Riebeek Kasteel Development

Erf 878, Riebeek Kasteel, Swartland Municipality

Civil Engineering Services Report

Ref. 20041 Rev. D

January 2025

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TABLE OF CONTENTS

1. INTRODUCTION

The purpose of this report is to address all civil engineering issues generated from the proposed development. The following documents and guidelines have been used in the civil engineering services infrastructure design for this development:

- The Topographical & Services Survey of the site done by *JOUBERT & BRINK SURVEYS & by CK RUMBOLL & PARTNERS* – ***Appendix B***
- The Subdivision & Rezoning Plan (SRP), compiled by *InterActive Town & Regional Planning* – ***Appendix C***
- Capacity Analysis of the Bulk Water & Sewer Services, dated 14-01-2025, compiled by *GLS Consulting (Pty) Ltd* – ***Appendix D***
- The standard guidelines for residential developments as stipulated in the "GUIDELINES FOR HUMAN SETTLEMENT PLANNING AND DESIGN" *(CSIR "Red Book")*
- The "ROADS DRAINAGE MANUAL" as published by the South African National Roads Agency

2. DEVELOPMENT OVERVIEW

2.1 Locality

The proposed development is planned on Erf 878, Riebeek Kasteel, which is situated within the Swartland Municipal Region. The total size of the erf is approximately 11ha and has an irregular rectangular shape which is surrounded by residential erven along the northern and eastern boundaries.

The site is bounded by Church Street *(R311)* to the west, and Fontein Street to the East

Fig 1: Locality Plan

2.2 Cadastral/Servitudes

*Refer to **Appendix A** for the Surveyor General Documentation for the site.*

There are two existing servitudes on Erf 878, i.e. a stormwater servitude on the northern boundary of the site and a right of way along the southern boundary.

Several new services servitudes on erf 878 to protect proposed civil engineering services, and to allow for overland stormwater escape routes, will be required.

A new services servitude across erven 1304 & 203 will also be required to accommodate a proposed municipal foul sewer line to connect on an existing foul sewer line within Fountain Street – ***Figure 2.***

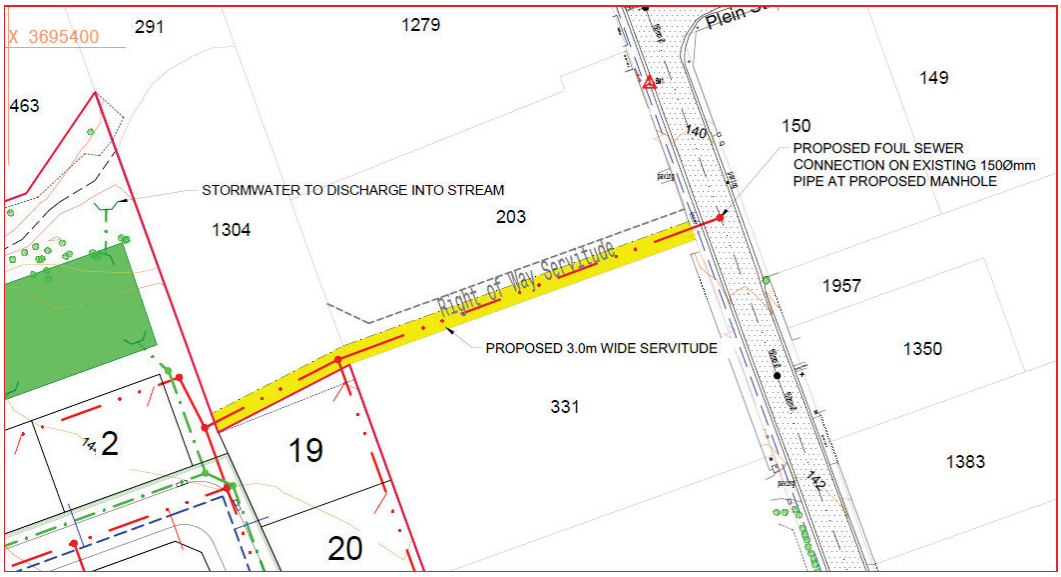


Fig 2: Services Servitude

2.3 Existing Topography & Bulk Services Connections

A Topographical & Services survey, ***Appendix B*** to establish the current contours and other features such as the existing buildings, kerbing, services, and trees, was undertaken during 2021.

Refer to ***Figure 3*** for the following roads/services connections:

- Roads at **RD1** (southbound left-in only), **RD2, RD3 & RD4**
- Foul Sewer at **FS1, FS2 & FS3**
- Water at **W1 & W2**
- Stormwater at **SW1, SW2 & SW3**

Fig 3: Roads & Municipal Services Connections

2.4 Description of proposed development

The proposed mixed-use development is shown in ***Table 1.*** *Refer to* ***Appendix C*** *for the Subdivision & Rezoning Plan (SRP).*

Zoning	Area	% of Total	Erven
Residential Zone 1: Low Density	41794m²	38%	54
General Residential Zone 2: Town Housing	13201m²	12%	47
General Residential Zone 3: Flats	2084m²	2%	1
Community Zone 3: Institution	2509m²	2%	1
Business Zone 1: General Business	9627m²	9%	2
Open Space Zone 2: Private Open Space	16148m²	15%	8
Transport Zone 2: Roads	24724m²	22%	3
Total	**110087m²**	**100%**	**116**

Table 1: Land Use

3. GEOTECHNICAL CONDITIONS & SITE CLEARANCE

3.1 Geotechnical Conditions

R. A. Bradshaw & Associates cc, Consulting Engineering Geologists, undertook geotechnical investigations during July 2021 to evaluate items such as the existing soil conditions/properties, to establish the current water table etc. The location of the trial pits is shown on ***Figure 4***.

The entire Report ref. 1-176721 is available on request.

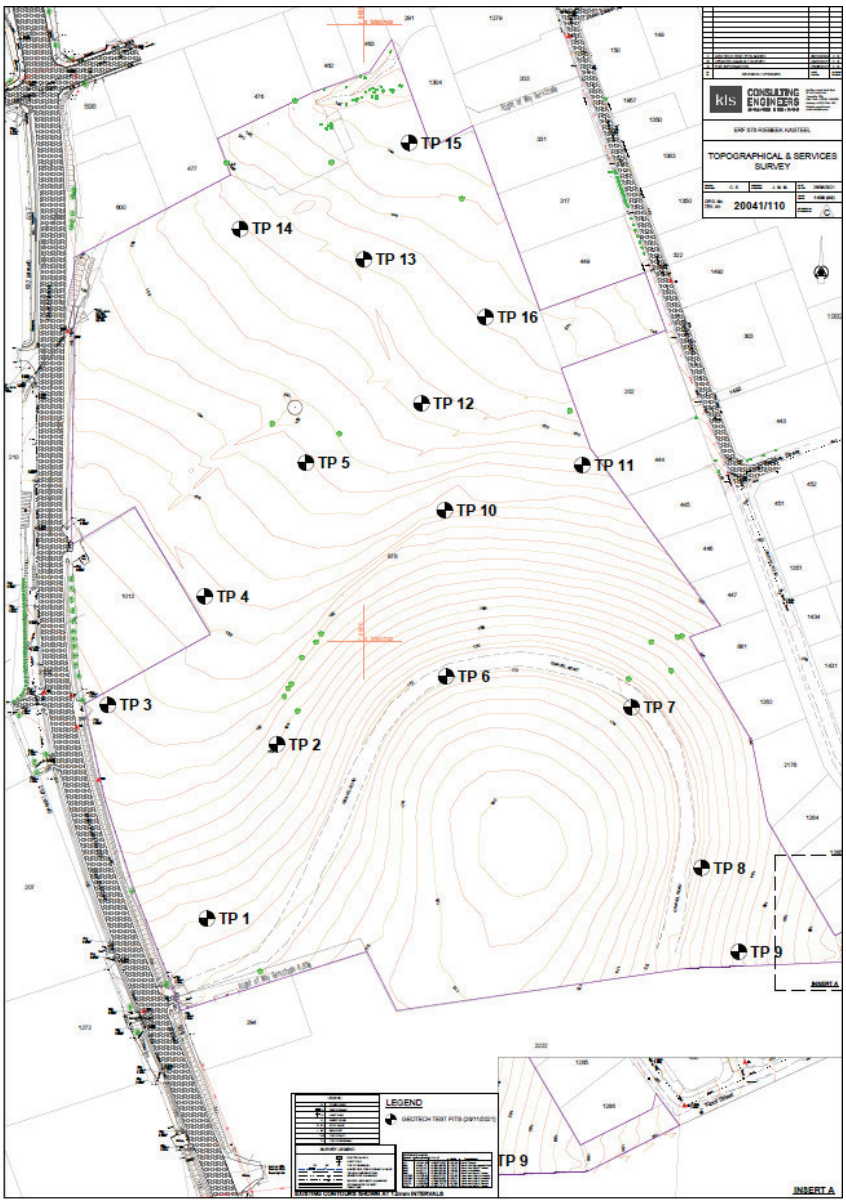


Fig 4: Layout of Trial Pits

3.2 Site Clearance & Site Preparation

Below find extracts from the Geotechnical Report:

5.1. Site Clearance and Preparation

Site clearance and preparation for road construction will include but not necessarily be limited to the following:

- The positions of all the trial pits should be identified before any clearing or construction commences and the loose backfill should be removed and replaced with sand that is compacted to at least 95% of mod ASSHTO dry density to avoid having soft 'spots' below the roads.
- Felling and removal of trees and their stumps.
- Removal of the grass and fynbos vegetation including roots. Exposures in the trial pits indicated that root growth extends to a depth of at least 150mm but the depth varies and an average of 75mm to 100mm would generally be applicable with roots extending to greatest depth in the Northern Soil Profile and in the southwestern parts of the Southern Soil Profile.
- Removing various fences and remnant fence poles.
- It is anticipated that the surficial soils in the Northern Soil Profile would become waterlogged after periods of rainfall and it would not be possible to drive wheeled vehicles around the site without some form of pioneering such as placement of crushed gravel or rubble.

5.2. Preparation of the Subgrade

Subgrade preparation should be relatively straightforward in the Southern Soil Profile for those parts of the internal roads in the area near TP1 and TP2 and downslope from TP9. The composition of the subgrade will vary with combinations of gravelly colluvium, silty soils and schist occurring because the road bed must be cut into the cross fall in places. Preparation of the newly exposed subgrade would include in-situ compaction to a minimum of 95% of mod AASHTO maximum dry density to ensure a subgrade of generally G9 quality.

The section of internal road from just to the east of TP2 rises over the edge of and onto the existing road/track that then passes over TP6 and TP7 and eventually runs over the eastern edge of the existing embankment fill near TP8 before joining the steeply, easterly sloping section of the road that runs to the southeastern exit/entrance off/onto the property. The material in the filled portion on the downslope side of the track apparently comprises a mixture of clayey sandy gravel, residual Malmesbury soil and weathered schist. The quality of workmanship and the degree of compaction of this fill are unknown and it is recommended that the fill is re-worked, and a small bench or benches are constructed onto which the new engineered fill can then be placed.

In the Northern Soil Profile, the subgrade will mainly comprise alluvial wash sands and silty sands over clayey soils. Subgrade preparation will be impossible at present because of the high moisture content and local free water in the surficial soils. The soils will merely pump if compaction is attempted. Installation of the recommended drainage will assist in drying out the soils, but the process will be very slow and potentially impractical as a quick solution. Ideally therefore, construction, particularly in this part of the sit, should be conducted during the dry period of the year. The newly exposed 'dry' subgrade should then be compacted to 95% of mod density to ensure generally G9 subgrade conditions.

5.3. Subsurface Drainage

With a gravelly soil overlying effectively impermeable residual cohesive soils and weathered bedrock in the Southern Soil Profile, a seasonal perched water table would probably develop at the contact between the coarse surficial soils and the underlying soil and bedrock. Given the steepness of the slopes in this area and the proximity of the erven and houses to the roads, installation of conventional subsurface drainage upslope of the roads is probably not viable, but water flow could occur at the contact when the contact is exposed in cuttings and a toe drain will therefore be essential.

The typical profile of sandy soils over cohesive soils in the Northern Soil Profile has and will give rise to a perched water table with groundwater flow at or near the contact between the two soil types. Conventional subsurface drainage must therefore be provided next to all roads. The invert of the drains should be placed below the contact between the two soil types, i.e. typically at or below a depth of 0.9m to ensure that the water is intercepted. A fin-type drain should be considered. The construction of the drains should commence in the lower parts of the site and progress upslope.

The nature of the spring is not fully understood and formal surface and possibly subsurface drainage measures will probably be required to control and direct flows.

Ad hoc additions to the planned formal subsurface drainage layout for the site might be required to intersect and/or control seepage flows.

5.4. Excavation Conditions

The trial pitting indicated that all materials to a depth of at least 1.3m can be excavated with a digger/loader. The excavation would be classified as Soft Excavation Class according to SANS 1200D, grading to Intermediate Excavation Class in places towards the bottom of this depth range.

To avoid disputes over classification, measurement and payment, Soft and Intermediate Excavation Classes should be combined into one excavation class for this project and that all materials that can be excavated with a twenty-tonne excavator should fall within this project specific class.

4. ROADS, ACCESS, AND PARKING AREAS

4.1 External Roads and Traffic Impact Assessment

Below find an extract from a Transport Impact Assesment dated March 2024 (on SRP dated 12-10-2023), done by Liezl Stodart (assessor: Douw Louwrens):

The R46 (Trunk Road 2401) is a Class 2 Major Arterial. It is a single-carriageway two-way road with one lane per direction and surfaced shoulders in a rural roadside development environment.

Church Road (Main Road 227) is a Class 3 Minor Arterial in a semi-rural roadside development environment in the vicinity of the development. It is a single-carriageway two-way road with one lane per direction and surfaced shoulders. Paved sidewalks and on-street parking are located along a section of Church Road to the north of the Main Street intersection. Several properties also obtain direct access off Church Road along this section.

The 2020 Provincial Access Management Guidelines document indicates an access spacing requirement of 260 m between two unsignalised full intersections and 105 m between an unsignalised full intersection (UFI) and a high-volume driveway (HVD) for Class 3 roads in a semi-rural roadside development environment.

The Erf 878 development will obtain access off Church Road via an unsignalised full intersection approximately 690 m north of the R46 / Church Road intersection. The position of the proposed access point was previously discussed with the Directorate: Road Planning, Transport and Public Works, Western Cape Government and is in line with the Swartland Municipal Spatial Development Framework (2017 – 2022), indicating the affected section of Church Road as an 'Activity Corridor'.

A left-in-only access is also proposed off Church Road approximately 100 m south of the Church Road / Main Street intersection serving the filling station and commercial component of the development.

The proposed access on Church Road will be positioned just to the south of 'The Barn' opposite an existing farm access road. The intersection will be located approximately 240 m north of the Het Vlock Kasteel access (HVD) and 190 m south of the Kloovenburg access (HVD) and proposed left-in access. Please refer to the attached ***Figure 3***. The spacing therefore complies with the access spacing requirements.

Main Street (Main Road 226) is a Class 4 Collector Street. It is a single-carriageway two-way road with one lane per direction in an intermediate roadside development environment with an urban cross-section, surfaced sidewalks and on-street parking located along sections of the road.

Fontein Street is a Class 5 Local Street in a suburban roadside development environment. It is a single-carriageway two-way road with one lane per direction with multiple direct property accesses.

An unsignalised full intersection providing access on the eastern side of the development is proposed on Fontein Street approximately 150 m south of the Fontein Street / Plein Street intersection and 85m north of the Fontein Street / Van Riebeeck Street intersection.

(Fig 3 from TIA): Access Spacing Plan

4.2 Internal Roads and Parking Areas

The design philosophy for the proposed internal road network will be similar to that of a typical urban road network, which includes a minimum 2.0% crossfall and minimum 0.5% longitudinal slope. This road network will consist of 5.5m / 6.4m wides asphalt or brick paved roads with formal kerbs/edgings, roadside channels and a stormwater drainage system consisting of an underground pipe/road edge culvert network.

The link road between Church Street and Fontein Street will have a 13m wide road reserve, except a short portion connecting Church Street to the internal road network which will be 25m wide. The remainder of the internal road reserves will be 10 - 13m wide.

Below find the typical road cross sections for road reserves 10m and 13m width respectively **(Fig's 5 & 6)**.

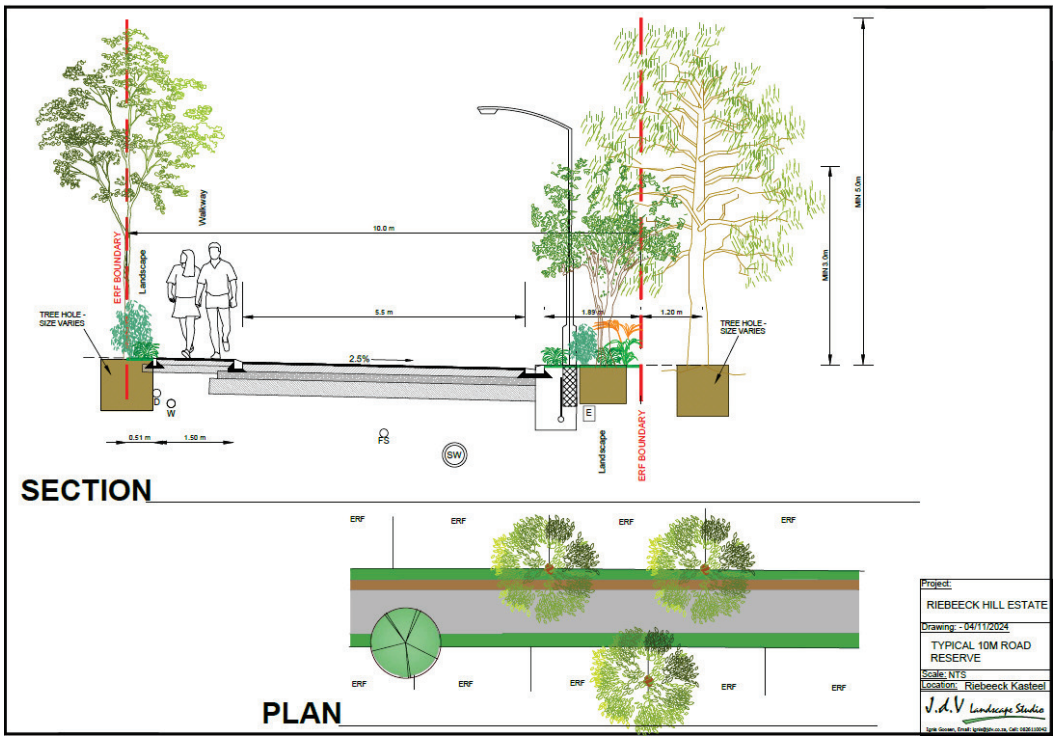


Fig 5: Typical X-Section (10m road reserve)

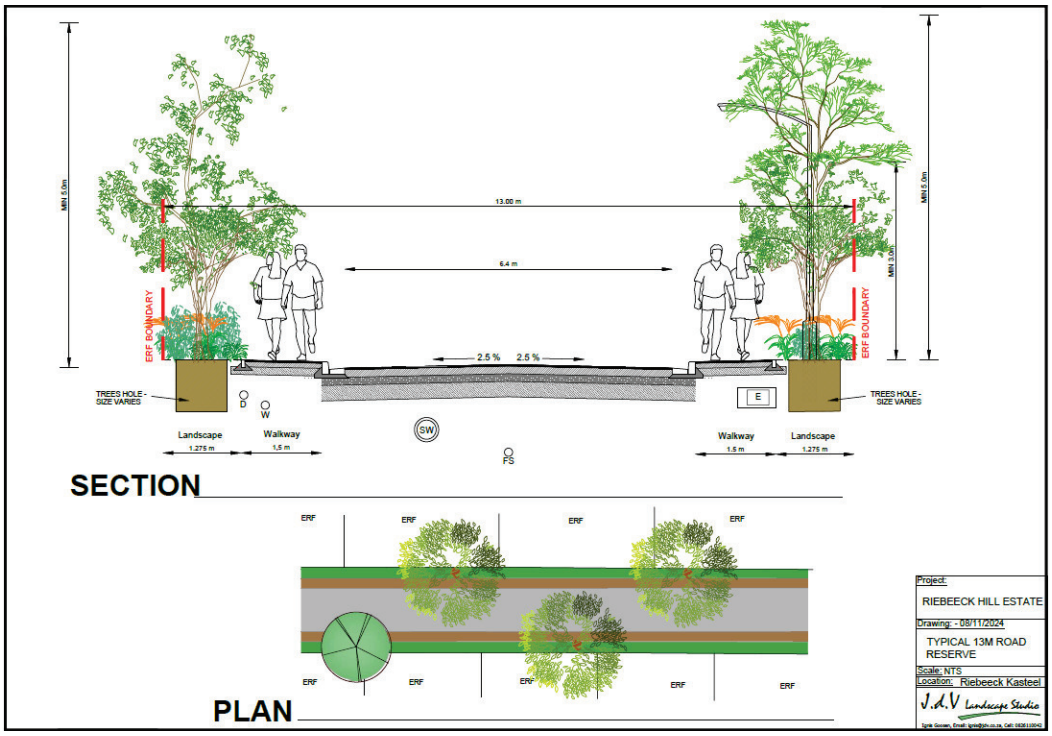


Fig 6: Typical X-Section (13m road reserve)

All internal roads within development clusters will be designed for low heavy vehicle traffic (*construction vehicles, furniture removal and refuse trucks*):

- Road Category C/D (TRH4) or UC (UTG)
- Pavement Class ES 0.1 (TRH4).
- Structural design period 20 years
- Surface finish: Asphalt or Concrete paving

5. STORMWATER DRAINAGE

5.1 External Stormwater Management

A preliminary investigation indicates that there is an existing stormwater course running along the northern boundary of the proposed development site, which is located within an existing servitude.

The majority of the pre-development site drains towards this existing water course, with a small portion along the southern boundary draining towards the south-eastern corner of the site, onto the Kloof Street Road reserve.

Discussions with Swartland Municipality has indicated that there is no additional capacity within the existing external stormwater system and allowance should thus be made for on-site attenuation of the post development run-off.

5.2 Internal Stormwater Network

The standard stormwater principles, as set out by the guidelines mentioned in section 1 of this document, will be employed for the design of the internal stormwater system.

The following minimum specifications will be implemented in the stormwater design:

- Minimum pipe specification: Class 75 D Concrete spigot & socket pipes
- Minimum pipe diameter: 300mm Nominal diameter
- Minimum pipe gradient: Minimum self-cleansing velocity 0.7m/s inside a half-full pipe
- Maximum spacing between manholes/inlets/catchpits: 90m
- Minimum attenuation storage volume: 1yr - 24hour rainfall event
- Maximum outflow rate: 1:10yr RI pre-development

The internal stormwater network will be designed to have sufficient capacity to adequately manage and convey a 1:10 year rainfall event into the underground municipal stormwater network. The proposed internal stormwater system will consist out of a series of open swales, permeable paved parking areas, underground gravity pipe network, roadside channels and inlet structures that will drain the roads and other impermeable and semi-impermeable surface areas.

Provision will be made for a subsoil drainage network beneath the roads and parking areas, where applicable. The subsoil network will protect the road and parking area layerworks from water ingress due to a seasonally perched water table. This subsoil drainage infrastructure will consist of a 110mm diameter perforated pipe network installed approximately 800mm below the final road level.

The internal roads infrastructure will be designed in such a way that during rainfall events with a return period larger than 1:10 years, the proposed roads, walkways, parking areas and channels will act as overland flow routes which will channel and convey the surface run-off via predetermined escape routes towards the four attenuation facilities.

Two new stormwater attenuation facilities will be constructed as part of the development. The main purpose of these facilities will be to attenuate

stormwater run-off and promote on-site infiltration. In order to achieve the required attenuation, the storage volume of the attenuation facility must be able to retain a 1:50 year post-development flood while discharging a peak flow equal to only the 1:10 year pre-development flow.

These attenuation facilities will act as extended wet attenuation dams, which requires them to have a permanent pool with an extended attenuation storage volume above the permanent pool level.

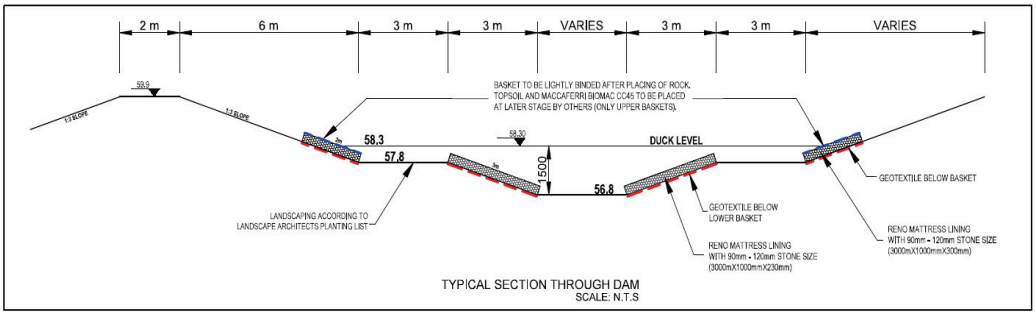


Fig 7: Typical section through attenuation dam

In addition to the stilling basin, the inside embankments of the attenuation dams *(area above the permanent water/duck level)* will be planted with indigenous vegetation which will act as bio-filters.

The invert level of the outlet pipe/structure will be approximately 200mm above the bottom of the bio-filter to ensure water build-up inside the bio-filter during rainfall events. The bio-filter areas will not be lined with an impermeable lining in order to promote infiltration into the subsurface water reserves. The bio-filters will effectively reduce the phosphorus content of water passing through them.

The proposed development will replace some existing pervious areas with impervious areas which will cause an increase to the stormwater run-off from the site.

The proposed internal stormwater system will consist of swales as part of the landscaping, an underground gravity pipe network, roadside channels, inlet structures that will collect the stormwater run-off from the roads and other impermeable and semi-impermeable surfaces.

The internal stormwater system for the development will connect to the municipal network as discussed in section 5.1 and as shown on ***Figure 3.***

The standard stormwater principles, as stipulated by the relevant guidelines of this document & the guidelines of the local authority, will be employed for the design of the internal stormwater network.

During rainfall events with a return period larger than 1:2 years, the swales will act as overland flow routes which will channel, attenuate, and ultimately discharge the surface run-off via the predetermined escape routes.

6. WATER RETICULATION

6.1 Municipal Water Network and Connections

Discussions with Swartland Municipality indicated that there is an existing 200mm diam. watermain situated within Fontein Street which the proposed development could connect to – ***Figure 3.***

This was confirmed by a the GLS Capacity Analysis – ***Appendix D***. Below find an extract relating to the findings from the Report:

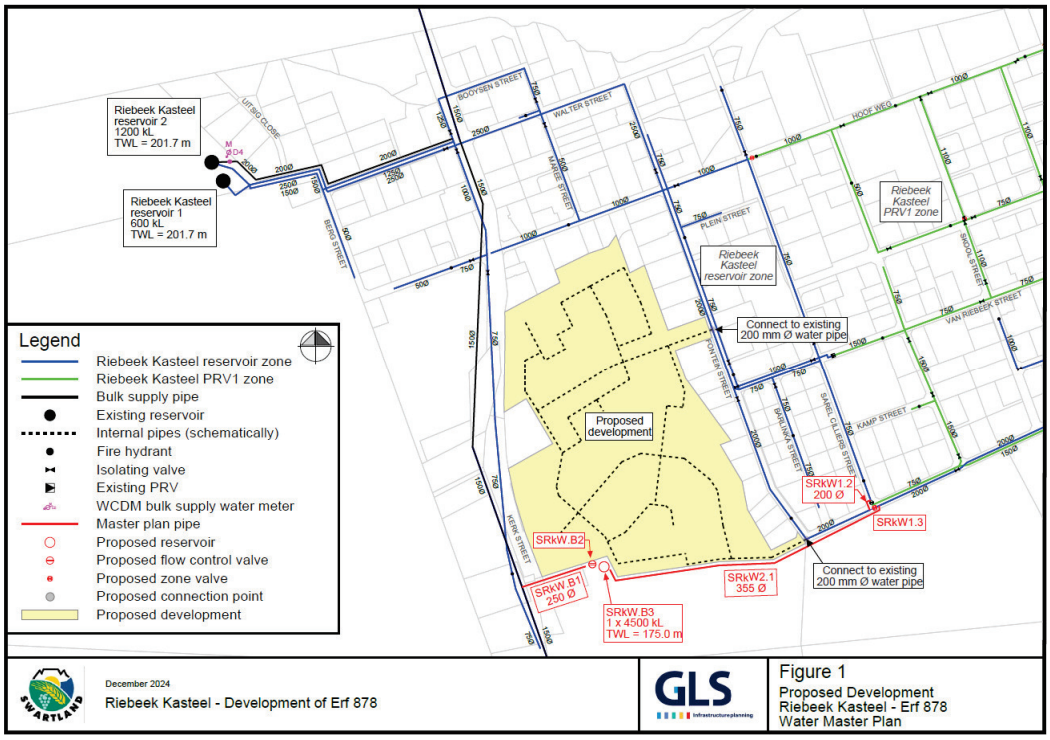
> The developer of Erf 878 in Riebeek Kasteel may be liable for the payment of a Development Contribution (as calculated by the Swartland Municipality) for bulk water and sewer infrastructure as per Council Policy.
>
> The water master plan indicated that the proposed development should be accommodated in the existing Riebeek Kasteel reservoir zone. The proposed connection to the existing reticulation system should be made to the existing 200 mm Ø pipe in Fontein Street.
>
> There is sufficient capacity in the existing Riebeek Kasteel water system to supply the proposed development on Erf 878 with sufficient water pressure and fire flow.
>
> Riebeek Kasteel has insufficient reservoir storage capacity to accommodate the proposed development and the implementation of master plan items SRkW.B1, SRkW.B2, SRkW.B3, SRkW1.2, SRkW1.3 & SRkW2.1 are proposed in order to augment reservoir storage capacity for Riebeek Kasteel.

The preliminary cost estimate for the infrastructure required for additional reservoir storage to accommodate the proposed development is shown below. Also refer to ***Fig. 1*** from the GLS report:

• SRkW.B1 :	120 m x 250 mm Ø new bulk supply pipe	R	440 000 *
• SRkW.B2 :	150 mm Ø flow control valve	R	376 000 *
• SRkW.B3 :	4,5 ML new reservoir for Riebeek Kasteel (new reservoir site at southern side of town)	R	18 039 000 *
• SRkW1.2 :	20 m x 200 mm Ø new inter-connection pipe	R	112 000 *
• SRkW1.3 :	1 x 200 mm Ø valve to insert and close	R	194 000 *
• SRwW2.1 :	400 m x 355 mm Ø new supply pipe	R	2 222 000 *
	Total	R	21 383 000 *

(* Including P & G, Contingencies and Fees, but excluding VAT – Year 2024/25 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

Note that the routes of the proposed pipelines and the position of the proposed valves and reservoir are schematically shown on Figure 1 attached, but have to be finalised subsequent to detailed pipeline route, valve placement and reservoir location investigations.



6.2 Internal Water Reticulation

The proposed internal water reticulation network will consist of a 110mm/160mm uPVC Class 12 potable water ring main, with 32mm diameter connections to each erf.

The bedding and blanket material for the internal waterpipe network will be clean sand from on-site excavations and will comply with SABS 1200 regulations for Class C bedding and blanket.

Fire hydrants will be spaced for Low-risk category 1.

*Refer to **Table 2** for the Water Demand Calculations.* The calculated GAADD of 94.7 kL/d is covered by the GLS master planning AADD allowance of 98.0 kL/d.

Erf 878, Riebeek Kasteel, SDP - Rev. 57

14-01-2025

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Item no	Description	Total no. of	Area	Water demand per day			TOTAL (litre)
				Per unit litre per unit/room	Area litre per hectare	Area litre per 100 m2	By area/ number
1	**Residential**						
1.1	Single Residential Zone 1	54 units	± 40,725 m²	600			32,400
1.2	General Residential Zone 2: Town Houses	47 units	± 16,281 m²	400			18,800
1.3	General Residential Zone 3: Flats	1 units	± 2,084 m²		21,000		4,376
2	**Community Zone 3:** Institution	1 units	± 2,509 m²			600	6,022
3	**Commercial**						-
3.1	Business Zone 1: General Business	1 units	± 2,136 m²			200	1,709
3.2	Business Zone 3: Service Station	1 units	± 7,491 m²			400	11,986
4	**Public Open Space**	8 units	± 16,148 m²		12,000		19,378
				Gross annual average daily water demand (GAADD)			**94,670 l/day**
				Demand per day			**1.10 l/s**
				Instantaneous Peak Demand (P(i) = 9)			**9.86 l/s**
				Fire Flow (based on 1 hydrant)			**15.00 l/s**

Design Methodology:

a) Units: Yield in litre per unit per day - SANS 10252-1; CSIR The Neighbourhood Planning and Design Guide Table J.2 Section J; Redbook - Table 9
b) Peak factor calculation:
Peak factor calculation as per Red Book Fig. 9.11 Chapter 9. Peak factor = 9
c) Fire Flow (Low Risk): 900 l/min for 1 hours, 1 hydrant: 15.0 l/s (fire engineer to confirm)
d Suggested Watermain pipe sizing - 160mm Watermain and 110mm Subnetworks (uPVC Class 12 or HDPE PN 12.5)
e No allowance was made for irrigation demand as the irrigation reticulation will feed off a borehole

Table 2: Water Demand

7. SANITATION

7.1 Municipal Foul Sewer Network

Preliminary discussions with Swartland Municipality confirmed that there is an existing underground foul sewer system within Fontein Street which the proposed development could connect to. This was confirmed by a the GLS Capacity Analysis - ***Appendix D***.

Multiple connections will be required due to the existing topography of the site – ***Figure 3.***

Below find an extract relating to the findings from the Report:

> The developer of Erf 878 in Riebeek Kasteel may be liable for the payment of a Development Contribution (as calculated by the Swartland Municipality) for bulk water and sewer infrastructure as per Council Policy.

> A servitude through Erven 203 and 1304 in favour of Swartland Municipality will have to be registered to allow the northern part of the proposed development to be connected to the existing outfall sewer in Fontein Street.
>
> The existing sewer reticulation system from Erf 878 to the main outfall sewer in Pieter Cruythoff Avenue has sufficient capacity to accommodate the proposed development. Bulk sewers in Pieter Cruythoff Avenue (from the bottom of Kloof Street towards the railway line) are however at capacity and should be upgraded through the implementation of master plan items SRkS1.2 & SRkS1.3 in order to accommodate the proposed development in Riebeek Kasteel.

GLS proposed the upgrading of the existing bulk sewer infrastructure – *refer to* ***Figure 3*** *(from the GLS report),* although the current main outfall sewer has sufficient capacity to accommodate the proposed development.

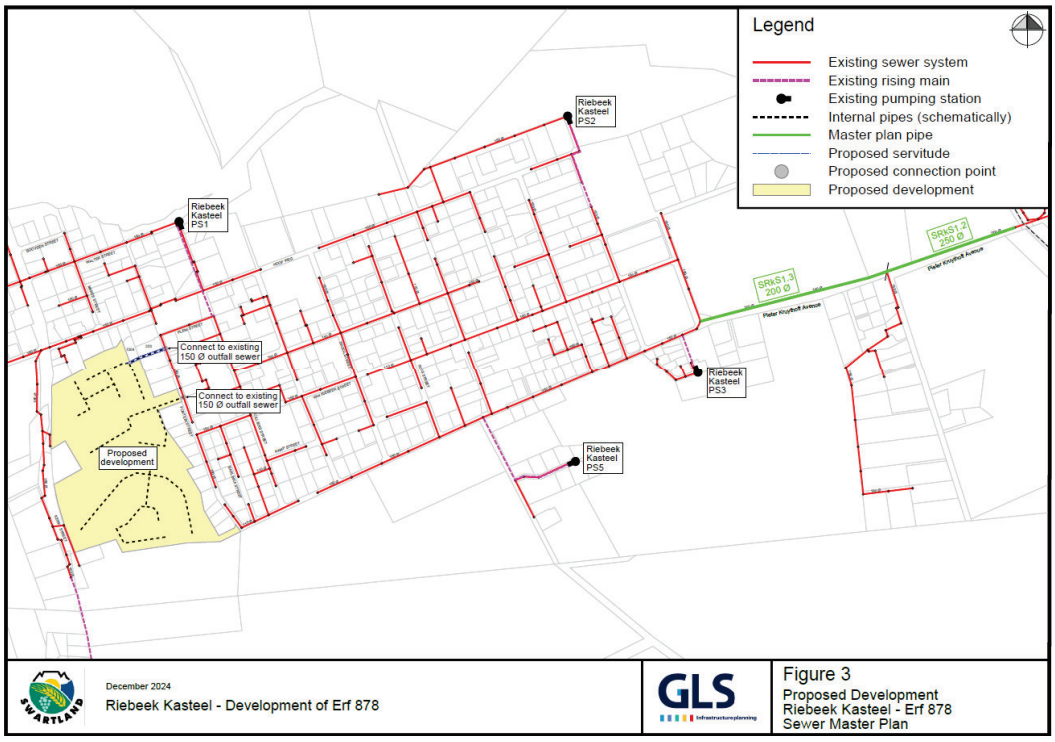
The following master plan items will be required to augment capacity within the existing Riebeek Kasteel bulk sewer system in order to accommodate the proposed development together with other future development areas:

Network upgrades

• SRkS1.2 : 300 m x 250 mm Ø upgrade 250 mm Ø outfall sewer		R	1 137 000 *
• SRkW1.3 : 535 m x 200 mm Ø upgrade 160 mm Ø outfall sewer		R	1 659 000 *
	Total	R	2 796 000 *

(* Including P & G, Contingencies and Fees, but excluding VAT – Year 2024/25 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

Note that the routes of the proposed pipelines are schematically shown on Figure 3 attached, but have to be finalised subsequent to detailed pipeline route investigations.



7.2 Internal Sewage Network

The internal sewage infrastructure will consist of a 160mm diameter uPVC Class 34 gravity pipe network and round precast concrete manholes in the road reserves. Each property cluster will have a 110mm diameter connection point/manhole, situated at the lowest portion of the erf.

All pipes will be laid at a minimum gradient of 1:120, with clean sand bedding and blanket installed around the pipe to comply with SABS Class 1200 regulations.

*Refer to **Table 3** for the Sewage Yield Calculations.* The calculated AADSY of 67.8 kL/d is covered by the GLS master planning PDDWF allowance of 68.6 kL/d.

Erf 878, Riebeek Kasteel, SDP - Rev. 57

14-01-2025

Item no	Description	Total no. of	Area	Sewage Yield per day			TOTAL (litre)
				Per unit litre per unit/room	Area litre per hectare	Area litre per 100 m2	By area/ number
1	**Residential**						
1.1	Single Residential Zone 1	54 units	± 40,725 m²	540			29,160
1.2	General Residential Zone 2: Town House	47 units	± 16,281 m²	360			16,920
1.3	General Residential Zone 3: Flats	1 units	± 2,084 m²		18,900		3,939
2	**Community Zone 3:** Institution	1 units	± 2,509 m²			540	5,419
3	**Commercial**						
3.1	Business Zone 1: General Business	1 units	± 2,136 m²			180	1,538
3.2	Business Zone 3: Service Station	1 units	± 7,491 m²			360	10,787
4	**Public Open Space**	8 units	± 16,148 m²				-
				Annual Average Daily Sewage Yield (AADSY)			**67,763 l/day**
				Flow over 24 hour day = daily flow/24/60/60			**0.78 l/s**
				Peak Factor = 3.50			
				Peak Daily Dry Weather Sewage Yield (PDDWSY)			**2.75 l/s**
				Infiltration = 15%			
				Peak Daily Wet weather Sewage Yield (PDWWSY)			**3.16 l/s**

Design Methodology:
a Units: Yield in litre per unit per day - SANS 10252-1 and CSIR Red Book Table C.1 Chapter 10 Appendix C
b Yield in litre per day - Assume 90% of water consumption for Units
c Peak factor calculation: 3.5
d Assume infiltration of 15%: During Heavy Rainfall in Winter

Table 3: Sewage Yield

8. CONCLUSION

This report confirms that Civil Engineering bulk Services are available or could be made available for this development, and that the SRP is supported from a Civil Engineering perspective, on the following conditions:

i) that agreement between developer & the Swartland Municipality is reached on the value of Development Contribution (bulk water infrastructure) which could be used towards "reservoir infrastructure" (by others)

ii) that agreement between developer & the Swartland Municipality is reached on the value of Development Contribution (bulk foul sewer infrastructure) which value could be used towards upgrading of existing bulk infrastructure (in accordance GLS *Fig. 3, or portion therefore*), by developer

iii) that the proposed road intersection onto Kerkstraat (at RD2) is approved by the Provincial Roads Authority

APPENDIX A

Cadastral

8922-85

SIDES Metres		ANGLES OF DIRECTION		CO-ORDINATES System Lo.19° Y		X	
			Constant	± 0,00		+3 600 000,00	
AB	51,95	244 06 00	A	+ 9 906,66	+	95 155,76	
BC	28,90	249 59 10	B	+ 9 859,93	+	95 133,07	
CD	18,87	214 13 20	C	+ 9 832,78	+	95 123,18	
DE	55,71	340 02 10	D	+ 9 822,17	+	95 107,58	
EF	22,78	242 47 00	E	+ 9 803,16	+	95 159,94	
FG	95,52	340 02 50	F	+ 9 782,89	+	95 149,52	
GH	54,07	250 03 40	G	+ 9 750,29	+	95 239,31	
HJ	30,00	340 09 00	H	+ 9 699,46	+	95 220,87	
JK	54,02	70 03 40	J	+ 9 689,28	+	95 249,08	
KL	41,57	340 02 50	K	+ 9 740,06	+	95 267,51	
LM	106,74	323 48 ~~18~~ 20	L	+ 9 725,87	+	95 306,58	
MN	16,10	70 09 00	M	+ 9 662,83	+	95 392,72	
NO	26,46	329 15 10	N	+ 9 677,97	+	95 398,19	
OP	35,00	250 09 00	O	+ 9 664,44	+	95 420,93	
PQ	55,52	340 08 30	P	+ 9 631,52	+	95 409,05	
QR	89,~~92~~ 93	323 48 20	Q	+ 9 612,66	+	95 461,27	
RS	132,65	63 17 00	R	+ 9 589,57	+	95 533,85	
ST	126,67	81 41 20	S	+ 9 678,06	+	95 593,49	
TU	68,06	153 00 50	T	+ 9 803,40	+	95 611,80	
UV	94,48	72 20 50	U	+ 9 834,28	+	95 551,15	
VW	64,13	158 48 00	V	+ 9 924,31	+	95 579,80	
WX	45,40	162 25 20	W	+ 9 947,50	+	95 520,01	
XY	46,99	167 58 30	X	+ 9 961,21	+	95 476,73	
YZ	69,92	240 57 20	Y	+ 9 971,00	+	95 430,77	
ZA'	72,08	149 22 20	Z	+ 9 909,87	+	95 396,82	
A'B'	35,~~39~~ 59	58 45 30	A'	+ 9 946,59	+	95 334,80	
B'C'	12,37	178 36 40	B'	+ 9 977,02	+	95 353,26	
C'D'	92,21	180 58 10	C'	+ 9 977,32	+	95 340,89	
D'E'	34,93	179 22 40	D'	+ 9 975,76	+	95 248,69	
E'F'	86,05	242 03 00	E'	+ 9 976,14	+	95 213,76	
F'A	18,84	159 42 30	F'	+ 9 900,13	+	95 173,43	
		Bothmaskloof A	△	+10 907,43	+	97 906,80	
		Uitkyk	△	+ 8 888,42	+	90 783,71	

Beacon Description:

F R	iron rail fence post
J L Q V F'	12 mm iron peg
All other beacons	15 mm iron peg

FOR SUBDIVISION OF THIS PROPERTY VIDE GENERAL PLAN No. 1731

The figure ABCDEFGHJKLMNOPQRSTUVWXYZA'B'C'D'E'F'

represents 12,1523 hectares *of land, being*

Erf 878 Riebeek Kasteel and comprising 1)-7) as enumerated alongside

situate in the Municipality of Riebeek Kasteel Administrative District

of MALMESBURY Province of Cape of Good Hope.

Surveyed in January, October 1985 and November 1984

by me,

Land Surveyor

This diagram is annexed to Cert. Consol. Title No. T.39770/1986 dated

I.f.o.

Registrar of Deeds

The original diagram is enumerated alongside

~~No.~~ ~~annexed to~~ ~~Transfer/Grant~~ ~~No.~~

File No. S/8106

S.R. No. B 2682/85

Comp. BH-4DN/W1 (854)
BH-4DB/W1 (856)

Beacons L, R acknowledged

C

OFFICE COPY

S.G. No. 8922-85

Approved

for Surveyor-General

1985-11-29

Components:

1) The fig. ABCDED'E'F' represents Erf 876 Riebeek Kasteel Vide Diagram No 8920/85 D/T 39767/1986

2) The fig. D'FLMNOxRSTntZA'B'C' represents Erf 872 Riebeek Kasteel Vide Diagram No 8916/85 D/T 1986- -39765

3) The fig. GHJK represents Erf 450 Riebeek Kasteel *Vide Diagram No 807/71 D/T 1973, 805,40202*

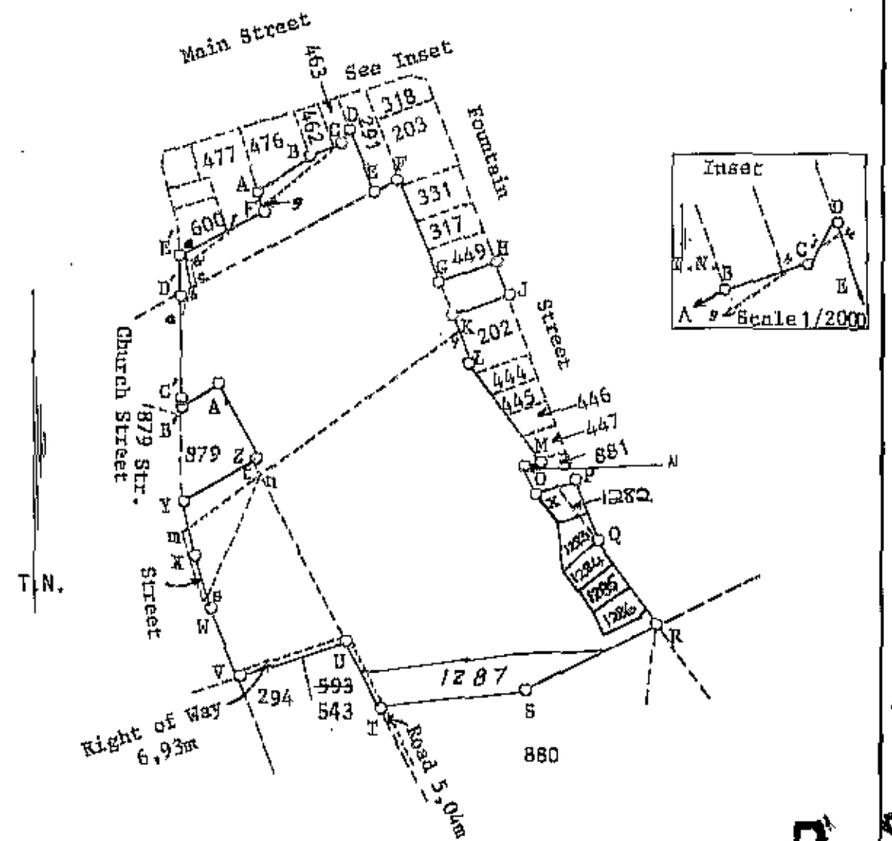
4) The fig. xPQ represents Erf 877 Riebeek Kasteel Vide Diagram No 8921/85 D/T 1986- -39769

5) *The fig. Ytnm represents Erf 873 Riebeek Kasteel* Vide Diagram No 8917/85 D/T 1986- -39763

6) The fig. mnsX represents Erf 875 Riebeek Kasteel Vide Diagram No 8919/85 D/T 1986- -39763

7) The fig. snUVW represents Erf 874 Riebeek Kasteel Vide Diagram No 8918/85 D/T 1986- -39763

Note:
The figure snyLMNOPQRSTUVW represents Quitrent Land, the Remainder is Freehold.



B

S

WALFORD ENGINEERING (Pty) Ltd
SEE BACK OF DIAGRAM

APPENDIX B

Topographical & Services Survey

C	GEOTECH TEST PITS ADDED	28/10/2024	C. S
B	UPDATED AS-BUILT SURVEY	23/07/2021	C. S
A	FOR INFORMATION	25/06/2021	C. S
No. Nr.	REVISION / WYSIGING	DATE DATUM	AUTHOR OUTEUR

kls CONSULTING ENGINEERS progress delivered

2nd Floor Avanti South Block
35 Carl Cronje Drive
Tygervalley 7536
Cape Town: +27(0)21 948 0900
Gauteng: +27(0)12 346 1672
Website: www.kls.co.za
e-mail: info@kls.co.za

ERF 878 RIEBEEK KASTEEL

TOPOGRAPHICAL & SERVICES SURVEY

DRAWN GETEKEN	C. S	CHECKED NAGESIEN	J. M. M.
DATE DATUM	25/06/2021	SCALE SKAAL	1:500 (A0)
DRG. No. TEK. Nr.	20041/110	REVISION No. WYSIGING Nr.	C

LEGEND	
CL	COVER LEVEL
FH	FIRE HYDRANT
LP	LIGHT POLE
IL	INVERT LEVEL
SV	STOP VALVE
SP	SIGN POST
TOD	TOP OF DUCT
TH	TOP OF HEADWALL

SURVEY LEGEND

- ELECTRICAL BOX
- LIGHT POLE
- TOP OF HEADWALL
- WATER PIPE, FIRE HYDRANT & VALVE
- TELKOM CABLE/DUCTING
- SEWER PIPE & MANHOLE
- SW PIPE, GRID-INLET & MANHOLE
- STORMWATER CULVERT
- FENCE LINE

LEGEND

GEOTECH TEST PITS (28/11/2021)

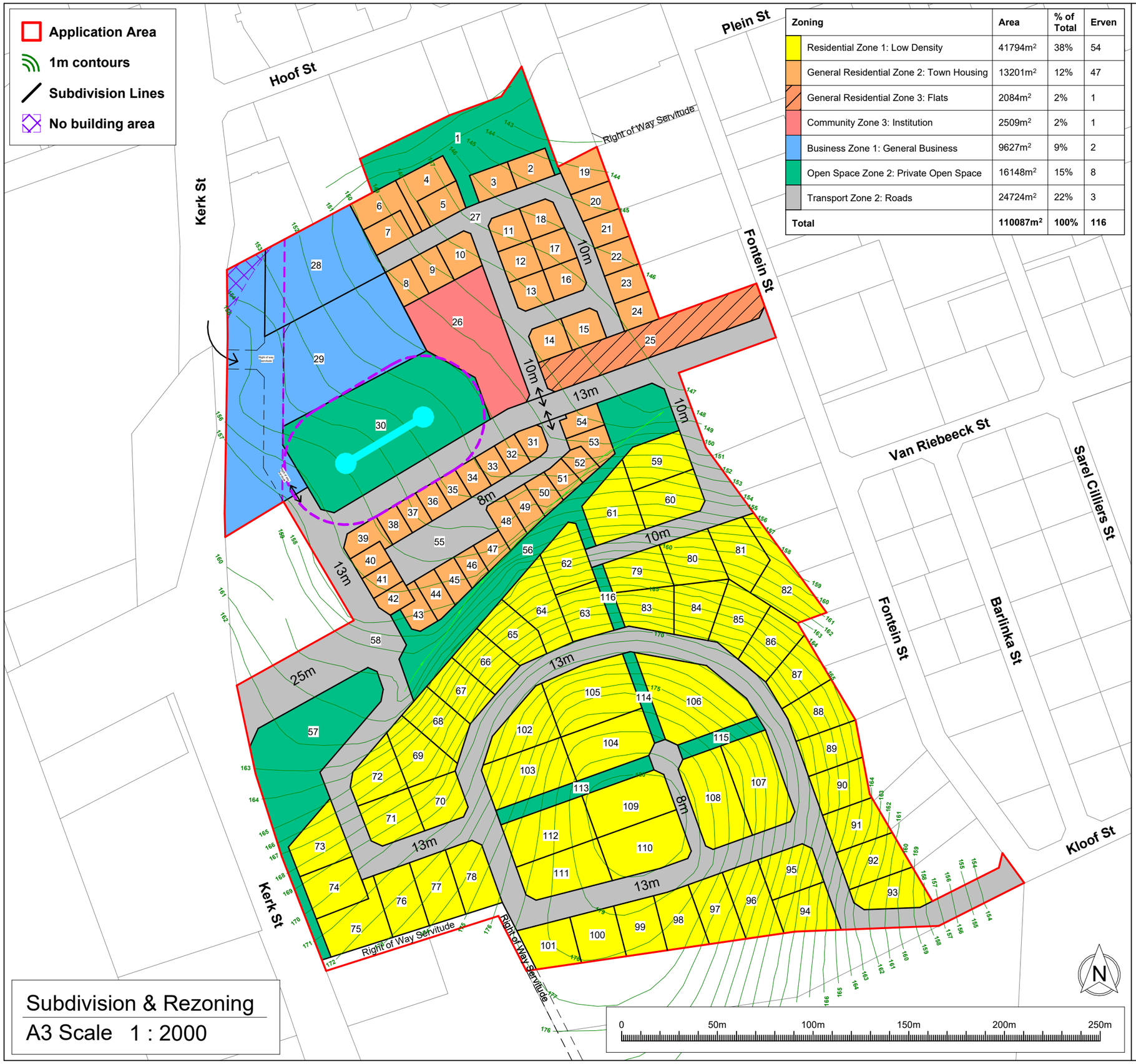
REFERENCE MARKS:
System: Hartbeesthoek94 / Lo.19

Pt.	Y	X	Height	Descriptions
AT1	+10 041,95	+3 695 726,07	+162,35	Nail in Tarmac
BM1	+9 801,10	+3 695 405,56	+139,72	12mm Iron Peg against Kerb
BM2	+9 751,49	+3 695 524,49	+143,07	12mm Iron Peg in Tarmac
BM3	+9 621,71	+3 695 823,80	+150,86	Centre of Manhole
BM4	+9 592,43	+3 695 802,69	+147,77	12mm Iron Peg in Tarmac
PRD203	+10 028,81	+3 695 767,27	+162,66	12mm Iron Peg in Concrete
PRD204	+10 043,45	+3 695 548,97	+155,74	12mm Iron Peg in Concrete
PRDT5	+10 006,77	+3 695 879,66	+169,21	12mm Iron Peg in Tarmac
PRDT6	+10 055,06	+3 695 724,72	+162,55	12mm Iron Peg in Tarmac
R1FN	+10 039,29	+3 695 741,51	+163,01	12mm Iron Peg in Tarmac

EXISTING CONTOURS SHOWN AT 1.0mm INTERVALS

APPENDIX C

Subdivision & Rezoning Plan



Zoning	Area	% of Total	Erven
Residential Zone 1: Low Density	41794m²	38%	54
General Residential Zone 2: Town Housing	13201m²	12%	47
General Residential Zone 3: Flats	2084m²	2%	1
Community Zone 3: Institution	2509m²	2%	1
Business Zone 1: General Business	9627m²	9%	2
Open Space Zone 2: Private Open Space	16148m²	15%	8
Transport Zone 2: Roads	24724m²	22%	3
Total	**110087m²**	**100%**	**116**

PROJECT

Erf 878 Riebeek Kasteel

TITLE

Subdivision & Rezoning Plan

Erven	Area	Erven	Area	Erven	Area
1	2785m²	40	216m²	79	606m²
2	315m²	41	216m²	80	700m²
3	315m²	42	206m²	81	723m²
4	491m²	43	253m²	82	906m²
5	330m²	44	279m²	83	612m²
6	479m²	45	245m²	84	668m²
7	330m²	46	209m²	85	712m²
8	306m²	47	216m²	86	701m²
9	307m²	48	296m²	87	650m²
10	362m²	49	268m²	88	671m²
11	320m²	50	236m²	89	614m²
12	320m²	51	215m²	90	609m²
13	318m²	52	198m²	91	609m²
14	329m²	53	289m²	92	679m²
15	330m²	54	249m²	93	617m²
16	319m²	55	1805m²	94	638m²
17	321m²	56	3450m²	95	639m²
18	309m²	57	3423m²	96	756m²
19	384m²	58	19692m²	97	662m²
20	318m²	59	702m²	98	631m²
21	301m²	60	719m²	99	607m²
22	296m²	61	835m²	100	610m²
23	295m²	62	659m²	101	607m²
24	295m²	63	602m²	102	797m²
25	2084m²	64	849m²	103	1100m²
26	2509m²	65	648m²	104	1090m²
27	3224m²	66	600m²	105	1388m²
28	2426m²	67	600m²	106	1759m²
29	7201m²	68	685m²	107	1226m²
30	4945m²	69	716m²	108	1222m²
31	205m²	70	612m²	109	1028m²
32	204m²	71	662m²	110	1106m²
33	204m²	72	632m²	111	956m²
34	204m²	73	722m²	112	1059m²
35	204m²	74	699m²	113	680m²
36	204m²	75	836m²	114	295m²
37	204m²	76	682m²	115	361m²
38	204m²	77	697m²	116	210m²
39	286m²	78	681m²		

Subdivision & Rezoning

A3 Scale 1 : 2000

DRAWN BY	CHECKED BY	DATE
JM	AW	09-12-2024

SCALE (@ A3)	PROJECT NUMBER
As indicated	0001

DRAWING NUMBER

Rev 57

CLIENT

Huguemont Trust

InterActive Town & Regional Planning

Andre Wiehahn Pr Pln A/927/1996
B Art et Sc (Town and Regional Planning)
Telephone 028 312 1668
Cell phone: 082 466 0490
E-Mail: wiehahn.a@gmail.com

APPENDIX D

GLS Capacity Analysis of the
Bulk Water & Sewer Services (14-01-2024)

Revision 1

14 January 2025

The Manager: Civil Engineering Services
Swartland Municipality
Private Bag X52
Malmesbury
7229

Attention: Mr Esias de Jager

Dear Sir,

PROPOSED MIXED-USE DEVELOPMENT ON ERF 878, RIEBEEK KASTEEL: CAPACITY ANALYSIS OF THE BULK WATER AND SEWER SERVICES

The request by Mr Johan Malherbe of KLS Consulting Engineers regarding comments on the bulk water and sewer supply of the proposed development (proposed mixed-use development on Erf 878, Riebeek Kasteel), refers.

This document should inter alia be read in conjunction with the Water Master Plan (performed for the Swartland Municipality) dated June 2020 and the Sewer Master Plan dated June 2020.

The proposed development was conceptually taken into consideration for the June 2020 master plans for the water and sewer networks as future development area RK_02.

1. WATER DISTRIBUTION SYSTEM

1.1 *Distribution zone*

The master plan indicated that the proposed development should be accommodated within the Riebeek Kasteel reservoir water distribution zone. The connections to the existing reticulation system should be made to the existing 200 mm Ø pipe in Fontein Street, as shown on Figure 1 attached.

The development is situated inside the water priority area.

1.2 *Water demand*

The original water analysis for the master plan was performed with a total annual average daily demand (AADD) for the proposed development (future development area RK_02 in the June 2020 water master plan) of 57,9 kL/d.

GLS Consulting (Pty) Ltd
Reg no: 2007/003039/07

T +27 21 880 0388 www.gls.co.za
Head office: 15 Termo Lane, Techno Park, Stellenbosch, 7600, ZA | PO Box 814, Stellenbosch, 7599, ZA
Gauteng office: Walker Creek Office Park, 90 Florence Ribeiro Avenue, Brooklyn, Pretoria, 0181, ZA

Directors: Flip du Plessis, Tsolane Mokoena

For this re-analysis of the water master plan, the AADD and fire flow for the proposed development was calculated as follows:

Water demand:

• 100 Single residential units @ 0,6 kL/d/unit		=	60,0 kL/d
• 29 Town housing units @ 0,5 kL/d/unit		=	14,5 kL/d
• 0,21 ha area Flats @ 21,0 kL/d/ha		=	4,4 kL/d
• 0,31 ha Institutional area @ 19,2 kL/d/ha		=	6,0 kL/d
• 2 013 m^2 Business/commercial area @ 0,65 kL/d/100 m^2		=	13,1 kL/d
	Total	=	98,0 kL/d

Fire flow criteria:

- Moderate risk 1 = 25 L/s @ 15 m

1.3 *Present situation*

1.3.1 *Reticulation system*

The existing water reticulation system of Riebeek Kasteel has sufficient capacity in order to supply the proposed development with sufficient domestic and fire flow supply.

1.3.2 *Bulk supply*

The Riebeek Kasteel water system is supplied with bulk water from the West Coast District Municipality's (WCDM) bulk system. Bulk water is conveyed from the Swartland Water Treatment Plant (WTP) to the Kasteelberg reservoirs, from where water is then further distributed through a dedicated 200 mm Ø pipe (to Riebeek West) and 150 mm Ø pipe (from Riebeek West to Riebeek Kasteel).

The analysis of the capacity of the WCDM bulk water system in order to accommodate the proposed development is discussed in a separate report, addressed to WCDM.

1.3.3 *Reservoir capacity*

The criteria for total reservoir volume used in the Swartland Water Master Plan is 48 hours of the AADD (of the reservoir supply zone).

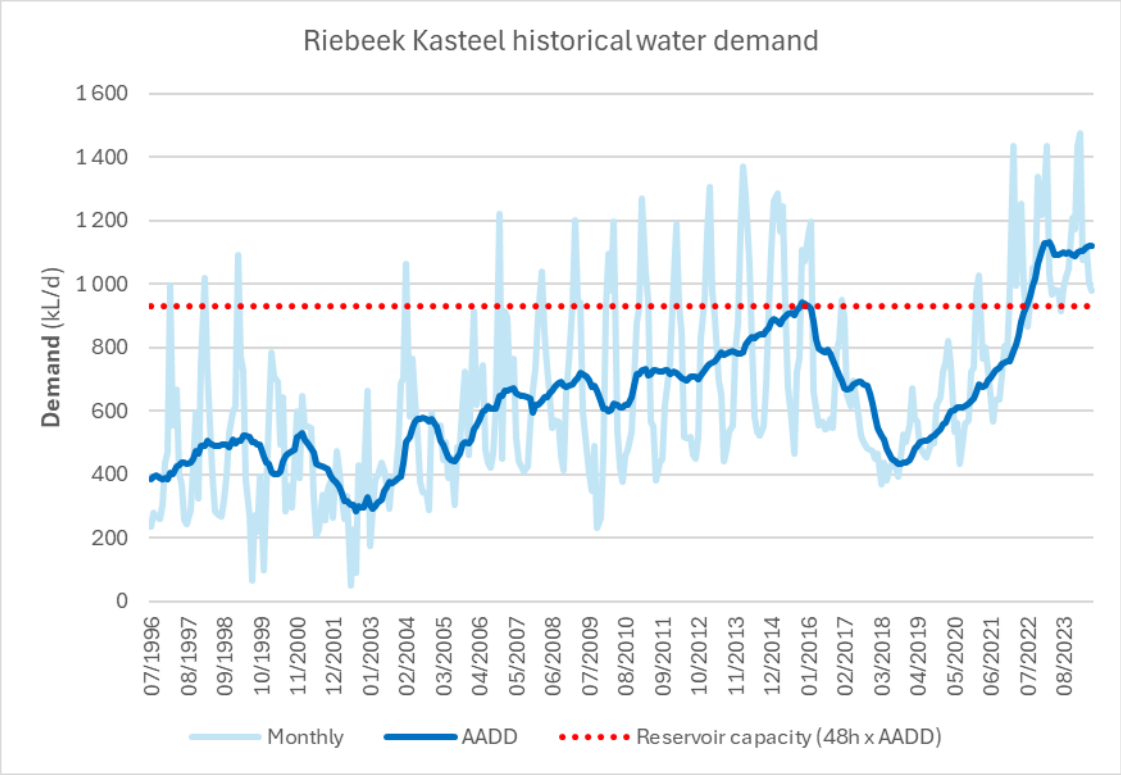
According to the water master plan the Riebeek Kasteel reservoir water supply area has a water demand of approximately 550 kL/d (based on the 2020 Water Master Plan, where the existing system was modelled with water demand figures from the 2018/19 financial year). The capacity of the existing Riebeek Kasteel reservoirs is 1 862 kL, which results in a reservoir storage capacity of 81 hours of the AADD.

The latest water demand readings obtained from WCDM (readings from July 2023 to June 2024), however, indicated that the water demand has increased significantly during the last 5 years from 550 kL/d (2018/19 financial year) to the current demand of 1 120 kL/d. The current demand for Riebeek Kasteel of 1 120 kL/d results in a current reservoir storage capacity of only 40 hours of the AADD supplied.

There is therefore insufficient capacity in the existing Riebeek Kasteel reservoirs to accommodate the proposed development.

Figure W1 below shows the historical water demand for Riebeek Kasteel from 1996 to 2024:

Figure W1: Riebeek Kasteel historical water demand



1.4 *Implementation of the water master plan*

The existing Riebeek Kasteel reservoirs have capacity to accommodate an AADD of 930 kL/d and it is therefore proposed that additional reservoir storage capacity is implemented by Swartland Municipality to accommodate additional developments in Riebeek Kasteel.

The current Riebeek Kasteel water system is supplied from the existing Riebeek Kasteel reservoirs with a Top Water Level (TWL) of 201,7 m above mean sea level (m a.s.l.). Water pressure to the lower lying supply areas in Riebeek Kasteel is reduced through the implementation of pressure reducing valves. In the water master plan a lower lying reservoir (at a TWL of roughly 175.0 m a.s.l.) is proposed for when the existing higher lying reservoirs reaches capacity. This reservoir should then supply directly to the existing Riebeek Kasteel PRV no. 1 water distribution zone, which will result that the existing Riebeek Kasteel reservoirs will supply a smaller supply area and consequently will have sufficient spare capacity available to accommodate the proposed development area.

It is therefore proposed that the new Riebeek Kasteel Lower reservoir and supporting infrastructure is implemented in order to accommodate the proposed development:

<u>Additional reservoir storage capacity</u>

• SRkW.B1 :	120 m x 250 mm Ø new bulk supply pipe	R	440 000 *
• SRkW.B2 :	150 mm Ø flow control valve	R	376 000 *
• SRkW.B3 :	4,5 ML new reservoir for Riebeek Kasteel (new reservoir site at southern side of town)	R	18 039 000 *
• SRkW1.2 :	20 m x 200 mm Ø new inter-connection pipe	R	112 000 *
• SRkW1.3 :	1 x 200 mm Ø valve to insert and close	R	194 000 *
• SRwW2.1 :	400 m x 355 mm Ø new supply pipe	R	2 222 000 *
	Total	R	21 383 000 *

(* Including P & G, Contingencies and Fees, but excluding VAT – Year 2024/25 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

Note that the routes of the proposed pipelines and the position of the proposed valves and reservoir are schematically shown on Figure 1 attached, but have to be finalised subsequent to detailed pipeline route, valve placement and reservoir location investigations.

1.5 *Minimum items required*

There is sufficient capacity in the existing Riebeek Kasteel water reticulation system to supply the proposed development on Erf 878 with sufficient water pressure and fire flow.

Riebeek Kasteel, however, has insufficient reservoir storage capacity to accommodate the proposed development and the implementation of master plan items SRkW.B1, SRkW.B2, SRkW.B3, SRkW1.2, SRkW1.3 & SRkW2.1 are proposed in order to augment reservoir storage capacity for Riebeek Kasteel.

2. SEWER NETWORK

2.1 *Drainage area*

The master plan indicated that the proposed development should be accommodated in the existing Riebeek Valley pumping station (PS) sewer drainage area. The proposed connections to the existing sewer system are to the existing 150 mm Ø outfall sewer in Fontein Street, as shown on Figure 2 attached.

A servitude through Erven 203 and 1304 in favour of Swartland Municipality will have to be registered to allow the northern part of the proposed development to be connected to the existing outfall sewer in Fontein Street.

The development is inside the sewer priority area.

2.2 *Sewer flow*

The original sewer analysis for the master plan was performed with a total peak daily dry weather flow (PDDWF) for the proposed development (future development area RK_02 in the June 2020 sewer master plan) of 38,8 kL/d.

For this re-analysis, the PDDWF for the proposed development was calculated as 68,6 kL/d.

2.3 *Present situation*

The existing sewer reticulation system from Erf 878 to the main outfall sewer in Pieter Cruythoff Avenue has sufficient capacity in order to accommodate the proposed development within the existing Riebeek Kasteel sewer system.

The existing 160 mm Ø and 200 mm Ø main outfall sewers in Pieter Cruythoff Avenue (from the bottom of Kloof Street towards the railway line, as indicated on Figure 3 attached) are however at capacity and should be upgraded to larger diameters in order to accommodate any additional development within the upstream drainage area.

2.4 *Implementation of the master plan*

The following master plan items will be required to augment capacity within the existing Riebeek Kasteel bulk sewer system in order to accommodate the proposed development together with other future development areas:

Network upgrades

• SRkS1.2 : 300 m x 250 mm Ø upgrade 250 mm Ø outfall sewer		R	1 137 000 *
• SRkW1.3 : 535 m x 200 mm Ø upgrade 160 mm Ø outfall sewer		R	1 659 000 *
	Total	R	2 796 000 *

(* Including P & G, Contingencies and Fees, but excluding VAT – Year 2024/25 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

Note that the routes of the proposed pipelines are schematically shown on Figure 3 attached, but have to be finalised subsequent to detailed pipeline route investigations.

2.5 *Minimum items required*

The minimum items required to accommodate the proposed development in the existing Riebeek Kasteel sewer system are master plan item SRkS1.2 & SRkS1.3 in order to augment capacity within the existing bulk sewer system.

3. CONCLUSION

The developer of Erf 878 in Riebeek Kasteel may be liable for the payment of a Development Contribution (as calculated by the Swartland Municipality) for bulk water and sewer infrastructure as per Council Policy.

The water master plan indicated that the proposed development should be accommodated in the existing Riebeek Kasteel reservoir zone. The proposed connection to the existing reticulation system should be made to the existing 200 mm Ø pipe in Fontein Street.

There is sufficient capacity in the existing Riebeek Kasteel water system to supply the proposed development on Erf 878 with sufficient water pressure and fire flow.

Riebeek Kasteel has insufficient reservoir storage capacity to accommodate the proposed development and the implementation of master plan items SRkW.B1, SRkW.B2, SRkW.B3, SRkW1.2, SRkW1.3 & SRkW2.1 are proposed in order to augment reservoir storage capacity for Riebeek Kasteel.

The sewer master plan indicated that the proposed development should be accommodated in the existing Riebeek Valley PS sewer drainage area. The proposed connections to the existing sewer system are to the existing 150 mm Ø outfall sewer in Fontein Street.

A servitude through Erven 203 and 1304 in favour of Swartland Municipality will have to be registered to allow the northern part of the proposed development to be connected to the existing outfall sewer in Fontein Street.

The existing sewer reticulation system from Erf 878 to the main outfall sewer in Pieter Cruythoff Avenue has sufficient capacity to accommodate the proposed development. Bulk sewers in Pieter Cruythoff Avenue (from the bottom of Kloof Street towards the railway line) are however at capacity and should be upgraded through the implementation of master plan items SRkS1.2 & SRkS1.3 in order to accommodate the proposed development in Riebeek Kasteel.

We trust you find this of value.

Yours sincerely,

GLS CONSULTING (PTY) LTD
REG. NO.: 2007/003039/07

_____
Per: PC DU PLESSIS

cc. KLS Consulting Engineers
13 Pasita Street
Rosenpark
CAPE TOWN
7550

Attention: Mr Johan Malherbe