

**G13 – Stellenbosch Regional Cemetery: Calcutta -Services Report**



**STELLENBOSCH MUNICIPALITY**

## **Stellenbosch Regional Cemetery: Calcutta : SERVICES REPORT**

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**STELLENBOSCH MUNICIPALITY**

**SYNOPSIS**

The purpose of this services report is to provide detail on the type of development to be provided, as well as providing a design philosophy with regards to the management of storm water and sewage from the development and provision of water and roads to the development.

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**STELLENBOSCH MUNICIPALITY**

**Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT**

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**CONTENTS**

1.	PURPOSE OF REPORT.....	1
2.	LOCATION, TOPOGRAPHY AND LAYOUT .....	1
3.	STREET LAYOUT AND DESIGN .....	2
4.	STORMWATER .....	3
5.	SEWER RETICULATION.....	4
6.	WATER RETICULATION.....	4
7.	GEOTECHNICAL.....	4
8.	TELKOM SERVICES .....	5
9.	ELECTRICITY .....	5
10.	PROPOSED SERVICES.....	6
10.1	STREETS.....	6
10.1.1	MINIMUM STANDARDS (SEE ATTACHED TABLE) .....	6
10.1.2	ROAD AND STREET NAME SIGNAGE .....	6
10.1.3	PAVEMENT LAYERS .....	6
10.1.4	VERGES .....	6
10.1.5	STREET DESIGN LAYOUT.....	7
10.2	STORMWATER AND SUBSURFACE DRAINAGE.....	7
10.2.1	PIPES.....	7
10.2.2	MANHOLES/CATCHPITS.....	8
10.2.3	RETENTION FACILITIES .....	8
10.3	FOUL SEWER .....	8
10.3.1	MINIMUM DESIGN CRITERIA .....	8
10.3.2	PIPES.....	9
10.3.3	MANHOLES .....	9
10.3.4	GENERAL .....	10
10.4	WATER .....	10



**STELLENBOSCH MUNICIPALITY**

**Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT**

---

10.4.1 MINIMUM DESIGN CRITERIA ..... 10

10.4.2 PIPES..... 10

10.4.3 VALVES ..... 10

10.4.4 FIRE HYDRANTS ..... 11

10.4.5 ERF CONNECTIONS ..... 11

10.4.6 GENERAL ..... 11

10.5 ELECTRICAL ..... 12

10.6 RESOURCE EFFICIENCY ..... 12

10.7 CABLE DUCTING ..... 13

**APPENDIX 1 - MINIMUM REQUIREMENTS FOR ROAD CROSS SECTIONS**

## STELLENBOSCH MUNICIPALITY

### Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

---

#### 1. PURPOSE OF REPORT

The purpose of this report is to summarise the status of all existing services, as well as to provide standards of the services proposed for the development of a regional cemetery for the Stellenbosch Municipality.

#### 2. LOCATION, TOPOGRAPHY AND LAYOUT

A site on the remainder of Farm Calcutta, No 29, has been identified as a regional cemetery site. The site is approximately 39 ha in size and is situated 10 km north of Stellenbosch adjacent the Stellenbosch Road, R304.

The area adjacent the site proposed for the cemetery consists mainly of vineyards. There are a number of farm dams upstream of the proposed terrain. These dams' effects the normal drainage pattern of the stream found on the western boundary of the terrain. This watercourse is therefore mainly dry and feeds into the Plankenburg River. The site itself is covered by alien plant species and a phase 2 geotechnical investigation of Calcutta indicates that the soils seem firm and areas earmarked for graves can be easily excavated. Initial indications are that the material found on site consists of clay and loam. In the northern areas of the terrain, sand can be found to a depth of 700mm, with underlying calcrete on top of clay and sandstone in excess of 2,0m. The material found on site has low permeability and hence will prevent the movement of underground water.

The yield of groundwater will be low as the site is underlain by shale, but this will have to be verified. Testing of water from boreholes adjacent the terrain proposed for development, indicates poor water quality, which could influence the usage of the water from a borehole. It would however be possible to construct a dam on site or downstream of the site from surface runoff.

The existing topography for the site of Calcutta is predominantly in a westerly direction with even slopes towards the R304 Stellenbosch Road. The fall from north to south is minimal towards the Plankenburg River.

A Land-surveyor had been appointed by Stellenbosch Municipality to do a topographical survey of the site to confirm drainage patterns on site. Topographical surveys will be utilized to design possible earthworks for the development, as well as provision of civil engineering services.

The town planners have produced a draft layout plan for the development which consists of different zones catering for a memorial park centre, chapel, offices workshops, different types of graves and informal zones. This preliminary layout plan is being used to propose the necessary services to be provided.

## STELLENBOSCH MUNICIPALITY

### Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

---

### 3. STREET LAYOUT AND DESIGN

Preliminary investigations indicate that the site is mainly overlain by sands, clay and loam material on a layer of shale. Clay material on site could be as a result of the construction of the R304 Stellenbosch Road. Geotechnical investigations have been performed to verify underground conditions and will be used to determine the foundations for roads and buildings proposed. Imported material will be required to provide proper pavement structures to accommodate traffic loading and meet the minimum design standards of Stellenbosch Municipality.

In order to meet minimum drainage requirements and to provide areas for buildings, burial zones and gathering spaces, bulk engineered earthworks will be unavoidable, however it is foreseen at this stage that the current slopes towards the west and south will be maintained in order to minimize on the amount of earthworks to be performed.

The street layout proposed for the facility will consist of an intersection with the R304 Stellenbosch Road, as indicated on the layout plan in the annexures, with an access road towards the entrance of the cemetery facility. Proper access control to the cemetery is however essential and will be a requirement from the Department of Transport. The positioning of the intersection will be crucial, in order to perform turning manoeuvres into and from the terrain safely. The current speed on the R304 is 100km/h with required shoulder sight distances of 220m. It is envisaged that the intersection be provided at km 50.58 km as provided in the Arterial Management Plan(AMP) for Main Road 174( R304) document. In this position the R304 is situated within a 50 m road reserve and consist of a single lane per direction. The road width is 3, 7 m with a 2, 0 m shoulder in each direction.

The AMP for Main Road 174( R304) proposes the road to be duelled due to the traffic encountered on this road. This report furthermore proposes that existing intersections be consolidated in order to provide the necessary spacing of intersections. Future planning by the department of Transport will play a significant role in the planning strategy for access onto R304. Alternatives for the intersection required would include a roundabout with consolidation of access to residence in the vicinity of the cemetery location, as well as a normal at grade intersection with the necessary turning and acceleration lanes from and to the proposed facility. A Traffic Engineer has been appointed to facilitate the process of approval from the Department of Transport in order to obtain the necessary approvals.

**STELLENBOSCH MUNICIPALITY**

**Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT**

---

From the intersection, an access road will be provided to the entrance of the cemetery, leading to the entrance and parking area for visitors. The detail of road to be provided later in this report. A culvert structure to be provided where the proposed road crosses the stream.

Internal roads will be provided which will provide access to the memorial park, offices, workshops and offices. A combination of paved areas is proposed for esthetical purposes. The necessity of paved parking areas will be investigated in order to accommodate the turning movements of busses in the parking area. The main access road can be provided with a tarred surface with barrier kerbs and a channel alongside for transportation of the storm water to the irrigation reservoir.

#### **4. STORMWATER**

An existing stream transverses the proposed terrain for development from north to south on the western boundary. This stream feeds into the Plankenburg River which connects to the Eerste River. Only in the rainy season this stream will transport storm water, as existing dams on adjacent farms cut off the flow to the stream. Allowance will however be made to protect the stream and the 32 m ecological zone will be maintained.

It is envisaged that as part of the facility, the wetland will be rehabilitated, with the creation of areas where parklands are created forming a green zone within the vicinity of the stream.

The overall philosophy that will be followed for the development is to transport storm water from hardened surfaces (roofs of buildings and roads) to a storm water retention facility where storm water can be polished and used for irrigation of trees, vineyards and the like. Storm water from outside the terrain for the development, will be incorporated into the storm water reticulation system leading to the attenuation facility. The option of providing permeable paving will be investigated in order to transport storm water from the development. It is envisaged that any overflow from the attenuation facility could be taken to the stream on the western boundary. This is however very unlikely, as an additional borehole is planned to provide water for the development. The provision of a cut off trench facility on the north and eastern boundaries will be investigated during the design phase.

Surface storm water from the areas earmarked for graves and informal areas will be taken via swales or rock lines channels to the storm water reticulation system in order to feed into the attenuation facility.

Subsurface drainage will have to be provided to minimise the potential negative effects of a possible high-water table in winter months. Soil tests and profiling of the terrain has been performed to establish the exact



## STELLENBOSCH MUNICIPALITY

### Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

---

condition of the in-situ material and water table. The design of pavement structures and other amenities will take cognizance of the prevailing geotechnical conditions.

#### 5. SEWER RETICULATION

There is currently no existing sewer network services on the terrain or any municipal reticulation system close to the proposed site for development. It is therefore proposed that a package plant be constructed on site which can treat the effluent from the offices/toilets. It is furthermore proposed that the sewer treatment occurs upstream of the irrigation reservoir which can then contribute to the capacity to irrigate the green areas. We do not foresee that the treated effluent will contribute a lot to the source of irrigation water.

A reticulation underground system will be provided, leading from wet areas to the treatment plant, via sewer pipes and manholes. It is foreseen that a network of 160 mm piping will be adequate with smaller 110mm individual connections to different buildings.

#### 6. WATER RETICULATION

Due to the fact that no water network is available on site and that no potable water from the municipality is available, it is proposed that a borehole(s) be provided to provide water to the development. Investigations will however be required to determine the position(s) of the borehole(s). Initial investigations indicated poor quality of water and the yield of 1 l/s could necessitate more than one borehole. During the investigation phase of the project, the detail of water provision will be finalized on.

From the boreholes, water will be pumped to the offices and toilets via an underground pipe system.

It is foreseen that a network of  $\varnothing$  110 /  $\varnothing$  160 mm main feed lines will be provided for the development. Analysis during the design stage, will however verify the required sizes of the water lines.

#### 7. GEOTECHNICAL

A comprehensive geotechnical site investigation has been carried out, with the objectives of fully determining site geotechnical conditions and facilitating the choice and design of foundations and surface beds for the planned structures. The findings of the geotechnical report will be used to determine the founding detail of the buildings and roads, as well as excavation detail for engineering services and backfill of trenches.

## STELLENBOSCH MUNICIPALITY

### Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

---

#### 8. TELKOM SERVICES

Telkom and other service providers will be approached with a layout of the development and will have the opportunity to provide a distribution system within the development. The necessary sleeves will be provided at street crossings.

#### 9. ELECTRICITY

The electricity supply authority for the development is Eskom. The required bulk electrical infrastructure strengthening/upgrades will be investigated and infrastructure will be proposed.

It is however envisaged that the provision of electricity from a solar system will be favoured. Provision of electricity by means of solar compared to the normal installation and maintenance costs of electricity from Eskom will be done. During the design phase, both options will be investigated and the most cost effective solution will be followed, taking into account safety and maintenance of the system.

## STELLENBOSCH MUNICIPALITY

### Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

---

## 10. PROPOSED SERVICES

### 10.1 STREETS

#### 10.1.1 Minimum Standards

- Minimum longitudinal gradient: 0,5%.
- Cross-fall on streets must be 2,5 %.

#### 10.1.2 Road And Street Name Signage

- All approved street name signs shall be cast in kerb type with white lettering on “Kingfisher blue” PVA background.
- All lettering to be 75 mm high, white on blue reflective background.
- All road markings must be repainted just before the end of the Defects Liability Period.

#### 10.1.3 Pavement Layers

- Bituminous surface treatments in the form of Chip and Spray, slurry, Cape Seals or sand asphalt are not acceptable.
- Pavement layers shall be as per the attached table.
- Asphalt surfacing must be laid with a paver. Asphalt only to be considered for the main access road
- 80 mm Interlocking paving will be provided in the parking areas, as well as all load bearing areas.
- 60 mm paving will be provided for pedestrian areas/walkways.

#### 10.1.4 Verges

The area adjacent the main access road shall be provided with a 75 mm thick gravel material (both sides of the road).

The remainder of the verge will be trimmed and shaped with the possibility of trees.

## STELLENBOSCH MUNICIPALITY

### Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

---

#### 10.1.5 Street Design Layout

The street layout will consist of the main access road with a parking area that leads to the gateways and pedestrian entrance. The main access route for the development will connect onto Main Road 174( R304).The intersection detail of providing a circle on Main Road 174 or a normal at grade intersection , is still to be finalized.

In the case of a normal intersection, the intersection will be designed in order to provide slip lanes and acceleration lanes, in order to provide safe in and out movement to and from the facility. Minimum stacking requirement will be followed as prescribed by the Department of Transport

#### 10.2 STORMWATER AND SUBSURFACE DRAINAGE

##### 10.2.1 Pipes

- Minimum pipe size to be OD 375 mm Ø.
- Pipes must be laid crown- to –crown.
- Spigot and socket pipes with rubber ring joints must be used. Interlocking joint pipes (Ogee) is not acceptable.
- Minimum gradients for pipelines must ensure self-cleansing velocity of at least 0,9 m/s and not exceed scour velocity of 3,5 m/s at full flows.
- Minimum cover to pipes to be generally 750 mm and at road intersections cover to be 1000 mm.
- Pipes to be positioned in front of the kerb due to the fact that space is limited in narrow reserve widths. The pipes must be positioned under the roadway.
- Pipes may not run “through” a catchpit. Pipes must be connected to catchpits by means of a manhole (situated in the roadway), except at the beginning of a stormwater line.
- uPVC to SABS 1601, “Corflo” or similar with smooth internal bore with holes or slots, complying with the requirements of SABS 791 shall be used in subsurface drains.
- Sausage and fin type subsoil drains are not permitted.

## STELLENBOSCH MUNICIPALITY

### Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

---

- The drainage medium to be 9.5 mm stone complying with SABS 1083.

#### 10.2.2 Manholes/Catchpits

- Manholes to be standard brick manholes with precast top slabs, with calcamite step irons placed at 300 mm c/c below manhole opening. Alternatively, precast ring type manholes may be used (minimum  $\varnothing$  1050 mm).
- Catchpits to be side inlet kerb type with precast concrete cover and slab. Full benching shall be constructed throughout the catchpit. Details as per Stellenbosch Municipality
- No junction boxes will be allowed in stormwater lines. Catchpit positions will be determined from run-off calculations and financial implications.
- Inlets may not be positioned on bellmouth radii.
- Manhole cover and frames to be SG Iron (ductile iron), tipe 2A, GJ rotating wedge lock system.
- All kerb inlets to be "stirling" type, galvanised metal hinged cover and frames, for single and double inlets.

#### 10.2.3 Retention Facilities

It is proposed that a storm water retention facility be used for attenuation of storm water.

### 10.3 FOUL SEWER

#### 10.3.1 Minimum Design Criteria

- Minimum gradient for pipelines must ensure a minimum velocity of 0,7 m/s.
- Minimum acceptable starting gradient for 100/110 mm  $\varnothing$  = 1:100 with a limiting gradient of 1:180 for 150/160 mm  $\varnothing$  pipes. Where possible, 1:80 gradients will be used at the start of all sewer lines.
- Minimum cover to pipes to be 1 000 mm.
- Minimum building connection depth to be generally 1,0 m (invert level to lowest ground level on premises) and where topography requires, 80 % of the premises must be able to drain towards the connection.

## STELLENBOSCH MUNICIPALITY

### Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

---

#### 10.3.2 Pipes

- Pipes to be positioned in the middle of one of the carriageways.
- Minimum pipe size for collecting sewers to be 150/160 mm.
- Minimum pipe size for building connection to be 100/110 mm.
- The following pipes may be used:
  - Bitumen dipped Fibre Cement – series 4 pipes with Triplex couplings
  - Class 34 heavy duty uPVC

#### 10.3.3 Manholes

- Manholes to be
  - Dolomitic precast concrete rings
  - Fibre Cement manholes (full resistance to flotation provided)
  - Brick manholes (wall must be plastered internally)
- Manhole cover and frames to be SG Iron (duct tile iron), type 2A, GJ rotating wedge lock system to EN 124 D400.
- Manholes to be constructed as per details of Stellenbosch Municipality, Water Services.
- All manholes to be provided with calcamite (or polypropylene) step irons.
- Maximum spacing between manholes to be 90 m. (according to Stellenbosch specifications).
- Maximum chimney height may not exceed 400 mm.
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## STELLENBOSCH MUNICIPALITY

### Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

---

#### 10.3.4 General

- All amenities with wet areas to be provided with water and sewer connections.
- All manholes to be water tight.
- Double connections will be allowed terminating with an endcap.. Connections to be visible and clearly marked.
- Rodding eyes to be provided with split sewer connections.

#### 10.4 WATER

##### 10.4.1 Minimum Design Criteria

- Minimum cover to pipes shall be 900 mm, with maximum 1000 mm.
- Connection for buildings to be laid to cross roadways with a minimum cover of 800 mm terminating 1,0 m inside the boundary at a depth of 400 mm.

##### 10.4.2 Pipes (Standard specifications for uPVC pipes and pressure bends and cast iron fittings and specials Stellenbosch Municipal standards shall apply)

- Minimum pipe size to be 110 mm Ø.
- uPVC Class 12 heavy duty pipes to be used.
- Pipes generally to be positioned 1,0 m off the road reserve boundary.

##### 10.4.3 Valves (Standard specification for gate valves Stellenbosch Municipal standards shall apply)

- Isolating valves should be provided to ensure that not more than 4 valves must be closed to isolate any section.
- Valves to be positioned opposite splays and where possible outside paved areas.
- Spindle top to be maximum 450 mm below beltoby cover.

## STELLENBOSCH MUNICIPALITY

### Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

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- Valves to be clearly marked and visible.

#### 10.4.4 Fire Hydrants

- Fire hydrants to be pillar type, fitted with tamper proof quick coupling type hydrant outlets, painted yellow.
- All fire hydrants shall be 65 mm diameter (internal) Fire hydrants shall be positioned such that the spacing does not exceed 180 m, and where possible care must be taken not to place them in front of driveways.
- Fire hydrants are to be anti clockwise closing – Ainsworth RSV type with London round thread” with loose cap and securing chain.
- Fire hydrants to be placed on high/low points and at pipe ends in cul-de-sac roads.
- Hydrant outlet to be between 400 and 600 mm below hydrant cover.
- Hydrant chambers to be in accordance with Drawing W2.
- Hydrant covers shall be ductile iron conforming to EN 124 and painted with yellow oil paint. Covers to be secured to the frame with a galvanised chain or cable.

#### 10.4.5 Connections to Buildings

- Building connections shall be installed according to all wet service areas of buildings
- All water connection pipes to be HDPE PE 100 PN16 pipes.
- Saddles must be ductile / cast iron, secured with stainless steel bolts and nuts, and wrapped in “Denso” tape or similar approved.
- Single connection to be minimum 20 mm nominal.
- Double connections to be minimum 22 mm nominal  $\varnothing$  splitting to 2 x 20 mm nominal diameter connection.
- All connections to be clearly marked on kerb by a cutting slot. The slot must be painted with an approved paint.

#### 10.4.6 General



## STELLENBOSCH MUNICIPALITY

### Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

---

- Valve cover and frame to be painted King blue with a 200 mm wide blue strip painted on the kerb face.
- Hydrant cover and frame to be painted yellow with a 200 mm wide yellow strip painted on the kerb face.
- Valve and hydrant chambers to be constructed as per Stellenbosch Municipal standards.

#### 10.5 ELECTRICAL

All electrical infrastructure will be designed and installed in order to provide electricity to buildings and other amenities such as pump rooms and guard houses. The terrain for the development is within the Escom Provision Area and the option of connecting to Escom power will be investigated. It is however envisaged that a solar system and/or wind turbine system be provided in order to provide electricity to the development.

During winter months sunlight might necessitate the introduction of a wind turbine to provide electricity. The cost of this installation will be compared to the rates from Escom as a supplier and installation costs. The position of the closest Escom connecting point will contribute to additional costs, if connecting electrical lines need to be established. During the design phase of the electrical distribution network, both options will be investigated.

#### 10.6 RESOURCE EFFICIENCY

The proposed development will address, inter alia, water, energy and resource demand management and efficiency measures to ensure that all devices and fittings are energy and water efficient, including, but not limited to the following:

- All toilets will have interruptible flush mechanisms, or the cistern will be supplied with a fitted weight to interrupt the flow.
- Dual flush toilet cisterns.
- All taps will include an aerator to reduce the flow of water to 6 litres / minute.
- Shower heads will have restrictor or aerators to reduce water flow to 10 litres / minute.
- Energy saving light bulbs such as CFL's and LED's will be installed instead of incandescent bulbs.
- Outdoor lighting will be restricted to a minimum.

## STELLENBOSCH MUNICIPALITY

### Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

---

- Rain water will be harvested from roofs and taken to the irrigation reservoir.
- Adequate thermal insulation will be provided in roofs.
- Provision for installation of future solar geysers will be made.

#### 10.7 CABLE DUCTING

Marking of cable ducting will be as follows:

- Communication ducts
  - 5mm thick T, cut out on kerb and painted green. Draw wire attached to a wooden marker with a 200 mm green painted top.
- Electrical ducts
  - 5mm thick V, cut out on kerb and painted red. 2,5mm galvanised steel draw wire attached to a wooden marker with a 200 mm red painted top, end sealed with polyurethane plugs or double layer of warning tape bound with wire.
- Valve
  - Beltoby to be painted blue with 5 mm wide V cut on kerb and 250 mm wide blue strip painted on kerb directly opposite valve.
- Hydrant
  - Cover to be painted yellow with standard FH marking as per SARTSM marked on road surface directly opposite hydrant.

**STELLENBOSCH MUNICIPALITY**

**Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT**

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## **Appendix 1 - Minimum Requirements for Road Cross Sections**



STELLENBOSCH MUNICIPALITY

Stellenbosch Regional Cemetery: Calcutta: SERVICES REPORT

TABLE 1: MINIMUM REQUIREMENTS FOR ROAD CROSS SECTIONS

Road class	Function	Road reserve width	Blacktop width	Camber/ crossfall	Kerb type	Pavement layers	Surfacing	Minimum bellmouth radius
4	Main access	N/A m	6,5 m	Cross fall	BK2 + C1	150 mm G4 basecourse 150 mm G5 subbase 150 mm G7 selected	40 mm premix	10 m
4	Internal Roads	N/A	5,0 m	Cross fall	BK2 + C1	150 mm C4 basecourse 150 mm G5 subbase 150 mm G7 selected	80 mm pavers	10 m