



**ENGINEERING SERVICES REPORT FOR:
PORTION 2 OF THE FARM STRANDFONTEIN No.
712, DE KELDERS, GANSBAAI**

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Prepared For:

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1. INTRODUCTION

Ice Group Consulting Engineers were appointed by messers Spronk & Associates for the compilation of an engineering services report for the development of Portion 2 of the Farm Strandfontein No. 712, De Kelders in the Overstrand Municipal area. Portion 2 of the Farm Strandfontein No. 712, De Kelders will therefore; for the purpose of this report hereinafter be referred to as "the site".

The site is proposed to be subdivided as follows:

TYPE OF DEVELOPMENT	ERVEN	NUMBER	ZONING	AVE ERF SIZE
Single Residential				
	1-84 & 87-120	118	Single Residential	532
	121	1	Road Zone	
	122 - 127	6	Public Open Space	
	128	1	Institutional Zone	
	129	1	Local Business Zone	
Town House & Group House Cluster A				
	A1 – A79	79	Group House Zone	410
	A80 – A113	34	Town House Zone	314
	A114 – A123	10	Private Open Space Zone	
	A124	1	Road Zone	
Town House & Group House Cluster B				
	B1 – B64	64	Group House Zone	397
	B65 – B84	20	Town House Zone	266
	B85 – B94	10	Private Open Space Zone	
	B95	1	Club House	
	B96	1	Road Zone	
Town House & Group House Cluster C				
	C1 – C89	89	Town House Zone	296
	C90 – C125	36	Group House Zone	417
	C126 – C139	14	Private Open Space Zone	
	C140 – C141	2	Road Zone	
Town House & Group House Cluster D				
	D1 – D32	32	Town House Zone	289
	D33 – D36	4	Private Open Space Zone	
	D37	1	Road Zone	

The proposed subdivision of the site is indicated on the plan attached as **Annexure A**.

2. SITE DESCRIPTION

The site is situated East of the existing De Kelders development and North of the R43 in Gansbaai.

A detail topographical survey was done by messers Spronk and Associates land surveyors which were used for the preliminary design purposes.

The entire site is approximately 110ha in extent of which 56ha is within the urban edge for development an approximately 38ha is earmarked for development.

The contour plan indicate that a large number of individual dunes exist in the existing surface of the site. These dunes cause various depressed low areas which will, in turn provide a large number of depressed low points in the vertical alignment of roads, should the existing surface be followed. It is therefore proposed that these dunes be leveled by means of a cut-to-fill operation over the proposed site for development in order to create a general gradient according to the existing boundaries of the site. This will result in a general gradient into a north-westerly direction. Note that a number of additional localized earthwork operations will be required on the proposed surface to ensure optimum stormwater drainage.

3. GEOTECHNICAL INFORMATION

The site is underlain by quartzite sandstone of the Peninsula Formation of the Table Mountain Group. A variable of wind-blown sand and residual soil consisting of quartz sand overlies the solid rock. No trial holes were dug but the depth of the sand is of such a nature that no rock should be encountered.

4. SERVICES

The position of existing services was obtained from Overstrand Municipality, the topographical survey of messers Spronk and Associates and various site investigations.

The design of services will be in accordance with the "Guidelines for the provision of Engineering Services for Residential Townships" (Blue book), the UTG7 publication "Geometric Design of Urban Local Residential Streets", the TRH4 and the specific standards of the Local Authority and the NRS 034 Specifications for electrification of residential areas..

4.1 Sewerage

The existing De Kelders area is not serviced with a sewerage reticulation system. Sewage is transported to the treatment works from conservancy tanks with trucks.

The proposed internal sewerage reticulation system will consist of the following:

Internal system	:	Gravity full bore	:	160 mm diameter Class 34 uPVC
			:	200 mm diameter Class 34 uPVC
			:	225 mm diameter Class 34 uPVC
			:	250 mm diameter Class 34 uPVC
House connections	:	Gravity full bore	:	110 mm diameter Class 34 uPVC

The following average daily flow values will be used for the calculations with regard to the design of the internal sewerage reticulation system:

Description	No. of Units/Size	ADF	ADF (l/day)
Res I	118	850 l/day/unit	100 300
Res II	179	750 l/day/unit	134 250
Res III	175	600 l/day/unit	105 000
Local Business	5 783m ²	10kl/ha/day	5 783
Institutional	2 417m ²	10kl/ha/day	2 417
Recreational	4 562m ²	10kl/ha/day	4 562
TOTAL ADF (l/day)			352 312
Peak Factor			2.5
PDWF (l/day)			880 780
Extraneous flow			15%
PWWF (l/day)			1 012 897
PWWF (l/s)			11.723
PWWF (m ³ /s)			0.012

To ensure that a minimum full bore velocity of 0.7 m/s is maintained, the following gradients will be accepted as the minimum:

Diameter	No. of Dwellings	Minimum Gradient
100	1 House connection	1 : 60
	Other	1 : 90
150	1 to 10	1 : 90
	11 to 80	1 : 120
	81 to 110	1 : 150
	111 to 130	1 : 180
	More than 131	1 : 200
200		1 : 300
225		1 : 350
250		1 : 400
300		1 : 500

Further to the above, a peak flow factor of 2.5 for less than 1 500 erven and an allowance of 15% for infiltration will be used.

The position of the internal sewerage reticulation system will be according to the following guideline:

General position in road reserves	:	1.5m from erf boundaries
Midblock sewers	:	1.2m from erf boundaries
Erf connections	:	1.0m from erf boundary
	:	1.5m from side boundary

The site will be graded in order to ensure that the internal sewerage reticulation system can be collected at two positions within the proposed development. The sewage from the proposed development will be transported to the existing sewage treatment plant via an underground piped system. The proposed external sewage pipe system will be designed to ensure that the existing De Kelders area can be connected to the proposed system.

According to Overstrand Municipality, the existing sewage treatment works was recently upgraded from 300kl/day capacity to 2 000kl/day capacity. On a peak day the sewage treatment plant currently requires approximately 1 200kl. It is estimated that this development will generate approximately 1 013kl effluent on a peak day, including infiltration and a peak flow factor and approximately 352kl without taking infiltration and the peak flow factor into consideration.

4.2 Water

According to the water master plan of Overstrand Municipality, which was compiled by CES consulting engineers, the water distribution system in De Kelders is operated as a single pressure zone supplied directly from the Klipgat system as well as an existing 0.75MI reservoir, a 2MI proposed De Kelders reservoir and two boreholes south-west of De Kelders, namely Grotte and Stanfordsbaai. The two reservoirs are supplied by means of a 250mm diameter pumping main with a flow meter from the Klipgat Pump station. Outflow meters were provided on the gravity pipeline from the reservoirs as well as on the pipelines from the two boreholes. A 75mm diameter link with a flow meter between the De Kelders zone and the Gansbaai zone were provided for emergency requirements. This link is closed under normal operating conditions and opened under emergency condition only.

The report by CES consulting engineers indicates that the entire northern part of De Kelders show residual pressures below the required 24m during peak hour demand conditions due to high flow velocities (in excess of 1.5 m/s) and insufficient pipe capacities resulting in high head losses.

The following bulk water reticulation items are required to proceed with the development of the site and to improve residual pressures in areas where problems are currently experienced during peak demand conditions:

- 2.2MI reservoir
- 300mm diameter parallel pipe reinforcement (560m) – From the proposed reservoir to the branch of the existing De Kelders development and the proposed site
- 300mm diameter future main (300m) – From the branch as mentioned above and the proposed ring-main for the site
- 200mm diameter future main pipe (4 465m) – Proposed ring-main for the site along the boundaries of the site and in the proposed roads (Road 2, R43).

According to the water master plan of CES consulting engineers, the top and bottom water level of the proposed 2.2MI reservoir is 97.5m MSL and 91.5m MSL respectively. To ensure residual pressure above the minimum of 24m, the demand area should be lower than approximately 70m. The proposed site for development is situated at levels between 45m MSL and 68m MSL.

It is however our proposal that a variable speed booster pump be provided directly on the reticulation system as part of the bulk supply to ensure that the required residual pressure is maintained.

The following average daily water demand for residential developments will be used as a guide for this development:

Description	No. of Units/Size	ADF	ADF
			(l/day)
Res I	118	850 l/day/unit	100 300
Res II	179	750 l/day/unit	134 250
Res III	175	600 l/day/unit	105 000
Local Business	5 783m ²	10kl/ha/day	5 783
Institutional	2 417m ²	10kl/ha/day	2 417
Recreational	4 562m ²	10kl/ha/day	4 562
TOTAL ADF (l/day)			352 312
Equivalent Units			353
Peak Factor			14
IPF (l/day)			4 942 000
IPF (l/s)			57.200

The internal network will be designed on a ring-main principle and will connect to the proposed bulk reticulation ring-main system at various positions around the boundaries of the site to complete the internal ring-mains.

The minimum pipe size will be 110mm diameter uPVC Class 12 pipes. Each individual erf will be provided with a water meter as required by the Local Authority. Isolating valves shall be provided to ensure that no more than 3 valves need to be closed to isolate any section and will be positioned opposite splays.

The minimum fire hydrant flow will be 900 l/min at a minimum residual head of 7m and will be positioned at a general radius of 240m.

House connections will be 28mm inside diameter for single connections and 35mm for double connections, if required. The connections will be positioned 0.5m from both front and side erf boundaries

The impact of the proposed development on the existing water reticulation system, including the reservoir capacity will be determined by the Local Authority's consulting engineers, if required.

4.3 Stormwater

Due to the topography of the site as discussed above under paragraph 2 (site description), the site is sub-divided into three main drainage areas. These drainage areas will therefore be the basis on which the drainage patterns will be determined. The three drainage areas are as follows:

Drainage Area	Existing system	Size of pipe required	Storm event
1	No system	No System Required	1:2
2	No System	900mm diameter	1:2
3	No System	450mm diameter	1:2

The position of the drainage area outfalls areas are as follows:

Drainage area 1 : Northern end of the site
 Drainage area 2 : Normandie road
 Drainage area 3 : Main road



Approximately 15% of the site drains directly from the erven into the ocean, nature reserve or existing roads.

Due to the lack of a sufficient stormwater reticulation system in the adjacent section of the existing De Kelders development, it is our proposal that the 1:2 year recurrence interval storm event runoff, generated in the sub-catchment areas of the site be conveyed through the existing De Kelders development in a piped reticulation systems to discharge at two main positions. The runoff from the existing De Kelders development will be accommodated in the proposed reticulation system and the cost of the additional capacity required, deducted from the bulk service contributions. It should however be noted that the roads in the existing De Kelders development does not have any kerbs or channels.

The discharge positions will then be continued through the existing development as follows:

Drainage area 1	:	None Required
Drainage area 2	:	Along Normandie road, down Eden road and discharge at the Eden/Smuts road intersection
Drainage area 3	:	Along Main road and discharge into the existing channel

Other smaller reticulation systems should also be provided through the existing De Kelders development. These systems will also accommodate the existing De Kelders development and follow routes along Storm, Reitz, de Villiers and Crescent Roads.

Various local depressed low points exist in the roads in the existing De Kelders development but are of such a nature that it should not cause problems with the proposed underground reticulation system's alignment, as the overall gradient of roads seems to be sufficient.

The minor stormwater system will consist of catchpits and underground concrete spigot and socket pipes, which will discharge as described above. The minimum pipe size will be 375mm diameter and a self cleaning velocity during 75% of the 1:2 year recurrence interval storm event of 0.9 m/s will be maintained. The maximum distance between manholes and catchpits will be 90m.

The major stormwater system will be conveyed via the roads. Due to the proposed earthworks, all erven will discharge onto roads and all roads will be graded without low points. Overland escape routes for the major storm event will be provided where required.

Due to the localized low points of roads in the existing De Kelders development, as mentioned above, the major storm event might experience difficulty to discharge through the existing roads without causing flooding of the adjacent properties. The main drainage area should however be conveyed without difficulty.

4.4 Roads

The proposed development will gain access from the R43, where additional lanes will be provided and from Main road in the existing De Kelders development.

All internal roads will be provided with an asphalt surface, mountable kerbs on both sides (CK5 and MK10), at a minimum crossfall of 2.0% and sufficient substructure, according to the TRH4.

The proposed roads in the development were classified as follows:

Class	Function	Dwelling units served	Road width
4	Local distributor	400 to 1 500	7.4m
4	Local distributor	400 to 1 500	7.4m
5a	Residential access collector	Up to 200	5.5m
5b	Residential access loop	Up to 120	5.0m
5b	Residential access collector	Up to 120	5.0m

The roads will be designed according to the following minimum standard:

Road	Design speed	CI Radius	Min Gradient	K-value	Min Vertical curve length
1	50 km/h	150m	0.4%	11	80m
2	50 km/h	40m	0.4%	11	80m
3	40km/h	15m	0.4%	6	30m
4	30km/h	10m	0.4%	4	20m
All other	20km/h	10m	0.4%	2	20m

The substructure of roads was designed according to the following road categories:

Road	Class	Category	Traffic class	Design period
1	UB	B	E2	20 years
2	UB	B	E2	20 years
3	UC	C	E0	20 years
4	UC	D	ER	20 years
All other	UC	D	ER	20 years

Bellmouth radii on the roads will generally be 6m, except at intersections with Class 5a and Class 4 roads, where the radii will be 8m and 10m respectively.

It is proposed that traffic circles be provided at intersections with major roads for traffic flow and traffic calming measures.

4.5 Telkom

Telkom uPVC service ducts will be installed with regular inspection chamber/draw boxes, according to the required specifications and connected to the existing network.

4.6 Electricity

4.6.1 Bulk Electricity Supply

The inclusion of this development area into the Overstrand Municipal area of supply was approved by the National Energy Regulator of South Africa (NERSA) and the supply authority therefore will be Overstrand Municipality.

The maximum electricity demand for the planned 472 residential units is estimated at 2 000 kVA, with the average demand 1 200 kVA.

The electrical networks in the De Kelders area currently does not have adequate capacity for this additional load, and a new bulk supply will therefore have to be installed.

The proposed bulk supply will consist of a new medium voltage cable from the Gansbaai Main switching station some 4,6km away, via this development, linking up the Klipgat supply point and ending in De Kelders where it will be incorporated into the existing networks in Vyfer Street. The connection to De Kelders will ensure a secondary supply should the new primary cable fail.

In addition to the installation of this new bulk supply, an application will also be lodged with Eskom for an increase of 2 000kVA in the Municipal supply point. This aspect will be done in liaison with the electricity department of Overstrand Municipality.

4.6.2 Internal Electricity Services

The internal services will consist of medium and low voltage underground cables, miniature substations, consumer distribution kiosks and single phase erf connections.

Design of all new infrastructure will be done as per NRS 034 Specification and the latest design guidelines of Overstrand Municipality.

Streetlighting will be installed as per the architectural guidelines of the development and the design guidelines of Overstrand Municipality.

All services will be handed over to Overstrand Municipality after completion and commissioning.

5. CONCLUSION

The layout is practical and cost effective from a civil engineering point of view. It is however critical that the mass earthworks be done as it could affect the layout at certain points where the provision of major stormwater systems becomes more expensive.

The proposed external sewage reticulation system between the proposed development and the existing sewage treatment plant is required for the development to proceed. Sufficient capacity is available in the existing sewage treatment plant but upgrading will be required prior to the entire development being fully developed.

It is critical that the 2.2Ml reservoir and the bulk water reticulation system be provided to the development in order to ensure that the required peak demand at the minimum residual pressure be maintained.



The paragraphs under electricity (4.6) was obtained from Worley Parsons previously known as Kwezi V3 Consulting engineers and Mr. Theo Potgieter can be contacted in this regard should additional information be required at (021) 912 3000.

We trust that the report will be to your satisfaction and will gladly provide any further information required on request.



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