100
Potato	6 months	Sept-Feb	700	150	5	100
Total Per month:					89	500

*Water Use from FAO Database

*Maximum Supplemental Irrigation: Baseline 100mm

*Monthly Water Use for 10x10m plot, drip irrigation.

	Maximum usage per Month (m3/month)
Livestock / Poultry	
Cattle	3
Sheep	0.6
Chicken	0.012
Game	3

ANNEXURE T:

Archaeological Impact Assessment



Jenna Lavin

Artefactual Heritage Consulting (pty) Ltd

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083 619 0854

Specialist Archaeology Assessment Hoogekraal Farm Estate near Glentana, George

For: HilLand Environmental

Date: August 2026



Executive Summary

This application is for the proposed development of a Farm Estate near to Glentana in George. Lagoon bay Lifestyle Estate (Pty) Ltd owns several portions of the Farm Hoogekraal No 238, and 2 portions of the Farm Buffelsdrift No 227, in the Division and Municipality of George. The Applicant envisages including some of the neighbouring farms, and developing a farming estate. The application area consists of 32 portions of the Farm Hoogekraal No 238, and 2 portions of the Farm Buffelsdrift No 227, in the Division and Municipality of George.

The field assessment confirmed that the development area has been subject to extensive cattle grazing and cultivation and is now vegetated with grass. The area is largely flat, with very limited topography. The area is sparsely populated, with small occupied worker "villages" that have been established throughout the area. These "villages" are largely informal, with informal structures and access routes.

In addition to an archaeology assessment, the field assessment included a heritage survey of all of the built structures within the project area in order to update the work conducted by Aikman (2005). The results of this survey are included in Table 2 above.

Despite the findings of Kaplan (2005), the field assessment did not identify any stone age artefacts within the area proposed for development. The field assessment did record a number of graded resources including burial grounds, some structures of contextual value and a number of ruins. Importantly, the field assessment confirmed that, due to its high levels of historic significance, the Hoogekraal Farm werf precinct is the key heritage resource within the project area. It is important to note that, while the historic Hoogekraal Farm werf precinct is located within the project area, it is excluded from the proposed development.

The overall archaeological sensitivity of the area proposed for development is therefore LOW except for the areas mapped as having VERY HIGH archaeological sensitivity in Figure 7.

Recommendations

Based on the outcomes of this report, this project is supported from an archaeological perspective as it is not anticipated that the proposed will negatively impact on significant archaeological resources on condition that:

- The Hoogekraal Farm Werf precinct is excluded from the development activities and is not impacted by the project.
- The structures graded IIIC in Table 2 are retained
- The areas of high archaeological sensitivity mapped in Figures 5.2, 5.3 and 7 are not impacted by any construction activities. Any construction activities within these areas must be subject to monitoring by an archaeologist
- The current informal cemetery (Site 8 and 11) be formalised through the erection of a fence, with access to the cemetery guaranteed throughout the life of the project.
- Should the development proceed, it is recommended that a thorough survey of the sea-cut caves in the cliffs be undertaken in order to determine their scientific value and in order to inform a Conservation Management Plan to ensure the appropriate management of these resources for the life of the project should it be deemed necessary.

- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and HWC must be alerted immediately to determine an appropriate way forward



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1. Project Background

a. Proposed Development

This application is for the proposed development of a Farm Estate near to Glentana in George. Lagoon bay Lifestyle Estate (Pty) Ltd owns several portions of the Farm Hoogekraal No 238, and 2 portions of the Farm Buffelsdrift No 227, in the Division and Municipality of George. The Applicant envisages including some of the neighbouring farms, and developing a farming estate. The application area consists of 32 portions of the Farm Hoogekraal No 238, and 2 portions of the Farm Buffelsdrift No 227, in the Division and Municipality of George.

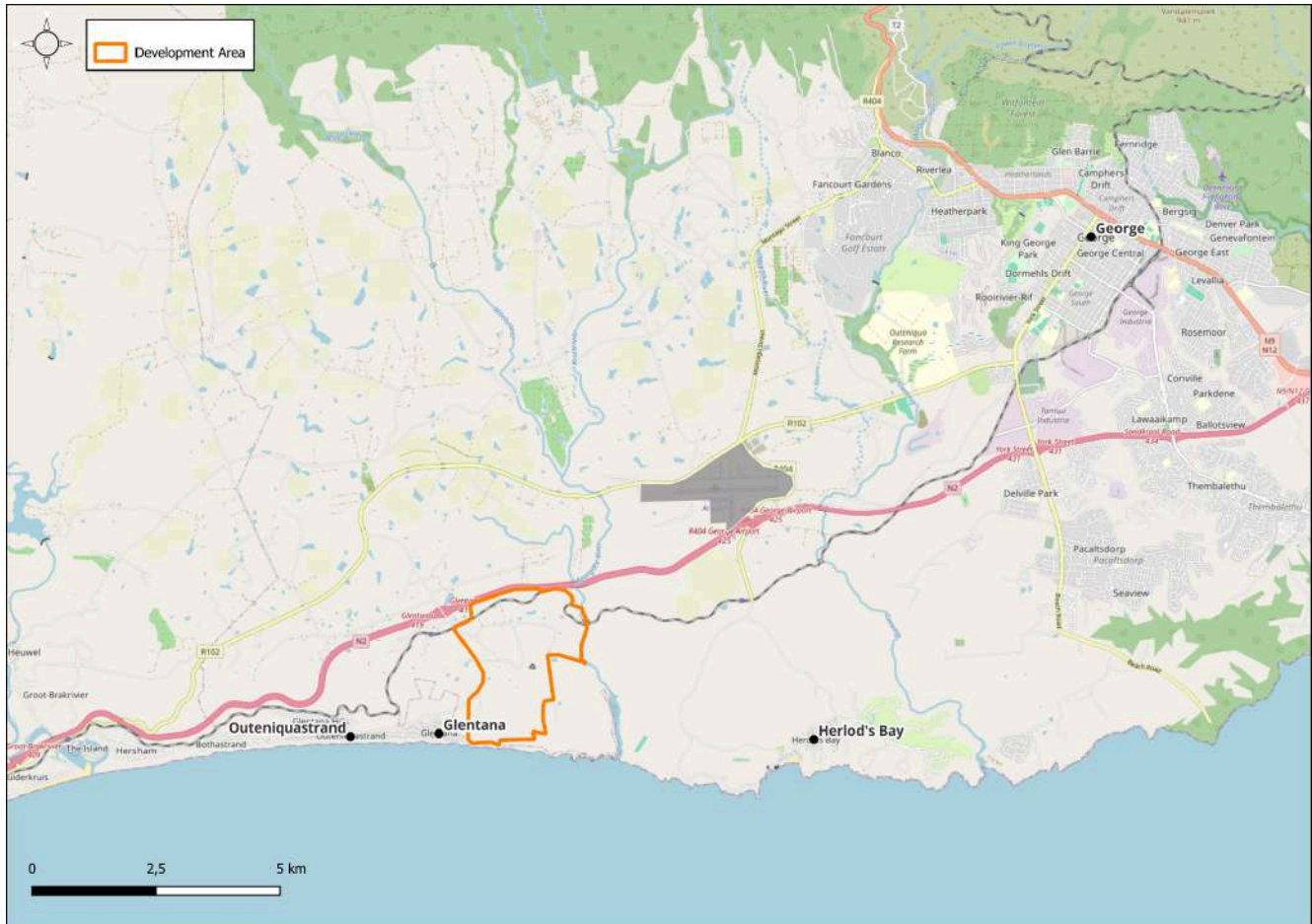


Figure 1.1: Locality map

b. Description of Development Area

Hoogeland spans a transitional landscape of farmland, fynbos hills, and natural plains situated ± 24 km northeast of the Mossel Bay town centre, ± 15 km southwest of the George town centre, ± 9 km east of the town Great Brak River and ± 6.4 km southwest of the George Airport. The development area is bound to the north by the N2. The on- and off ramps are directly from Morrison Road, which serves as a movement corridor connecting coastal areas such as Glentana, Bothastrand, The Island, the town of Great Brak River and beyond. Northbound, Morrison Road connects with the R102, which follows the alignment of the historic inland route connecting the hinterland of George (including the George Airport) and Great Brak River. The

The southern section of the development area is dominated by dense thick vegetation and forest and steep cliffs that lead down to the coastline. The densely vegetated areas on top of the cliffs are currently used for firewood harvesting. The famous Gentana shipwreck is located at the bottom of these cliffs. The cliffs are also known to house an archaeologically sensitive cave system with openings within the cliff face.



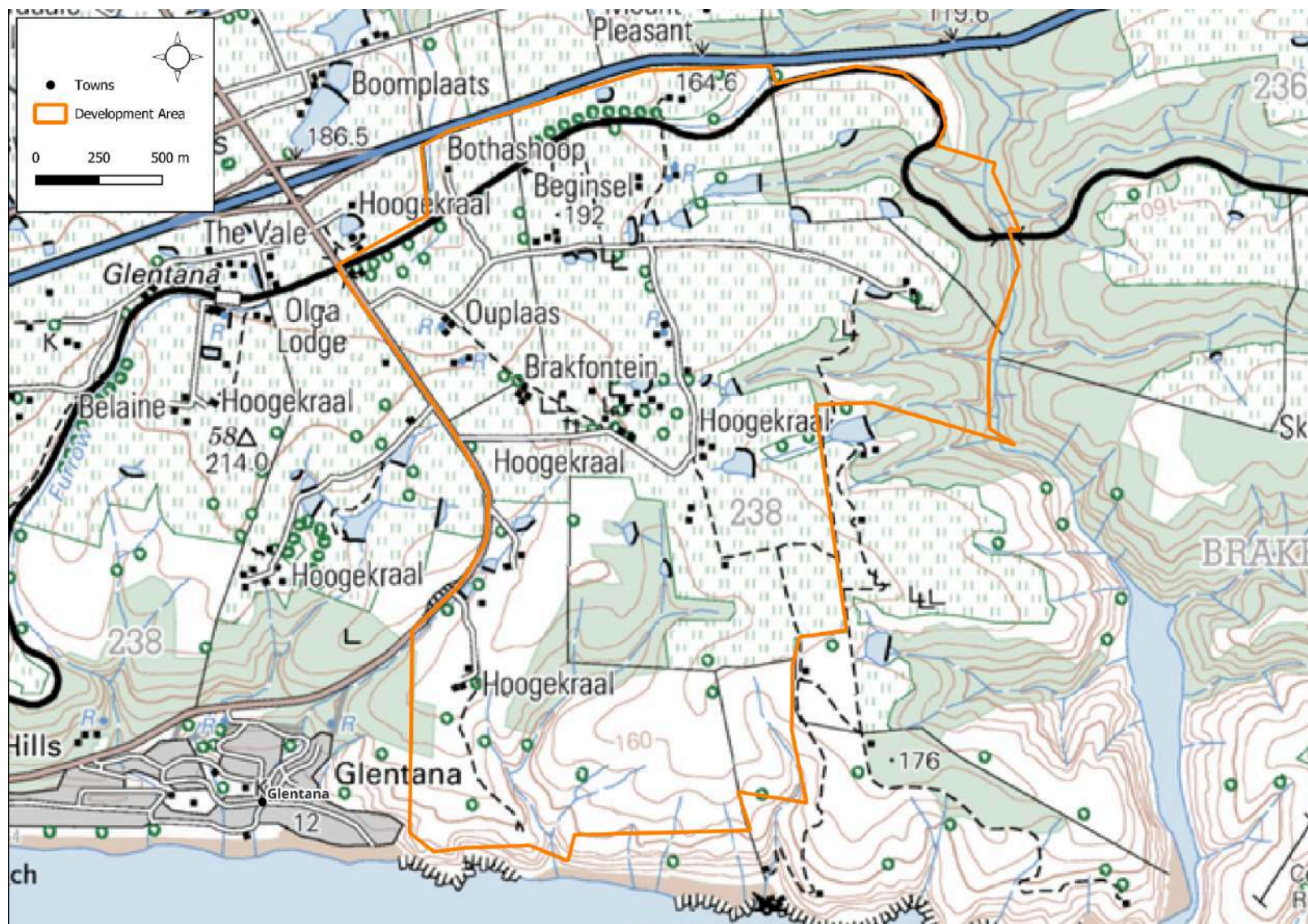


Figure 1.3: Location of the development area on the Topo Map (NGI)

2. Methodology

a. Purpose of the Report

The purpose of this specialist archaeology report is to contribute to the report required in terms of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999).

b. Summary of steps followed

A desktop analysis of the subject properties was undertaken in anticipation of the site visit. Please see the reference list for the details of the sources cited.

J. Lavin undertook a site visit from 30 March 2026 to 2 April 2026 to identify archaeological heritage resources likely to be impacted by the proposed development. The development area was surveyed on foot. Identified heritage resources were recorded and photographed, and their location noted using GPS co-ordinates. The identified resources were assessed to evaluate their heritage significance in terms of the grading system outlined in section 3 of the NHRA (Act 25 of 1999). The scientific and cultural value of these resources are evaluated and described in order to inform heritage sensitivity areas and related mitigation measures.

c. Assumptions and uncertainties

The significance of the sites and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.

It should be noted that archaeological and palaeontological deposits often occur below ground level. Should artefacts or skeletal material be revealed at the site during construction, such activities should be halted, and it would be required that the heritage consultants are notified for an investigation and evaluation of the find(s) to take place.

d. Constraints and Limitations

The field assessment was completed from 30 March to 2 April 2026. While most of the development area was accessible, some portions were inaccessible due to locked gates. Additionally, despite the seasonality of the site visit at the end of summer, the cultivated farmland included dense grasses which hindered archaeological visibility. The vegetated portions in the southern areas are very densely vegetated to the point of being impenetrable.

The southern section of the development area is dominated by dense thick vegetation and forest and steep cliffs that lead down to the coastline. The densely vegetated areas on top of the cliffs are currently used for firewood harvesting. The cliffs are also known to house an archaeologically sensitive cave system with openings within the cliff face, however these were inaccessible at the time of the site visit due to the overgrown nature of footpaths and the high tide timing. Additionally, the specific locations of the footprint of any new proposed structures were not available at the time of the site visit and as such, a general assessment was undertaken.

3. Contextual Analysis

a. Archaeology

Archaeological sites spanning the Earlier, Middle and Later Stone Age have been found in the region despite the extensive agricultural transformation of the area. Kaplan (2006) provides a short summary of archaeological finds from the greater area, *"A few Early Stone Age (ESA) tools were located during a study of the proposed Kraaibosch residential housing estate directly to the north of the N2 and the study site (Kaplan 2003). Further afield, relatively large numbers of ESA and Middle Stone Age (MSA) tools have been documented at Oubaai (Kaplan 2002) and The Brink (Kaplan 2004) near Herolds Bay. Shell middens have also been recorded on the high coastal cliffs at Oubaai (Kaplan 2002)."*

Kaplan (2006) goes on to note that *"up to 70,000 ESA tools have been documented and collected during monitoring of earthmoving operations at Pinnacle Point near Mossel Bay (Dr Peter Nilssen pers. comm.). According to Dr Nilssen, the majority of tools are located in sandy deposits underlying the top soil about 1 m below the surface. Fewer artefacts appear in the underlying clay deposits, but several Pleistocene hyena lairs with well-preserved bone were documented in limestone deposits nearly 3 m below the surface. The key point is that the archaeology below the surface is undisturbed (as opposed to the surface disturbance of the site) and it is precisely the context of the finds that is so important for conservation purposes."*

Archaeologists have found that the pastoralist Khoe people moved into the southern Cape with their sheep around 2,000 years ago. Place names like the Outeniqua Mountains and Gwayang Road reflect their historical presence. The Attaqua and Inqua groups were prominent in the region between Mossel Bay and Plettenberg Bay, trading with the Dutch in the 18th century. By the early 1700s, the Khoe lost control of the area due to internal conflicts, diseases like smallpox, and wars with European settlers.

Raper et al (1987) provides the following information regarding the names of the Outeniqua Mountains:

- Outeniqualand (C 3222). Region between the present Knysna and Mossel Bay, situated south of the Outeniqua Mountains, east of Ruitersboskraal and west of the Krom River. Named after the Outeniqua Khoekhoen, whose name probably means people who carry bags (of honey)
- Outeniqua Mountains (C 3322- 3322). Part of the range is parallel to the southern coast, with the Langeberg to the west and the Tsitsikamma Mountains to the east. Known to the Portuguese as Serra de Estrella. Named after the Outeniqua Khoekhoen who lived there.
- Serra da Estrella (C 3322 D-3323 C). Early Portuguese name of the Outeniqua Mountains, meaning "mountains of the star"

They continued to exist as a community at Hoogekraal, and at the Pacaltsdorp mission station, which was established in 1813 (Aikman, 2009). The Settlement of Hoogekraal was established in 1813 as a station of the London Missionary Society (LMS). In 1818 its name was changed to Pacaltsdorp, in honour of the Rev. Charles Pacalt, the first missionary to serve there.

The region saw significant development under Dutch and later British colonial rule, especially after the reports of Swedish botanists in the 1770s highlighted the presence of vast forests. A timber industry emerged, leading to the establishment of George and the construction of key roads and passes built between 1844 and 1847

under the direction of engineer Henry Fancourt White.

As recorded by De Kock (2025), a few archaeological surveys have been undertaken around Glentana (Nilssen 2005; Nilssen 2008; Kaplan 2005). Nilssen (2008) surveyed a Remainder of Portion 54 of the farm Hooge Kraal 238, which is located between the south of the study area and the coastline, and adjoining the Maalgate River where a higher density of archaeological remains is expected. Due to the dense vegetation cover, a comprehensive survey was not possible. He observed several sea-cut caves along the cliffs which may be of scientific/heritage significance, noting some cemented Middle Stone Age deposits containing stone tools and marine shells which are very rare and highly significant. He also observed medium density scatters of Later and/or Middle Stone Age stone artefacts in vehicle tracks. The resources recorded by Nilssen (2008) are located approximately 1km outside of the project area

Kaplan (2005) undertook an extensive survey of the project area, which also extended to the north of the N2, concentrating on the 'historic' Hoogekraal Farm and the catchment of the Maalgate River. He noted that *"over 95% of the area was already heavily disturbed, with no natural vegetation. The area having been intensively farmed for many decades"*. Like Nilssen (2008), he too mentions the caves with archaeological deposits at the bottom of steep cliffs between Glentana and the mouth of the Maalgate River.

The historic farmstead of Hoogekraal 238 (Schultz 2005) is located within the area proposed for development. Kaplan (2005) points out that the farm is one of the oldest in the southern Cape and the homestead dates back to 1753. Although he undertook an archaeological survey of the property, he did not comment on its historical archaeological significance or potential. The farmhouse has been extensively vandalized and stripped of its roof, windows, doors and floor. It may, nevertheless, contain remains of archaeological interest.

Kaplan (2005) identified between 60 and 70 ESA and smaller Middle Stone Age (MSA) tools were located in old grazing lands alongside the railway line and south of the N2, in the area designated for the agri-village. Several more ESA tools were found during the course of Kaplan's study (2005), in both the proposed development footprint, as well as in the proposed conservation area, but these tools are very thinly spread over the surrounding landscape. His finds were determined to have low local significance (Grade IIIC) and no mitigation was recommended.

Kaplan (2005) did, however, recommend that, due to the archaeological scatter located across the development area, all bulk earthworks must be monitored by a professional archaeologist.

Although Kaplan (2005) surveyed the historic Hooge Kraal farm, he did not comment on graveyards. According to the eGGSa branch of the Genealogical Society of South Africa website, there are at least 47 graves in the Hoogekraal 238 farm cemetery, approximately 1.2 km to the south-east of the proposed development. With regard to pre-colonial graves, according to Morris (1992), at least four burials were recovered from a cave near Great Brak River in 1933. Three further were recorded in the general area (but with no provenance) and another *"buried in the sand near Hartenbos"* in 1936. This does indicate the possibility of recovering pre-colonial human remains in the area.

The area adjoining the Maalgate River and the ocean is potentially of high archaeological significance with the possibility of *in situ* Middle Stone Age material (Nilssen 2008). Nilssen (2008) concludes that *"Overall, the*

quantity and quality of the archaeological record in the study area is impressive, significant and relatively rare. The contexts of finds are not greatly disturbed by human activity and the potential for the occurrence of palaeontological, climatic and environmental resources should not be ignored."

b. Evolution of the Area

According to De Kock (2025), at least three early farms named "Hoogekraal" occurred within the George magisterial district, with others, located in for example the neighbouring Knysna district. Within the George area, one of these lay inland from the Wilderness Lakes, another at the present location of the village of Pacaltsdorp and the third being the subject farm Hoogekraal.

One of the earliest maps (1789 - 1790) recording the coastline between Breede River and present day Gqeberha denotes occupation of the subject area by colonial occupant Adam Botha. The map denotes the location of at least three features, two of which are presumed to be the farmstead and an outbuilding, as well as a patch of cultivated land. This early map assigns the name "Hoogekraal" to the area that was to become Pacaltsdorp rather than the subject study area.

As noted by Aikman (2005) and his report on the work completed by Schulz, the area proposed for development has been subject to cultivation and agricultural activities since 1886. *"Starting in 1882: "An extremely complex set of Deeds transactions took place...when the farm was registered in 1/8th undivided shares" which all "changed hands in 1886 when an amended grant was registered". An annexure shows the resurvey of 1886 and subdivision into 5 portions regranted in 1887, apparently largely to the Botha family and associates, namely: Robert Ogilvie Scott (Portion 1), Cornelius Terblans (Portion 2), Johannes Hendriks Botha (Portion 3), Adam Francis Scott (Portion 4), and Hendrik Christoffel Botha (Portion 5). Kathleen Schulz found further names of tenant farmers (7) and Coloured labourers (41+) in her investigation.*

*This process of subdivision carried on through the 20th Century as the property was cut up into smaller and smaller portions. Kathleen Schulz recorded a total of 13 buildings shown on the title deed diagrams from 1908 up until 1947. The economic viability of these small farms appears to have always been marginal and this is reflected in the modest materials used for the construction of farmhouses and cottages for labourers. By the end of the 20th Century there were a total of 58 farmhouses and cottages. Dairy farming and stock rearing continues on parts of the property but no crops have been grown for some time. The landscape today is made up of fenced stock camps, sometimes bordered by windbreaks of Monterey pines (*Pinus radiata*) or beefwood (*Casuarina spp*). Invasive alien trees and scrub occupies much of the land. The property has a generally neglected and run-down appearance."*

According to Schulz (2005), 1809 archival records confirm the presence of thriving, well-established farming and woodcutter communities within the Outeniqualand area, thus representing one of the earliest within the Southern Cape region. Occupants of Hoogekraal therefore formed part of a broader economical (colonial) context to which neighbouring early farms such as Voorbrug, Dwarsweg, Uitkyk, Modder Rivier, Moeras Rivier, Hurr (Sandkraal), Gwayang, Diepkloof and Hansmoeskraal all contributed.

The first formal land rights in respect of the early farm Hoogekraal were only registered in 1818 in favour of the widow Botha (Lea Jacoba Barnard). The 1818 diagram depicts the location of a single building, a fountain, cultivated land and grazing lands. Similar to the 1789/1790 map, the 1818 diagram shows the building within the centre of the early farm, thus well south of the subject study area. During 1886 Hoogekraal was resurveyed and subdivided into eleven portions and regranted.

Historic aerial imagery from 1957 (top) and 1974 (bottom) confirm the ongoing and historic agricultural use of this landscape for small-scale agricultural activities. The George Airport is located within 5km of the subject properties. The George Airport was constructed in 1977. The N2 currently runs through the subject properties with the R102 (historic N2 alignment) running north of the subject properties. Despite the expansion of George into a regional node, and the extensive development associated with this expansion, the subject properties have remained largely unchanged since the first half of the 20th Century.

c. Known Heritage Resources

In 2005, Aikman completed a built environment analysis of the structures located within this development area. His findings are summarised in the table below.

Table 1: Extract from the previous HIA completed by Aikman (2005)

ID	Property	Statement of Significance	Grade
1	Farmhouse on Portion 75/238	<p>This is an early 20th Century farmhouse of a type found throughout South Africa. This one has been fairly extensively remodelled although its basic form is still retained. The mature trees add to its historical value.</p> <p>Intrinsic and contextual significance in terms of the following:</p> <ul style="list-style-type: none"> • Historical fabric is significantly altered (scale and form still intact) • Limited evidence for historical layering • Few elements of construction are authentic • Remaining fabric has historical value (older than 60 years) • Remaining fabric contributes to understanding of uses and roles of place over time • Contributes to the broader historical, visual-spatial character of a place 	3C
2	Farmhouse on Portion 52/238	This house has been heavily remodelled and retains little of its original form and character. The new house erected immediately to the north of it completely overwhelms it visually.	NCW
3	House on Portion 53/238	This house has also been modernised and is architecturally undistinguished. A second house has been built next to it and overwhelms it visually. Apart from its age it has little to commend it.	NCW
4	Houses and barn on Portion 55/238	These three buildings have been vacant for some time and are in very poor condition. The main house has been vandalised. Apart from its basic form there is little remaining fabric. Its veranda roof has been lost and there is a mixture of joinery elements. The cottage to the west of the house is in slightly better condition. It is a simple vernacular building typical of many hundreds throughout South Africa.	NCW
5	House on Portion 146/238	<p>This small house probably dates from the mid to late 19th Century and is almost entirely intact. Its steep roof suggests that it may have been thatched originally. Its joinery is original. It is currently used as a store.</p> <p>Intrinsic and contextual significance in terms of the following:</p> <ul style="list-style-type: none"> • Historical fabric is mostly intact (past damage is reversible) • Fabric possesses very strong evidence for historical layering • Most elements of construction are authentic • Fabric dates to the early origins of a place • Rare or excellent example of its type or form • Fabric clearly illustrates an historical period in the evolution of a place • Fabric clearly illustrates the key uses and roles of a place over time <p><i>Could not be located on map</i></p>	3A
6	Cottage on Portion 17/238	<p>This little cottage is a fine example of a vernacular building and probably dates from the 19th Century. It has a steeply pitched corrugated iron roof suggesting that it may have been thatched. Although it has been poorly maintained and is not beyond repair and could be easily renovated. An unusual feature of its construction is the walls. These are of lime-plastered sun-dried clay blocks. A portion of plaster is missing revealing this form of construction once common in this district</p> <p>Its central siting in a field near to one of the old farm roads gives it landmark status.</p> <p>Intrinsic and contextual significance in terms of the following:</p> <ul style="list-style-type: none"> • Historical fabric is mostly intact (past damage is reversible) • Fabric possesses very strong evidence for historical layering • Most elements of construction are authentic • Fabric dates to the early origins of a place • Rare or excellent example of its type or form • Fabric clearly illustrates an historical period in the evolution of a place 	3A

		<ul style="list-style-type: none"> Fabric clearly illustrates the key uses and roles of a place over time. Historical and/or visual-spatial landmark within a place. 	
7	House on Portion 68/238	<p>It appears to have been altered with its awkward gable in the Cape Revival tradition, which became popular in the Edwardian era. Its thick walls and rough plaster suggest that the core of the house is probably from the mid to late 19th Century as do the sliding sash windows which are incongruous with the quirky gable. An intriguing feature of the house is that its main façade faces north and inland and its back is firmly turned towards the sea and the winds. There is a derelict freestanding "bakoond" at the back of the house and a concrete water tank to collect rainwater from the roof. The roof of corrugated iron has a loft dormer.</p> <p>Intrinsic and contextual significance in terms of the following:</p> <ul style="list-style-type: none"> Historical fabric is mostly intact (past damage is reversible) Fabric possesses very strong evidence for historical layering Most elements of construction are authentic Fabric dates to the early origins of a place Rare or excellent example of its type or form Fabric clearly illustrates an historical period in the evolution of a place Fabric clearly illustrates the key uses and roles of a place over time. Historical and/or visual-spatial landmark within a place. 	3A
8	House on Portion 64/238	<p>The house, shown in figure 18 below commands a hilltop site to the northwest of the Hoogekraal homestead. It is similar to the house (6) discussed above although it is in better condition.</p> <p>Intrinsic and contextual significance in terms of the following:</p> <ul style="list-style-type: none"> Historical fabric is mostly intact (past damage is reversible) Fabric possesses very strong evidence for historical layering Most elements of construction are authentic Fabric dates to the early origins of a place Rare or excellent example of its type or form Fabric clearly illustrates an historical period in the evolution of a place Fabric clearly illustrates the key uses and roles of a place over time. Historical and/or visual-spatial landmark within a place. 	3A
9	The Hoogekraal Farmstead	<p>This complex is sited on a hilltop and commands fine views all around and has an intrinsic relationship to its rural setting. The complex contains the Botha family cemetery, the original farmhouse and a second house in close proximity. It is screened from the onshore winds by a mature windbreak of indigenous trees. Although the farmhouse has been significantly remodelled and extended to convert it into a guesthouse the original core remains intact with its yellowwood doors, joinery and boarded ceiling.</p> <p>Intrinsic, associational and contextual significance in terms of the following:</p> <ul style="list-style-type: none"> Historical fabric is mostly intact (past damage is reversible) Fabric possesses very strong evidence for historical layering Most elements of construction are authentic Fabric dates to the early origins of a place Rare or excellent example of its type or form Highly significant association with an historic person or social grouping Highly significant association with historic events or activities Highly significant association with the key uses or roles of a place over time Fabric clearly illustrates an historical period in the evolution of a place Fabric clearly illustrates the key uses and roles of a place over time Historical and/or visual-spatial landmark within a place. 	3A

Due to the time that has lapsed since Aikman's assessment (2005), and as part of this analysis, all of the structures located within the project area were subject to an updated assessment. The results of this assessment are included in section 4 below, including updated proposed gradings. Unfortunately, many of the structures have fallen further into disrepair since Aikman's assessment in 2005.

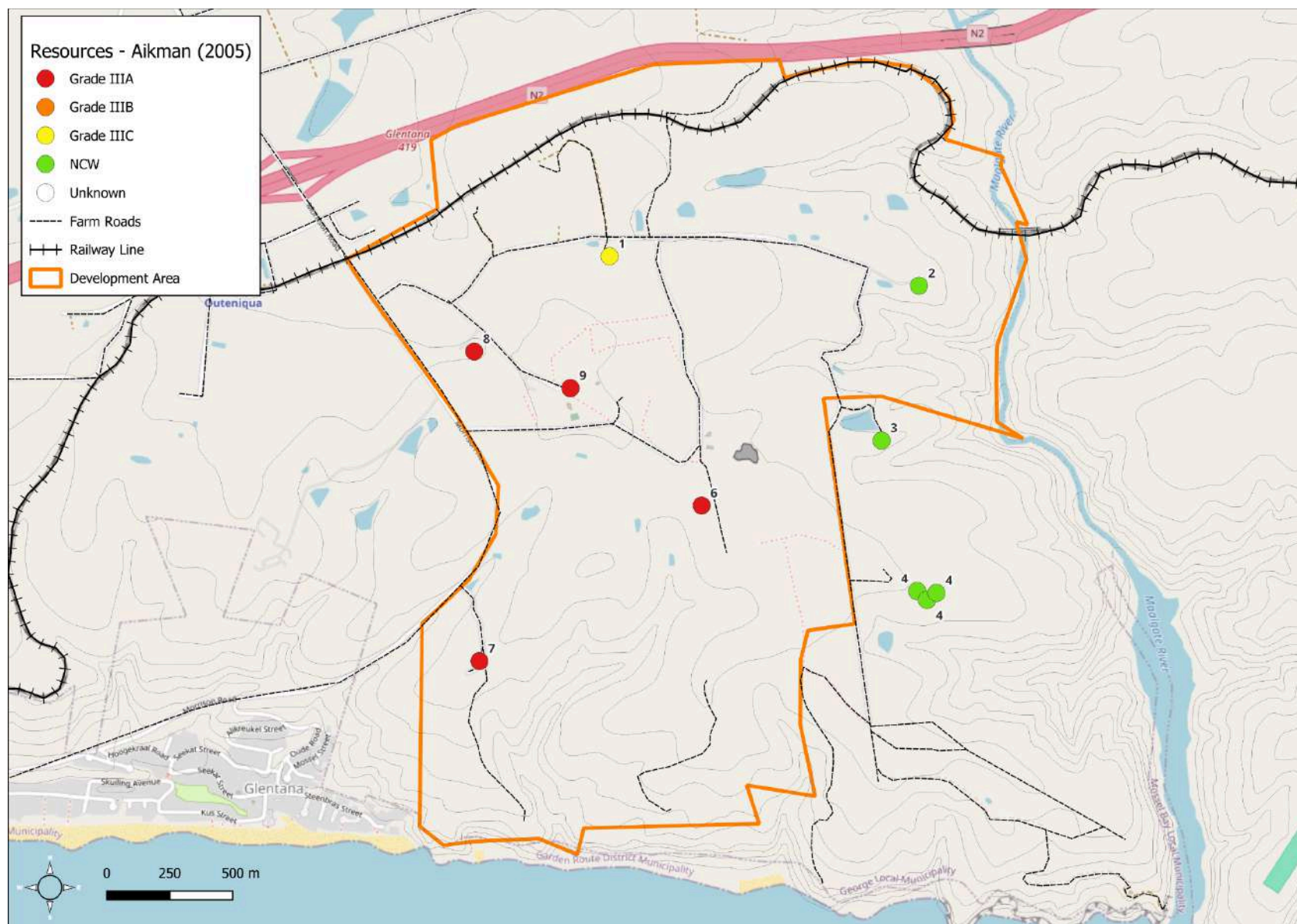


Figure 2.1: Map of known heritage resources from Aikman (2005) in close proximity to the development area

4. Identification of Heritage Resources

a. Field Assessment

The development area has been subject to extensive cattle grazing and cultivation and is now vegetated with grass. The area is largely flat, with very limited topography. The area is sparsely populated, with small occupied worker “villages” that have been established throughout the area. These “villages” are largely informal, with informal structures and access routes.

Despite the findings of Kaplan (2005), no Stone Age artefacts were identified during the field assessment. This is likely due to the following:

- The cliffs that are known to house an archaeologically sensitive cave system with openings within the cliff face, were inaccessible at the time of the site visit due to the overgrown nature of footpaths, the high tide timing and locked gates.
- The establishment of informal settlements in the areas surveyed by Kaplan (2005). These informal settlements have obscured any stone age artefacts that may be located here.
- A number of locked gates, and the overgrown grasses within the areas that were accessible.

As a result of the above, the heritage resources identified are dominated by built structures, and the ruins of built structures within the landscape. The structures identified are detailed below.

Site Images



Figure 3.1: Images of the development area from Gelantana Beach



Figure 3.2: Cattle grazing fields within the Hoogekraal area



Figure 3.3: Cattle grazing fields within the Hoogekraal area



Figure 3.4: Cattle grazing fields within the Hoogekraal area





Figure 3.5: Cattle grazing fields within the Hoogekraal area



Figure 3.6: Cattle grazing fields within the Hoogekraal area

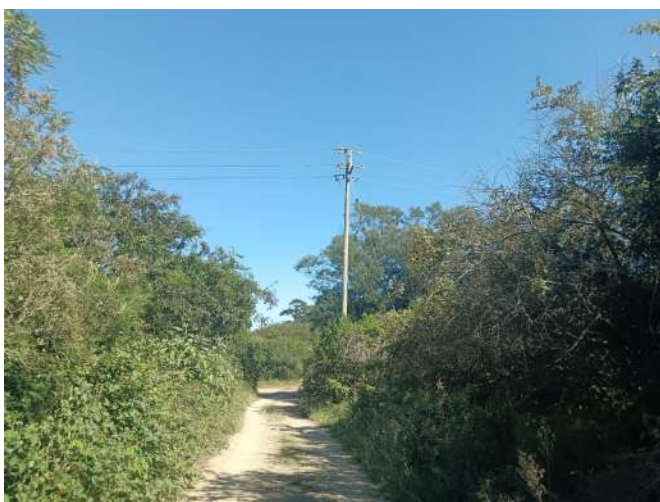


Figure 3.7: Dense vegetation located within the development area





Figure 3.8: Dense vegetation located within the development area around the road leading beneath the N2



Figure 3.9: Dense vegetation located within the development area



Figure 3.10: Dense vegetation along the cliff tops at the southern edge of the development area





Figure 3.11: Dense vegetation located within the development area





Figure 4: Track paths (2026)

b. Resources Identified

Descriptions of heritage resources identified during the site visit are detailed in Table 1 below. The location of the observations are mapped in Figure 5 and images of the observations are included in the table below.

Table 2: Table of observations

Site ID	Description	Grade	Photograph - March/April 2026
1	Farm-workers cottages	NCW	
2	Small farm-workers cottage	NCW	
3	Modern farm-workers cottages	NCW	

4	Modern farm-workers cottages	NCW	
5	Modern farm-workers cottages	NCW	
6	Hoogekraal Primary School	NCW	
7	Ruin of historic farm house. Same as ID#1 in Aikman (2005)	NCW	

8	Burial ground at road intersection. Consists of a number of clearly visible modern burials. Same as #11 below	IIIA	
9	Barn structure	NCW	
10	Modern farm house	NCW	

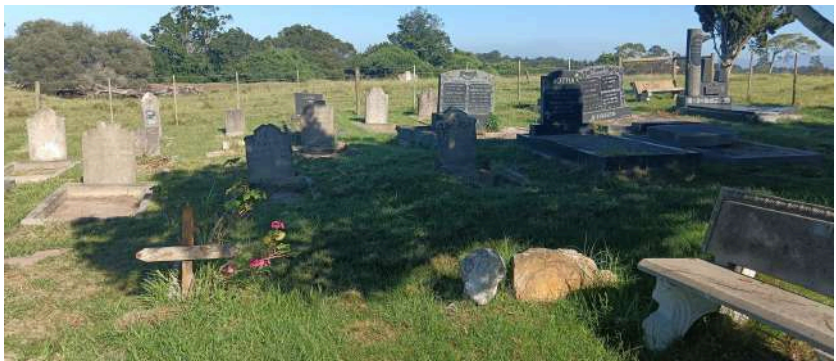
11	Burial ground at road intersection. Consists of a number of clearly visible modern burials. Same as #8 above	IIIA	
12	Pilgrimskraal farm house. Behind a locked gate, partially visible from the road. Appears modern.	NCW	
13	Hoogekraal Drankwinkel and Outeniqua Handelhuis in modern building	NCW	
14	Modern farm-workers cottages	NCW	

15	Ruin of small farm cottage	NCW	
16	Small modern cottage	NCW	
17	Small form cottage with Cape Revival Gable. Same as ID #8 in Aikman (2005)	IIIC	

18	Small modern farm cottage	NCW	
19	Modern farm-workers cottages	NCW	
20	Modern farm-workers cottages	NCW	

21	Recently renovated Jonkmanshuis located within the Hoogekraal Werf precinct. Currently used as tourist accommodation. Described as a historical property which dates back to 1723, the renovations of the Jonkmans Huis on the property are under curatorship of the Hoogekraal Educational Trust overseen by Tienie Botha.	IIIB	
22	Modern farm outbuilding within the Hoogekraal werf precinct	NCW	
23	Ruins of the Smitswinkel and "Old School". Was likely one of the oldest structures in the broader area. Potential archaeological value.	IIIC	

24	<p>Ruins of Hoogekraal Historic Manor. In dire state of disrepair, extensively vandalised with no roof or windows. Said to be the oldest farmstead in the region dating back to the 1700s, the property has been systematically stripped. Some interesting features remain intact including ramshead and floral plaster detail above some of the doors, historic stone work visible in wall section. High likelihood of buried archaeology within the Hoogekraal werf precinct.</p> <p>The old manor house is said to have provided hospitality to early travellers as far back as the 1840s. Then, in the 1990s, it was used as a guesthouse run by Tony Botha, a former international banker and later an ANC politician, and his partner Colin Bryan. Botha is buried in the family graveyard.</p> <p>Same as ID#9 in Aikman (2005)</p>	IIIB	
25	<p>Modern farm house</p>	NCW	
26	<p>Farm house located beyond locked fence. Appears modern.</p>	NCW	

27	Hoogekraal Historic Cemetery, more than 50 marked and unmarked modern and historic burials. Cemetery is fenced off.	IIIA	
28	Small historic cottage. Same as ID#5 in Aikman (2005)	IIIC	
29	Farm outbuildings	NCW	

30	Modern farm-workers cottages	NCW	
31	Sooikloof outbuilding, not visible from any access points	NCW	Unavailable
32	Sooikloof outbuilding, not visible from any access points	NCW	Unavailable
33	Sooikloof farm house	NCW	
34	Ruins of farm cottage	NCW	

35	Small recently renovated farm cottage with pediment detail	IIC	
36	Small farm cottage	NCW	
37	Modern farm-workers cottages	NCW	

38	Ruins of farm cottage	NCW	
39	Ruin of farm structure located on the boundary of the project area	NCW	Unavailable
40	Small cottage, not visible from the road and behind a locked gate. Possible IIIC	IIIC	Unavailable
41	Not visible from the road	Unknown	Unavailable
42	Not visible from the road	Unknown	Unavailable
43	Farm-workers cottage	NCW	
44	Historic farm werf with partial hipped roof, stoep and end-gable	IIIC	

45	Farm outbuilding	NCW	
46	Inaccessible	Unknown	Unavailable
47	Modern tourist accommodation	NCW	
48	Farm building	NCW	
49	Small farm cottage	IIC	

50	Modern farm cottages	NCW	
51	Ruin of small workers cottage located on the boundary of the project area	NCW	
52	Small farm cottage with Cape Revival Gable. Same as ID #7 in Aikman (2005)	IIIC	

53	Small modern cottage	NCW	
54	Small ruin of structure within the Hoogekraal werf precinct. Potential archaeological value.	IIIC	

c. Mapping and Spatialisation of Heritage Resources

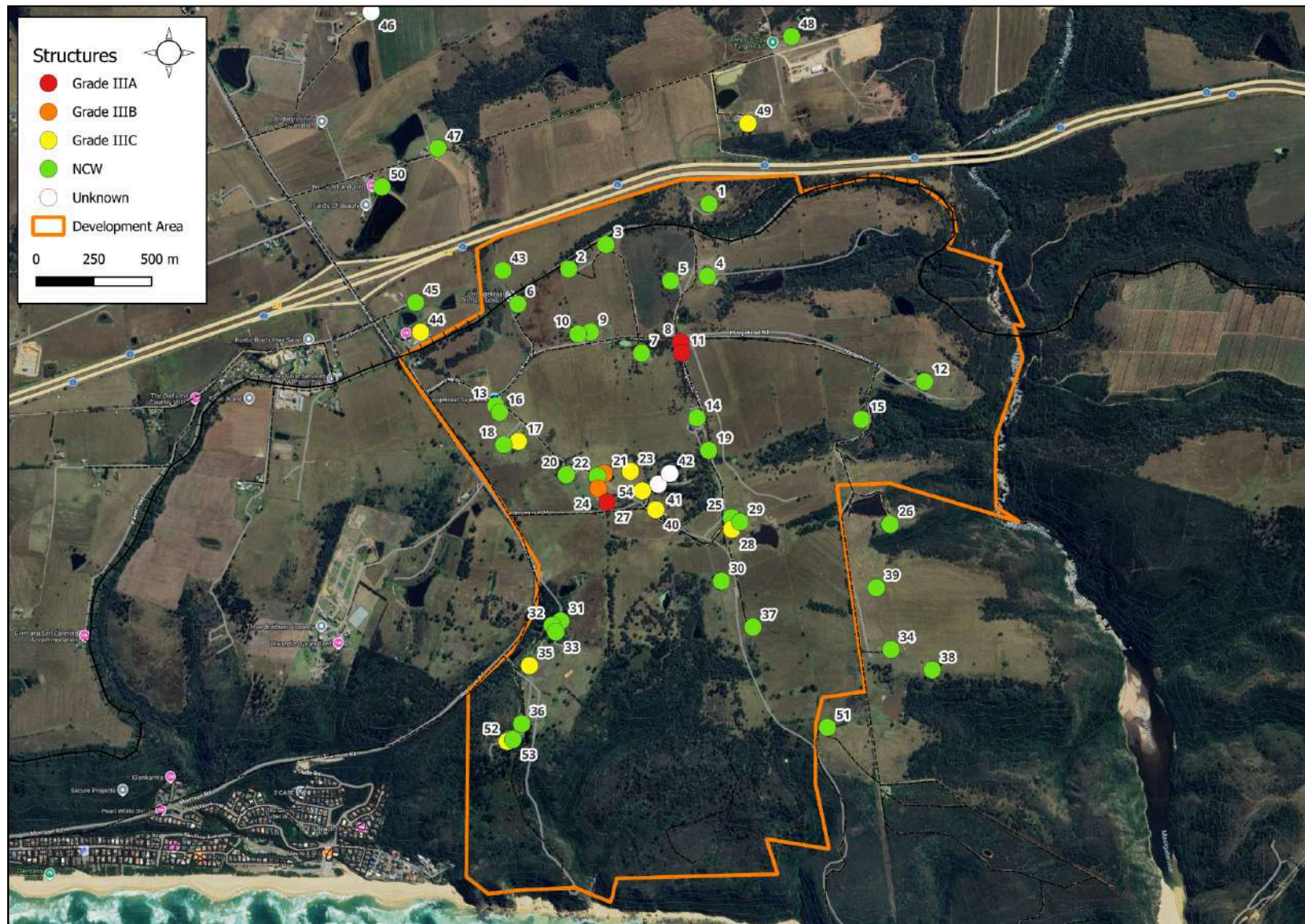


Figure 5.1: Map of Observations listed in Table 1 above



Figure 5.1: Inset map indicating the proposed location of the new farmworkers village

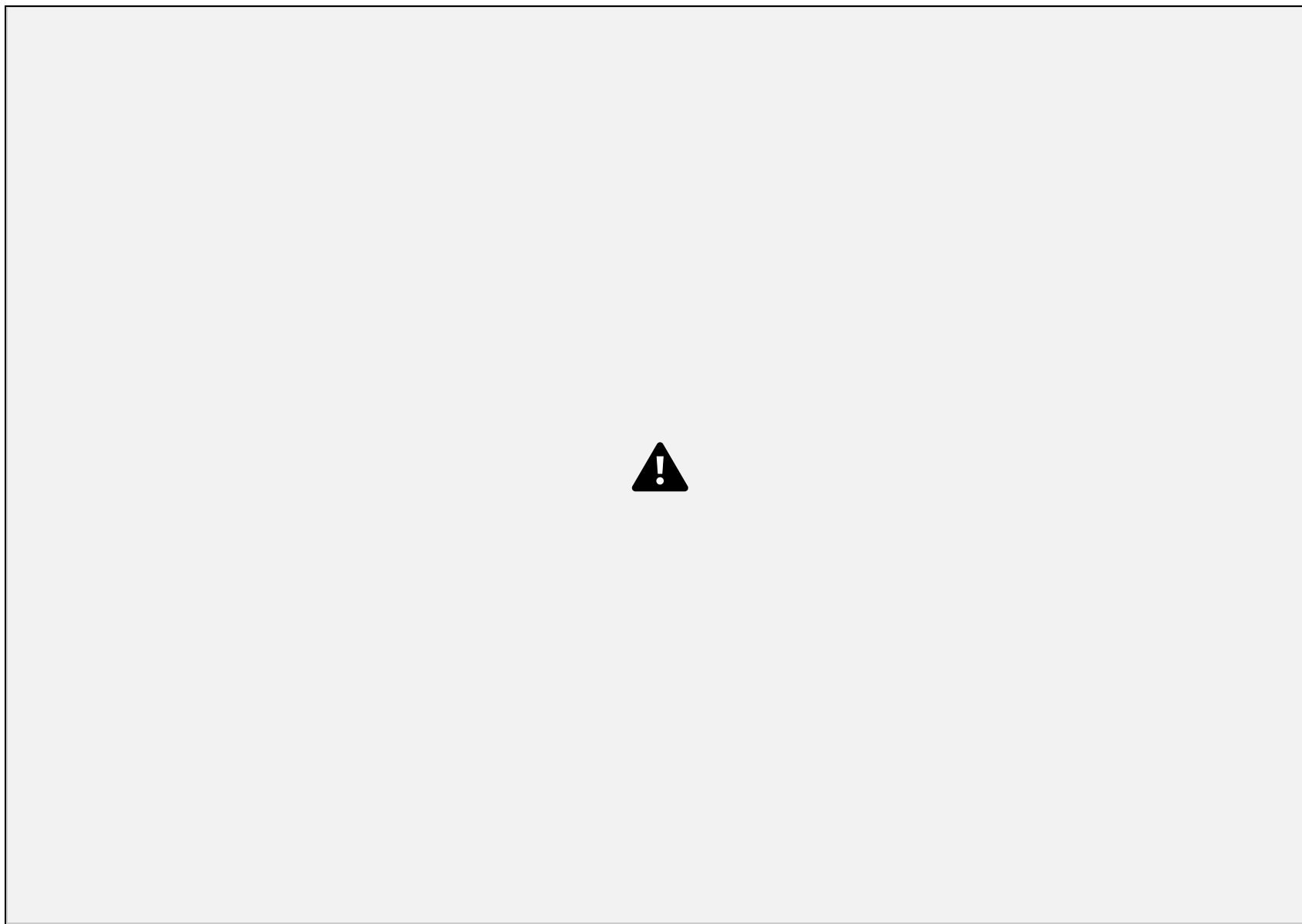


Figure 5.2: Inset map indicating the location of the road-side burial ground along Hoogekraal road

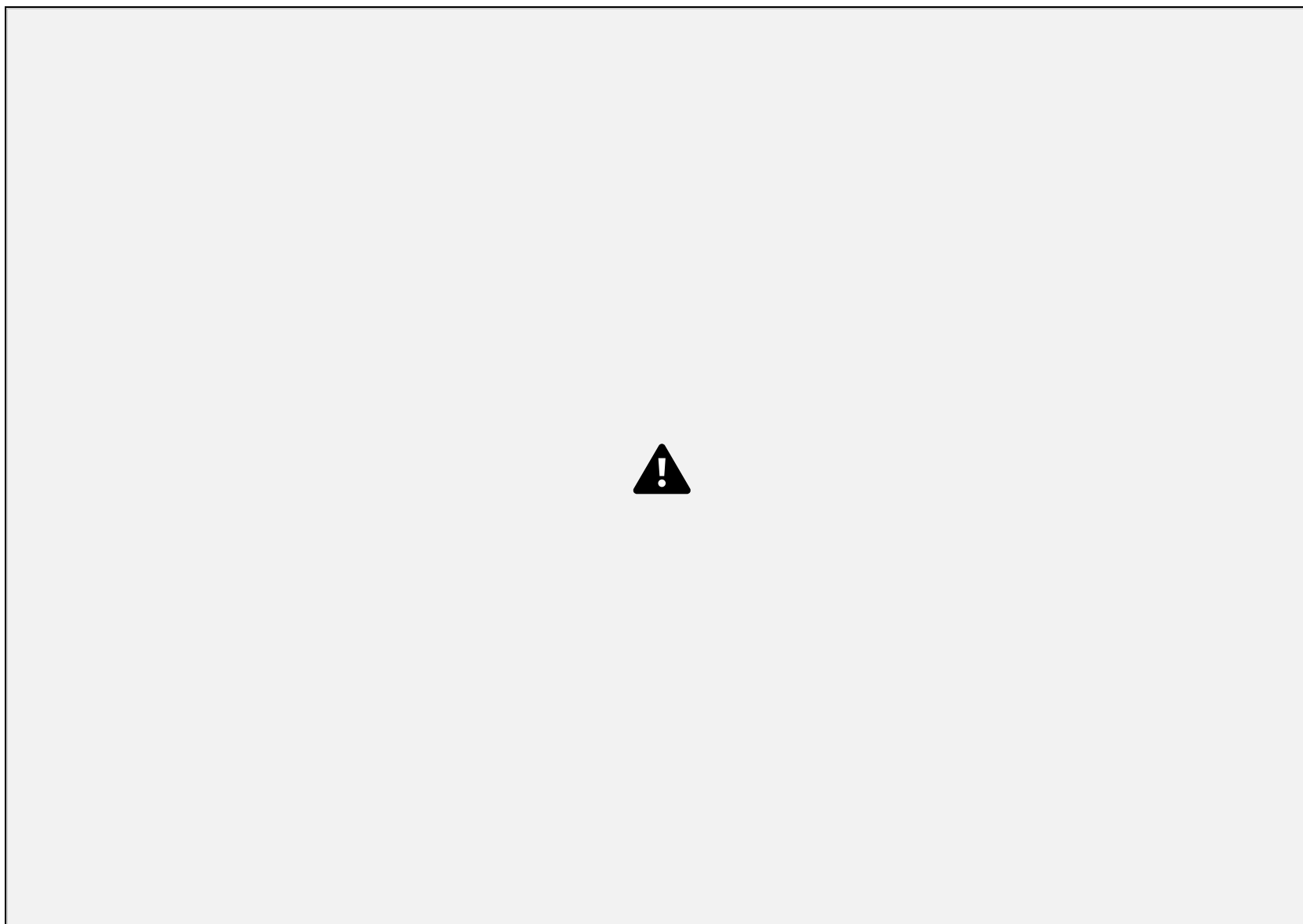


Figure 5.3: Inset map indicating the areas of archaeological sensitivity associated with the Hoogekraal werf precinct

Additional Images of Graded Resources

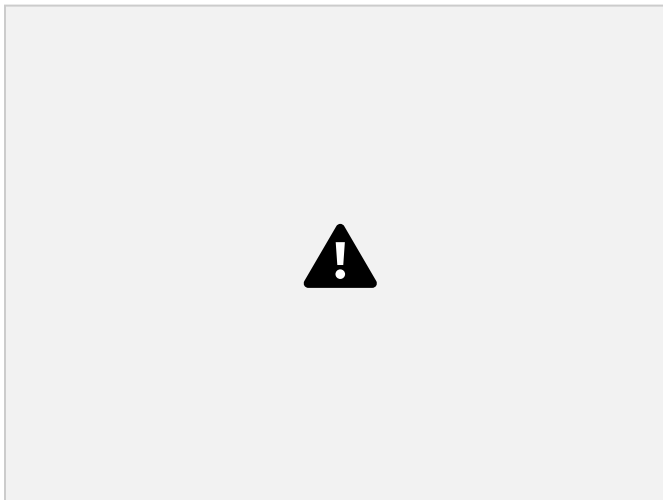


Figure 6.1: Site 8 and 11 - Road site burial ground

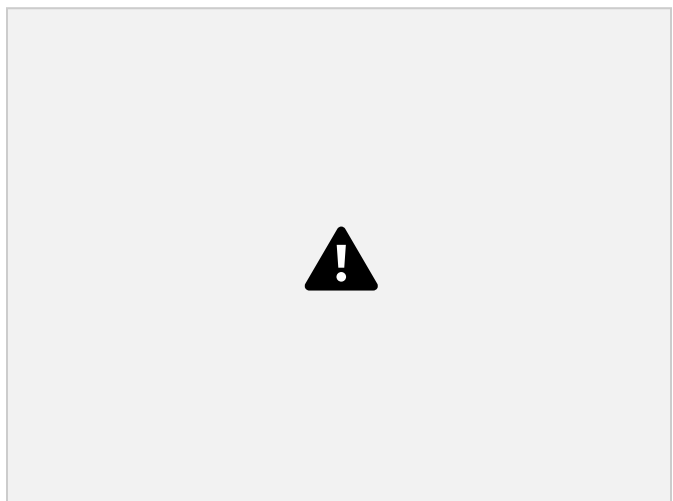


Figure 6.2a: Site 21



Figure 6.2b: Site 21



Figure 6.3: Site 23



Figure 6.4a: Site 24

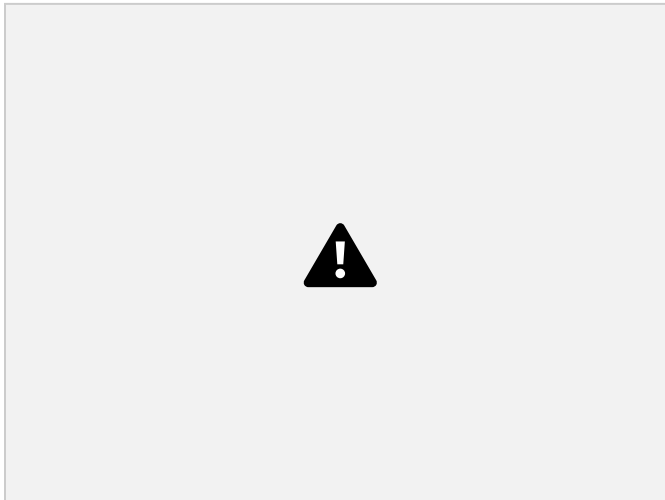
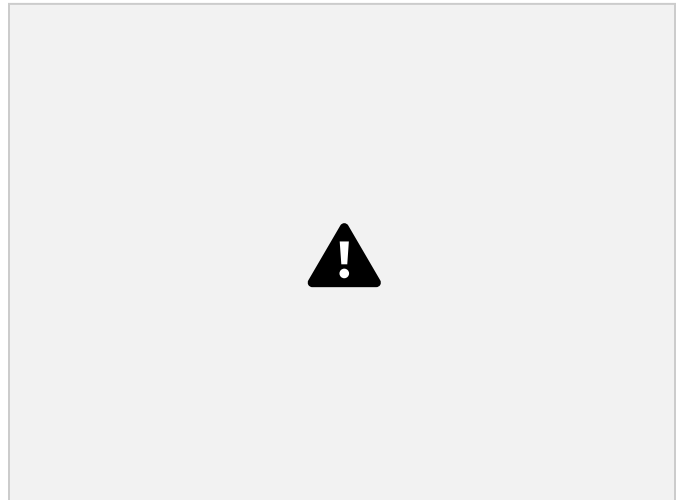
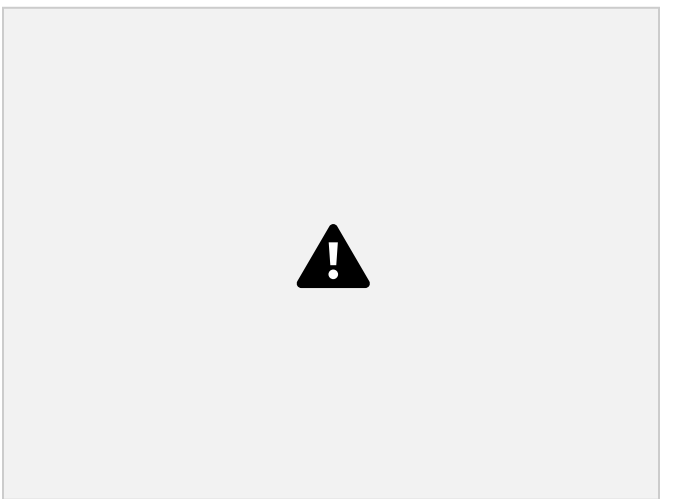


Figure 6.4b: Site 24

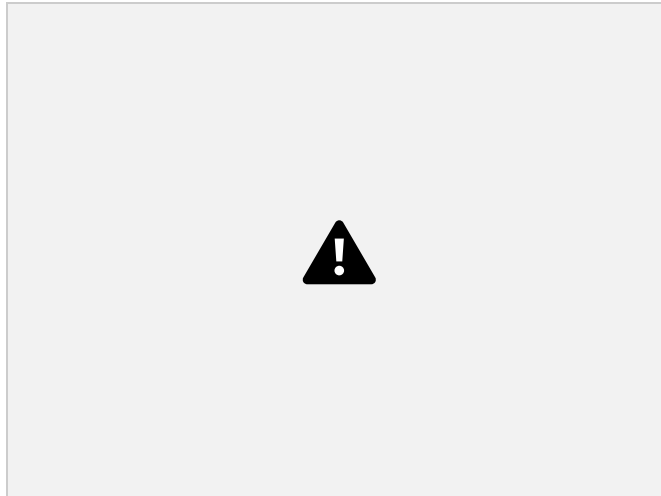
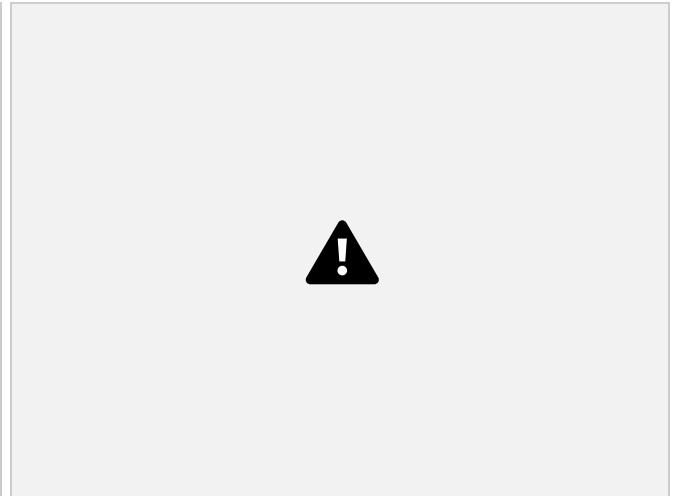
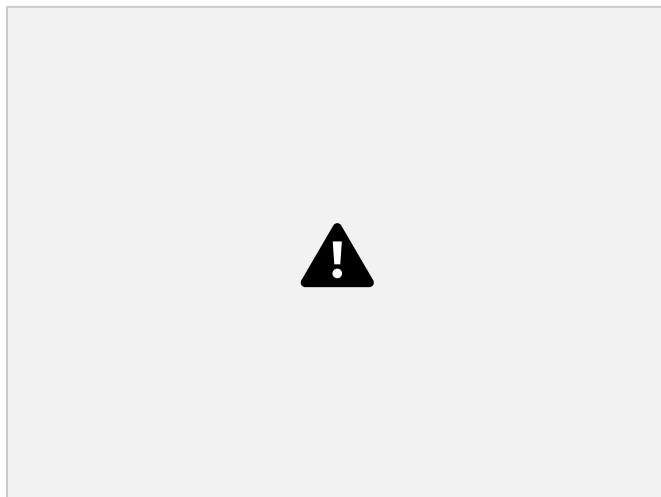
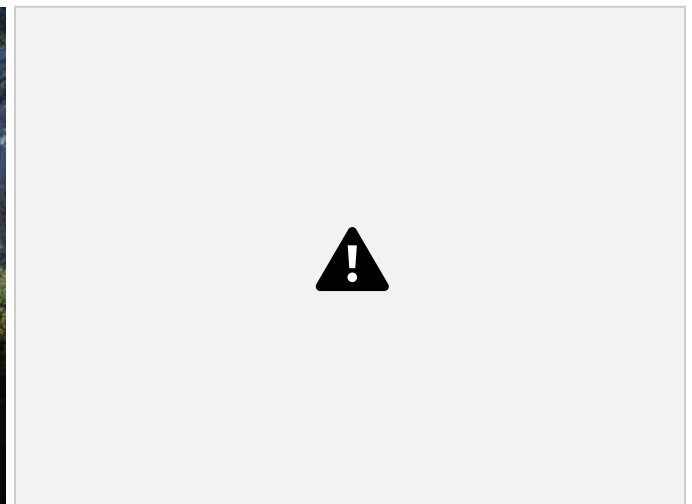


Figure 6.4c: Site 24



Figure 6.4d: Site 24

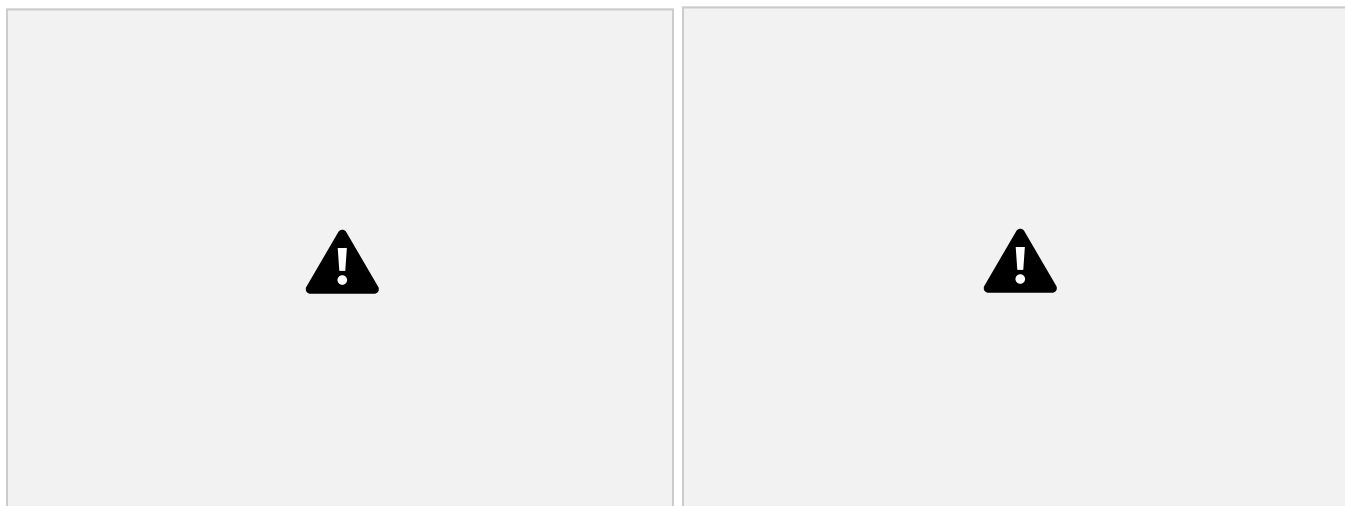


Figure 6.5a: Site 27

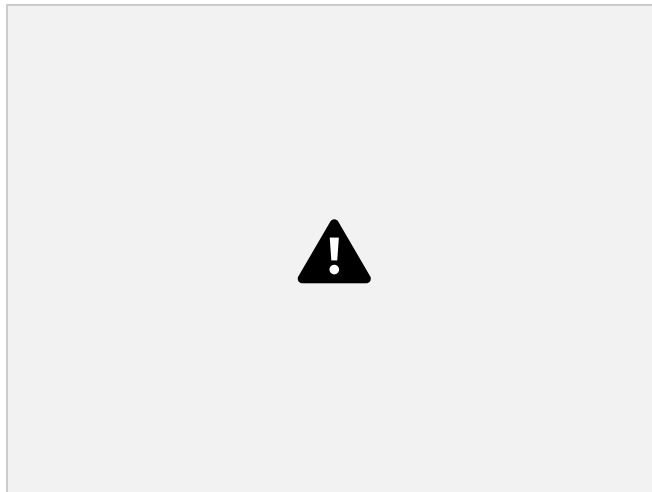
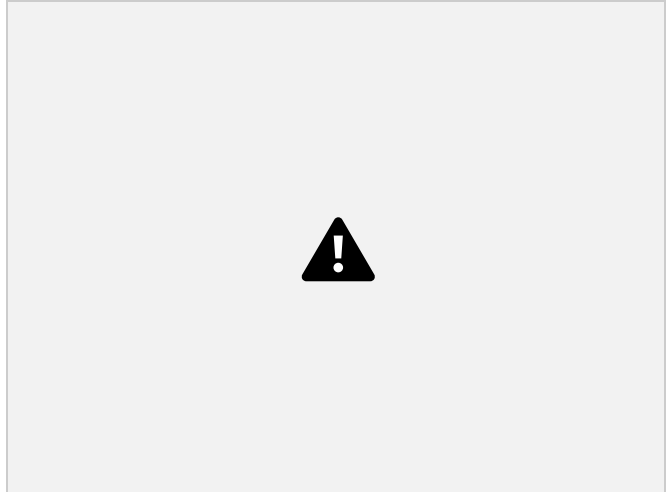
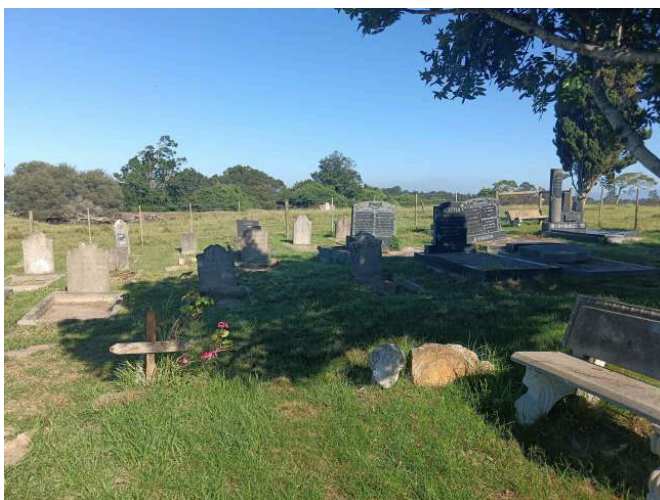
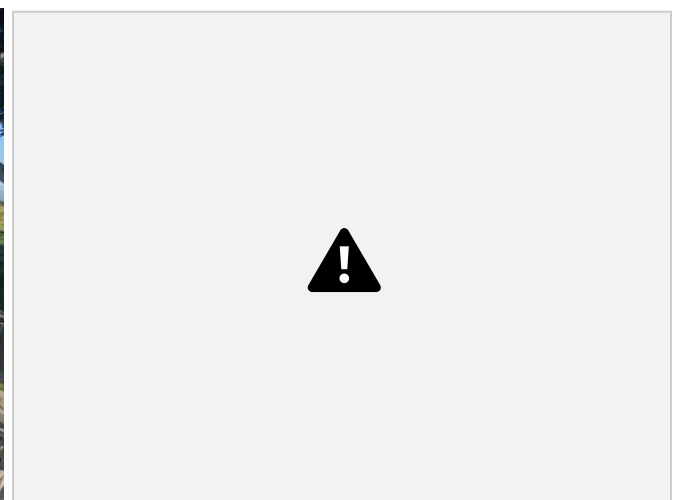


Figure 6.5b: Site 27

5. Impact of the Development

a. Assessment of the impacts to Archaeological Resources

Project Area

The field assessment did not identify any stone age archaeology within the development area. This is likely a result of the extensive cultivation that has been undertaken here, the extensive grass coverage cultivated for cattle grazing and the transformation of pockets of land as a result of the construction of informal farm workers' cottages. Similar findings were made by Kaplan (2005), who undertook an extensive survey of the project area, which also extended to the north of the N2. He noted that *"over 95% of the area was already heavily disturbed, with no natural vegetation. The area having been intensively farmed for many decades"*.

However, it is important to note that Kaplan (2005) identified between 60 and 70 ESA and smaller Middle Stone Age (MSA) tools were located in old grazing lands alongside the railway line and south of the N2, in the area designated for the agri-village. Several more ESA tools were found during the course of Kaplan's study (2005), in both the proposed development footprint, as well as in the proposed conservation area, but these tools are very thinly spread over the surrounding landscape. His finds were determined to have low local significance (Grade IIIC) and no mitigation was recommended.

A number of modern structures, and structures that are determined to be Not Conservation-Worthy, were identified within the project area. These structures are not considered further here and there is no heritage objection to their demolition.

Ruins

The field assessment identified a number of ruins of historic structures located within the area proposed for development, including sites 7, 15, 34, 38, 39 and 51. Site 7 was previously graded IIIC in Aikman (2005), however the structure has since fallen into ruin. None of the above structures have any discernible heritage value based on the information available to date and as such, these ruined structures are all determined to be Not Conservation-Worthy.

Cliffs to the south

The southern section of the project area is presently densely vegetated with limited accessibility through the vegetation through to the cliffs above the Glentana beach. No archaeology was visible within the densely vegetated southern portions, however visibility was significantly obscured by the dense vegetation.

The Glentana shipwreck is located at the Glentana beach below the cliffs that form part of the project area. There are some footpaths that navigate the steep cliffs down to the beach and the shipwreck.

Nilssen (2008) surveyed a Remainder of Portion 54 of the farm Hooie Kraal 238, which is located between the south of the study area and the coastline, and adjoining the Maalgate River where a higher density of archaeological remains is expected. Due to the dense vegetation cover, a comprehensive survey was not possible. He observed several sea-cut caves along the cliffs which may be of scientific/heritage significance, noting some cemented Middle Stone Age deposits containing stone tools and marine shells which are very rare and highly significant. He also observed medium density scatters of Later and/or Middle Stone Age stone

artefacts in vehicle tracks. The resources recorded by Nilssen (2008) are located approximately 1km outside of the project area, and were not accessible at the time of the field assessment due to locked gates. However, the cliffs and cliff-face have been identified as an area of high archaeological significance in the maps above.

An increase in the number of people living above the cliffs is likely to increase the number of people who access the Glentana beach and the shipwreck via the footpaths through the cliffs. This is likely to increase the accessibility of the sea-cut caves within the cliff-face which may be of archaeological significance.

Should the development proceed, it is recommended that a thorough survey of these sea-cut caves be undertaken in order to determine their scientific value and in order to inform a Conservation Management Plan to ensure the appropriate management of these resources should it be deemed necessary.

Burial grounds

Two burial grounds are located within the project area. One of these is associated with the Hoogekraal farm werf and is further detailed below. The other is recorded as Sites 8 and 11 above (Figure 5.2). This burial ground is located at the intersection of two farm roads, and appears to be largely informal. The area occupied by the cemetery is indicated as an area of high archaeological significance in the maps above.

High cultural value is placed on human remains and as such, no impact to these sites can take place. There is a high risk of accidental impact or disturbance to these sites during the construction phase of development. Recommendations pertaining to the management of impact to these sites are included below. Furthermore, unknown or unmarked burial grounds and graves remain at risk during the construction phase and are likely to be subject to very high direct impacts without mitigation.

As noted in the project description for this development, The graves linked to the current farm workers will remain, but going forward, any new burials will take place in the area indicated for that use to be located near to the proposed farm-workers village. The current cemetery site will remain and be respected as indicated on the layout plan.

It is further recommended that the current informal cemetery be formalised through the erection of a fence, with access to the cemetery guaranteed throughout the life of the development. Any proposed roadworks located within 10m of the existing cemetery must be monitored by an archaeologist to ensure that no unmarked burials are accidentally impacted by any proposed development activities.

Hoogekraal Farm werf precinct

It is important to note that the historic Hoogekraal Farm werf is located within the project area but is excluded from the proposed development. The farm werf precinct includes the recently renovated Jonkmanshuis (site 21, graded IIIB), the ruins of the old Smitswinkel (site 23, graded IIIC), the ruins of the Hoogekraal Manor house (site 24, graded IIIB) and the Hoogekraal farm burial ground (site 27, graded IIIA). Due to its high levels of historic significance, this precinct is the key heritage resource within the project area (Figure 5.3).

No direct impact to the Hoogekraal werf precinct is anticipated as a result from this proposed development.

Graded Structures

The field assessment identified 7 structures located within the project area that have contextual architectural value at a local scale. Site 44 is located just outside of the project boundary, and site 49 is located north of the N2, and is also excluded from this project area. As such, these structures are not discussed further.

Site 40 was not easily visible from the road, and was behind a locked gate, and as such, a conservative grading of IIIC is proposed. This grading may be revised upon the receipt of up-to-date images of the structure.

Sites 17, 28, 35 and 52 are all small cottages located within the project footprint. Site 28 was graded IIIA by Aikman in 2005 and is described as "This small house probably dates from the mid to late 19th Century and is almost entirely intact. Its steep roof suggests that it may have been thatched originally. Its joinery is original. It is currently used as a store." In this report, it is recommended that this site be graded IIIC for its contribution to the agricultural context of the development area.

Sites 17 and 52 were also graded IIIA by Aikman in 2005. Site 17 is described as commanding "a hilltop site to the northwest of the Hoogekraal homestead. It is similar to the house (6) discussed above (site 52 in this 2026 report) although it is in better condition" Site 52 is described as appearing "to have been altered with its awkward gable in the Cape Revival tradition, which became popular in the Edwardian era. Its thick walls and rough plaster suggest that the core of the house is probably from the mid to late 19th Century as do the sliding sash windows which are incongruous with the quirky gable. An intriguing feature of the house is that its main façade faces north and inland and its back is firmly turned towards the sea and the winds. There is a derelict freestanding "bakoond" at the back of the house and a concrete water tank to collect rainwater from the roof. The roof of corrugated iron has a loft dormer." In this report, it is recommended that these sites be graded IIIC for their contribution to the agricultural context of the development area.

Site 35 is located only 300m from site 52 and was not identified in Aikman (2005). As such, it is unclear if this structure is older than 60 years. However, this small cottage has an interesting half-moon curved pediment located above the central door. While this structure has recent features, its scale and pediment contribute to the agricultural context of the area and as such, it is recommended as a Grade IIIC resource.

It is recommended that the above graded buildings are retained within the development and are not demolished due to their contribution to the broader agricultural context of the project area.

b. Archaeological Sensitivities

The field assessment did not identify any stone age resources within the project area, although previous assessments have identified scatters of ESA and MSA artefacts within the cultivated fields. Due to the extensive history of agricultural activities in this area over the last 300 years, and the distance of the assessment area from the coastline, the likelihood of impact to intact significant archaeological heritage is low. As such, the overall archaeological sensitivity of the project area is LOW. Areas of VERY HIGH archaeological sensitivity have been identified within the Hoogekraal farm werf precinct, around the informal cemetery (sites 8 and 11) and along the densely vegetated cliffs and cliff-face in the south.

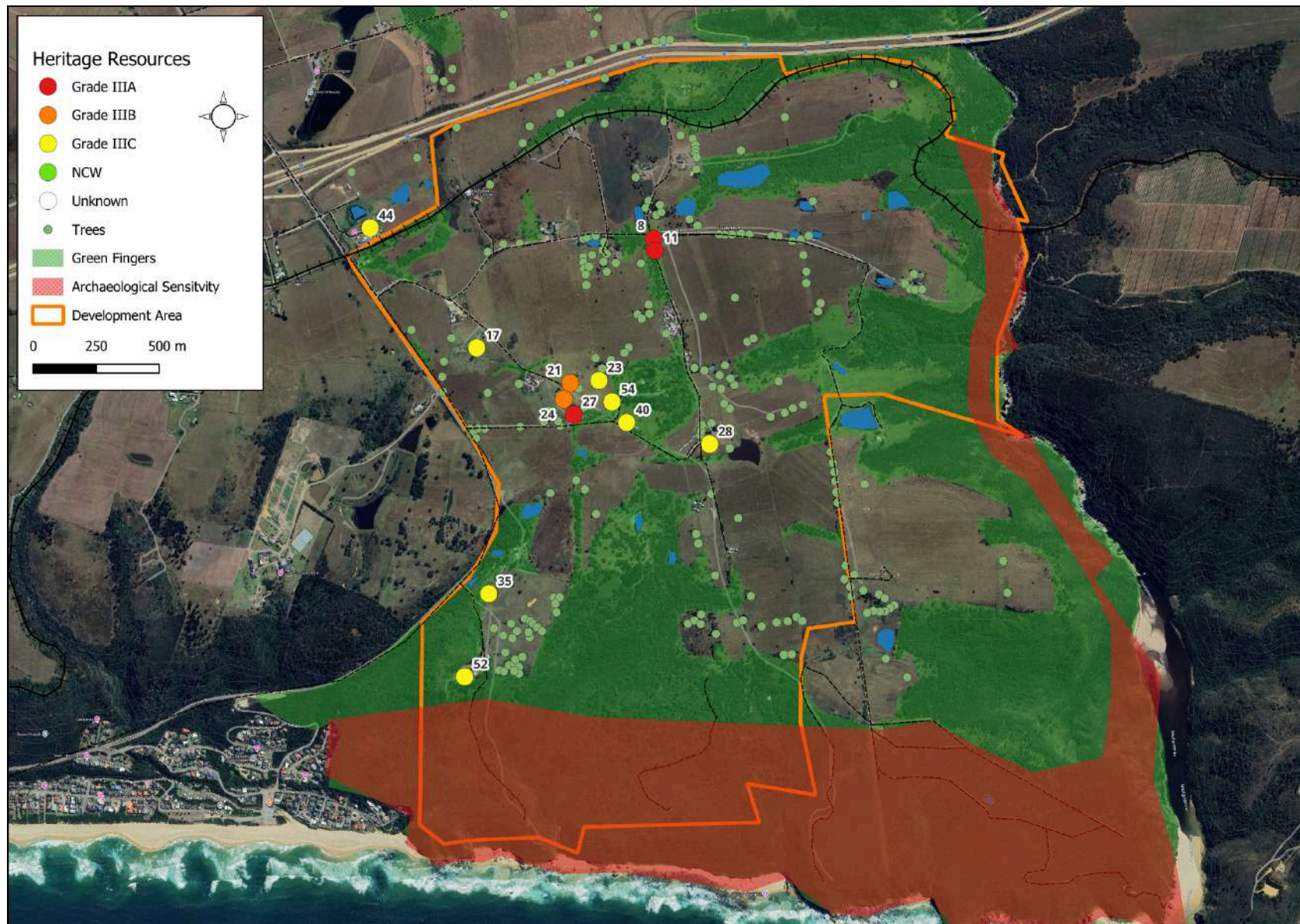


Figure 7: Map of significant heritage resources and areas of heritage sensitivity

6. Conclusion and Recommendations

The field assessment confirmed that the development area has been subject to extensive cattle grazing and cultivation and is now vegetated with grass. The area is largely flat, with very limited topography. The area is sparsely populated, with small occupied worker “villages” that have been established throughout the area. These “villages” are largely informal, with informal structures and access routes.

In addition to an archaeology assessment, the field assessment included a heritage survey of all of the built structures within the project area in order to update the work conducted by Aikman (2005). The results of this survey are included in Table 2 above.

Despite the findings of Kaplan (2005), the field assessment did not identify any stone age artefacts within the area proposed for development. The field assessment did record a number of graded resources including burial grounds, some structures of contextual value and a number of ruins. Importantly, the field assessment confirmed that, due to its high levels of historic significance, the Hoogekraal Farm werf precinct is the key heritage resource within the project area. It is important to note that, while the historic Hoogekraal Farm werf precinct is located within the project area, it is excluded from the proposed development.

The overall archaeological sensitivity of the area proposed for development is therefore LOW except for the areas mapped as having VERY HIGH archaeological sensitivity in Figure 7.

Recommendations

Based on the outcomes of this report, this project is supported from an archaeological perspective as it is not anticipated that the proposed will negatively impact on significant archaeological resources on condition that:

- The Hoogekraal Farm Werf precinct is excluded from the development activities and is not impacted by the project.
- The structures graded IIIC in Table 2 are retained
- The areas of high archaeological sensitivity mapped in Figures 5.2, 5.3 and 7 are not impacted by any construction activities. Any construction activities within these areas must be subject to monitoring by an archaeologist
- The current informal cemetery (Site 8 and 11) be formalised through the erection of a fence, with access to the cemetery guaranteed throughout the life of the project.
- Should the development proceed, it is recommended that a thorough survey of the sea-cut caves in the cliffs be undertaken in order to determine their scientific value and in order to inform a Conservation Management Plan to ensure the appropriate management of these resources for the life of the project should it be deemed necessary.
- Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and HWC must be alerted immediately to determine an appropriate way forward

7. References

- Aikman, H. 2005. SURVEY OF THE BUILT ENVIRONMENT PORTIONS OF THE FARM HOOGEKRAAL 238 DIVISION OF GEORGE
- Aikman, H. 2009. FANCOURT RETIREMENT VILLAGE PORTION 111 OF THE FARM MODDER RIVER 209 GEORGE.
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