HARTENBOS
Garden Estate
Natuur-Landgoed

SERVICES REPORT

FOR

HARTENBOS GARDEN ESTATE RESIDENTIAL DEVELOPMENT ERF 3122 HARTENBOS

PROJECT No: 1704062

Compiled By:

LJR Civil Consultants cc
DESIGN & DRAUGHTING ENGINEERING CONSULTANTS
2000/007738/23

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I N D E X

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1. INTRODUCTION

1.1 GENERAL

LJR Civil Consultants CC has been appointed by the Hartenbos Hills Propco (Pty) Ltd, to compile a Services Report, for the proposed Hartenbos Garden Estate residential development.

Please note: This project will be done in phases.

1.2 LOCALITY

The site is situated in Hartenbos, Mosselbay, Western Cape, Erf 3122. Locality plan is on the layout plan, attached as Annexure A.

1.3 LAND OWNER

Hartenbos Garden estate

Postal address		:	252 Val de Vie Paarl 7646
Contact Person		:	Dr. Kotie Kruger
Contact number	Cell.	:	082 375 9679
	E-mail	:	ajkcons@gmail.com

1.4 CONSULTING ENGINEERS

LJR Civil Consultants CC

Company Registration No.		:	2000/007738/23
Physical address		:	55 Louis Trichardt Street Parktown Estate Pretoria 0084
Postal address		:	(Same as physical address)
Contact person		:	Louis Roets
Professional registration no.		:	9370055
Contact number -	Cell.	:	083 283 7540
	Tel.	:	(012) 804 1514
	E-mail	:	ljr@ljr.co.za

2. DESCRIPTION OF SITE

2.1 LAYOUT AND PROPOSED DEVELOPMENT PARAMETERS

A site layout plan from PJ le Roux Town and Regional Planner is attached in Annexure B that also indicates the proposed phasing of the project. The proposed development parameters are as follows:

Total site Area 60.519ha
The developable area will consist of:

Ptn Nos	No of Units	Extent (ha)	Zoning	Land Use
1-279	279	10,9151	Single Residential I	Dwelling House
280-282	3	0,8394	General Residential Zone III	Terrace Apartments (Flats)
283-290	8	12,0308	Open Space Zone II	Private Open Space with tearooms, telecom station
291	1	23,9230	Open Space Zone III	Nature conservation area with tearoom and utility
292	1	0,1884	Open Space Zone II	Sport facilities, clubhouse, restaurant, bar, office utility
293	1	0,3720	Open Space Zone II	Maintenance Shed/Store, utility
294	1	2,4333	General Residential Zone III	Village precinct, flats, clubhouse, frail care and recreation*
295	1	8,8884	Transport Zone III	Private Road
296	1	0,9286	Utility Zone	Municipal Reservoir
TOTAL	**296**	**60,5190ha**		

2.2 TOPOGRAPHY

The property is roughly between 102 and 135 metres above sea level. The slope of the site is mostly to the eastern side. The developed area has a moderate slope and the undeveloped area has a steep slope.

2.3 GEOTECHNICAL CONDITION

A detailed Geotechnical Investigation of the site was done in November 1984 by Schwartz Tromp and Associates. An extract from the report is attached in Annexure C, indicate a summary of engineering properties of on-site materials. (Table 7.2)

3. CIVIL SERVICES

3.1 DESIGN STANDARD

All Civil Services will be designed according to the design standards as per "Guidelines for human settlements planning and design "Red Book" and Mosselbaai Municipality requirements.

3.2 ACCESS

Access to the development will be via Kammiebos Lane with a 20m road reserve.

3.3 ROADS

3.3.1 Road Type

All internal roads to be permanently surfaced with asphalt or brick paving, with kerbing.

Minimum road width is 5.0m in 13m road reserve, 5.0m in 16m road reserve and 6.0m in 20m road reserve. Roads Layout Plan is attached in Annexure D.

Typical road cross section indicating the road positions on services is attached in Annexure E.

3.3.2 Traffic Impact Assessment

A traffic impact assessment for the development forms part of a separate report that was done by a traffic engineer specialist, Tech IQ Consulting engineers.

They concluded that the existing external road network can accommodate the projected 2026 traffic demand, provided that the following road improvements should be implemented:

i. A 60m exclusive left turn lane with 60m taper on the southern approach of Louis Fourie Road at the intersection of Louis Fourie Road and Boekenhout Avenue. This left turn lane serves both Erf 3122 and the adjacent Renosterbos development.

ii. Installation of traffic signals and the provision of an exclusive right turn lane on Waboom Street at the intersection of Waboom Street, Louis Fourie Road, the R328 to Oudtshoorn and the R102 to Groot Brak. This improvement was recommended by ITS in 2018 in the TIA for the Outeniquasbosch development.

The contribution of the applicant to the provision at an exclusive left turn lane on the southern approach of Louis Fourie Road at its intersection with Boekenhout Avenue should be addressed in the Engineering Service Agreement.

The Traffic Impact Assessment is attached in Annexure F.

3.4 STORMWATER

3.4.1 Design Methodology

Stormwater system will be designed according to design standard as per “Guidelines for human settlements planning and design “Red Book”, and proposals as per this

report. It is proposed that stormwater on the developable area will be handled as follows:

- Major storm 1 in 25 years to be handled by the road system, with a maximum flow depth of 150mm.
- All roads will be designed with a cross fall or camber of 3%.
- All pipe systems to be designed for the 1 in 5 year storm, minimum size 450 with kerb inlets.
- To ensure that the out flows of the increased post development does not put the downstream development at risk and that erosion does not take place, detention structures will be constructed at all outlets. Furthermore it is proposed to implement the SUDS (Sustainable Urban Drainage System).
  In short it means to get surface run-off as quickly as possible back into the natural ground by using of well vegetated buffer strips, unlined grass channels with rock/subsoil drains (retention channels), and energy dissipaters.
- Rain harvesting systems to be implemented.

Also taking into account the key stormwater management objectives from the Baseline Assessment of wetlands prepared by Freshwater Consulting for this project. Below a summary of their objectives;

Stormwater management objectives

1 **Minimise the Threat of Flooding –** by designing a system that mimics pre-development responses to storms, reduces the volume of runoff by promoting infiltration, reducing the peak flows and time-to-peak by detention and slow release of flood runoff.

2 **Protect receiving water bodies – this should be achieved by:**

a) Preventing the deterioration of water quality,

b) Maintaining the natural flow regime and seasonality of these systems, this means low flows too;

c) Preventing erosion or sedimentation of wetlands and streams, and

d) Preservation of Natural River channels, wetlands and vegetation.

3 **Promote Multifunctional use of stormwater Management systems –** to maximise the use of resource and thereby minimise costs and the pressure on land for public land use, conservation etc.

4 **Develop sustainable Environments** – through minimising the need for intensive maintenance intervention.

3.4.2 Stormwater Catchments

Attached in Annexure G is the Stormwater Management Plan, which indicates the catchment areas and water sheds.

The biggest portion of the development is on the western side of the development, with a water shed that runs on the western side. Therefore most of the catchments will drain east towards Road A. Road A between points A and B runs with the contours. To ensure that stormwater can drain towards the Kerb inlet, it is proposed to construct Road A in a saw tooth manner with high points indicated with dots on the plan and lower points at the kerb inlet. This defines the catchment areas as indicated on the stormwater management plan.

The 5 in 1 and 1 in 25 year pre- and post-development are indicated in the table below:

Catchment	Pre-development		Post-development	
	1 in 5 years (m^3 /s)	1 in 25 years (m^3 /s)	1 in 5 years (m^3 /s)	1 in 25 years (m^3 /s)
A	0.010	0.018	0.035	0.063
B	0.019	0.035	0.066	0.120
C	0.012	0.022	0.014	0.026
D	0.006	0.012	0.018	0.032
E	0.023	0.042	0.041	0.074
F	0.021	0.038	0.026	0.047
G	0.016	0.028	0.077	0.139
H	0.006	0.011	0.030	0.059
I	0.053	0.096	0.290	0.530
J	0.021	0.038	0.074	0.135
K1	0.020	0.037	0.085	0.155
K2	0.040	0.074	0.147	0.267
L1	0.009	0.016	0.034	0.062
L2	0.011	0.020	0.054	0.099
L3	0.002	0.004	0.007	0.012
M	0.026	0.048	0.082	0.150

N	0.040	0.072	0.132	0.241
O1	0.032	0.058	0.093	0.170
O2	0.005	0.010	0.037	0.067
P1	0.013	0.024	0.084	0.153
P2	0.023	0.043	0.065	0.118
P3	0.017	0.032	0.062	0.112
P4	0.009	0.016	0.024	0.044
P5	0.007	0.012	0.019	0.035
Q	0.012	0.022	0.022	0.040
R1	0.002	0.005	0.009	0.016
R2	0.012	0.023	0.051	0.093
S	0.014	0.025	0.060	0.110
T1	0.006	0.011	0.022	0.041
T2	0.011	0.020	0.040	0.073
V	0.009	0.016	0.033	0.059
X	0.006	0.011	0.022	0.039
Y	0.010	0.019	0.038	0.069

3.4.3 Rain harvesting

Rain harvesting can be achieved by installing rainwater tank at each house/building and rainwater collection tanks at some outlets. This water can then be used for irrigation of the green areas and/or to supplement the water for the sewer system, filling of swimming pool, etc.

Typical tank that is used at houses/building to collect rainwater is uPVC tanks (Jo-Jo tanks). Example of these tanks is attached in Annexure H. Different tanks are available on the market, above ground tanks are normally chosen to tie into the architects theme of the development. The tanks can be installed above ground or underground. The collected water can be utilized for irrigation or for supplementing the water for the sewer via a pump system.

The tank that will be installed at the outlets (wing walls) of the stormwater pipe system will be the typical horizontal and will be installed underground. It is proposed that a silt trap be installed before the inlet of the tank to minimize silt flow into the tank. This harvested water can be utilized for irrigation via a pipe and pump system.

3.4.4 Stormwater Erosion Control

Stormwater erosion is one of the most challenging factors of stormwater management as it happens quickly and destructively. With the slopes in the study area being fairly steep, surface runoff on bare soil could have negative impacts on the receiving environment due to transportation of silt to the storage (attenuation close) ponds. Should erosion occur, the eroded soil may need to be replaced to reinstate the integrity of the slopes and banks. In doing so, awareness will be necessary to prevent the use of unsuitable soil in replacing the eroded soil.

It is possible to make use of sand bags/straw bales to prevent erosion during the construction phase of the development, before stabilizing vegetation is established. Following the construction phase, it is recommended that rapidly growing grasses be planted on site as this will serve to stabilize disturbed soil as well as retard sheet flow.

3.4.5 Stormwater pollution control

Sewer reticulation within the development must be designed in such a way as to obviate blockages and possible overtopping of manholes. The blockage or leakage of any sewer may pose considerable pollution threats to both surface and groundwater resources.

3.4.6 Stormwater Management Recommendation

It is recommended that the stormwater system as indicated on the stormwater management plan be constructed. Detail design must be done to determine pipe size, kerb inlet lengths and detention structure sizes. It is recommended that detention structures are constructed with Gabions and with geo-fabric. That rainwater harvesting tanks at outlets, as shown on the plan, be installed and the rainwater harvested used for irrigation of green areas. Furthermore it is recommended to install flow retention channels at green area as indicated on the plan. Buildings to be fitted with rain harvesting tanks, where practical. A Stormwater Maintenance Plan must be implemented to ensure that the stormwater system function over long term.

3.5 WATER

3.5.1 Existing Bulk Water Supply

An existing reservoir (Hartenboskop – 3.5Ml) is situated on the north side of the site. A 200 dia. pipe runs from the reservoir to the existing township. The exact position of the 200 dia. pipe is not known and must be determined on site.

A bulk service report was compiled by GLS Consulting Engineers, see attached in Annexure I. The report indicates that Hartenboskop reservoir has sufficient capacity. For the development a booster pump station must be constructed that will supply the water reticulation of the proposed development.

Furthermore, an existing new 160 dia. 200 meter long pipe is to be installed at the Hartenbos pump station – this cost will be for the developers. A 200 dia. gravity line must be installed from the Hartenboskop reservoir within the road reserve of the new development for future developments. This cost will be played off against bulk contributions.

Comments on the township layout has indicated that allowance must be made for a future reservoir in the Utility stand. Discussions with Mr. E Louw of the Municipality has indicated that allowance for a future 1200kl must be made.

3.5.2 Expected Water Usage

5The total annual daily demand is calculated as follows:

• Residential erven (350-600m²): 117 erven x 0.7kl/day =		81.9kl/day
• Residential erven (≤ 350m²): 122 x 0.6kl/day =		73.2kl/day
• Residential erven (200m²): 40 x 0.6kl/day =		24kl/day
• Residential (Terrace apartments): 54 x 0.6kl/day =		32.4kl/day
• Residential (Village apartments): 144 x 0.6kl/day =		86.4kl/day
• Care centre (apartments/rooms 45m²): 20 x 0.5kl/day =		10.0kl/day
• Care centre (rooms 28m²): 34 x 0.5kl/day =		17kl/day
	Total	324.9kl/day
	=	3.76l/s

A 15 l/s for fire is applicable.

3.5.3 Proposed Water Reticulation

The internal water network will be designed as follows:

a. All pipes will be laid in the road reserve and all erven will be provided with a metered connection.
b. Minimum residual head to be 24m.
c. Minimum residual head under peak flow plus minimum hydrant flow (15l/s) to be 7m.

d. Hydrants to be spaced at 240m maximum.

3.5.4 Proposed Water Consumption Measures

a. Low volume shower heads to be installed.
b. Storage tanks to be provided at all buildings to collect rainwater that can be used for gardening.
c. Toilets to be equipped with a double flush system.

A proposed water layout plan is attached in Annexure J.

3.6 SEWER

3.6.1 Existing Bulk Sewer Connection

A GLS report attached in Annexure I, indicates that the existing bulk sewage system has sufficient capacity to accommodate the additional sewage from the proposed development.

3.6.2 Expected Sewage Outflow

• Residential erven (350-600m²): 117 erven x 0.6kl/day =		70.2kl/day
• Residential erven (≤ 350m²): 122 x 0.5kl/day =		61kl/day
• Residential erven (200m²): 40 x 0.5kl/day =		20kl/day
• Residential (Terrace apartments): 54 x 0.5kl/day =		27kl/day
• Residential (Village apartments): 144 x 0.5kl/day =		72kl/day
• Care centre (apartments/rooms 45m²): 20 x 0.4kl/day =		8kl/day
• Care centre (rooms 28m²): 34 x 0.4kl/day =		13.6kl/day
	Total	271.8kl/day
	=	3.14l/s

3.6.3 Proposed Sewer System

The internal sewer reticulation will consist of 160mm dia. uPVC class 400 gravity pipes with 110mm house connection. Due to the topography of the site some areas will drain to pump stations that will pump back to the gravity system that will drain to the existing system in Geelhoud Lane. All pump stations and rising mains will be designed according to the ‘Red Book”:

i) Rising Mains

Velocities:
The minimum velocity of flow in a rising main should be 0.7 m/s.
The maximum velocity of flow in a rising main should be 2.5 m/s.

Minimum Diameter:
The minimum diameter of a rising main should be 100mm, except where a macerator system is used, in which case the diameter can be reduced to 75mm.

Gradient:
Wherever practicable, rising mains should be graded so as to avoid use of air and scour valves.

Stilling Chambers:
Stilling chambers should be provided at the heads of all rising mains, and should be so designed that the liquid level always remains above the soffit level of the rising main where it enters the chamber. Stilling chambers should preferably be ventilated.

ii) Sumps for Pump Stations

Emergency Storage:
A minimum emergency storage capacity representing a capacity equivalent to four hours flow at the average flow rate should be provided, over and above the capacity available in the sump at normal top-water level (i.e. the level at which the duty pump cuts in). This provision applies only to pump stations serving not more than 250 dwelling units. All pump stations will serve less than 250 dwelling units.

Sizing:
In all pump stations, sumps should be sized and pump operating controls placed so as to restrict pump starts to a maximum of six per hour.

Flooding:
Care should be taken in the design of pump stations in order to avoid flooding of the dry well and/or electrical installations by Stormwater or infiltration.

Screens:
Adequate protection, where necessary, in the form of screens or metal baskets, should be provided at the inlets of the pump stations for the protection of the pumping equipment.

iii) Pumps

Standby:
All pump stations should be provided with at least one standby pump of a capacity at least equal to the capacity of the largest duty pump. The standby pump should come into operation automatically if a duty pump or its driving motor fails due to mechanical failure.
The development must have a mobile generator, able to power the biggest pump.

iv) Safety Precautions

Safety precautions in accordance with the relevant legislation should be incorporated into the design of all pump stations and, in particular:

- All sumps and dry wells should be adequately ventilated;

- Handrails should be provided to all landings and staircases and to the sides of open sumps and dry wells;
- Skid-proof surfaces should be provided to all floors and steps; and
- The layout of the pumps, pipework and equipment should allow easy access to individual items of equipment without obstruction by pipework.

A proposed Sewer Layout plan is attached in Annexure K.

4. WASTE DISPOSAL

Allowance was made for a central waste disposal area at the entrance gate, from where the municipality will collect the solid waste.

5. SERVITUDES

Most new and existing services will be located within the road reserves on public open spaces – where services crosses stands – servitudes must be registered. A 2m Servitude must be registered over the 200dia gravity water pipe line.

6. COST ESTIMATE AND BULK CONTRIBUTIONS

The table below indicates cost estimate including bulk contributions as calculated by Mosselbay DC Calculator – with tariffs 2020/2021 (excluding VAT).

Description of Service	Total Cost	
Internal services		
Construction cost internal services	R	60,951,592.75
Construction cost fire / construction road	R	4,544,362.06
Security fence	R	1,683,937.68
Stormwater rain harvesting tanks	R	459,998.00
Sub Total	R	67,639,890.49
Bulk/ external upgrades		
Upgrade of Louis Fourie and Boekenhout intersection	R	478,400.00
Upgrade of Louis Fourie and Waboom intersection including traffic signals	R	1,289,500.00
Upgrade 200m 160dia supply pipeline at pump station	R	177,726.50
Install 200 dia water pipeline for future developments	R	3,049,786.74
Sub Total	R	4,995,413.24
Sub Total	R	72,635,303.73
P & G	R	9,079,412.97
Sub Total	R	81,714,716.70
Contingencies 5%	R	4,085,735.83
Total Estimate Construction cost	R	85,800,452.53
Bulk Contributions		
Water	R	6,351,744.00
Sewer	R	6,317,106.84
Roads	R	1,527,807.54
Storm water	R	201,627.27
Solid waste	R	1,356,574.50
Total Bulk Contributions	R	15,754,860.15
Less Bulk Upgrades		
Upgrade of Louis Fourie and Boekenhout intersection	R	478,400.00
Upgrade of Louis Fourie and Waboom intersection including traffic signals	R	1,289,500.00
Install 200 dia water pipeline for future developments	R	3,049,786.74
Sub Total	R	-4,817,686.74
Total Bulk Construction cost	R	10,937,173.41
TOTAL ESTIMATE PROJECT COST (VAT EXCLUDED)	R	96,737,625.94

Final contribution to be as per Service Agreement and final construction amounts.

7. CONCLUSION

It is therefore recommended that the proposed township be approved, as existing services are available and will have the capacity if upgrades are implemented as proposed in this report.

The design of the services for the Township will be done to standard as indicated in this report. The construction drawings for the project will be presented to the Council for approval, on completion of the designs. We trust therefore that you will give this Services Report your urgent and favourable attention.

For more information please contact Louis Roets at 083 283 7540.

J. L. Roets Pr. Tech (Eng)

ANNEXURE A

LOCALITY PLAN

ANNEXURE B

SITE LAYOUT PLAN

ANNEXURE C

GEOTECHNICAL REPORT

ANNEXURE D

ROADS LAYOUT PLAN

ANNEXURE E

TYPICAL ROAD CROSS SECTION

ANNEXURE F

TRAFFIC IMPACT ASSESSMENT

ANNEXURE G

STORMWATER MANAGEMENT PLAN

ANNEXURE H

RAIN HARVEST TANKS

ANNEXURE I

GLS REPORT PROPOSED

ANNEXURE J

WATER LAYOUT PLAN

ANNEXURE K

SEWER LAYOUT PLAN