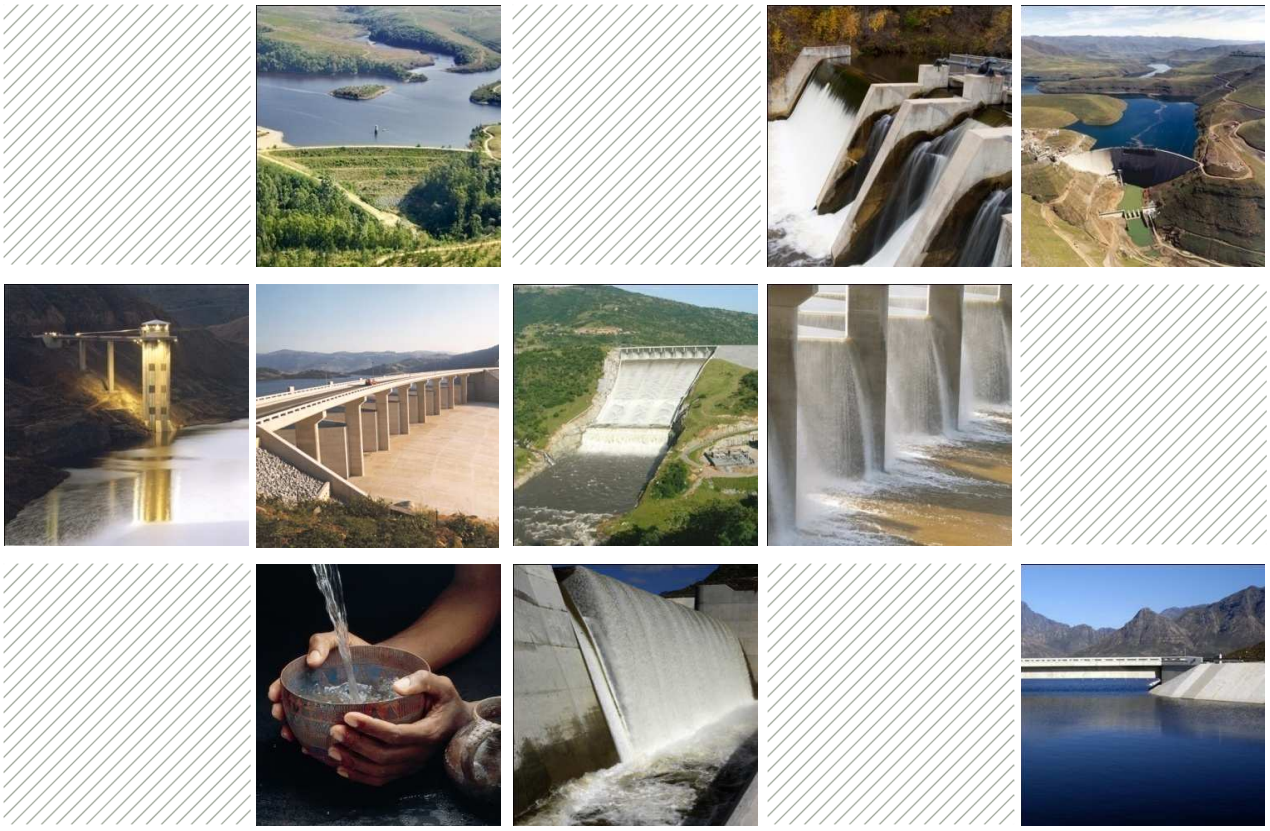

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REPORT ON CIVIL AND ELECTRICAL ENGINEERING SERVICES FOR THE PROPOSED DURBANVILLE GARDENS ASSISTED LIVING DEVELOPMENT

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TABLE OF CONTENTS

1. Introduction

The Devco Group appointed Aurecon to report on the availability of engineering services for the proposed Durbanville Gardens Assisted Living development on five residential erven 56, 4144, 4145, 15736 and 10853 situated in Durbanville, within the Northern Suburbs of Cape Town.

This report will assist to determine the availability of the existing civil and electrical engineering infrastructure as well as possible upgrades of the existing civil or electrical engineering services required for the successful development of the property. The report will advise on the necessary measures which will have to be taken to ensure that the existing infrastructure will be able to supply the demand of the new development without impacting negatively on the existing demand, as well as any requirements from the local authorities.

2. Location

Erven 56, 4144, 4145, 15736 and 10853 are situated on Vissershok Road in Durbanville, within the northern suburbs of Cape Town in the Western Cape and fall under the jurisdiction of the City of Cape Town: Kraaifontein Administration.

The site of the combined properties is 2.54 hectares and falls within the existing urban edge. It currently consists of five residential properties and borders existing residential property to the north and the south of the site, borders Vissershok Road to the west, and borders an existing wetland area to the east.

A locality map and layout plan are included in Appendix A.

3. Site Topography

The property generally slopes from west to east in the direction of the existing wetland area. The average slopes on the site range between 4.79% and 9.11% across the site towards the wetland.

The site is currently occupied by 5 single residential houses and is densely covered with vegetation and trees.

4. Hydrology and Climate

The average annual rainfall in the Durbanville area is approximately 475 mm per year, and occurs mainly in the winter months. The average monthly temperature varies between 16°C in winter and 27°C in summer.

5. Engineering Services

5.1 Roads

5.1.1 Access Roads

The City of Cape Town has confirmed that access to the site will be gained from the Willow Wood Close circle off Vissershok Road to the north of the site. No additional length of road needs to be constructed to gain access to the site from this road. It is foreseen that there will be public access to the frail care facility on the site with an access controlled entrance to the rest of the development.

5.1.2 Internal Roads

Access to the site will be gained off the Willow Wood Close circle approximately in the middle of the site's northern boundary, from where an access-controlled road will provide access to the proposed frail care facility as well as to the assisted living development's semi-detached separate title units, sectional title apartment units and the community center. It is envisaged that the existing 60-unit residential development to the south of the site, The Villas, will also gain access through the proposed development via the access-controlled road off the Willow Wood Close circle.

At this stage of the development the specific horizontal road layout and cross-sectional configuration is not yet defined but will comply with the City of Cape Town's minimum standards for roads and any further council requirements for gated developments.

5.2 Stormwater Drainage

5.2.1 Existing Stormwater

An existing stormwater drainage system, consisting mostly of 300 – 450 mm diameter concrete stormwater pipes, exists within the surrounding Durbanville neighbourhood bordering the proposed Durbanville Gardens development. This existing stormwater system drains towards and discharges into the existing drainage channel at the north-

eastern corner of the site via an existing 750 mm diameter concrete stormwater main that runs northwards along the western side of Vissershok Road to the west of the site and eastwards along the site's northern boundary.

Stormwater from the northern-most existing residential property forming part of the proposed development site currently drains directly into the existing drainage channel at the north eastern corner of the property. Stormwater runoff from the other 4 existing residential properties currently drains to the east into the Mosselbank river.

5.2.2 Internal Stormwater Drainage

To comply with the *City of Cape Town's Management of Urban Stormwater Impacts Policy* careful consideration was given to the choice of surfacing, stormwater best management practices (BMPs) and pipework proposed for the site. Due to the low pre-development peak runoff values, the following is proposed to achieve the attenuation and treatment goals of this policy:

- Maximization of landscaping and permeable paving areas
- Installation of 2 small and 2 large dry ponds with engineered layerworks (BMPs)

The site's runoff for all storms with a return interval of less than 100 years will not encroach on the water course as all 4 dry ponds are above the 1 in 100 year flood line. The permeable paving areas will be situated in the walkways, road and parking areas, and these areas will be connected to the underground piped stormwater network via a shallow subsoil drainage network separate to the basement groundwater drainage system.

In addition to the above, five bio retention basins will be situated on the eastern border of the site. This is to address the concern raised by the freshwater consultant that the construction of the basements would impede the flow of subsurface water not only from the proposed site but also from the upstream sites. It is for this reason that a separate (from the permeable paving subsoil system), deeper groundwater drainage system will be installed. Groundwater beneath the basement level will be pumped to the bioretention basins. These bioretention basins will only take groundwater from the deeper basement drainage system thus no runoff will be discharged at this eastern border. All runoff generated on site will be attenuated and treated as per the *City of Cape Town's Management of Urban Stormwater Impacts Policy*. Overflow structures will be installed in each bioretention basin so that in the major storm events (between 10 year and 50 year storm events) any runoff that reaches these ponds will be directed to the attenuation ponds via the piped stormwater system.

Overland flow will be conveyed to a subsurface concrete pipe network leading to the 2 large dry ponds to the north of the site. These ponds are connected in series, with the final pond collecting all stormwater on the site. At the inlet of this final pond, a silt & litter trap as well as an oil and grease trap will be installed. All four dry ponds will include a variable outlet structure to control the discharge of attenuated stormwater. The final dry pond will discharge through a variable outlet structure into a new stormwater outfall structure in the existing drainage channel at the north eastern corner of the site. This outfall structure will consist of a headwall as well as a gabion structure for erosion control and energy dissipation. For larger storm events the general direction for the overland flow on the site is north towards the north eastern corner of the site.

For further details on the proposed stormwater management, kindly refer to the Stormwater Strategy Report.

The proposed development's Stormwater Management Plan (SMP) and stormwater design will comply with all of the City of Cape Town's minimum stormwater requirements and guidelines. On-going liaison with the City of Cape Town during the planning and design stage of the SMP will take place to ensure that the final approval process will not be delayed.

5.3 Sewer Reticulation

5.3.1 Existing Sewer Network

An existing 150 mm diameter sewer main runs along the site's eastern boundary, flowing in a northern direction, with at least 4, possibly 5, existing 110 mm diameter erf connections into the proposed development site. The downstream portion of this main is supposed to be upgraded through a services agreement between the City of Cape Town and the neighbouring Willow Wood Estate developer, although the timing of this upgrading work is unknown.

The City of Cape Town has confirmed that this 150 mm diameter sewer main has sufficient capacity for the proposed Durbanville Gardens development even without the pending upgrades, although they experience blockages due to reduced wastewater flow as a result of the recent water crisis/drought. The City of Cape Town will therefore require that the first portion of abovementioned upgrading be installed as part of this development. The upgrading work entails a short section of pipeline (±23m between the two manhole outside egdes) to eliminate two problematic manholes. Refer to email correspondence from the City of Cape Town dated 13 August 2019 enclosed as Appendix B.

5.3.2 Internal Sewer Network

The proposed internal sewer network will consist of the necessary underground pipes and manholes to supply connection points to all the proposed erven and buildings. The internal sewer network will be a gravity drainage system which will drain towards the north eastern side of the site. The design and specifications of the proposed sewer network will be in accordance with standards provided by City of Cape Town.

It is recommended that a minimum pipe diameter of 160mm diameter heavy duty uPVC pipes be used for the main sewer collection with 110mm diameter heavy duty uPVC pipes for erf and building connections. It is proposed that, in order to prevent the new sewer connection from having to cross the "intact deep wetland" as marked in the freshwater study report, the development connect to the existing sewer manhole on the existing 150mm diameter main directly east of Cottages 2 and 3 shown on the site plan in Appendix A (outside the centre of the eastern erf boundary line of Erf 56) instead of connecting to the existing sewer manhole outside the most northern corner of the development (i.e. outside the top corner of Erf 56) as originally envisaged.

The City of Cape Town's Environmental Department has raised concerns regarding the construction a new connection within the existing wetland, and as an alternative it is proposed to split the site's sewer drainage to tie into the existing 110 mm diameter sewer erf connections. This will eliminate the need for construction within the wetland, however, will require that all sewer reticulation mains within the proposed development be 110 mm diameter heavy duty uPVC as opposed to the recommended 160 mm diameter heavy duty uPVC. Specific input and approval from the City of Cape Town's Water and Sanitation Department will be required for connection into the existing 110 mm diameter erf connections without upgrading their size as well as for a single development effectively having multiple connection points into the municipal network.

Preliminary calculations show that the 4 existing 110 mm diameter erf connections should in theory have the capacity to accommodate the sewer runoff generated by the proposed development site. The capacity of a single 110 mm diameter erf connection is calculated as 5.760 l/s, assuming a 1:60 standard minimum erf connection slope and calculated at 70% partially full pipe flow. This equates to a maximum flow capacity of 23.04 l/s across all 4 existing erf connections. Assuming a 1:90 slope for each 110 mm diameter erf connection, the maximum flow capacity across all 4 existing erf connections equates to 18.812 l/s.

Table 1: Water Demand vs Sewer Generation vs Existing Sewer Connections Outlet Capacity

	Water Demand	Sewer Generation	Sewer Outlet Capacity (1:60 slope)	Sewer Outlet Capacity (1:90 slope)
Annual Average Daily Demand (as calculated in Section 5.4.3 below)	342,700 l/day = 3.966 l/s	2.777 l/s	4 x 5.760 l/s	4 x 4.703 l/s
Peak Week Factor	x 1.8 = 7.140 l/s	4.998 l/s	=	=
Peak Daily Factor	x 2.2 = 8.726 l/s	6.108 l/s	23.04 l/s	18.812 l/s
Peak Hourly Factor	x 4.6 = 18.246 l/s	12.772 l/s		

The sewer generation figures presented in Table 1 above are calculated in accordance with the City of Cape Town estimation of 70% of the average water demand figures. The water demand figures are calculated in accordance with the Guidelines for Human Settlement Planning and Design as detailed in Section 5.4.3 below.

The City of Cape Town's Water and Sanitation Department has subsequently indicated in their email dated 13 August 2019 (Refer to Appendix B) that they are not in support of this alternative.

5.4 Water Reticulation

5.4.1 Existing Water Network

An existing water network services the surrounding Durbanville neighbourhood which borders the proposed Durbanville Gardens development site and includes a 250 mm diameter water main running along Vissershok Road to the west of the site, from which a 160 mm diameter connection is already brought to the site boundary at the Willow Wood Close circle to the north of the site. The City of Cape Town confirmed that sufficient capacity exists within the existing system to supply the development. The correspondence from the City of Cape Town is attached to this report in Appendix B. The working pressure within the existing water mains will have to be confirmed by the City of Cape Town.

5.4.2 Internal Water Reticulation

It is proposed that a single internal water reticulation network be installed to supply both potable and fire water to the development. The proposed water network will consist of 110 mm diameter uPVC pipes supplying erf connection points to the semi-detached residential erven, and bulk water connection points and fire water booster

points to the apartment units, the frail care facility and community centre. These connection points will be determined during the detail design stage. The necessary provision will be made for isolating valves as well as for water metering and fire hydrants within the development as required.

Confirmation has been requested from the City of Cape Town whether they require a separate fire water reticulation network inside the development. No confirmation has been received to date. However, should this be the case, the fire hydrants and booster connections points will be removed from the proposed water network as described above and an additional fire water reticulation network will be designed for the site. The proposed internal fire water reticulation network will consist of 110 mm or 160 mm diameter uPVC pipes supplying booster connection points to the apartment units, the frail care facility and community centre. These connection points will be determined during the detail design stage. The necessary provision for fire hydrants across the site will then also be made off the proposed fire water reticulation network.

Connection of the internal systems will be made onto the existing water network at the existing 160 mm diameter connection point provided at the Willow Wood Close circle at the north of the site. A 150 mm diameter bulk water meter will be installed at this connection point in accordance with the City of Cape Town standards and requirements. Internal water meters will also be installed to each subdivision and/or phase within the development to be read and managed by the body corporate of the development.

The design and specifications of the proposed water reticulation systems will be in accordance with the standards provided by City of Cape Town.

5.4.3 Water Demand

The average daily water demand for the proposed development is calculated below in accordance with the Guidelines for Human Settlement Planning and Design (Red Book).

The proposed development includes 4 semi-detached cottages, 331 sectional title apartments, a clubhouse, an artificial lawn bowling green and a frail care centre. The following assumptions and classifications are made:

- The proposed development is a high-income development, therefore the calculations are based on the upper limits of water demand estimations.

- The semi-detached cottages are classified as dwelling houses – Red Book Table 9.14 Category 1.
- The sectional title apartments are classified as low-rise multiple dwelling unit buildings – Red Book Table 9.14 Category 2.
- The clubhouse is classified as offices and shops – Red Book Table 9.14 Category 4.
- The clubhouse has a gross floor area of 450 m^2 based on architect's notes on latest site plan.
- The green open area will either be constructed from artificial lawn or will not be irrigated with potable water and will therefore have no water demand.
- The frail care building is classified a clinic – Red Book Table 9.14 Category 6.
- The frail care building has a gross floor area of 1020 m^2 based on architect's notes on latest site plan.

Table 2: Annual Average Daily Water Demand as per Red Book Table 9.14

Type	Cate-gory	Unit	Average Water Demand	No of Units	Total Average Water Demand
Semi-detached Cottages	1	Erf area for dwelling house	1200 l/day (erf area up to 600 m^2)	4	4,800 l/day
Sectional Title Apartments	2	Dwelling	1000 l/day	331	331,000 l/day
Clubhouse	4	100 m^2 of gross floor area	400 l/day	4.5 (450 m^2 / 100 m^2)	1,800 l/day
Frail Care	6	100 m^2 of gross floor area	500 l/day	10.2 (1,020 m^2 / 100 m^2)	5,100 l/day
TOTAL ANNUAL AVERAGE DAILY WATER DEMAND:					**342,700 l/day**

Using a peak week factor of 1.8 for residential areas for which the annual average daily demand is smaller than 1,000 kl/day, the average daily peak week flow for the proposed development is 616,860 l/day.

5.5 Electrical Reticulation

5.5.1 Existing Electrical Network

An existing Miniature Substation has been identified on the sidewalk in front of the new proposed development. This miniature substation does not have sufficient electrical

capacity for the anticipated load of the new development. It is therefore foreseen that the proposed development will tie into the existing medium voltage cable installed on the sidewalk of Vissershok Road to the west of the property.

A formal request to confirm electrical capacity was submitted to the City of Cape Town however the confirmation is still outstanding.

5.5.2 Internal Electrical Reticulation

It is proposed that the tie-in to the existing medium voltage cable be by means of installing a (3-way) ring main unit inclusive of a bulk metering unit on the edge of the development. This will provide the network service provider with 24 hour access to the point of connection

Two additional miniature substations, strategically positioned at the load centres of the proposed development, are to be installed within the development.

An underground cable network is proposed for the low voltage distribution network suppling the units via 9-way and/or 12-way stubby kiosks. The miniature substations shall be ordered with an internal streetlight control circuitry capable of supplying the internal area- / street lighting.

Table 3: Proposed technology to use on the electrical networks for the Development

Description	Requirements
Medium Voltage Conductors	3C Cables installed on the sidewalks by means of direct burial
Reticulation Transformers	Typical 500kVA and/or 630kVA Miniature Substations, installed on the sidewalks and/or public open spaces
Low Voltage Conductors	4C Cables installed on the sidewalks by means of direct burial
Service connection distribution boxes	6-way, 9-way & 12-way stubby kiosks, installed on the sidewalks and/or public open spaces
Service Connection Conductors	2C & 4C Cables installed on the sidewalks by means of direct burial
Metering	City of Cape Town Prepaid Meters
Streetlights	Streetlight cable feeders with a dedicated streetlight control cubicle inside the miniature substations

5.6 Telecommunications

5.6.1 External Telecommunication

No formal confirmation of the existing telecommunications network within the existing Durbanville neighbourhood was available at the stage of this report. There is an existing telecommunications network in the area and it is assume that the existing system can be connected into. Detailed information of the neighbourhood's telecommunications network will be requested as required.

5.6.2 Internal Telecommunications

The internal telecommunication reticulation system will consist of a 110 mm diameter sleeve network system with accessible junction box manholes placed as required. During the detail design stage the required amount of sleeves as well as the connection point positions will be determined. Services providers like Telkom, Neotel and DFA can all be given the opportunity to supply their services within the development if required, and the cost of supplying sleeves for their services can be negotiated.

Cellular phone coverage of all major cellular network suppliers is available in the area and no problems are foreseen with cellular phone reception within the proposed development.

5.7 Solid Waste

The City of Cape Town's policy states that if the roads of the development are privatised, they will supply services up to the boundary of the property, and a refuse room may be required by the council. The residents will have to deliver their refuse to the refuse area themselves. The policy also states that preceding the approval of the development, a detailed servicing arrangement must be concluded. Therefore the removal of refuse can be arranged to be collected from individual properties if access of refuse trucks can be arranged without any restriction. The removal of solid waste must therefore be stipulated within the development agreement with the City of Cape Town prior to the development taking place.

5.8 Conclusion

From the information gathered it is evident that all the necessary civil and electrical engineering services for the proposed Durbanville Gardens are available. Confirmation has been received from the sewer and water departments of the City of Cape Town

that the required capacities within the systems do exist to accept the demands from the proposed development.

Once the final designs for all the engineering services have been completed, including sewer, water, stormwater, electrical and roads, final approvals will have to be received. On-going liaison with the City of Cape Town during the planning stage of the development will take place to ensure that the final approval process will not be delayed.

APPENDIX A

LOCALITY MAP AND SITE PLAN

APPENDIX B

CITY OF CAPE TOWN CORRESPONDENCE