

Portion 191/915 Tweefontein

Engineering Services for Polokwane Municipality

Water & Sanitation, Roads & Stormwater

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1 GENERAL INFORMATION

1.1 Locality of proposed development

Portion 191 is situated south the R81 some 1.4 Km from the Mall of The North intersection and bordering Bendor X103 on the South-Eastern corner.

Refer to the Locality Plan in Annexure A

1.2 Proposed development

Development Development of a student accommodation, educational facilities and associated services.

Zoning and property size

Table 1: Zoning and property size

Plot Number	Site Area		Use	FAR	No. of Beds / Bulk m ²
Special	31 360	m ²	Student Tenements	0.24	2000
Educational	9 370	m ²	Place of Instruction	0.31	2 905m ²
Special	33 756	m ²	Place of Instruction Student Tenements	0.88	1100 1 612m ²
Special	21 763	m ²	Student Tenements	1.07	1600
Educational	9 924	m ²	Place of Instruction	0.31	3 076m ²
Special	20 297	m ²	Internal Streets	0.05	1 015m ²
Park	73 511	m ²	Recreational		
TOTAL	199 981	m ²			4 700 Beds 8 608m²

Terrain Mixed Bushveld of the Savanna Biome, typically occurring on coarse, sandy and shallow soils developed on granite, quartzite, sandstone or shale.

The natural vegetation within the study area has been denuded to a degree, due to urban development in the immediate vicinity.

Western sloping of 4.0%

Site geology Full Geotechnical report is available on request.

The natural soil underlying the study area exhibits adverse geotechnical characteristics that may require the implementation of specific design and/or precautionary measures to reduce the risk of structural damage. However, these characteristics do not disqualify the site from being used for the proposed development, but rather require the implementation of site-specific precautionary measures during the design and construction phases of the development.

The eastern portion of the study area (Zone A) is deemed suitable for residential development, provided due cognisance is given to the strict implementation of precautionary measures to prevent structural damage due to the occurrence of a significant thickness of potentially compressible and/or collapsible soil, as well as highly localized pockets of potentially expansive soil. This zone exhibits a risk of excavatability problems due to the presence of weathered bedrock and/or dense/stiff material occurring at relatively shallow depth. This area may also exhibit

a degree of groundwater seepage at relatively shallow depth mainly after heavy precipitation events.

The western portion of the study area (Zone B) is deemed suitable for residential development, provided due cognisance is given to the strict implementation of precautionary measures to prevent structural damage due to the occurrence of a significant thickness of potentially compressible and/or collapsible soil, as well as highly localized pockets of potentially expansive.

This zone exhibits a risk of excavatability problems due to the presence of weathered bedrock and/or dense/stiff material occurring at relatively shallow depth. This area may also exhibit groundwater seepage at relatively shallow depth mainly after heavy precipitation events, while prolonged saturation of the sub-surface material may occur nearer the non-perennial stream in the west.

2 WATER SUPPLY

2.1 Description

The proposed development will be supplied from the municipal network from the Krugersburg reservoirs. A new 470 m long 200/250 mm Dia. needs to be constructed to the existing 200mm connection point on the northern corner of the existing school. See attached Bulk Water Master Plan.

The static pressure on the highest point of the development is 35m. Any multi-storey buildings will require on-site storage and pressure pumps for the domestic as well as fire water supply. The daily peak requirements will then also be addressed and will not be required from the bulk reticulation system.

- Water network

Available adequate pressure	New pressure pumps to be installed
Available adequate flow requirements	New 200mm Dia.
Storage	Site specific
Size of connection to development	200 mm diameter
Network layout	Ring network for summer peak supply

- Design standards

Designed to standards of (Domestic)	Polokwane Local Municipality (Red Book)
Main network pipes	110 Ø to 200 Ø uPVC Class 12 pressure pipes
Position of water network	Road reserves
Valve positions	Road reserves
Cover of pipes	1.0 m minimum cover
Design flow	Summer peak flow requirements
Fitting, hydrants, valves, etc. to conform to:	Polokwane Local Municipality (Red Book)

2.2 Water supply and reticulation design

- Domestic usage

	Zone / Reservation	No. of Units/ Cap/Area/Beds	Calculation	Demand (kl/day)
Special	Student Tenements	2000	150l/bed/day	300.0
Educational	Place of Instruction	2 905m ²	400 l/100m ²	11.6
Special	Place of Instruction	1100	150l/bed/day	165.0
	Student Tenements	1 612m ²	400 l/100m ²	6.5
Special	Student Tenements	1600	400 l/100m ²	240.0
Educational	Place of Instruction	3 076m ²	400 l/100m ²	12.3
Special	Internal Streets	1 015m ²	400 l/100m ²	4.10
Park	Recreational			
	TOTAL			739.5

Table 2: Domestic usage

Average flow Full Development	8.56 l/s
Summer peak (spf = 1.5) Full Development	12.84 l/s
Peak hourly flow (Pf = 3) Full Development	38.52 l/s – On site
Storage required (Summer peak for 36 Hrs)	Stand specific
Main supply pipe	200 mm Ø

- Fire requirements

Allowance for each individual development will be:

- pipes in internal network new 110 & 160mm Ø
- hydrants on potable supply 65 mm Ø
- Hydrant fire flow 20 l/s
- Fire storage 2 hrs
- Minimum pressure at hydrants (pressure pumps) 30 m
-

3 SEWER NETWORK

3.1 Description

The development connects to the existing municipal system that drains to the sewer pump station to the north of the railway line. As per the sewer master plan of the area, Portion 109 will be connected to the existing manhole 8/1 in the western corner of Portion 184/915. See attached Bulk Sewer Master Plan.

The pump station to the north of the railway line is only constructed to 50% of its design capacity and will in future have to be upgraded.

Network connection - 100% of sewerage will gravitate to the western corner of the development.

Slope of site: 4.0% slope to the west

3.2 Network design

	Zone / Reservation	No. of Units/ Cap/Area/Beds	Calculation	Demand (kl/day)
Special	Student Tenements	2000	120l/bed/day	240.0
Educational	Place of Instruction	2 905m ²	320 l/100m ²	9.30
Special	Place of Instruction	1100	120l/bed/day	132.0
	Student Tenements	1 612m ²	320 l/100m ²	5.20
Special	Student Tenements	1600	320 l/100m ²	192.0
Educational	Place of Instruction	3 076m ²	320 l/100m ²	9.84
Special	Internal Streets	1 015m ²	320 l/100m ²	3.25
Park	Recreational			
	TOTAL			591.59

- Expected sewage outflow

Average flow Full Development	6.85 l/s
Peak hourly flow (Pf = 2,9) Full Development	19.75 l/s
Sewer pipes sized for domestic connections	110 mm Ø
Main network	200, 160, mm Ø

3.3 Design standards

- Sewer pipes will be 200 & 160 mm diameter uPVC Solid wall Supradur Class 34 pipes
- All sewer pipes will be laid on the appropriate bedding.
- All sewers under roads will have a minimum cover of 1,2m.
- House connections will be 110mm diameter for residences, same pipes as above
- All installation work to be done in accordance with Municipal (Red Book) requirements.

3.4 Sewage disposal

- The sewerage will drain to the western corner of the development and connected to the municipal reticulation.

4 ROADS

4.1 Access to the Development

- Access to the development will be from the R81.

4.2 Traffic Impact Assessment

- A study will be done to establish any additional intersection requirements.

4.3 Design standard

- Internal roads:

DESCRIPTION	CLASS	ROAD RESERVE	ROAD WIDTH
Entrance	4b	25m	2 x 7.4m
Access Collector	5a	20m	7.4m
Access Loop (major)	5b	16m	6.0m or 7,4m
Access Loop (minor)	5b	10m	5.5m

Table 3 : Internal roads

The proposed pavement design will be:

Internal 25 mm asphalt and 125 mm base

Entrance, external 30mm asphalt and 150 mm base (G1 crushed stone base course)

Subbase: 150 mm thick, stabilised C4 material
to 95% mod AASHTO, min UCS of 800

Sub grade(s): 150 mm thick, G7 material to 93% mod
AASHTO density, min CBR of 15

Roadbed: 150 mm thick, G9 material to 93% mod
AASHTO density, min CBR of 7 (in-situ)

5 STORMWATER

5.1 Description

- The site is not affected by the 1:50 or 1: 100-year flood line.

Hydrological data and run-off

A storm water model of the catchment area will be set up using Civil Designer software simulating various flows.

- Stormwater connection points**

The site slopes from the eastern corner to the western corner with an even slope of 4%.

The site can be drained to the western corner and the run-off discharged either along the boundary of Bendor X103 in concrete pipes discharging into a concrete channel along the R81 or into the existing natural drainage on Bendor X108.

Design standards

Pipe system	1:3 year flood
Pipe and road system	1:5 year flood
Pipe type	spigot & socket precast concrete
Design method	rational method

Pipe size	minimum 485 mm Ø
Minimum grade	0,67 %
Design standards to conform to:	Polokwane Local Municipality (Red Book)

Stormwater flood line

The 1:100 year flood line is not applicable to this development.

Detail design

The finalised detail design including hydrology design and longitudinal sections will be submitted to Polokwane Local Municipality, Roads & Stormwater Division for their approval.

5.2 Network Design

- **Hydrological data and stormwater run-off**

A stormwater model of the catchment area will be set up using Civil Designer software. Storms of various durations are simulated to obtain the maximum flood at various positions.

The following constants are used:

Rainfall Hyetograph	Triangular with a time to peak ratio of 0,35
Mean Annual Precipitation	485 mm

- **Network design**

The proposed stormwater system will allow for the 1:5 year flood to be disposed of in a pipe and street system.

All areas larger than 0.85 ha will have on site attenuation.

All work will be constructed to the requirements of the Polokwane Local Municipality.

5.3 Storm Water Management

- **Construction Phase**

The key elements to prevent sediment to reach the river system during construction are:

- Erosion prevention is the first line of defence in preventing off-site sedimentation.
- Minimize the area that will be disturbed.
- Sequence the land disturbing activities.
- Sediment must be retained on site.
- Disturbed areas must be permanently stabilised after construction.

Once construction is complete, the disturbed areas will be paved streets and buildings with gardens, which will eliminate sediment run-off.

6 ELECTRICAL

6.1 Description

- The development will be supplied by Polokwane Local Municipality with an estimated final link service requirement of 2 MVA.
- The electrical infrastructure will consist of an underground system utilising MV and LV cabling to distribute to the various consumers.
- Miniature substations will be utilised to obtain the 400V 3-Phase supplies from the 11kV feeding system.
- The township will be developed in five phases as indicated on the Phasing Layout drawing, comprising of 89, 129, 114, 115 and 90 stands respectively.

6.2 Network Design

- The network will consist of an MV cable supply system from a switching or existing 11kV ring with spare capacity in close proximity to the development. An MV ring will be created feeding various miniature substations strategically placed within the development. LV feeders originating from the various miniature substations will supply distribution/metering kiosks from where service cables will be connected to the various households.
- MV cable will utilise 11kV PILC cable whilst LV cable will utilise PVC/SWA/PVC 400V/1000V cable.
- Pre-paid metering-preferably PLC split type systems-will be proposed to measure energy consumption.

6.3 Energy Efficiency

Hot water installations will comprise of Solar Hot Water systems and household luminaries will utilise energy efficient lighting.

Street lights will utilise 70W HPS or 56W LED technology.

6.4 Total Electrical Load requirement

Zone / Reservation	No. of Units/ Cap/Area/Beds	Total Load (kVA)
Institution A	1 400	
Vocational A	15 324	
Institution B	2 000	
Vocational B	21 190	
Communal	1 296	
Streetlights		
TOTAL		

The total electrical link service requirement for the development is 2 MVA, which can be obtained from a single 95 mm² 11kV ring supply.

6.5 Design Standards

- Network will conform to Polokwane Local Municipality standards
- NRS 034 will be utilised to calculate the required electrical load.
- All electrical cabling will be underground and all materials must be SABS approved.

In diversity there is beauty and there is strength.

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