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**Civil Services report for Proposed
Development of Erf 7379, Pacaltsdorp**

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14 November 2023



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2. Introduction

We as DVP Incorporated Consulting Engineers were appointed by the client, Pacaltsprodev (Pty) Ltd to compile a Services Report for submission to the local authority. As part of this process, the availability of existing municipal infrastructure in relation to the proposed development must be investigated.

This report is aimed at outlining the design philosophy that will be applied when designing the internal engineering services for the proposed development. It is also aimed at providing relevant data so that the local authority can comment on their ability to accommodate the additional loads generated by the proposed development on existing infrastructure.

3. References for Design Criteria

Various recognised design standard documents and guidelines have been used as the design criteria and standards for the provision of internal engineering services for the proposed development.

These include:

- Guidelines for the Provision of Engineering Services for Residential Townships (Blue Book)
- The Neighbourhood Planning and Design Guide (Red Book)
- Guidelines for Urban Stormwater Management (UTG4)
- Structural Design of Urban Roads (UTG3)
- Geometric Design of Urban Collector Roads (UTG5)
- Guidelines of Road Construction Materials (TRH14)
- Structural Design of Interurban and Rural Roads (TRH4)
- George Municipality: Stormwater By-law
- George Municipality: By-law Relating to Streets, Sidewalks and Public Places
- George Municipality: Public Transport By-law
- George Municipality: Water and Sanitation By-law
- George Municipality: Water Services By-law to Restrict the Use of Water

All materials, techniques and measurement will be according to the latest relevant SABS specifications, specifically the SABS1200, ***The Standardised Specification for Civil Engineering Construction***

4. Proposed development

The Proposed development will consist of a filling station combined with a Drive through and a line shop of which the total GLE calculates to 863m².

The resultant area comprises of a yard area, electrical room, Refuse room, toilets, roads, and parking's.

5. Background

Location

The site is described as Erf 7379, Pacaltsdorp. It is 4 663 m² in extent. The current zoning is Single Residential Zone I. The site is located at 34° 0'52.31"S; 22°27'4.90"E (50668.452 Y; 3765412.558 X). Pacaltsdorp Central is located to the east of the site.

The site is bordered on the northern side by Church Street. It is bordered on the east by Erf 2558. Mission Road forms the southern boundary. The site is bordered on the west by the Beach Road.



Locality plan

Topography

The topography of the site is defined by the existing stormwater furrow creating a valley terrain. Generally, the northwestern portion falls from northwest to southeast; the southeastern portion falls from southeast to northwest. Generally, the site falls from northeast to southwest with the main stormwater furrow.

A comprehensive topographical survey of the site was completed and is attached as Annexure B.

A comprehensive geotechnical investigation must be done for input from structural and civil engineer.

There are currently no structures on the site.

The site is covered with medium to sparse grass.

6. Stormwater

Municipal Stormwater System

The site is intersected by a stormwater furrow, which descends from the northern boundary to the western boundary. This watercourse enters the site from the northern direction via a stormwater pipe beneath Church Street and subsequently departs from the site to the west through another box culvert positioned beneath Beach Road. Further to the west, the watercourse discharges into Erf 7387.

Notably, the elevation at the northern culvert is 200.90, whereas at the western culvert, is 199.45. The overall length of the stormwater furrow spans 58 meters. Consequently, the calculated average gradient of this watercourse equates to 1:40.

The Existing water furrow is to be re routed outside the erf boundaries of erf 7379 at the cost of the developer.

On the northern perimeter of the site, a piped system is situated within Church Street, directing its flow from west to east.

Conversely, on the southern boundary of the site, a separate piped system can be found within Mission Road, facilitating a west-to-east directional flow.

Runoff and Flow

This will be discussed briefly in this report. For more details and calculations, please refer to the separate Stormwater Management Plan compiled by DVP Consulting Engineers.

The basic design principles can be summarised as follows:

“Storage or attenuation/infiltration measures must provide for the difference between the Pre-development and Post-development 10-year storm runoffs generated/calculated.”

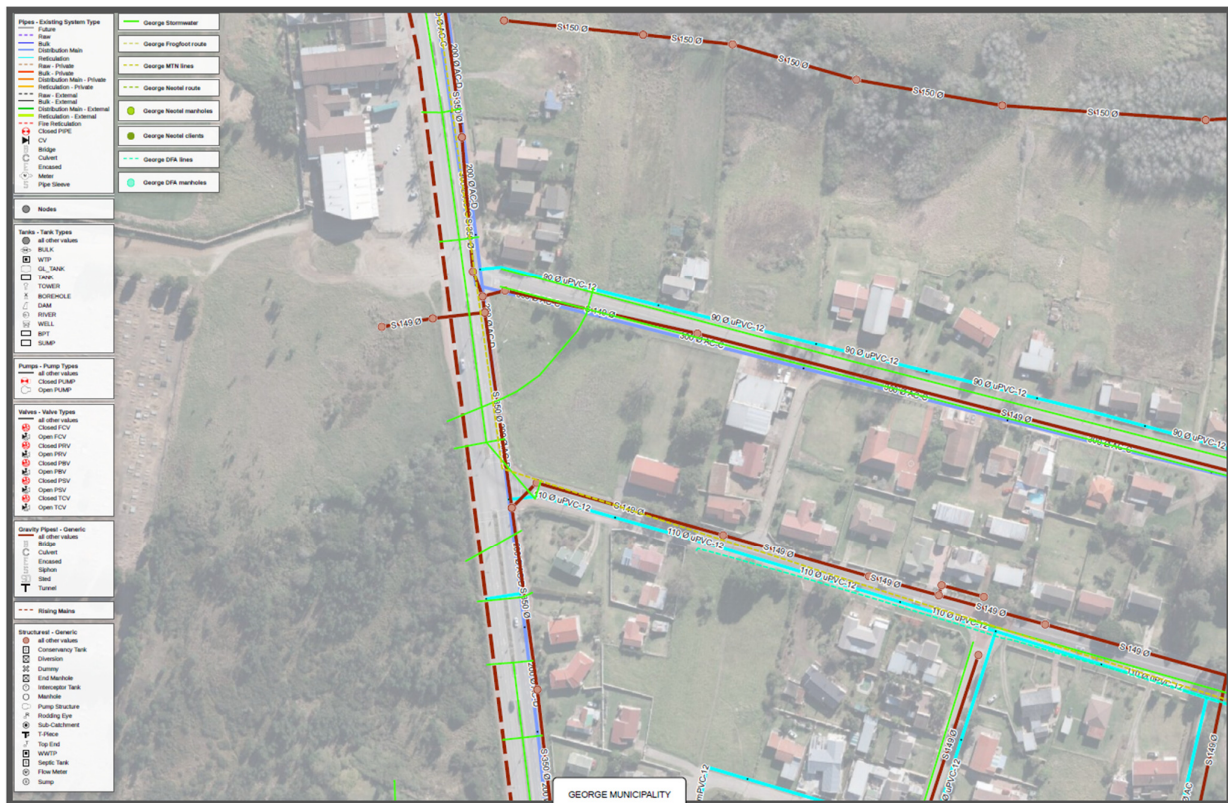
“The rate of outflow for any recurrence interval storm must be restricted to the pre-development runoff flow. The discharge may not exceed the pre-development flows in litres/second.”

The minor system will be designed to cater for the 1:5year return storm, and overland flow will be restricted to 60m. Roads and parking areas will be shaped to the main drainage routes and will be finished in material that will prevent scouring and erosion. The parking areas will also be designed in such a way as to temporarily retain the major storms, to relieve pressure on the main drainage routes.

Detailed design of the underground system will be completed with input from the Architect.

Groundwater

Ground water is present on site, A comprehensive geotechnical investigation must be done to confirm the extent of ground water present.



Existing stormwater infrastructure around the site (indicated in green)

Materials

Stormwater pipes will generally be Class 100D pre-cast concrete pipes with spigot and socket joints, laid on a Class B bed. Minimum pipe diameters on main lines will be 375 millimetres. Pipe diameters of catchpit links to be 300 millimetres. The minimum cover on stormwater pipes will generally be 0,8 metres under sidewalks and 1,0 metre at road crossings. Pipes under roadways shall be bedded and backfilled with clean sand compacted to 100% Mod AASHTO and pipes in other areas with approved backfill material compacted to 90% Mod AASHTO. Brick built catchpits with double cast iron grid inlets will be constructed to collect surface water. Pre-cast concrete ring manholes with precast concrete top slabs with ductile iron covers and frames will be constructed. Sub-surface drainage will be installed in appropriate areas to act as cut-off drains. Perforated pipes (110-millimetre diameter) in stone bedding and blanket with appropriate geofabric filter surround will be used. All subsoil runs will not exceed 60m and will terminate in a cleaning eye.

Layout

The minor stormwater system will be designed as a system of underground pipes, with associated structures to accommodate the runoff of a 1 in 5-year storm event. Flows will be piped to temporary stormwater retention facilities.

The emergency system recognises failure or malfunction of the minor and / or major systems by providing continuous overland flow routes in order to minimise flooding of residential areas. As with the pipes flows, these overland flow routes will be to retention facilities.

Detailed design of the underground system will be completed with input from the Architect.

See the separate **Stormwater Management Plan** for the proposed layout of the infrastructure.

7. Foul Sewer

The sewer system will be designed as a conventional waterborne gravity reticulation system. There are currently 2 possible connection points to the municipal infrastructure. The first is on the north of the development in Church Street. The second is on the south in Mission Street. Connection is to be made with a new manhole on the existing sewer line.

Discharge and Flow

The flows are calculated as follows:

ADDf= 4.248 Kl/Day

PDDWF= 5.523 Kl/day

IPDWF= 7.17 Kl/day

IPDWWF= 10.341 Kl/day

A peak factor of 1.3 is used.

Ground infiltration rate of 0.03 L/min/m pipe/ m diameter is used.

15% stormwater ingress is allowed for.

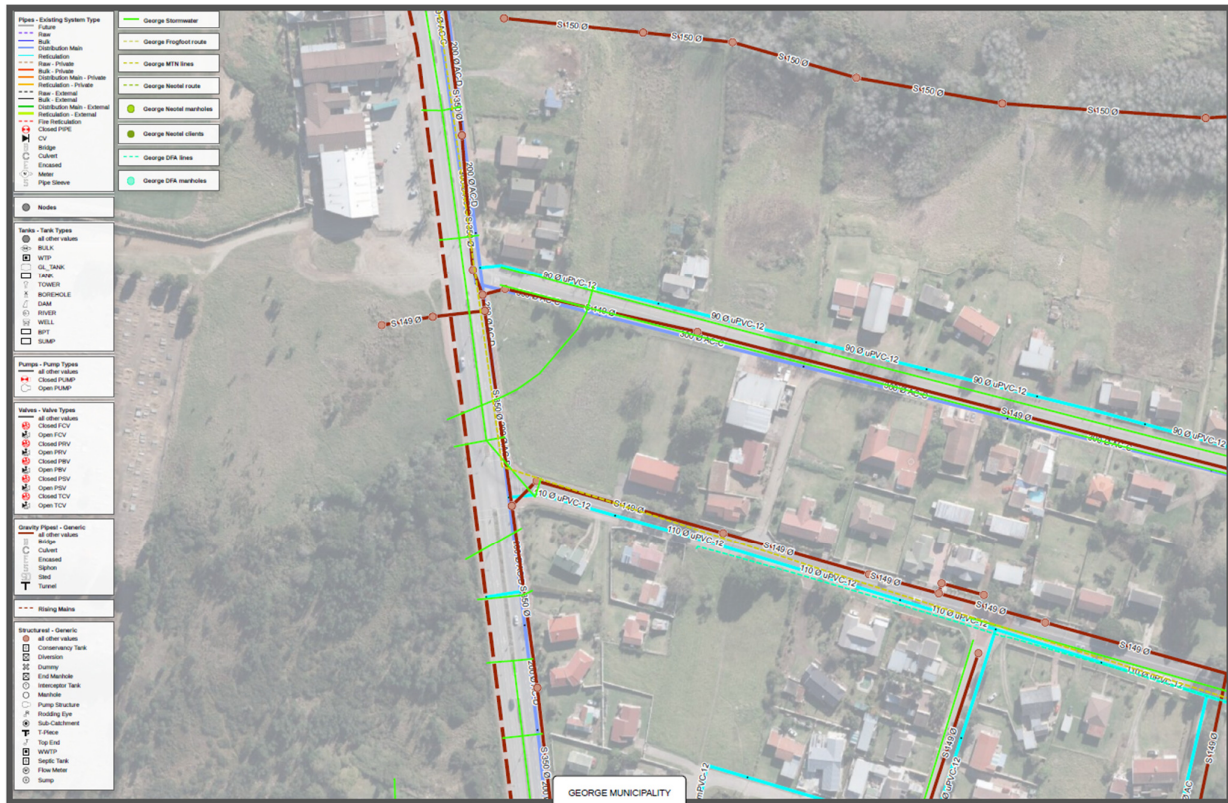
A minimum flow velocity of 0.7m/second will be achieved at least once per day to enable “self-cleaning” of the lines.

Materials

Pipes will be standard length, Class 34 heavy duty, solid wall uPVC pipes for both the main lines and the individual building connections, both on a bed suitable for flexible pipes. Minimum pipe diameter will be 160 millimetres for main lines and 110 millimetres for building connections. A minimum cover of 0,9 metres over all pipes outside trafficked areas and 1,2 metres in road reserves will be allowed. Pipes under roadways will be bedded and backfilled with clean sand compacted to 100% Mod AASHTO and pipes in other areas with approved backfill material compacted to 90% Mod AASHTO. Pre-cast concrete ring manholes (suitably waterproofed) with flexible pipe connections will be used. Covers and frames will be Type 2A (modified) hinged ductile iron throughout.

Layout

Main lines will generally be located in road reserves. Minimum grade on main lines of 1:150 and minimum grade on building connections of 1:60 will be applied. A maximum distance between manholes of 90 metres will be allowed. There shall be no change in flow direction where the internal angle of change is less than 90°.



Existing municipal sewer infrastructure (indicated in brown)

General

On completion, air pressure testing and mirror testing of the system will be carried out in the presence of the Engineer and representatives of the Local Authority.

8. Potable Water

The water system will be designed as a conventional medium pressure reticulation network.

The minimum water connection pipe size required for the development is 110mm diameter.

There are three possible connection points, the first being a 110mm UPVC reticulation pipe located in Mission Street to the south of the site. The second point is a 200mm asbestos-cement (AC) distribution main located in beach road to the west of the south. The third possible connection point is a 300mm asbestos-cement (AC) distribution main located to the north of the site in church street.

Municipal Supply System

The site is encircled by a multitude of water infrastructure components.

To the North, situated in Church Street, there is a 300mm asbestos-cement (AC) distribution main in conjunction with a 90mm (UPVC) reticulation pipe.

To the West of the site, positioned in Beach Road, there is a 200mm asbestos-cement (AC) distribution main.

To the South of the site, within Mission Street, there is an existing 110mm UPVC reticulation pipe.

Consumption and Flows

The flows are calculated as follows:

AADD= 6.904 Kl/Day

TAADD = 8.122 Kl/day

Peak demand= 13.07 Kl/day

A peak factor of 1.7 is used.

15% real losses are allowed for.

The fire demand will determine the instantaneous peak demand in the supply. A maximum head of 90m under static flow conditions will be designed for. A minimum instantaneous peak head of 24m will be designed for. The development will be provided with a 110mm connection, which will be metered using an 80mm bulk combination water meter that will be installed by a specialist contractor recommended by the local authority.

Fire Flow

The development can be classified as “High Risk” with a required flow of 200 litres/second. There must be a minimum residual head of 15m at peak demand with superimposed fire flow from one hydrant.

Materials

Minimum pipe diameter of 110 mm will be installed. Pipes will be SABS approved (SABS 966), standard length, Class 12 uPVC pipes on a bed suitable for flexible pipes. All uPVC pipes to utilise standard uPVC Z-lock couplings. Bends will be uPVC Class 12, but tees and crosses will be cast iron. Minimum cover on water pipes will be 0,9 metres. Specifications for valves as follows: -AVK or similar approved Class 16, left-hand closing isolation valves with non-rising spindles in brick built chambers with CI bell tobies. Underground type fire hydrants with London round screw thread and appropriate extensions and specials in brick built chambers with CI Type 5 FH box with appropriate lettering. Pipes under roadways will be bedded and backfilled with clean, imported sand compacted to 100% Mod AASHTO and pipes in other areas with approved backfill material compacted to 90% Mod AASHTO. Thrust blocks will be cast using Class 20/19 concrete throughout.

Layout

Pipes shall not have a longitudinal grade of less than 0,5%. Fire hydrants shall be located not more than 90 metres apart. Fire hydrants shall also be located to double as air release points or scour valves as required. The positions of all valves and hydrants shall be marked on the road kerbs opposite the valves. The minimum depth to invert on reticulation mains shall not be less than 900 millimetres and the minimum cover over shop connections shall not be less than 800 millimetres.

General

On completion, hydraulic testing of the system will be carried out in the presence of the Engineer and representatives of the Local Authority.

9. Roads

Access to the Property

Access to the property will be of both Church street and Mission Street for the development.

Both access points will serve as both entry and exit points.

Refuse will be collected from the refuse room provided in the yard area of the filling station. Adequate space is provided for movement of refuse trucks.

Materials

Subgrade CBR -7 to 15 minimum (in-situ sand / soil of G7 to G10 quality).

Subbase CBR -45 minimum at 95% Mod AASHTO (G5 quality).

Basecourse CBR -80 minimum at 98% Mod AASHTO (G3 quality).

Continuously graded hot asphalt premix with 80/100 penetration grade bitumen binder, compacted to 95% Marshall density.

Alternatively, 80 millimetre pre-cast interlocking concrete pavers on suitably designed layerworks may be used for aesthetic purposes in selected areas.

All road construction materials will be specified with due consideration for intended application, climatic conditions, level of stormwater system incorporated etc.

Material quality control tests and workmanship will be tested throughout the construction period in terms of the standard SABS test procedures for compliance with the specifications.

Layout

Parking bays will be 5m long by 2.5m wide perpendicular layout, with 7.5m aisle widths between bays. Pedestrian walkways with crossings will be provided for movement from the shops to the parked cars.

Precast concrete kerbs will be used on 75mm concrete bedding.

Minimum longitudinal grades will be 0.5%, and cross grades will be a minimum of 2%.

10. Solid Waste

The local authority will service the development as far as solid waste is concerned, and will collect refuse from the refuse room on the premises.

11. Recommendation

From our analysis of the existing and planned future civil engineering infrastructure, we are confident that the planned development can be adequately serviced.

Annexure C – Site Development Plan

