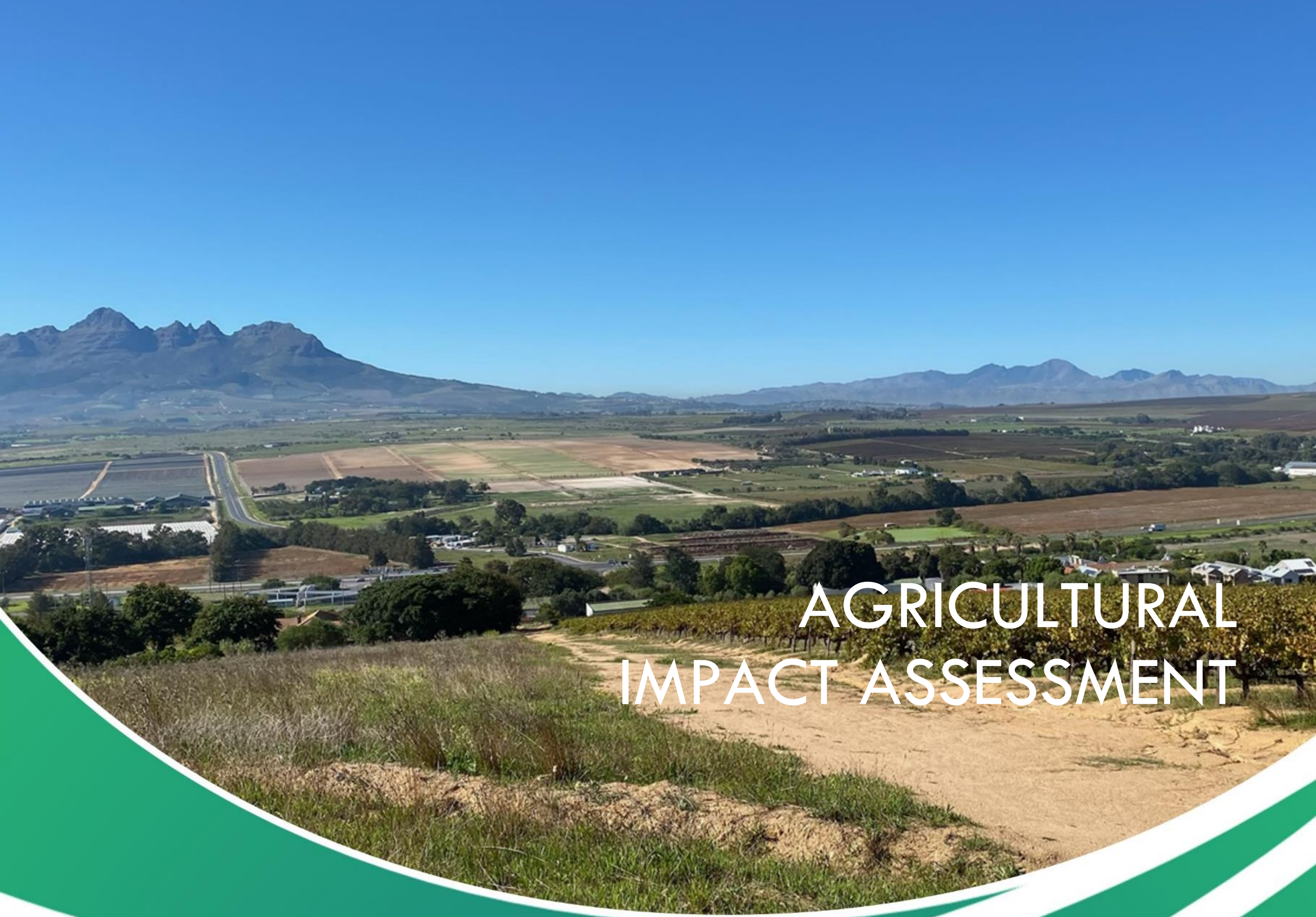

AGRICULTURAL IMPACT ASSESSMENT

EXTENTION OF THE LYNEDOCH URBAN NODE ON PORTION 28 OF FARM 468 STELLENBOSCH REGIONAL DIVISION

Prepared for:

UNiQON

Developers (Pty) Ltd

FINAL: 5 June 2023

AGRI informatics NATURAL RESOURCE SPECIALISTS

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Experience and Declaration of Independence

This report was compiled by François H Knight, principal consultant at Agri Informatics. Mr. Knight holds a B.Sc.Agric.Hons degree in Soil Science from the Free State University, a post graduate diploma in Terrain Evaluation from Potchefstroom University and a M.Sc.Agric.*cum laude* degree in Soil Science from the University of Stellenbosch. He has more than 35 years' experience in natural agricultural resource assessments, which stems from his work as a senior researcher at the Department of Agriculture and, for the past 21 years, as an independent consultant.

Mr. Knight has no business, financial, personal or other interests in the proposed development, other than fair remuneration for work performed in connection with this study and there are no circumstances that may compromise the objectivity of his work.

Francois Knight M.Sc.Agric. (Soil Science) | **5 June 2023** Date

Indemnity
The information contained in this report and the digital data provided, were compiled using the best available information, knowledge, technology and experience. Great effort was made to ensure the highest levels of accuracy possible. However, Agri Informatics Development Trust or any individual or any other company who have contributed towards the compilation of this information cannot be held responsible for any loss or damage incurred as a direct or indirect result of the use thereof. All recommendations were made in good will, but the risks associated with the implementation thereof, resides with the implementor.

Contents

1 Introduction

Lynedoch – also known as Lynedoch Eco Village – is a settlement, situated on Baden Powell Drive (R310) at the intersection with Annandale Road, in the Stellenbosch Municipal area. It is home to the Sustainability Institute, which offers tertiary training programmes in partnership with the University of Stellenbosch and other organisations.

The approved Stellenbosch Municipality Spatial Development Framework (MSDF, 2019) includes Portion 28 of Farm 468 in the urban edge of the Lynedoch precinct and proposes "mixed use and residential infill" on a portion thereof, while the remainder is indicated as "green areas retained" (Figure 1). The MSDF also mentions "*Further growth of the Sustainability Institute and its partners' education focus and offer, through expanded and new programmes, and further accommodation for students and staff within a compact, pedestrian oriented, child friendly community, appears appropriate.*"

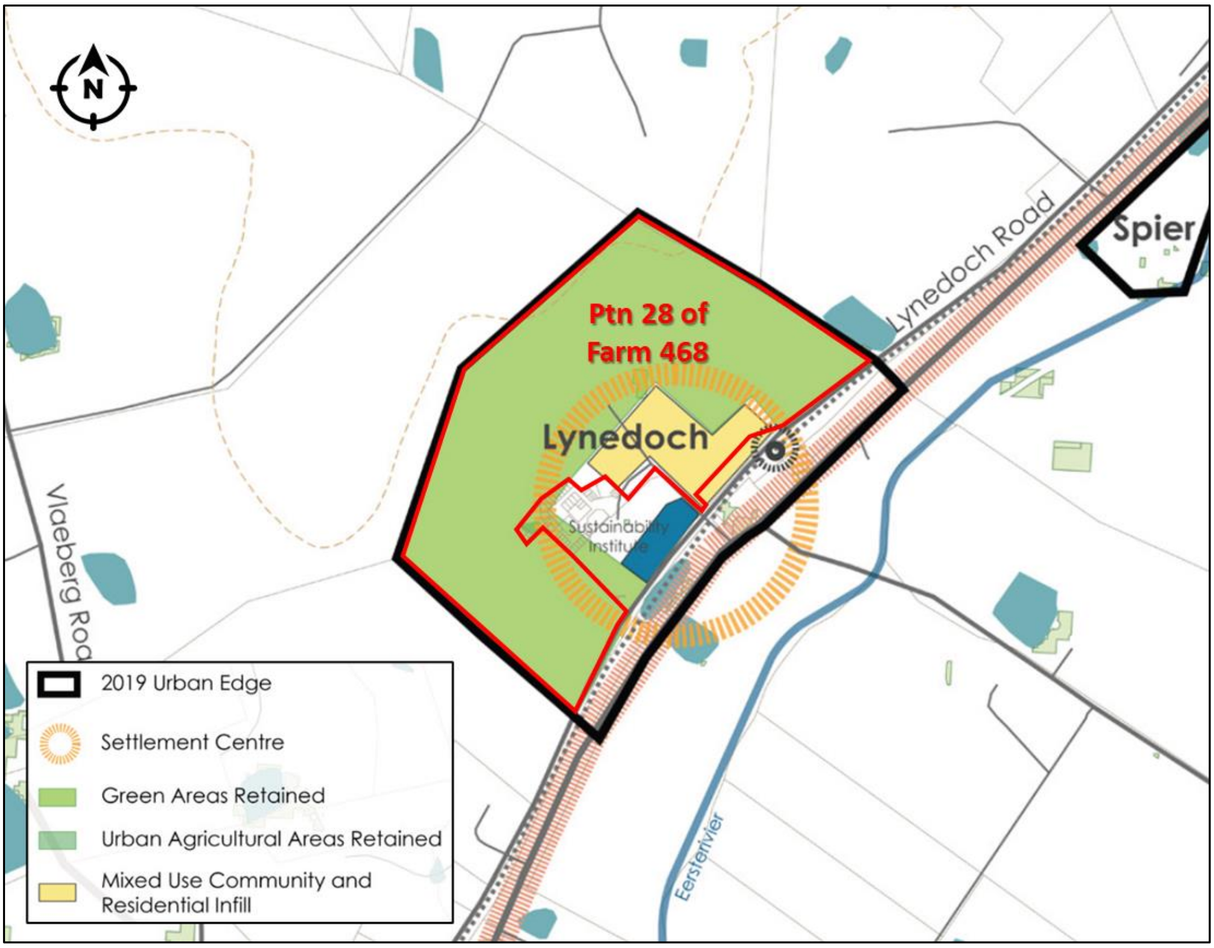


Figure 1: Extract from the Stellenbosch MSDF (2019), with the subject property indicated by the red line.

Uniqon Developers (Pty) Ltd is the proponent for a residential and multi-use development on Portion 28 of Farm 468, currently zoned as *Agriculture*.

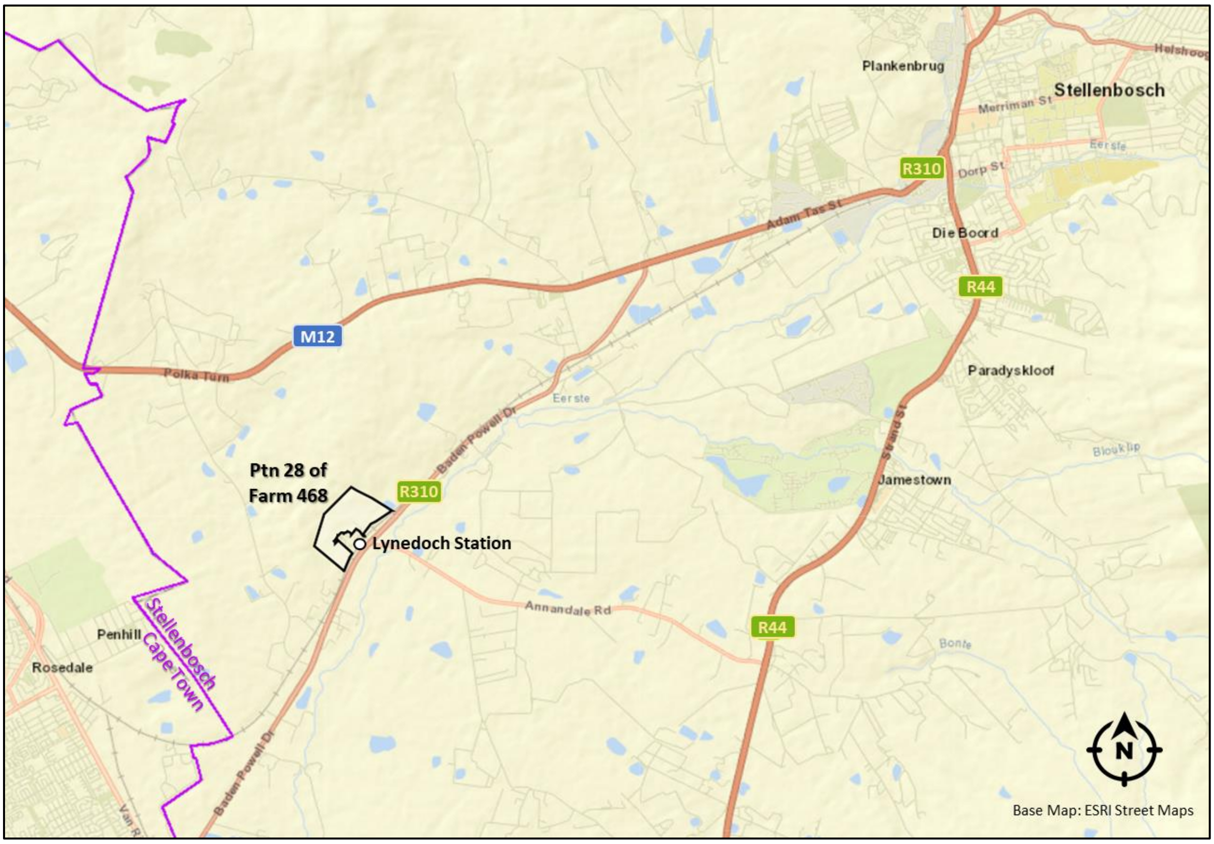


Figure 2: The study area is situated west of the R310, at the intersection with Annandale Road, in the Stellenbosch Municipal area.

An application in terms of the Subdivision of Agricultural Land Act (SALA – Act 70 of 1970) are being prepared for the inclusion of Portion 28 in the area of jurisdiction of Stellenbosch Municipality for urban development purposes. The purpose of this study is to inform the applicant and the statutory authorities about the agricultural potential of the said property and the possible impact of the proposed development on the agricultural resource base, food security and job opportunities of the Western Cape and the RSA.

Further to the SALA application the medium term development plan for the property, will include the transformation of agricultural land and may also trigger several other listed activities under NEMA (National Environmental Management Act EIA Regulations 2014 - as amended). A Scoping and Environmental Impact Assessment will therefore be required to apply for Environmental Authorisation (EA) of such proposed development at a subsequent stage. The NEMA guidelines prescribe a Site Sensitivity Verification, followed by an Agricultural Agro-Ecosystems Specialist Assessment where applicable, as part of the Scoping and EIA procedure.

Therefore, in anticipation of these future possible applications and to assist the deciding and commenting authorities in their evaluation of the applications, a Site Sensitivity Verification and Agricultural Agro-Ecosystems Specialist Assessment was requested by the applicant to inform and support their submission.

2 Terms of Reference

Agri Informatics was requested by Mr. Dupré Lombard of Virdus Works, lead consultant for the authorisation process for the proposed rezoning and development on the identified land, to conduct an Agricultural Agro-Ecosystems Specialist Assessment of Portion 28 of Farm 468, Stellenbosch RD. The assessment had to include:

- Site Sensitivity Verification
- Description of the Agricultural Land Use
- Soil Survey at a reconnaissance scale
- Topographic Assessment
- Climatological Assessment
- Assessment of Water Resources
- Description of the Grazing Capacity
- Agricultural Potential Assessment
- Assessment of the potential Impact of the proposed development
- Presentation of findings in relevant Report format

The findings and conclusions presented in this report are predominantly based on (i) own observations and surveys and (ii) independent third party data and information (e.g. climate data). Where information from the client, land owner or related parties are used, it will be clearly referenced.

3 The Study Area

The study area is situated ±8 km southwest of Stellenbosch in the Western Cape (Figure 2) and consists of a single farm portion, spanning an area of ±45.41 ha. The property detail is listed in Table 1.

Table 1: Cadastral units (properties) affected by the proposed development.

ID	Portion Nr	Farm Nr	Farm Name	District	Area* (ha)	GIS Area (ha)
1	28	468	Welmoed Estate	Stellenbosch RD	45.41	45.41
Total GIS area of cadastral units						**45.41**
* Areas as indicated by the Surveyor General Farm Portion data						

4 Site Sensitivity Verification

4.1 Protocol

This study needs to inform the future environmental authorisation process in terms of the NEMA EIA Regulations of 2014 - as amended, to obtain approval for the proposed development activities on the farm.

The procedure for the study is formally guided by the *Protocol for the Specialist Assessment and minimum report content requirements for Environmental Impacts on Agricultural Resources*, as published in Government Notice No 320 (March 2020). This Protocol makes use of the web-based Environmental Screening Tool of the Department of Forestry, Fisheries and Environment (DFFE), which identifies the general agricultural sensitivity of the study area and then prescribes either (i) an Agricultural Agro-Ecosystem Specialist Assessment (for areas with High or Very High sensitivity) or (ii) an Agricultural Compliance Statement for areas with Medium or Low sensitivity.

The first prescribed step is to conduct a **Site Sensitivity Verification** through the use of:
(a) a desk top analysis, using satellite imagery;
(b) a preliminary on-site inspection; and
(c) any other available and relevant information.
The aim of the site sensitivity verification is to confirm or amend the sensitivity classification of the site as indicated by the Screening Tool and thus determine the protocol for the rest of the study.

Figure 3: Agricultural Sensitivity as indicated by the Screening Tool of DFFE.

4.2 Findings

The Screening Tool of DFFE indicates most parts of the property as Very High or High agricultural sensitivity with only smaller parts as Medium or Low agricultural sensitivity (Figure 3). The areas mapped as Very High and High sensitivity corresponds to areas indicated by the Land Capability map (DAFF, 2016) as Moderate to Moderate-High land capability or areas mapped as irrigated wine grapes or dryland planted pastures (DAFF, Crop Census 2013, 2017/18).

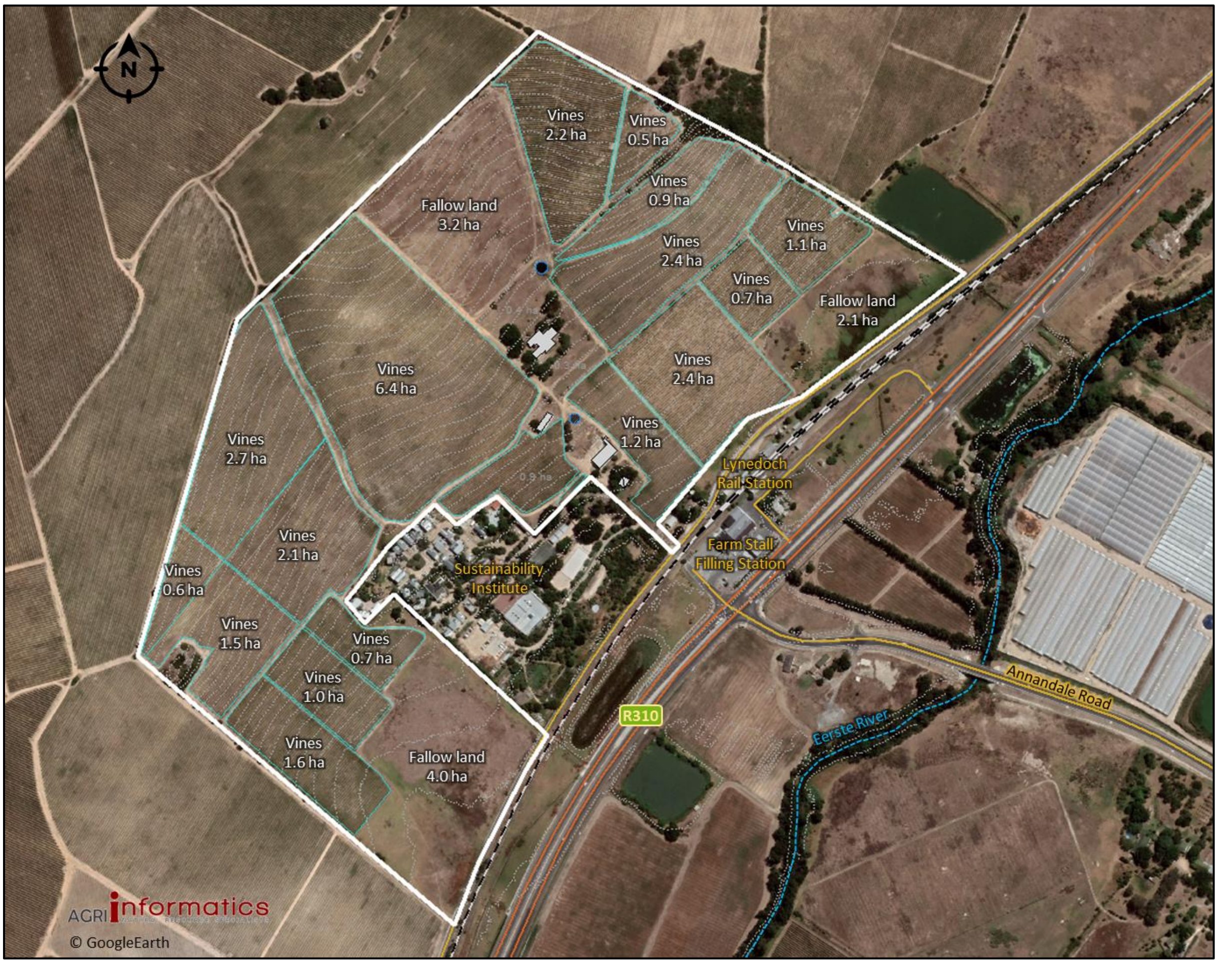


Figure 4: Recent GoogleEarth image indicating vineyards, fallow land and other infrastructure of Portion 28 of Farm 468.

At the time of the site visit (25 April 2023) the only agricultural activity on the property was dryland (rainfed) wine grape blocks with a total area of 28.9 ha, managed under contract by a neighbouring farmer. While two houses on the farm are occupied, the other farm infrastructure (mainly sheds) were unused while two cement dams were empty, without any sign of recent irrigation activity. The farm has some irrigation infrastructure in the form of main lines with water hydrants for moveable sprinkler systems. An assessment of historic aerial imagery confirmed that supplementary irrigation was applied to some vineyards. The extent and irrigation frequency is unkown, but the only source of irrigation water is a borehole with an unconfirmed supply. No record of water use registration could be obtained. As the supply is expected to be limited, only supplementary irrigation of selected blocks is presumed.

Aerial imagery indicating overhead irrigation of sections of vineyard blocks (LEFT: Nov '21 & RIGHT: Dec '22)

Most of the current vineyards were planted before 2005, as indicated by aerial imagery, while at least one block were planted in 1987. The current production footprint is 2.6 ha smaller than the footprint of circa 2008 as some blocks have been uprooted, but not replanted.

Given the current and historic cultivation of wine grapes and the fact that some supplementary irrigation did take place, the site sensitivity has to be regarded as High and thus an Agricultural Agro-Ecosystems Specialist Assessment is prescribed to inform any future environmental or other authorisation for activities that will transform the land from agriculture to another land use.

5 Agricultural Agro-Ecosystem Assessment

5.1 Methodology

A desktop study was augmented by a site visit and a reconnaissance scale soil survey, to compile an agricultural potential assessment of the farm.

5.1.1 Desktop Assessment

Land Capability

The term "land capability" is often used to refer to the suitability of land for agricultural activities. Various independent but similar Land Capability classification systems have been developed or used internationally to classify land. Most systems put strong emphasis on soil properties, but other factors such as climate and topography can also play a role. In an attempt to provide more detailed input to the Preservation and Development of Agricultural Land Bill (PDALB), the former National Department of Agriculture, Forestry and Fisheries (DAFF), expanded the earlier 8-class Land Capability classification of the RSA, to a 15-class Land Capability Map, based on national datasets on Soil, Climate and Terrain capability. The dataset was subsequently incorporated in the national web-based Environmental Screening Tool which re-classified and interpreted the Land Capability Map as follows:

Table 2: Land Capability interpretation as used in the Environmental Screening Tool.

Land Capability		Associated Land Use Types
Value	**Class**	
01	Very low	Natural veld with low grazing capacity; marginal dryland cultivated areas
02	Very low	
03	Low-Very low	
04	Low-Very low	
05	Low	
06	Low-Moderate	Some extensive dryland cultivated areas; natural veld with high grazing capacity
07	Low-Moderate	
08	Moderate	All productive cultivated areas including sugarcane; high value agricultural areas with a priority rating C or D
09	Moderate-High	
10	Moderate-High	
11	High	Irrigation, horticulture/viticulture, shade net; high value agricultural areas with priority rating A or B
12	High-Very high	
13	High-Very high	
14	Very high	
15	Very high	

Soils

Soil information was extracted from the South African Land Type Dataset, as obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC), augmented by *in situ* observations made during the site visit and soil survey.

Climate

Climate information was abstracted from the South African Atlas of Agrohydrology and - Climatology (Schulze & Maharaj, 1997), Agromet data (ARC ISCW) and NASA Power data.

Topography

The topography of the study area was derived and analysed, making use of the elevation survey provided by the client. An elevation model was constructed at a grid size of 5 m. This DEM was used to conduct a slope gradient analysis and assessment of the surface hydrology.

Irrigation Water

The availability of irrigation water was based on the existing lawful water use volumes as described in documentation issued by Department of Water and Sanitation (DWS) or the Wynland Water User's Association.

Agricultural Land Use

Current and earlier farming activities was noted during the site visit and from satellite image analysis to determine the extent and history of cultivation and other agricultural land use activity.

Agricultural Potential

Agricultural potential is firstly the combined result of the quality of the natural resources, soil, climate and water – as discussed above – whilst some degree of sustainability is also incorporated with respect to both environmental and financial sustainability.

Medium or high agricultural potential therefore implies an above average possibility to conduct agricultural activities that will be sustainable and financially viable under normal market conditions.

Site Sensitivity

Agro-ecosystem sensitivity is related to the intensity of current or potential farming activities, which in turn, is related to the *agricultural potential*.

5.1.2 Site Visit

A site visit was conducted on 5 April 2023 and followed by a soil survey on 25 April 2023 to support and augment the findings of the desktop assessment.

5.2 Findings

5.2.1 Land Capability

The Land Capability dataset (Figure 5) indicates land capability classes between 5 (low) to 10 (moderate-high) for the farm, with the lower values on the lower foot slopes or crest areas.

The soil survey and discussions on irrigation water availability in the following paragraphs will further confirm or dispute the capability of the land as suggested by this data.

5.2.2 Soils and Geology

The geology of the study area is shown in Figure 6, below. It consists of mainly coarse grained porphyritic granite of the Kuilsriver-Helderberg Pluton of the Malmesbury Group on the upper slopes and Quaternary Alluvium on the lower slopes.

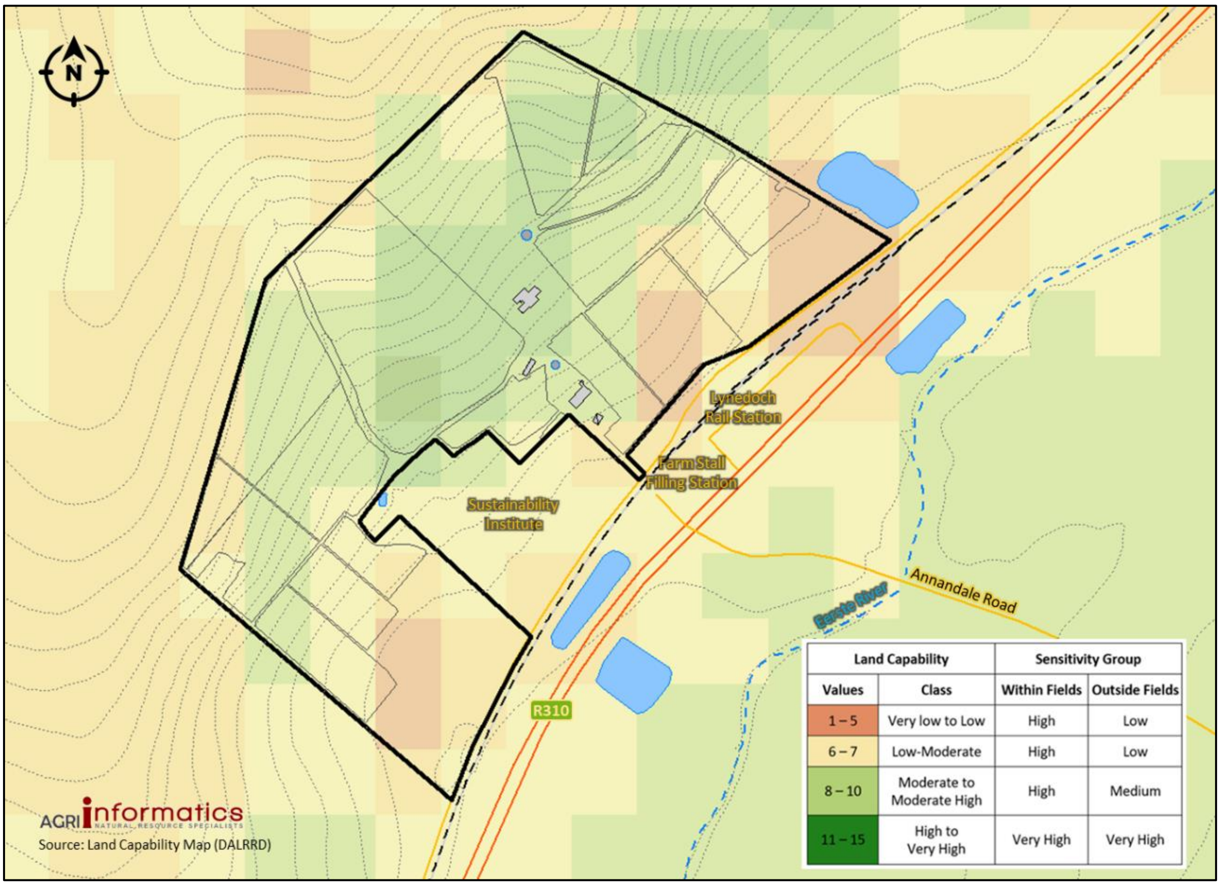


Figure 5: Land capability map of Portion 28 of Farm 468 (DALRRD).

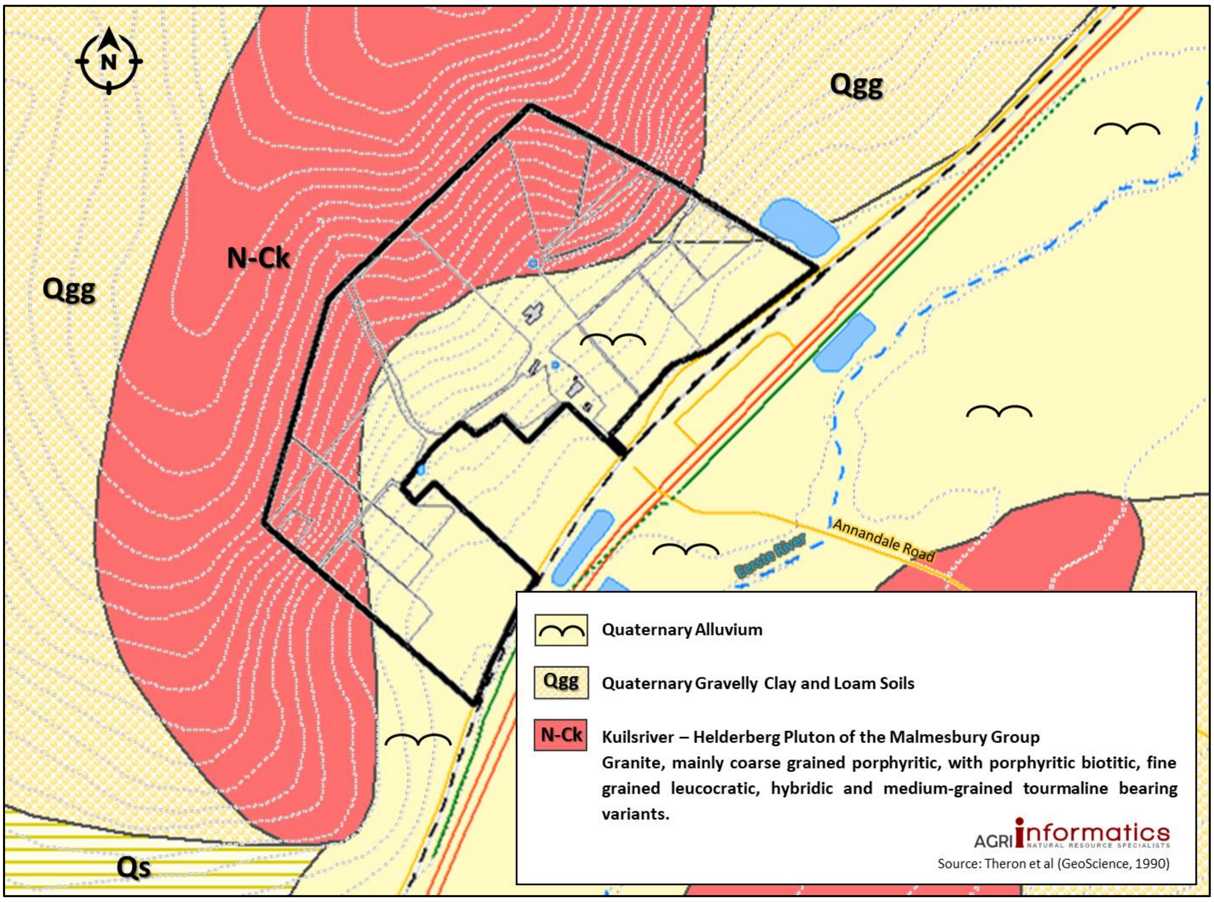


Figure 6: Geology of the study area (Theron et al 1990 - GeoScience).

The Land Type map (Figure 7) indicates correlation between Land Type Ac24 with the granite and Ca27 and Ca28 with the alluvial material. The dominant soil types on the mid slopes of Land Type Ac24 are moderately deep to deep soils of the Hutton and Clovelly soil forms (50%) and shallow rocky soils on 35% of the Land Type. Soils of the Kroonstad, Wasbank and Longlands soil forms are dominant on the foot slopes of Land Types Ca27 and Ca28.

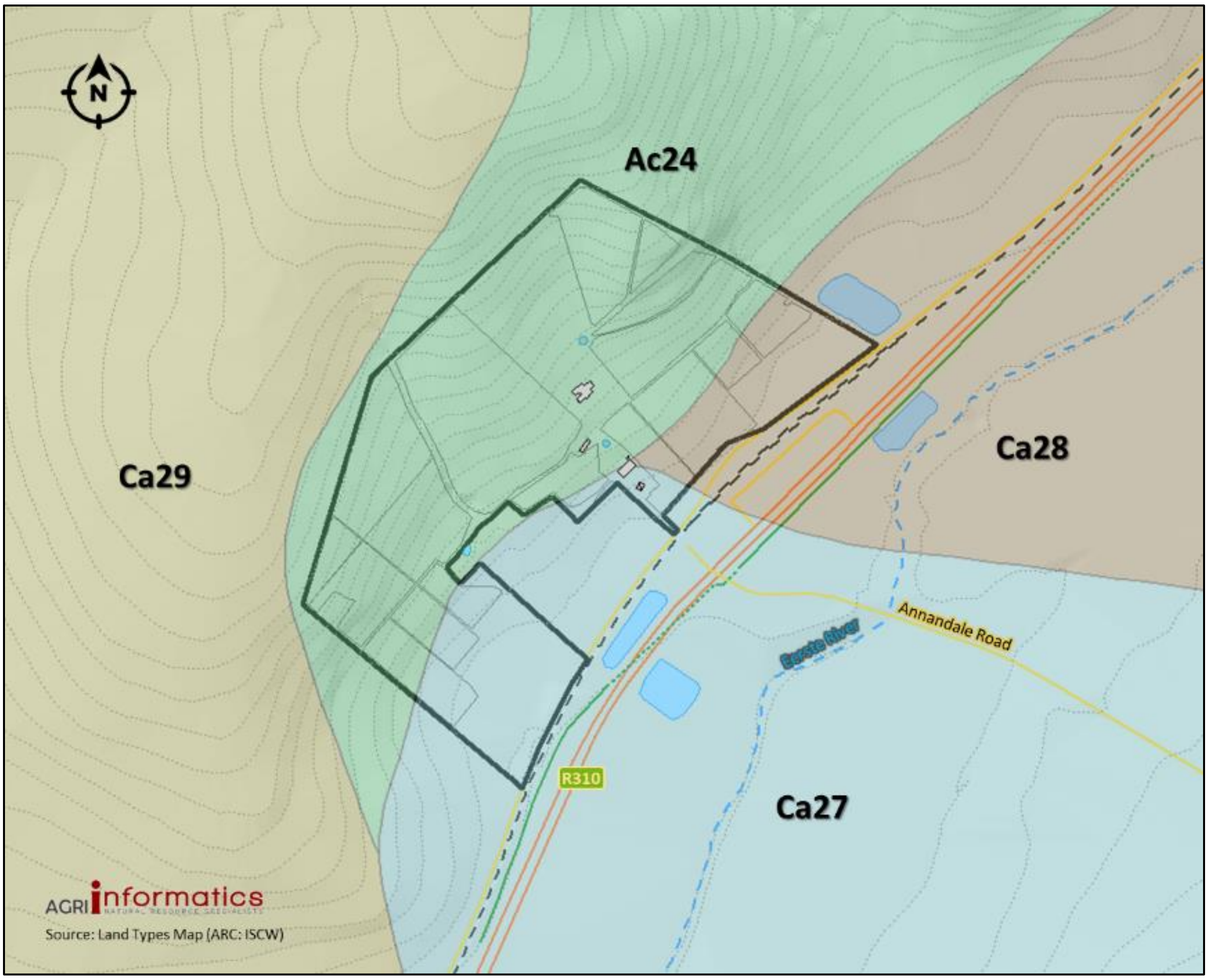


Figure 7: Land Types of the study area (ARC: ISCW).

A reconnaissance scale soil survey was conducted as part of this study. A total of 21 freshly prepared profile pits, excavated by a TLB was classified. The vineyard blocks limited access to some parts of the property, while steep slopes also prevented the distribution of profile pits on an ideal grid spacing. However, the variation in soil properties was mostly along the slope direction and it is believed that the different soil properties were sufficiently observed and captured to compile an adequate presentation of the soil types for the purpose of this study. Figure 8 below indicates the profile pit positions and soil forms as mapped during the survey.

The soil information on depth, clay content, porosity, permeability, water retention capacity and general morphological characteristics were interpreted to derive an indication of the soil potential for the production of crops under dryland (rainfed) or irrigated conditions. The soil potential of the various soil types further differs according to crop types (i.e. annual or perennial crops) and therefore three maps (Figure 9) were compiled to depict the soil potential for (i) irrigated perennial crops, including wine grapes, (ii) dryland wine grapes and (iii) dryland perennial crops.

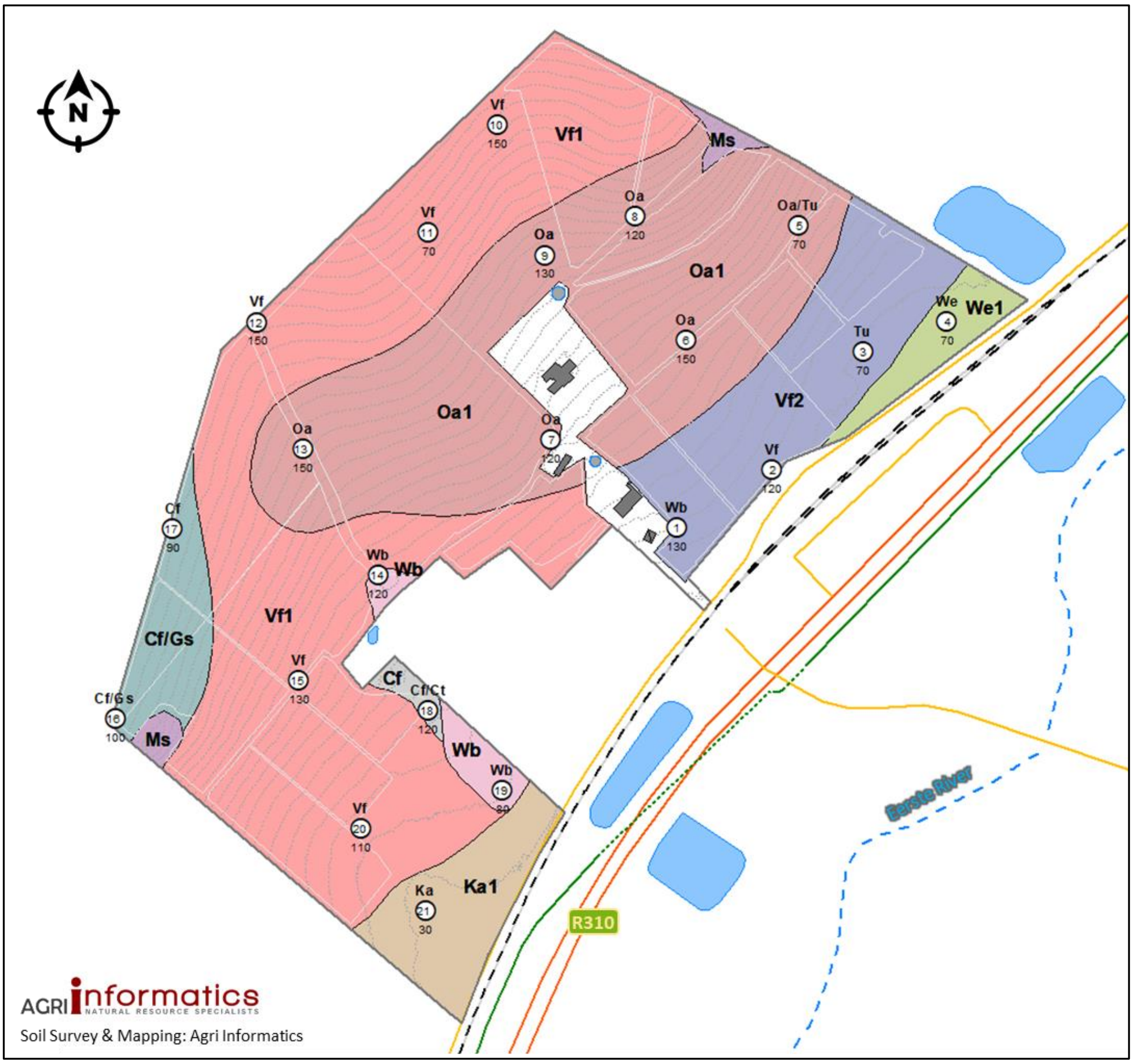


Figure 8: Soil profiles and map units as classified during the soil survey.

A fourth category, namely annual dryland crops (i.e. winter cereals) is not regarded as a viable option, given the steep slopes of the terrain (see paragraph 5.4), while the terrain will also limit the production of annual irrigated crops (e.g. vegetables).

The seasonality of the rainfall - ±80% during the winter months - and high summer evaporation of the study area, has a severe limitation on the production of summer crops (annual or perennial) without full irrigation. The water requirement of wine grapes is lower than most other perennial crops and soils with high water retention capacity are capable of storing sufficient water to sustain wine grape production, but at reduced yield levels.

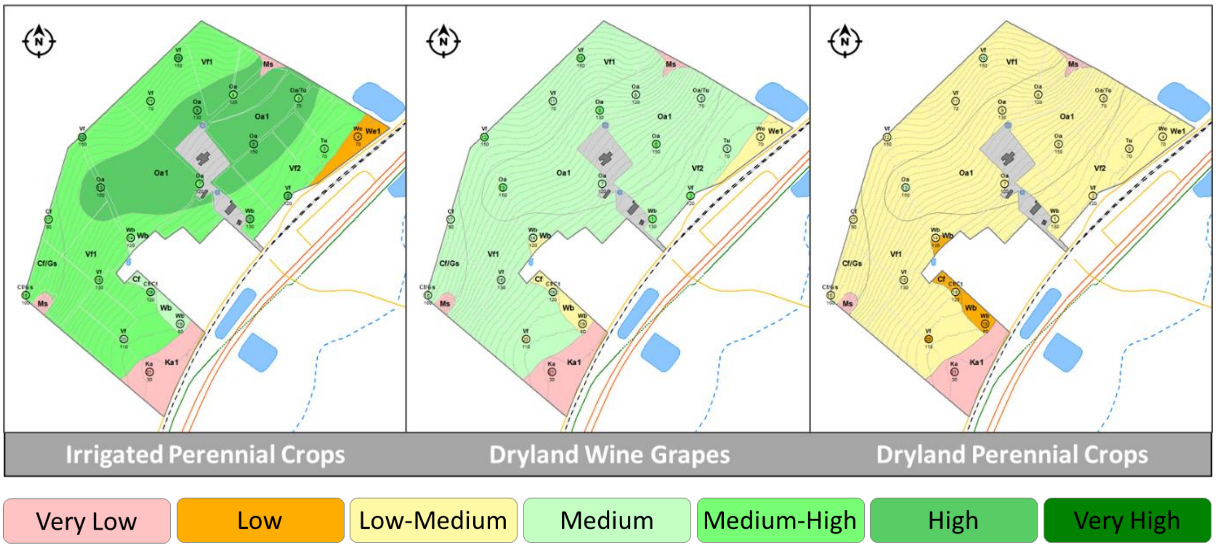


Figure 9: Soil potential for perennial crops and wine grapes under irrigation or dryland (rainfed) conditions.

5.3 Climate

5.3.1 Köppen-Geiger

The study area has a Köppen-Geiger climate classification of Csb – a temperate, dry warm summer Mediterranean climate. The average temperature of the coldest month is above 0°C, all months have an average temperature below 22°C and at least four months have an average temperature above 10°C. This region receives at least three times as much precipitation in the wettest month of winter as in the driest month of summer and the driest summer month receives less than 30 mm of rain.

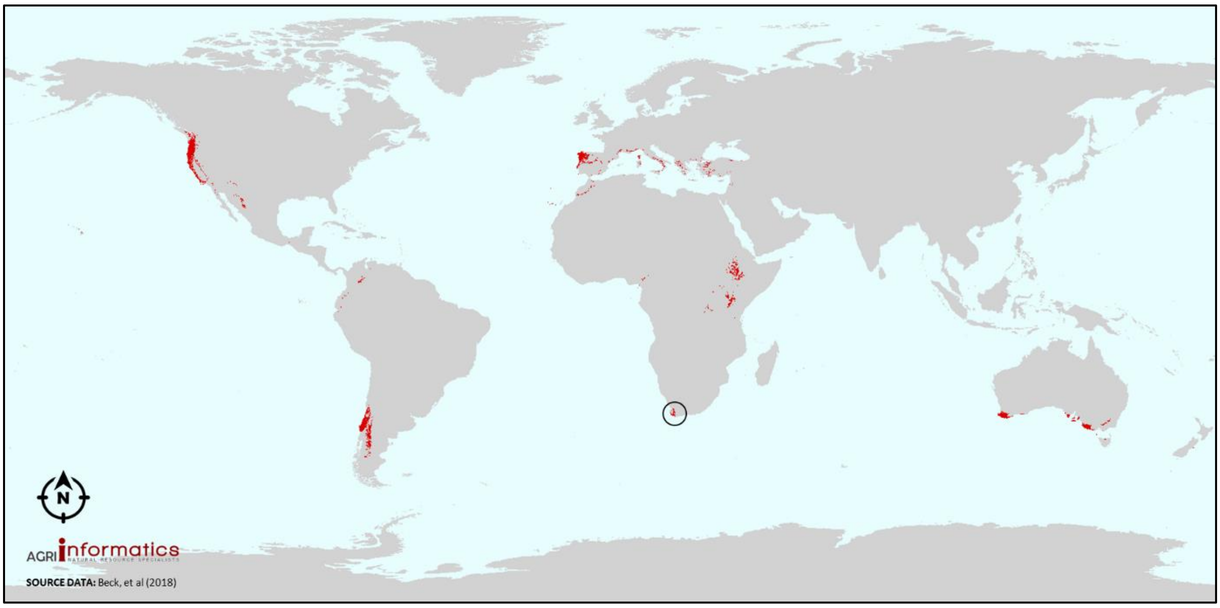


Figure 10: Köppen-Geiger Csb climate zones of the world (Data source: Beck, et al, 2018).

Based on the rainfall and ET_0 values in Table 4, the irrigation requirement of wine grapes amounts to 370 mm per annum, while citrus or stone fruit will require 670 mm/a and 700 mm/a respectively. The irrigation requirement for planted pastures is calculated at >900 mm/a.

5.3.2 Climate parameters

Table 4: Summary of key climate parameters of the study area (2001-2021) (NASA POWER Climatologies).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rel. Humidity %	66	66	68	71	77	80	82	83	81	77	72	67	**74**
Wind Direction °	163	161	161	174	264	293	286	293	223	178	167	170	**176**
Wind Speed Max m/s	12.0	9.7	10.4	13.3	11.8	13.7	11.9	11.9	10.9	11.0	11.2	11.2	**13.7**
Wind Speed Min m/s	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	**0.0**
Wind Speed Ave m/s	4.4	4.1	3.7	3.3	3.1	3.2	3.1	3.3	3.3	3.6	4.0	4.2	**3.6**
Rainfall mm	20	15	25	48	72	134	124	121	62	47	46	20	**733**
Mean Temp. °C	20.9	21.2	20.0	17.9	15.9	13.9	13.1	13.4	14.8	16.7	18.3	20.1	**17.2**
Ave. Max.T °C	23.1	22.4	21.4	19.2	17.7	15.3	14.9	15.0	16.7	18.4	21.0	22.5	**19.0**
Ave. Min.T °C	19.8	19.8	18.3	16.8	14.5	12.8	11.9	12.2	13.3	15.7	16.3	18.6	**15.8**
Highest Max. T. °C	35.6	35.4	34.6	33.9	30.1	26.9	25.0	27.4	29.2	37.1	37.0	36.2	**32.4**
Lowest Min. T. °C	13.0	12.9	12.0	8.9	7.6	6.1	4.8	5.5	6.9	7.8	10.2	11.7	**8.9**
Frost Days / month	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
PAR MJ/m²/day	13.5	12.2	9.8	7.1	4.9	4.1	4.6	5.8	7.9	10.5	12.5	13.6	**8.9**
ET_0 mm/month	217	185	166	115	82	68	70	87	107	152	180	210	**1639**

At an elevation of approximately 70 m amsl and <22 km from the False Bay coastlines the climate is maritime, i.e. mean temperature difference between hottest and coldest month is <10°C, at 8.1°C. The average annual rainfall is 773 mm, of which 561 mm (73%) is winter rain between April to September. The warmest months are October to February when maximum temperatures can reach 35.0°C. The coldest month is July with an average minimum temperature of 11.9°C and coldest recorded temperature of 4.8°C. The site is considered to be frost free. The mean annual wind speed is 3.6 m/s (NASA Power, 2022).

Despite the relatively mild minimum winter temperatures the positive chill units, calculated by the Linsey-Noakes model (10°C base temperature) are moderately high at 640 degree-hours (Schulze, 2009).

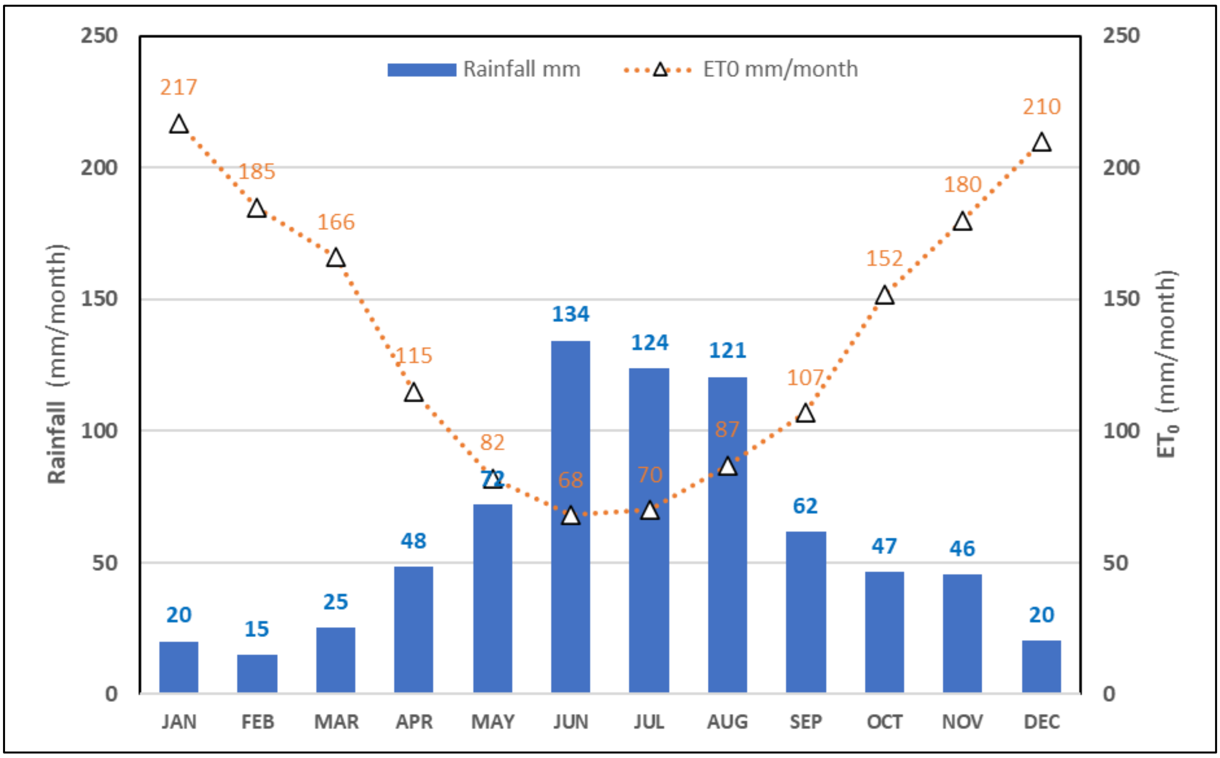


Figure 11: Relationship between monthly rainfall and ET_0.

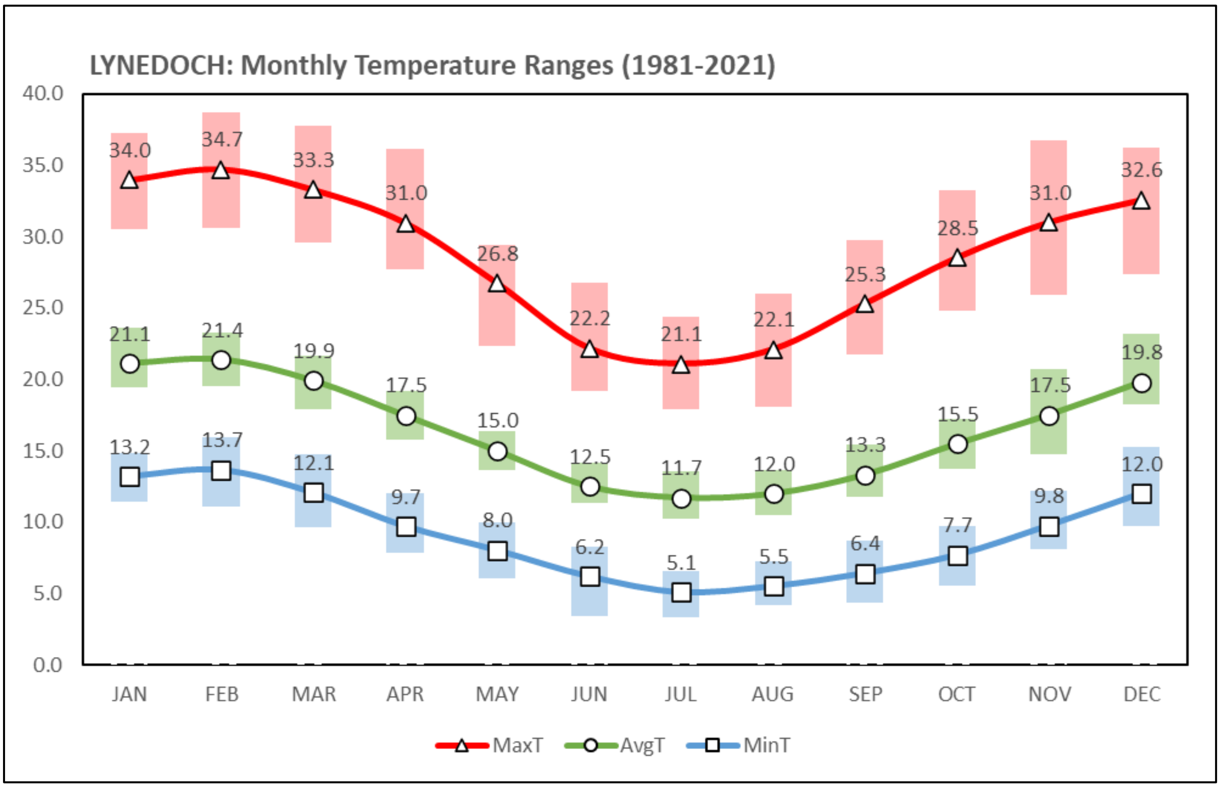


Figure 12: Long term temperature ranges at Lynedoch.

5.4 Topography and surface hydrology

An elevation model of the farm (Figure 13) has been compiled from 0.5 m contour lines, obtained from a detail elevation survey that was commissioned by the developer. The topography of Portion 28 of Farm 468 is characterised by steep slopes in the northwestern half of the farm, transitioning to flat areas along the southeastern boundaries, being the valley floor of the Eerste River. The highest point on the farm is in the northern corner at ±110 m amsl. The lowest point of the farm is at ±26 m amsl in the southern corner of the property. Many embankments and terraces had been constructed during the establishment of the vineyards, especially in the areas where the slope gradients exceed 15%.

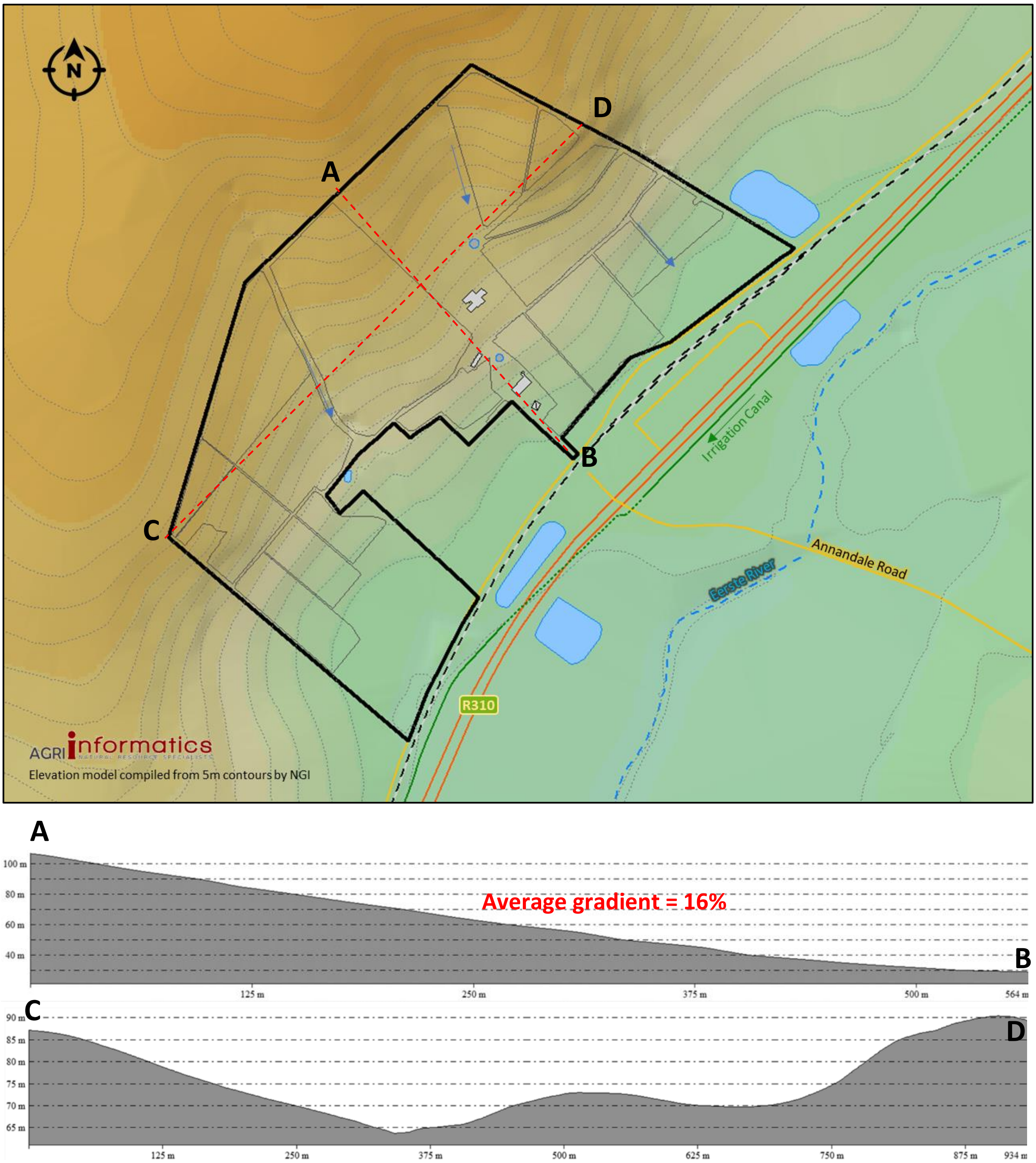


Figure 13: Map of the topography and relief cross-sections along lines A-B and C-D.

A slope gradient map was also compiled from the elevation model, which indicates a large portion of the farm with slope gradients steeper than 15% (Figure 14) and some smaller areas with gradients up to 30%. Surface drainage on the steeper slopes is controlled by vineyards row directions along the contour lines and runoff furrows. Surface water is expected to accumulate on the flat areas, although hydromorphic soils were limited to the lowest area in the south. Despite some very steep slope gradients, soil erosion is limited by terracing, vineyard row directions along the contour lines and the presence of cover crops – mostly volunteer grasses and weeds.

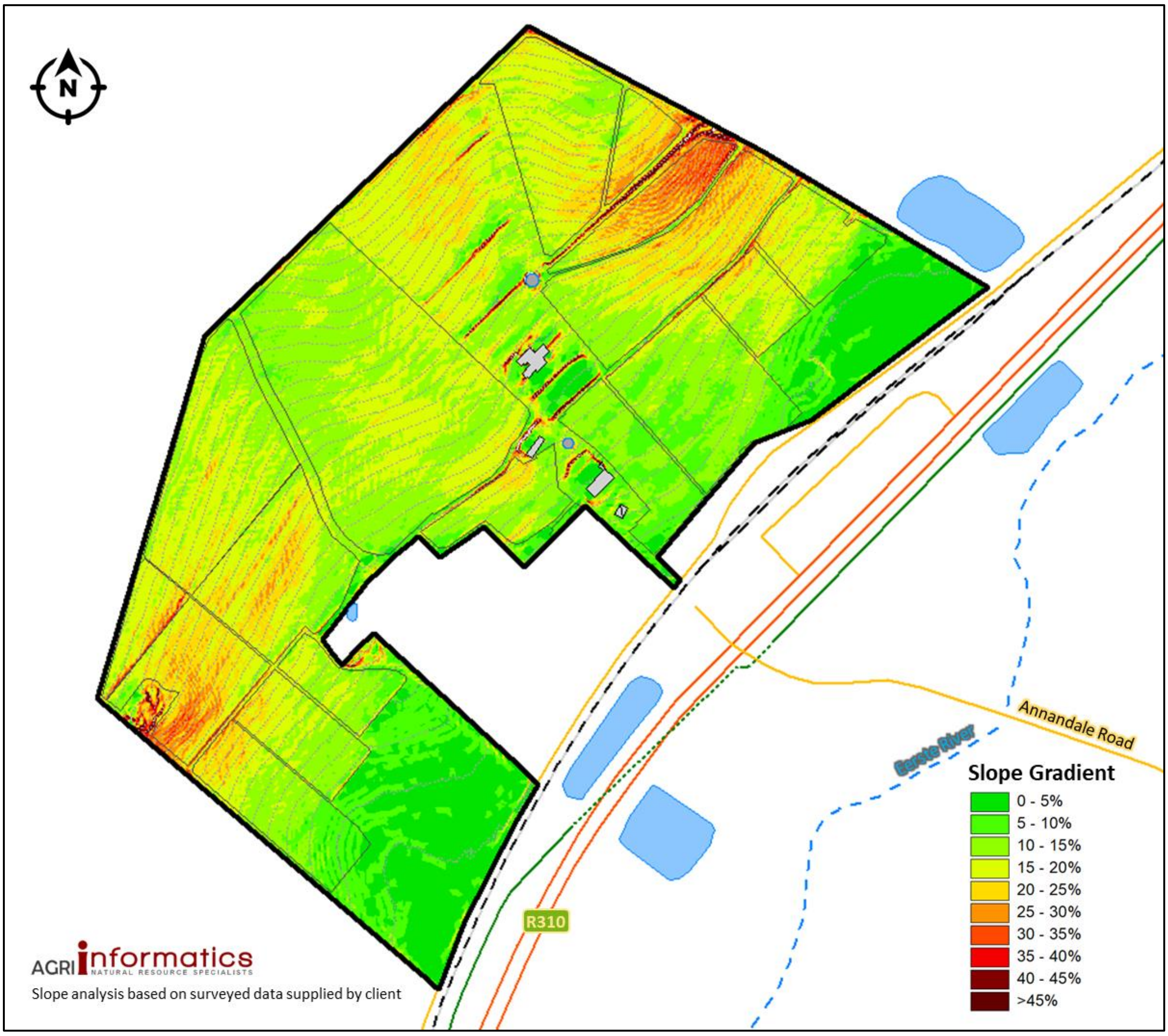


Figure 14: Slope gradient map of the study area.

5.5 Irrigation water

The potential groundwater yield of the study area is indicated as 0.1 – 0.5 liter/sec (<2.0 m^3/h) and of good to moderate quality at 70 – 150 mS/m. Recharge is at 58 mm/a and the depth to groundwater is <10 m below ground level (DWS, 2005).

Despite signs of limited supplementary irrigation that was done in the past, the Wynland Water User's Association has no record of water allocation or registration for Portion 28 of Farm 468.

At the theoretical yield of 2.0 m³/h, abstracted for 20 hours per day from two boreholes, the groundwater can yield 80 m³/day. During the period of peak water demand (Dec – Jan) winegrapes in this area will require about 20 mm per week or up to 3 mm/day. This equals 30 m³/ha/day. The groundwater yield is therefore sufficient to irrigate less than 3 ha. While this calculation is crude and rather speculative, it does provide a clear indication of the very limited contribution that groundwater can make towards the water requirement of any irrigated crop.

5.6 Recent agricultural activity

A landuse map (Figure 15) has been compiled from aerial imagery (Google Earth) and personal ground observations, to indicate the extent of the current and previously cultivated areas. Table 5, provides a summary of the results.

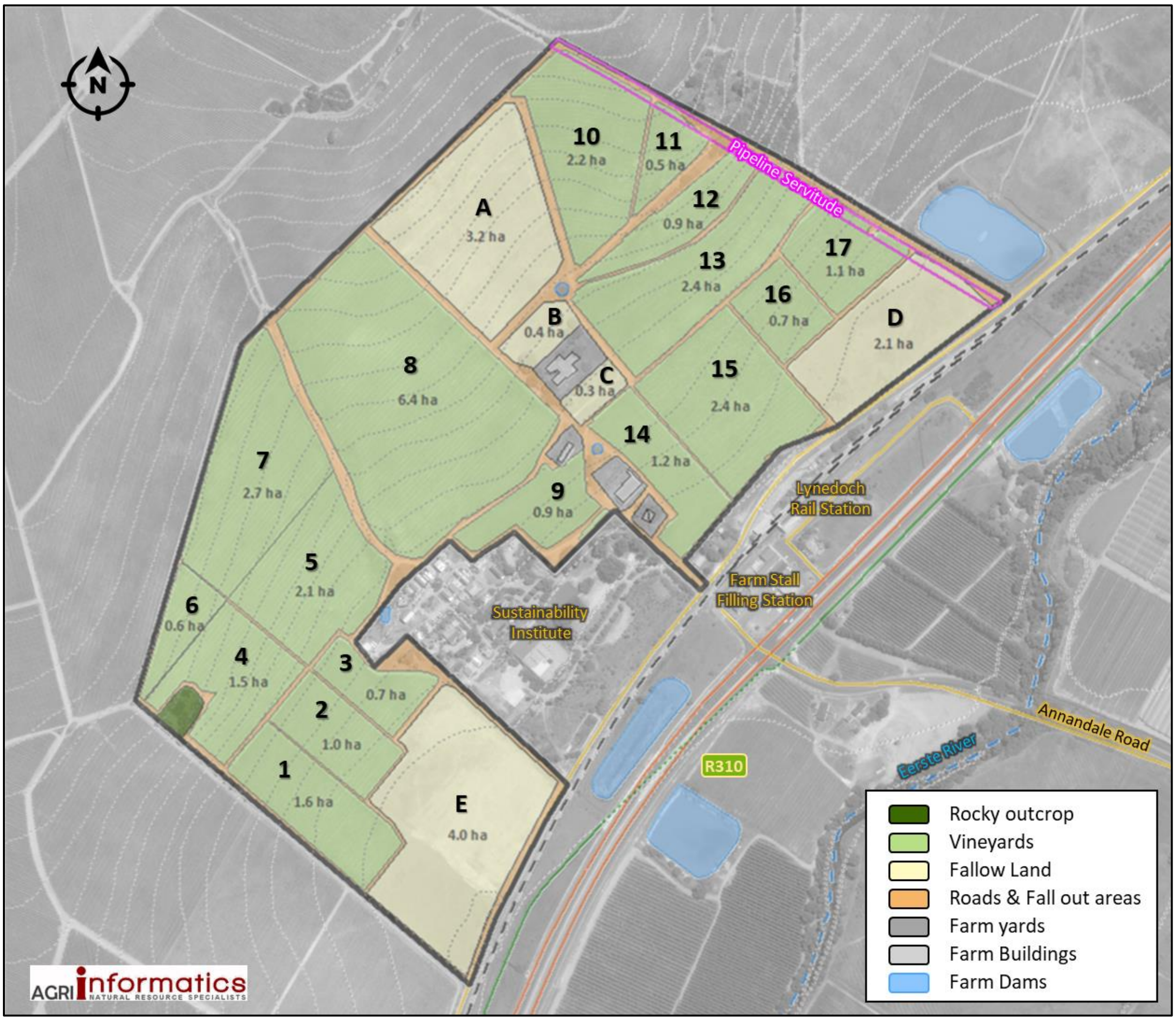


Figure 15: Land use of Portion 28 of Farm 468 - May 2023.

The combined potentially arable land on the property amounts to ±32.5 ha. Most of this area (28.9 ha) are being used for wine grape production at present, although many of the vineyards are at the end of their productive lifespan. Field A (3.2 ha) was used for wine grape production until *circa* 2008, while a small portion (0.4 ha) of Field D was also planted under wine grapes until 2012. However, as the profitability of wine grapes decreased systematically over the past two decades, no replacement of vineyards has been done after uprooting.

Table 5: Areas per land use category.

Land Use	**Area (ha)**
Vineyards	28.9
Fallow land	9.9
Farmyards	0.8
Fall-out areas & farm roads	5.9
Total	**45.4**

Table 6: Wine grape production statistics form Portion 28 of Farm 468, for the 2022 season.

Block	**Area (ha)**	**Vineyard**	**Vineyard Area**	**Year Planted**	**Age**	**Cultivar**	**2022 Yield (tons)***	**t/ha**
1	1.6	F	3.3	1983	40	Chenin blanc	25.30	7.7
2	1.0							
3	0.7							
4	1.5	M	3.6	1994	29	Merlot	16.62	4.6
5	2.1							
6	0.6	L	3.3	1990	33	Sauvignon blanc	24.26	7.4
7	2.7							
8	6.4	G	6.4	1985	38	Chenin blanc	41.72	6.5
9	0.9	A	0.9	1987	36	Cabernet Sauvignon	6.24	6.9
10	2.2	E	2.2	1992	31	Sauvignon blanc	12.02	5.5
11	0.5							
12	0.9	D	3.3	2003	20	Cabernet Sauvignon	9.86	3.0
13	2.4							
14	1.2	H	1	1987	36	Cabernet Sauvignon	5.34	4.5
15	2.4	C	4	1980	43	Chenin blanc	17.1	4.1
16	0.7							
17	1.1							
TOTAL	**28.9**						**158.46**	**5.5**

** Production data obtained form landowner*

A pipeline servitude of 12 meter wide, spans the property near the northeastern boundary, as indicated in Figure 15.

The aerial photographs below provide a visual overview of the land.

Farm dam and irrigation hydrants, used earlier for limited supplementary irrigation of vineyards

A view from the top over the vineyards toward the Sustainability Institute

A view from below, looking due north to the Sustainability Institute

Levelled terrace, to serve as farm working area

36-Year old Cabernet Sauvignon, planted in 1987

29-Year old Merlot, planted in 1994

A bush-vine block that has reached the end of its productive life

Old vineyards, with loss of productive plants

Old vineyards, with loss of productive spurs

Old bushvines with unproductive areas

Rocky granite outcrop on the southwestern boundary of the property

More bush vines dying off

Reeds growing in vineyard is probably an indication of poor drainage

6 Agricultural Potential

The discussions below analyse each of the main possible agricultural activities against the definition of agricultural potential as stated in paragraph 5.1.1.

The soils of the study area are generally moderately to well drained, of medium to good depth and with good to moderate water retention capacity. Poor permeability and compacted layers can be rectified by deep cultivation while amelioration can address low pH or other soil chemical limitations. With the exclusion of the lower lying, flat areas, the intrinsic soil potential of the farm is therefore medium high to high. However, without adequate irrigation water, the soil water retention capacity is not enough to ensure viable yields of perennial or annual summer crops.

6.1 Irrigated cultivation

While the farm has access to groundwater the supply is minimal and inadequate for the production of perennial crops. At best, the groundwater supply can only sustain the supplementary irrigation of a few hectares of wine grapes. The agricultural potential for irrigated cultivation is therefore regarded as **very low**.

6.2 Dry land cultivation

Dry land or rain fed cultivation refers to the practice of growing a crop without irrigation, thus fully depending on the rainfall to supply in the water requirement of the crop. During the warm summer months, when the water requirement of a summer crop would be at its highest, the rainfall is only ±170 mm, while the reference evapotranspiration (ET_0) is >1100 mm. This volume is not sufficient to grow any summer cash or fodder crop without irrigation. In winter the rainfall amounts to 560 mm and the reference evapotranspiration is ±530 mm. Theoretically this is sufficient for winter cereal production on soils with moderate water retention capacity, but ample external drainage to prevent water logging during periods of high rainfall. With the exception of the small area mapped as soils of the Katspruit soil form, the soils of Portion 28 of Farm 468 are suitable for dryland crop production, but the steep slopes will not only complicate tractor and farm movement, but also increase the risk of soil erosion after soil preparation. The suitably flat areas are small and thus the agricultural potential for dryland cultivation is regarded as not feasible or **very low**.

6.3 Wine grape production with supplementary irrigation

The property has been used for wine grape production for more than three decades. Supplementary irrigation was applied at a very limited scale, as indicated earlier. The sustainability of this farming practice is seriously eroded by low grape prices, falling yields and rising input costs that reduces profitability – first to the point where vineyard renewal becomes impossible and thereafter to full non-profitability, vineyard by vineyard as they age and yield levels reduce.

This phenomenon is not unique to this property and is reflected in the aging of vineyards in the entire South African industry. In 2006 the portion of vineyard blocks older than 20 years in the SA wine industry was 11%. In 2020 that figure grew to 24%. In 2016, young vineyards (<7 years) constitutes 44% of all plantings, while in 2020 only 24% of plantings were younger than 7 years (Vinpro, 2021). The reduction in vineyard renewal is a result of reduced profitability, driven by rising cost of production and gape prices lagging behind. Today many producers do not have access to the capital required to replace vineyards at R256 000 per hectare in Stellenbosch (Vinpro, 2022).

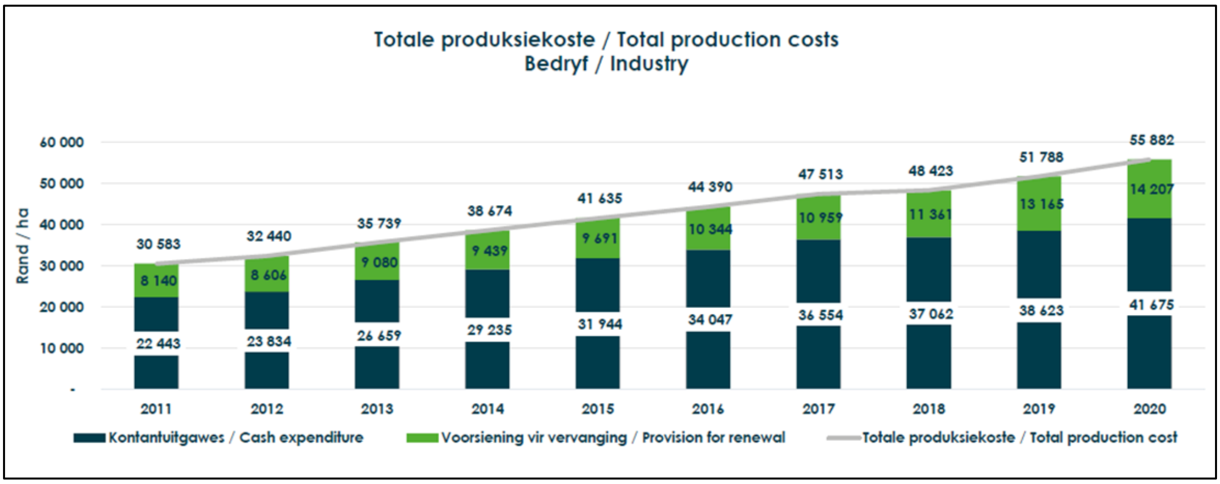


Figure 16: Wine grape production cost trends over the past decade (Vinpro, 2020).

Vinpro's cost guide indicates that the break-even income for Stellenbosch is R98 000/ha. To be sustainable and in a position to replace old vineyards the target income increases to R118 000/ha. The average price for wine grapes in 2022 in Stellenbosch was R7 850/ton. This implies that the target yield to achieve sustainability should be at least 15 t/ha. The average yield for Stellenbosch is below 8 t/ha. The 2022 production from Portion 28 of Farm 468 amounts to 158.5 tons from 28.9 ha, resulting in an average yield of only 5.5 t/ha (Table 6).

The current vineyard production on the farm is therefore a temporary activity that can be sustained only as long as yield levels and income are higher than the cost of the essential production activities and the harvest, without any provision for vineyard replacement.

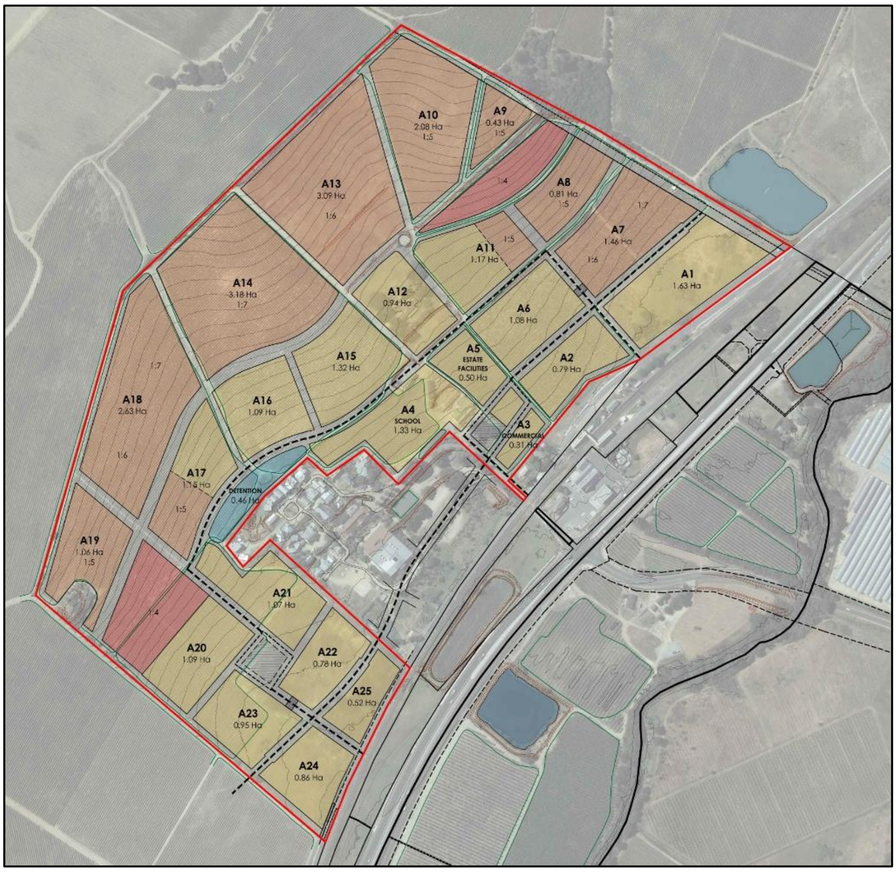
6.4 Livestock farming

The grazing capacity of non-irrigated planted pastures will be very limited during the late summer when the average rainfall is less than 1 mm/day. The indicated grazing capacity for the area is 25 ha per large stock unit. Thus less than 2 LSU's can be accommodated on the farm. This is not an economical unit and therefore the agricultural potential for livestock farming is regarded as **very low**.

6.5 Resulting agricultural potential

Factors limiting the agricultural potential of Portion 28 of Farm 468 include (i) limited supply of irrigation water, (ii) low to medium soil potential due to either poor drainage and water logging of the duplex soils or limited soil depth on a portion of the low lying soils, (iii) steep slopes, (iv) size limitation of the property on the establishment of any viable farming activity and (v) the general conversion of the area from agriculture to residential and associated land use activities. The overall agricultural potential of the study area is evaluated as being **low and unviable**, unless an additional source of irrigation water can be secured.

7 Impact on Agriculture



DRAWING KEY
Moderate slopes = 1:8 or flatter
Steep slopes = 1:8 or steeper
Extreme slopes = 1:4 or steeper
1:8 = 1m / 8m   1:4 = 1m / 4m

PORTION 28 AREA TABLE	
Total site area	**45.5 Ha**
Servitudes	0.73 Ha
Setbacks (10m boundary)	3.40 Ha
Extreme slopes (1:4)	2.06 Ha
Total developable area	**39.31 Ha**
Proposed parcel area	**31.35 Ha**

PORTION 28 COMPONENTS	
Proposed parcel area	**31.35 Ha**
School component (A4)	1.33 Ha
Commercial (A3)	0.31 Ha
Estate facilities (A5)	0.50 Ha
Detention area	0.46 Ha
Residential area	**28.75 Ha**
Residential units (@ 55 du/ha)	**1581 units**

Figure 16: Proposed Site Development Plan of Portion 28 of Farm 468 (Urban Studio).

The current development plan proposes a total of 1 581 residential units, plus a school and some commercial opportunities. The density thus converts to almost 35 units per hectare.

The development will transform ±29 ha net farmland that was used for wine grape production over the past three decades or more. The soil potential varies between low to medium high, with ±35 ha being suitable for irrigated perennial crop production – including road areas). The farm only has access to a very limited supply of groundwater for irrigation. The exact yield is unknown and appears to be unregistered, but is calculated at 80 m³/day, sufficient for the irrigation of less than 3 ha wine grapes, which is not regarded as a viable farming option. Given the demarcation of the urban edge around this property, the conversion of the land over the medium to long term is regarded as inevitable. A portion of the proposed development appears to be aligned with the Lynedoch precinct development plan of the Municipal Spatial Development Framework of Stellenbosch Municipality.

8 Specialist Statement

Sections of the property have been identified for urban development to complement the Sustainability Institute, in the Stellenbosch Municipal Development Plan.

The proposed development is of semi-high density and will establish almost 35 residential opportunities per hectare. Being a wine grape farm, the land does not directly contribute to food security, but do provide meaningful job opportunities at present and in the near future. It has been demonstrated that the current farming activities are not sustainable, unless an additional source of irrigation water can be secured.

It is believed that a development on this site will contribute to the retention of higher value agricultural resources elsewhere in the Stellenbosch or surrounding municipal areas and is therefore supported.

9 References

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Soil Classification Working Group, 1991. A Taxonomic System for South Africa. Department of Agriculture.

Van Heerden, J.M, 1991. Die vestiging van weidings in die wintereëngebied: 1. Gewaskeuse. *Elsenburg Journal*, Special Edition, Pasture Research, 12-28.

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APPENDIX

Land Type memoirs

Soil Profile Photos

Conceptual Development Plan (26 Apr 2023)

LAND TYPE/ *LANDTIPE* : **Ac24**

CLIMATE ZONE/ *KLIMAATSONE* : 2599W
Area/ *Oppervlakte* : 376ha
Estimated area unavailable for agriculture
Beraamde oppervlakte onbeskikbaar vir landbou : 0ha

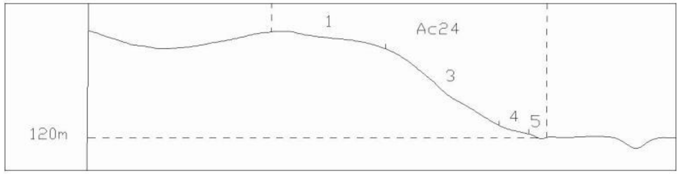
Occurrence (maps) and areas / *Voorkoms (kaarte) en oppervlaktes:*
3318 Cape Town (376ha)

Inventory by/ *Inventaris deur:*
F Ellis & B Stehr
Modal profiles/ *Modale profiele:*
Geen/None

Terrain unit/ *Terreineenheid*	1	3	4	5	Total/ *Totaal*	
% of land type/ *% van landtipe*	20	73	5	2		
Area/ *Oppervlakte (ha)*	75.2	274.48	18.8	7.52		
Slope/ *Helling (%)*	0 - 4	12 - 25	2 - 4	0 - 3		
Slope length/ *Hellingslengte (m)*	300 - 600	400 - 1500	250 - 450	75 - 100		
Slope shape/ *Hellingsvorm*	Y	Y	X-Z	X		
MB0,MB1 (ha)	72	260	20	7	S>12%	260
					S<12%	98
MB2-MB4 (ha)	4	14	0	0		18

Soil series or land classes / *Grondseries of landklasse*	Depth / *Diepte* (mm)	MB	1 %	1 ha	3 %	3 ha	4 %	4 ha	5 %	5 ha	Total ha	Total %	Clay content / *Klei-inhoud* % A	E	B21	Hor	Texture / *Tekstuur* Class / *Klas*	Depth limiting material / *Diepte-beperkende materiaal*
Rock/Rots	300 - 500	0	50	38	35	96					134	35.6	15-35+			A	fiSaLm-SaCl	so;R
Msinga Hu26, Doveton Hu27	800 - 1200	+0	30	23	30	82	15	3			108	28.7	15-25		25-40	B	meSaClLm-SaCl	so
Southwold Cv26, Newport Cv27	800 - 1200	+0	15	11	20	55	40	8			74	19.7	15-25		25-40	B	meSaClLm-SaCl	so
Jozini Oa36, Levubu Oa34	> 1200	0			7	19			55	4	23	6.1	15-25		15-35	B	meSaLm-SaClLm	
Avalon Av26, Newcastle Av25	600 - 800	0			3	8	30	6			14	3.7	15-25		15-35	B	me/coSaLm-SaClLm	sp
Paddock We31, Davel We32	200 - 400	0					15	3	45	3	6	1.6	10-30		10-30	B	coSaLm-SaClLm	sp

Terrain type/ *Terreintipe :* C3
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 granite and deposits of weathering products of granite of the Kuils River-Helderberg Pluton, Cape Granite Suite.

Geologie: Hoofsaaklik graniet en afsettingsprodukte van verweerde graniet van die Pluton Kuilsrivier-Helderberg, Granietsuite Kaap.

LAND TYPE/ *LANDTIPE* : **Ca27**

Occurrence (maps) and areas / *Voorkoms (kaarte) en oppervlaktes:*
3318 Cape Town (3280ha)

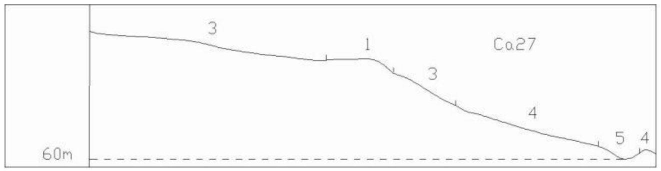
Inventory by/ *Inventaris deur:*
F Ellis, A B Oosthuizen & B Stehr
Modal profiles/ *Modale profiele:*
P520

CLIMATE ZONE/ *KLIMAATSONE* : 2603W
Area/ *Oppervlakte* : 3280ha
Estimated area unavailable for agriculture
Beraamde oppervlakte onbeskikbaar vir landbou : 30ha

Terrain unit/ *Terreineenheid*	1	3	4	5		Total/ *Totaal*
% of land type/ *% van landtipe*	5	45	40	10		
Area/ *Oppervlakte (ha)*	164	1476	1312	328		
Slope/ *Helling (%)*	0 - 4	3 - 8	1 - 4	0 - 2		
Slope length/ *Hellingslengte (m)*	1000 - 150	600 - 2000	1500 - 250	150 - 300		
Slope shape/ *Hellingsvorm*	Z	Y-Z	Z-X	X-Z		
MB0,MB1 (ha)	130	1330	1245	329	S>12%	0
					S<12%	3033
MB2-MB4 (ha)	33	148	66	0		247

Soil series or land classes / *Grondseries of landklasse*	Depth / *Diepte* (mm)	MB	1 %	1 ha	3 %	3 ha	4 %	4 ha	5 %	5 ha	Total ha	Total %	Clay content / *Klei-inhoud* % A	E	B21	Hor	Texture / *Tekstuur* Class / *Klas*	Depth limiting material / *Diepte-beperkende materiaal*
Hamman Wa30, Katarra Kd22	300 - 600	0			15	221	20	262			483	14.7	3-6	3-6		E	coSa	hp;gc
Katarra Kd22, Slangkop Kd15	400 - 800	0	10	16	15	221	10	131			368	11.2	3-10	3-10	>35	E	coSa-SaLm	gc
Sebakwe Cv22, Rossdale Av22																		
Chester Hu22	1000 - 1200	+0	5	8	10	148	10	131			287	8.8	0-6		0-6	B	LmcoSa	so;sp
Newcastle Av25, Avalon Av26	700 - 1000	0			10	148	10	131			279	8.5	10-25		10-25	B	meSaLm-SaClLm	sp
Klipfontein Ms11	200 - 400	3	20	33	10	148	5	66			247	7.5	10-20			A	meSaLm	hp
Tayside Lo30, Vaalsand Lo31	800 - 1000	0			5	74	10	131	10	33	238	7.2	3-10	3-10		E	coSa-SaLm	sp
Southwold Cv26, Gutu Cv25																		
Suurbraak Pn26	600 - 800	+0	15	25	5	74	10	131			230	7	10-25		10-25	B	meSaLm-SaClLm	so;gc
Avontuur Es22, Vredenhoek Es15																		
Grasslands Es14, Rosemead Es16	500 - 800	1	5	8	5	74	10	131			213	6.5	6-25	6-25	>35	E	me/coSa-SaClLm	pr
Kosi We20, Devon We22	200 - 400	0					10	131	20	66	197	6	5-10		5-20	B	meSa-SaLm	sp
Glenrosa Gs15, Robmore Gs18	300 - 500	0	20	33	10	148					181	5.5	10-25			A	coSaLm-SaClLm	so;R
Trevanian Gs17, Msinga Hu26	400 - 700	0	10	16	10	148					164	5	15-35		15-35	A	meSaLm-SaClLm	so;R
Hermanus Pn22, Chatsworth Pn25	800 - 1200	0			5	74	5	66			140	4.3	6-15		6-15	B	coSa-SaLm	gc
Paddock We31, Davel We32	200 - 400	0							35	115	115	3.5	10-25		10-35	B	coSaLm-SaClLm	sp
Dundee Du10, Jozini Oa36	900 - 1200	+0							20	66	66	2	10-20		15-35	A	fi/meSaLm	so
Silwana Ss22, Maanhaar Bv25																		
Kusasa Cf31, Williamson Gs16	300 - 800	0	5	8					15	49	57	1.7	0-6	6-15	10-25	A	LmcoSa-SaLm	pr;sp;so
Bontberg Hu25	800 - 1200	+0	10	16							16	0.5	5-15		6-15	B	coSa-SaLm	so;R

Terrain type/ *Terreintipe :* A3
Terrain form sketch/ *Terreinvormskets*



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Geologie: *Hoofsaaklik graniet en afsettingsprodukte van verweerde graniet van die Pluton Kuilsrivier-Helderberg, Granietsuite Kaap; plek-plek ferrikreet en alluvium.*

LAND TYPE/ *LANDTIPE* : **Ca28**

CLIMATE ZONE/ *KLIMAATSONE* : 2603W
Area/ *Oppervlakte* : 3645ha
Estimated area unavailable for agriculture
Beraamde oppervlakte onbeskikbaar vir landbou : 50ha

Occurrence (maps) and areas / *Voorkoms (kaarte) en oppervlaktes:*
3318 Cape Town (3645ha)

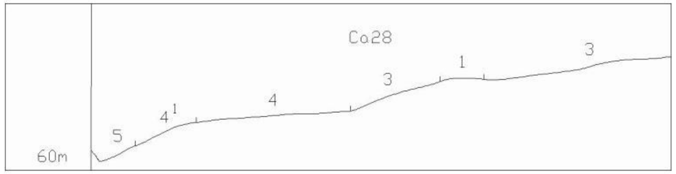
Inventory by/ *Inventaris deur:*
F Ellis, C W van Huyssteen & B Stehr
Modal profiles/ *Modale profiele:*
Geen/None

Terrain unit/ *Terreineenheid*	1	3	4	4(1)	5
% of land type/ *% van landtipe*	10	35	35	5	15
Area/ *Oppervlakte (ha)*	364.5	1275.75	1275.75	182.25	546.75
Slope/ *Helling (%)*	1 - 4	4 - 8	1 - 3	2 - 4	0 - 2
Slope length/ *Hellingslengte (m)*	250 - 3000	400 - 800	1000 - 180	300 - 600	200 - 500
Slope shape/ *Hellingsvorm*	Y-Z	Y	Z	X-Z	Z-X
MB0,MB1 (ha)	145	1086	1237	181	547
MB2-MB4 (ha)	219	192	38	0	0

Total/ *Totaal*: S>12% 0; S<12% 3196; 449

Soil series or land classes / *Grondseries of landklasse*	Depth / *Diepte* (mm)	MB	1 %	1 ha	3 %	3 ha	4 %	4 ha	4(1) %	4(1) ha	5 %	5 ha	Total ha	Total %	Clay content / *Klei-inhoud* % A	E	B21	Hor	Texture Class / *Tekstuur Klas*	Depth limiting material / *Diepte-beperkende materiaal*
Katarra Kd22, Hamman Wa30	300 - 450	0	5	18	45	574	45	574	20	36	10	55	1257	34.5	0-6	0-6	20-35	E	coSa-LmSa	gc;hp
Tayside Lo30	400 - 800	0			5	64	15	191	40	73	20	109	437	12	0-6	0-6	8-20	E	coSa-LmSa	sp
Glenrosa Gs15, Trevanian Gs17																				
Paardeberg Gs12	250 - 350	3	40	146	10	128	3	38					312	8.6	6-20			A	me/coSa-SaLm	so;R
Newcastle Av25, Avalon Av26	500 - 900	0			5	64	15	191	20	36			291	8	10-20		10-30	B	coSaLm-SaClLm	sp
Sebakwe Cv22, Chester Hu22	800 - 1200	+0	5	18	10	128	10	128	8	15			289	7.9	0-6		0-6	B	coSa-LmSa	so;R
Swartland Sw31, Hogsback Sw32	300 - 450	0	5	18	10	128	7	89	4	7			242	6.6	15-30		35-55+	B	ClLm-Cl	vp
Kosi We20, Devon We22																				
Langkuil We30	300 - 600	0							5	9	40	219	228	6.2	5-10		6-20	B	me/coSa-SaLm	sp
Dundee Du10, Jozini Oa36	500 - 1200	0									30	164	164	4.5	6-15		10-20	A	fi/meSa-SaLm	so;R
Msinga Hu26	800 - 1200	+0	25	91	5	64							155	4.2	10-20		15-35	B	meSaLm-SaClLm	so;R
Klipfontein Ms11																				
Bontberg Hu25	150 - 350	3	20	73	5	64							137	3.8	6-10		6-15	A	me/coSaLm	hp;R
Hermanus Pn22	400 - 800	0			5	64	5	64	3	5			133	3.6	0-6		0-6	B	coSa-LmSa	gc

Terrain type/ *Terreintipe :* A3
Terrain form sketch/ *Terreinvormskets*



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Profile 1

Profile 2

Profile 3

Profile 4

Profile 5

Profile 6

Profile 7

Profile 8

Profile 9

Profile 10

Profile 11

Profile 12

Profile 13

Profile 14


Profile 15


Profile 16

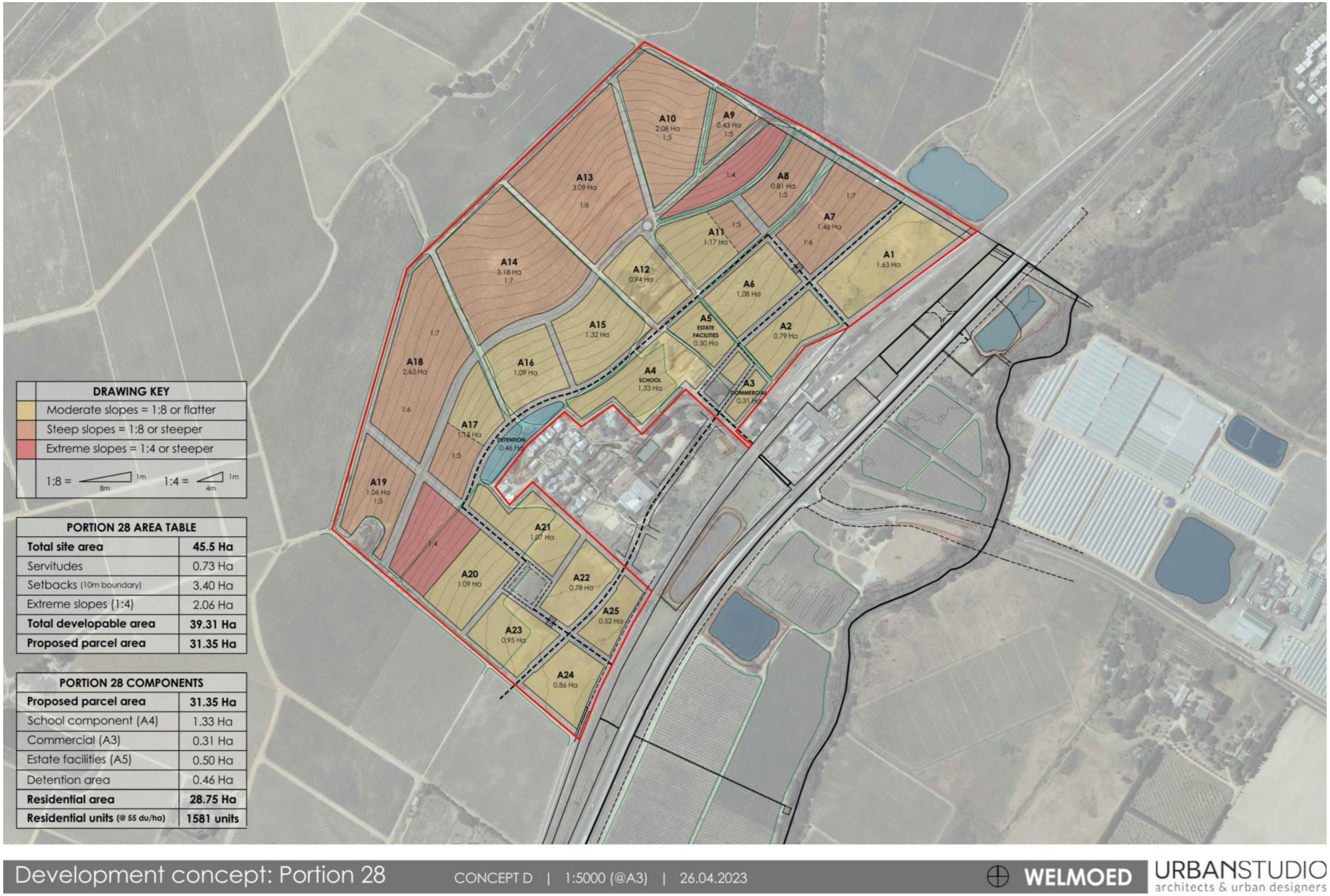

Profile 17


Profile 18


Profile 19


Profile 20


Profile 21



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Residential units (@ 55 du/ha)	**1581 units**