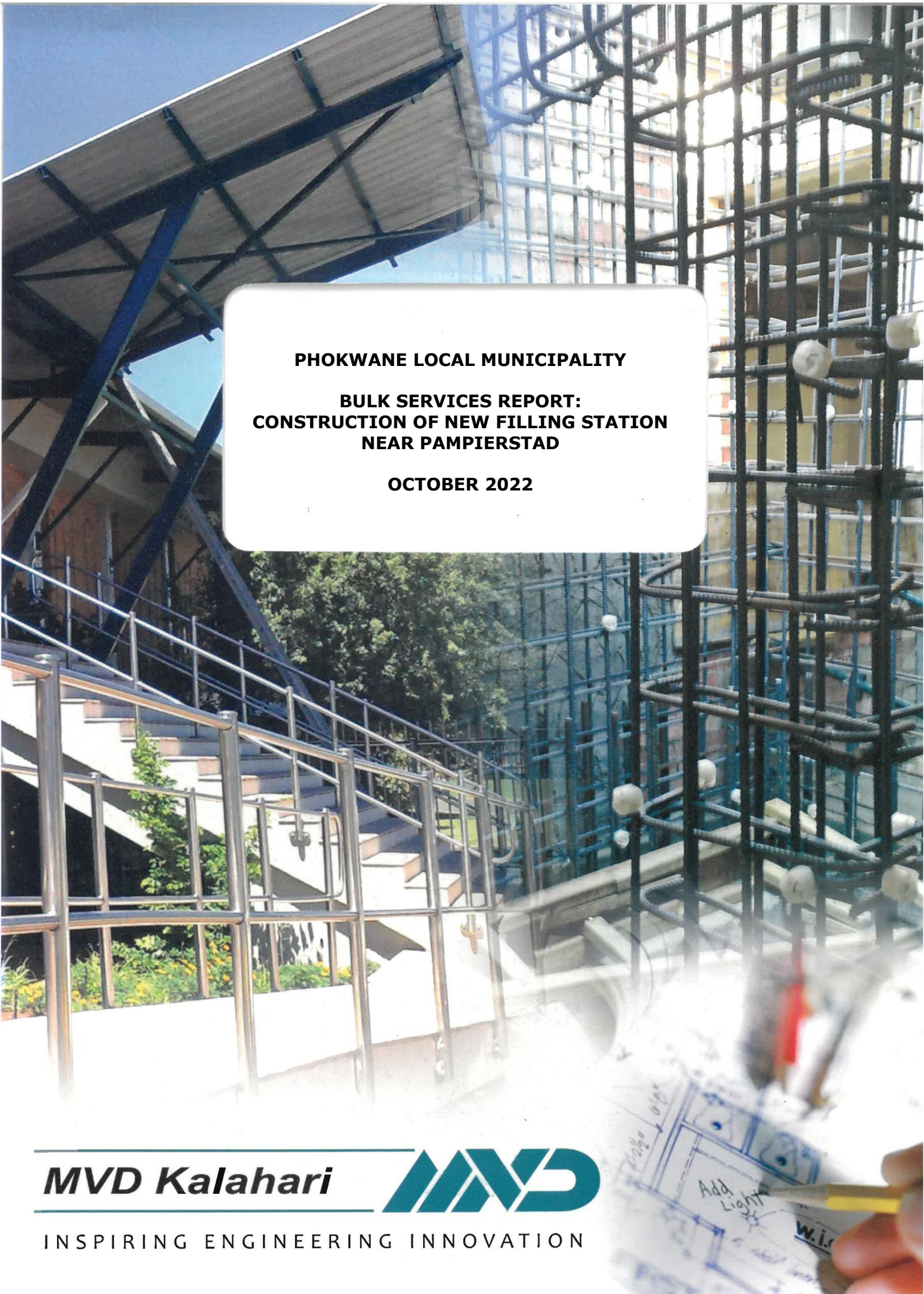

PHOKWANE LOCAL MUNICIPALITY

BULK SERVICES REPORT: CONSTRUCTION OF NEW FILLING STATION NEAR PAMPIERSTAD

OCTOBER 2022

MVD Kalahari

INSPIRING ENGINEERING INNOVATION

PHOKWANE LOCAL MUNICIPALITY

BULK SERVICES REPORT: CONSTRUCTION OF NEW FILLING STATION NEAR PAMPIERSTAD, HARTSWATER

OCTOBER 2022

Prepared by	**:**	**W KARSTEN**
Date	**:**	**OCTOBER 2022**
On behalf of	**:**	**MVD KALAHARI**
For	**:**	**GPO BOERDERY (PTY)LTD**
Attention	**:**	**Mr GP OLIVIER**

BULK SERVICES REPORT:

CONSTRUCTION OF NEW FILLING STATION NEAR PAMPIERSTAD (PHOKWANE LOCAL MUNICIPALITY)

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1. DEVELOPER AND SERVICE PROVIDERS DETAILS

1.1. Developers Details

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PO Box 789
HARTSWATER
8570

Contact Person	:	Mr GP Olivier
Cell No.	:	082 948 2114
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1.2. Service Providers Details

MVD Kalahari Consulting Engineers and Town Planners

MVD Kalahari

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8300

Contact Person	:	Mr Dirk Potgieter / Me W Karsten
Telephone No.	:	(053) 831 1889
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2. BACKGROUND

Pampierstad is a town located in Frances Baard District municipality of the Northern Cape Province, with in the Phokwane Local Municipality area. The town lies in the northern part of the Vaalharts irrigation scheme approximately 14 kilometres from the city of Hartswater along the N18 to Vryburg. See Figure 1.

The community consists of residents that mainly speak Tswana. Pampierstad (now Thuso a Sotho or Tswana word meaning Help/Assistance) was established in the former homeland of Bophuthatswana in the late 1960s. The town was named after Lekwalo Pampiri who was also known as Pampier. He was the son of a local Chief, Chief Motlaadile. According to a survey conducted in 1981 by the Surplus People's Project 78% of the people in Pampierstad came from white towns while 12% came from white farms while the rest came from other trust, tribal and freehold areas.

Figure 1: Town Location

3. SITE DESCRIPTION

3.1. Location

The site of the proposed project is situated in the Phokwane Local Municipal area, approximately 3.0 km east of Pampierstad, on a portion of Farmland along Provincial Road Kolong St. GIS reference:

Description	Longitude	Latitude
Proposed Development Site	24°43'4.30"E	27°47'23.07"S

Figure 2: Site Locality

3.2. Topography

The general topography of the proposed site may be characterized as flat with gentle slopes from southwest to north east of less than 2.7% and an average slope of 0.8% .

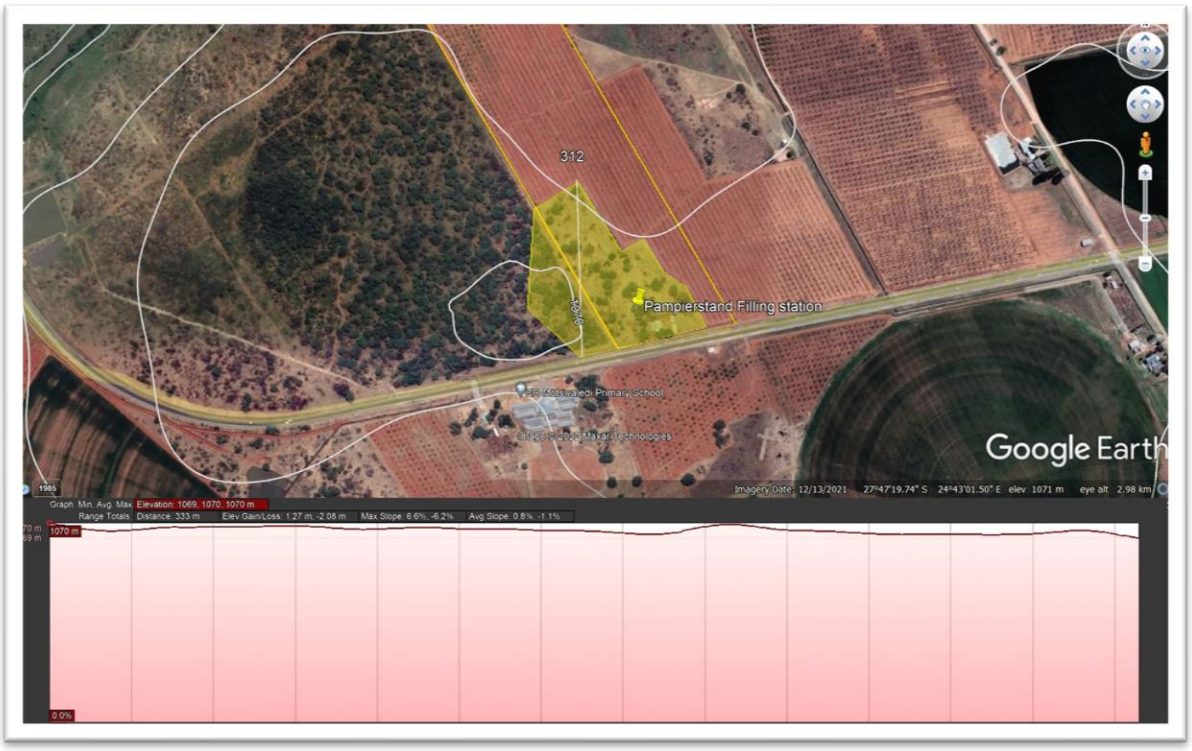

Figure 3: Site Elevation

3.3. Climate

3.3.1. Rainfall

Pampierstad experience significant seasonal variation in monthly rainfall. Mostly the variations are recorded over an 31-day period centred around each day of the year. The rainy period of the year lasts for 8 months, from September to May, with a sliding 31-day rainfall of at least 13 mm. The month with the most rain in Pampierstad is February, with an average rainfall of 68mm. The rainless period of the year lasts for 4 months, from May to September. The month with the least rain in Pampierstad is July, with an average rainfall of 2mm.

The average precipitation in Pampierstad can be categorised in two categories. The wetter season and drier season. The wetter season lasts 6 months, from October to April, with a greater than 18% chance of a given day being a wet day. The month with the most wet days is February, with an average of 9.1 days with at least 1mm of precipitation.

The drier season lasts 6 months, from April to October. The month with the fewest wet days is July, with an average of 0.4 days with at least 1mm of precipitation.

3.3.2. Temperature

The average temperatures for the year in the Pampierstad area are 34°C and 4°C for the mean daily maximum and minimum, respectively. The warmest month, on average, is January with an average temperature of 34°C, and the coolest month on average is July, with an average temperature of 4°C.

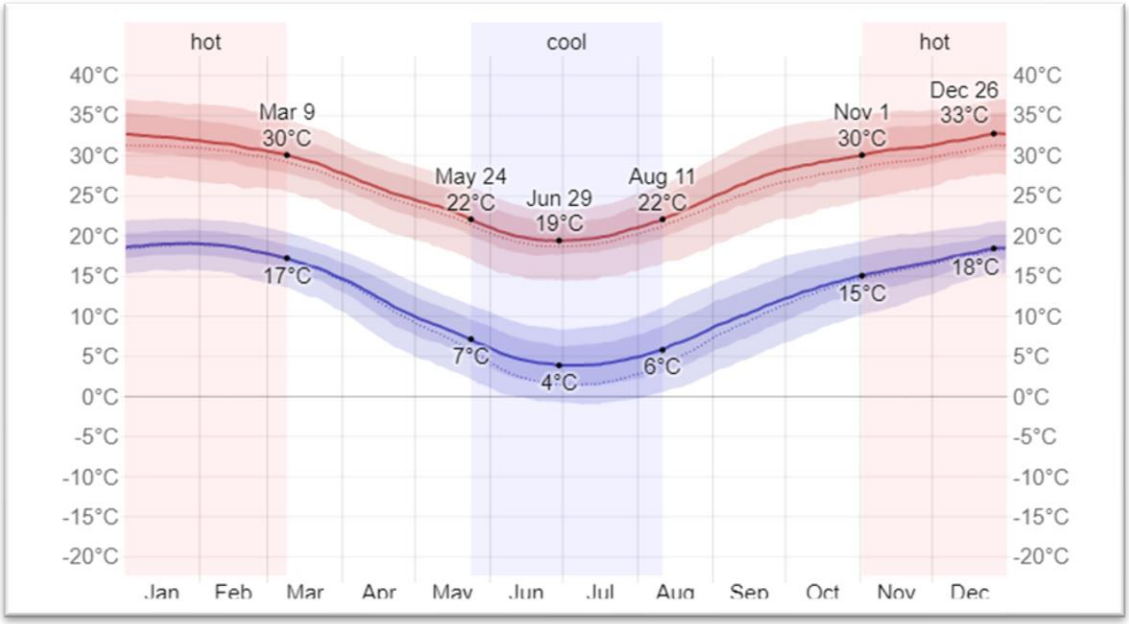

Figure 4: Average Temperature

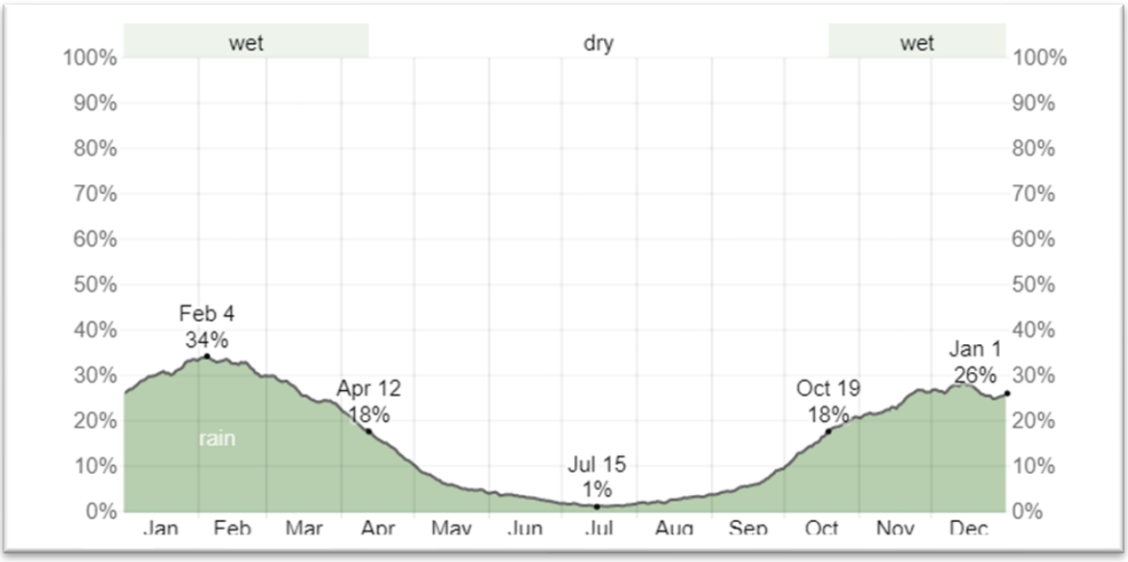

Figure 5: Average Precipitation

3.4. Geology

An engineering geological investigation will be conducted by Geocalibre on the proposed development site., with the aim to assess aspects such as geology relief and subsoil founding conditions which may influence the development. A report will be compiled and provided to MVD Kalahari with the details once the report have been completed and then implemented into all design conditions and considerations.

3.5. Drainage

Overland flow is the dominant drainage pattern in the surrounding area, with storm water run-off originating in the high lying area situated to the west and south-west of the proposed site, near the intersection Kolong Street. The estimated area of this catchment is 6.4ha (64 137.94 m^2).

See figure 6 for a graphic representation of the drainage area directly affecting the site of the proposed development.

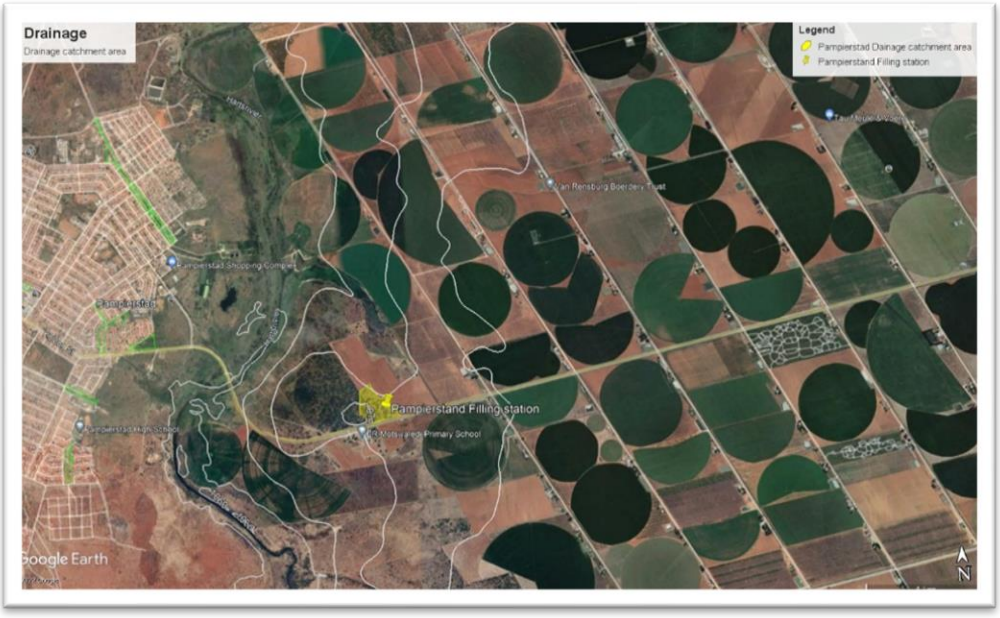

Figure 6: Drainage Catchment

Drainage of storm water run-off occurs from a south–western direction crossing over the site and discharging at the north-eastern corner before connection the existing farmlands.

3.6. DEMOGRAPHIC OVERVIEW

As indicated in **Table 3-1**, the population of Pampierstad in 2011 was 21 707 people.

Table 3-1: Overview of Key Demographic Indicators for Pampierstad	
Key Demographic Indicators	
Aspect	2011
Population	21 707
% Population <15 years	33.4
% Population 15-64	60.6
% Population 65+	6
Households	6 365
Household size (average)	3.4
Formal Dwellings %	92.3
Dependency ratio per 100 (15-64)	93.5
Unemployment rate (official) - % of economically active population	Not Available
Youth unemployment rate (official) - % of economically active population 15-34	Not Available
No schooling - % of population 20+	12.6
Higher Education - % of population 20+	7.8
Matric - % of population 20+	22.5

Source: Compiled from Stats SA Census 2011 Municipal Fact Sheet

The majority of the population in Pampierstad is indicated as Black African (98.9%) followed by Coloured people (0.5%), Indian/ Asian and Other people (0.3% respectively) (Census 2011).

The dominant language spoken in Pampierstad is indicated as Setswana (83.3%) followed by English (4.7%), IsiXhosa (4%), Afrikaans (1.9%), IsiZulu (1.8%), IsiNdebele (1.5%), Sesotho (1.1%), Sign language and Other (0.5% respectively), Sepedi (0.4%), Xitsonga (0.2%) and SiSwati and Tshivenda (0.1% respectively).

3.6.1. Employment

No employment statistics were available as of census 2011.

3.6.2. Household income

Based on the data from the 2011 Census, 16.1 % of the population of Pampierstad have no formal income, 5.6 % earn between 1 and R 4 800, 8.7% earn between R 4 801 and R 9 600 per annum, 23.7% between R 9 601 and 19 600 per annum, 20.7% between R 19 601 and R 38 200 per annum, 10.3% between R 38 201 and R 76 400 per annum, 7.1% between R 76 401 and R 153 800 per annum, 5.2% between R 153 801 and R 307 600 per annum, 2.1% between R 307 601 and R 614 400 per annum, 0.2% between R 614 001 and R 1 228 800, 0.1% between R 1 228 801 and R 2 457 600 per annum and 0.1% above R 2 457 601 per annum. (Census 2011).

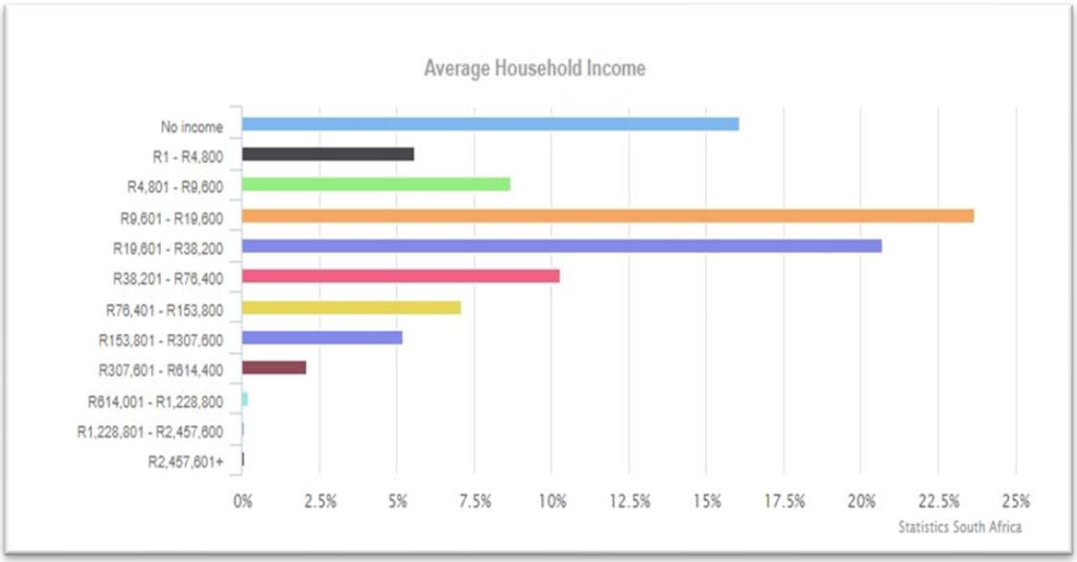

Figure 7: Household Income

Source: Compiled from Stats SA Census 2011 Municipal Fact Sheet

3.6.3. Education

The highest education levels for Pampierstad are as indicated in Figure 8.

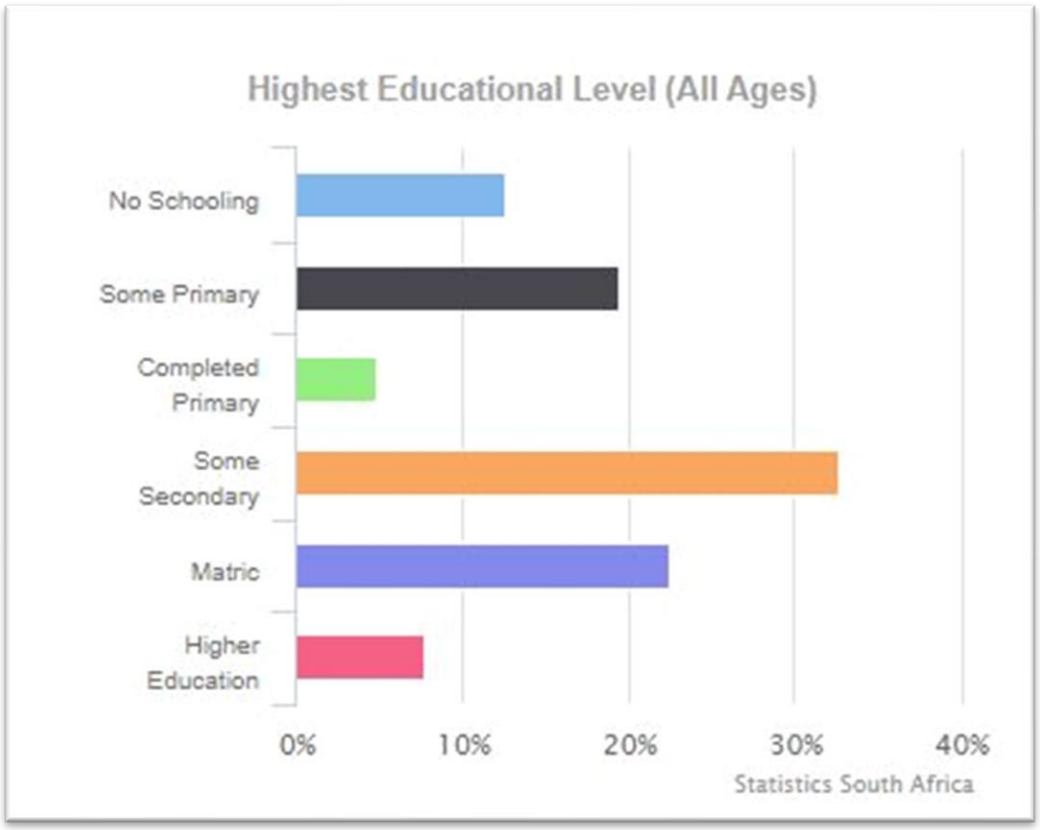

Figure 8: Education Levels

Source: Compiled from Stats SA Census 2011 Municipal Fact Sheet

3.6.4. Municipal Services

Access to basic municipal services as of census 2011 is indicated in table **Table 3-2**:

Table 3-2: Overview of Access to Basic Services in Phokwane Local Municipality	
Municipal Services	2011
% Households with access to flush toilet	73.6
% Households with weekly municipal refuse removal	72.6
% Households with piped water inside dwelling	33.6
% Households which uses electricity for lighting	87.3

Source: Compiled from Stats SA Census 2011 Municipal Fact Sheet

3.6.5. Population Figures

Phokwane Local Municipality incorporates the previous municipal areas of Hartswater, Jan Kempdorp, Ganspan and Pampierstad. They strive to deliver basic services to its community by ensuring that there is water, sanitation, and electricity. Phokwane is nestled in the lush green delta of the Hartswater region and boasts the second largest irrigation scheme in the Southern Hemisphere, namely the Vaalharts Irrigation Scheme. The municipality has a total population of 63 000 inhabitants with the majority found in the peri -urban areas of the municipality. The population figures for the Phokwane Local Municipality are depicted in Table 3-3 below.

Table 3-3: Beneficiaries 2011		
Suburb Benefiting	Total Benefiting Population	Total No. of Households Benefiting
Banksdrif	505	134
Ganspan	2 301	583
Hartswater	10 465	2 829
Jan Kempdorp	24 220	6 167
Pampierstad	**21 707**	**6 365**
Phokwane NU	3 802	1 464
Total	**63 000**	**17 542**

Source: Compiled from Stats SA Census 2011 Municipal Fact Sheet

Assuming the average growth rate per annum of 0.27%, based on these figures, the anticipated population in 2022 is displayed in table **Table 3-4** below:

Table 3-4: Beneficiaries 2022		
Suburb Benefiting	Total Benefiting Population	Total No. of Households Benefiting
Banksdrif	520	137
Ganspan	2 370	608
Hartswater	10 780	2 914
Jan Kempdorp	24 949	6 397
Pampierstad	**22 361**	**6 577**
Phokwane NU	3 916	1 507
Total	**64 896**	**18 140**

4. TERMS OF REFERENCE

MVD Kalahari Consulting Engineers and Town Planners were appointed by GPO Boerdery (Pty)Ltd for the compilation of a bulk civil services engineering report for the establishment of a new refuelling station and truck stop along the Kolong st to Pampierstad, at an existing access to a 5 ha portion of farmland to be subdivided for this development.

The scope of the proposed development will comprise the following:

- Truck stop, and refuelling facilities.
- Truck driver ablution and attendance facilities.
- Retail filling station with support facilities.
- Convenience store.
- Fast food outlet.

The main objectives of the proposed project are:

- Provide trucks enroot to south eastern and south western destinations with ease of access to refuelling and refreshment facilities.
- Provide ease of access to the surrounding community to fuel resources and basic amenities.

The proposed project will also have the following outcomes:

- Alleviation of local unemployment and poverty
- Upliftment of local business opportunities.
- Upliftment of local socio-economic activities and standards.
- Capacity building and skills development within the local community.
- Revival of local economy.

5. INFORMATION

5.1. Information Obtained

5.1.1. Estimated Existing Population Figures

As indicated previously, the projected population figures for Pampierstad for 2022 were obtained from extrapolated figures based on the outcomes of senses 2011. These extrapolated figures may be summarised as follows:

- No. of Households : 6 577
- Population per Household : 3.4
- Total Population : 22 361

5.1.2. Proposed Site Development Plan

A proposed site development plan was developed by MVD Kalahari. See ***Annexure A.***

5.1.3. Existing Infrastructure

5.1.3.1. Sewer

No existing municipal sewer infrastructure exists within the immediate area of the proposed development. The existing Pampierstad infrastructure is to far away and ER Motswaled Primary School is currently serviced by means of conservancy tanks, emptied by Phokwane Municipality on a weekly basis with suction tankers.

5.1.3.2. Water:

At present there is no existing water infrastructure in the immediate area of the proposed development as per information form Phokwane Municipality. There is however an existing bore hole on site that must be tested, and studies done to ensure the bore hole will have sufficient capacity and quality for domestic and fire use for the development.

5.1.3.3. Roads:

The site of the proposed development is bordered on one side by well-developed road infrastructure. To the south the site is bordered by the Kolong Regional Road linking Pampierstad and Hartswater at an existing access to the site. The road is a paved road.

It must be noted that the Kolong regional rout falls under the jurisdiction of the Department of Roads and Public Works (DRPW).

5.1.3.4. Storm Water:

At present there is no discernible existing storm water drainage infrastructure surrounding the proposed development site.

5.1.4. Cadastral and Topographic survey

A detailed cadastral and topographical survey has been completed. This information will be used for detail designs and surface drainage design.

6. TECHNICAL DESIGN PARAMETERS AND STANDARDS

The design criteria and specifications as contained in this report are based on the following:

- The *Neighbourhood Planning and Design Guide, 2019 (a.k.a. the "Red Book").*
- South *African Local Government Association (SALGA) Planning and Design Guidelines Part II (K-Sanitation).*

6.1. PROPOSED DESIGN CRITERIA: SEWER INFRASTRUCTURE

Table 6-1: Sewer Gravitational Network: Proposed Design Criteria		
Parameter	Element	Guideline
1. Effluent Generation (PDDWF)	• Filling Station:	640 ℓ/100m² floor area/day
2. Sewer gradients	• Maximum (all diameters) • Minimum 110mm Ø • Minimum 160mm Ø	1:60 1:120 1:200
3. Flow Velocity	• Minimum (all diameters; self-cleansing) • Maximum (all diameters)	0.6 m/s 1.2 m/s
4. Dry weather Peak Factor (DWPF)	• Design Peak ○ Business:	1.5
5. Ground Water Infiltration	Infiltration for estimated theoretical pipe length.	0.03 ℓ/min/m Ø/m pipe length/day
6. Storm Water Infiltration	Design Peak	15% to 30% additional to Dry Weather Peak Flow
7. Pipe Location	All Areas	1.5 m from roads edge and building sides
8. Pipe Materials	All pipe diameters	uPVC Class 34
9. Pipe Size	Minimum diameter	160mm Ø
10. Cover to Pipes	Minimum: Road reserves Other Areas	1,000 mm 800 mm

6.2. PROPOSED DESIGN CRITERIA: WATER INFRASTRUCTURE

Table 6-2: Water Distribution Network: Proposed Design Criteria				
Parameter	Element	Guideline		
1. Demand	• Filling Station:	800 ℓ/100m² floor area/day		
2. Pressure	• Maximum (Static) • Minimum: Trunk Mains • Minimum: Reticulation Mains	90 m (9.0 bar) 25 m (2.5 bar) 10 m (1.0 bar)		
3. Flow Velocity	• Minimum (all diameters • Maximum (all diameters)	0.6 m/s 1.2 m/s		
4. Fire Flow	• Number of hydrants in operation. • Flow rate • Maximum velocity • Design fire duration	2 1200 ℓ/min/hydrant 3.0m/s 2 hours		
5. Peak Factor (P)	• Filling Station:	P_w	P_d	P_h
		1.45	1.70	3.30
6. Pipe Location	All Areas	1.5 m from roads edge and building sides		
7. Pipe Materials	All pipe diameters	uPVC Class 09		
8. Cover to Pipes	Minimum: Road reserves Other Areas	1,000 mm 800 mm		

7. SEWER

7.1. ANTICIPATED TOTAL EFFLUENT GENERATION

The anticipated peak flow will be based on figures and peak factors as obtained from The Neighbourhood Planning and Design Guide, 2019 (a.k.a. the "Red Book") as set out in table 6-1, in conjunction with the elements of the proposed development to produce sewer effluent.

The relevant elements of the proposed development to generate sewer effluent are:

- Filling Station: Total floor area : 1 167m^2

7.1.1. Peak Daily Dry Weather Flow (PDDWF):

The total **Peak Daily Dry Weather Flow (PDDWF)** for the proposed development as depicted in the table below, amounts to **7.469m³/day (0.086ℓ/s)**.

Table 7-1: Peak Daily Dry Weather Flow (PDDWF)

Description	Capacity (ℓ/unit measurement/day)	Area (m^2)	Unit factor	m³/day
• Filling Station	640 ℓ/100m^2/day	1 167	11.67	7.469
TOTAL				**7.469**

7.1.2. Instantaneous Peak Dry Weather Flow (IPDWF):

For ground water infiltration estimation an assumption of 160mm Ø pipes will be taken over an estimated pipe length of 159m per element of the proposed project as indicated in table 7-2 below. The estimated ground water infiltration will be as follows:

Table 7-2: Ground Water Infiltration (GWI)

Description	Ground Water Infiltration (ℓ/min/m Ø/m pipe length)	Ø of pipe (m)	Length of pipe(m)	Unit factor (No of Erven)	m³/day
• Filling Station	0.03	0.160	159.0	-	1.099
TOTAL					**1.099**

From the above, the total **Instantaneous Peak Dry Weather Flow** for the proposed development will be as follows:

- (PDDWF from table 7-1) x (DWPF from table 6-1) + (Total GWI)= **(IPDDWF)**.
- (7.469m³/day x 1.5) + (1.099m³/day) = **12.303m³/day (0.1424ℓ/s)**.

7.1.3. Instantaneous Peak Wet Weather Flow (IPWWF):

Considering storm water infiltration rate of 30%, the **Instantaneous Peak Wet Weather Flow (IPWWF)** amounts to the following:

- (IPDWF) / (1-0.3) = **(IPWWF)**

Thus, from the previous, the IPWWF will be as follows:

- IPWWF = (12.303m³/day) / (1-0.3)
- IPWWF = **17.576m³/day (0.203ℓ/s)**

7.2. PROPOSED INFRASTRUCTURE

7.2.1. Overview:

The proposed infrastructure for the proposed development may be defined as follows:

- Proposed 160mm Ø uPVC class 34 sewer gravitational network.
- Proposed sub-surface sewer conservancy tank.

7.2.2. Proposed Gravitational Network:

It is recommended that a waterborne gravitational sewer reticulation network be installed, consisting of minimum 160 mm Ø uPVC class 34 sewer pipes installed and drained at slopes not exceeding 1:60 and no less than 1:200, toward the low-lying area situated in the middle northern side of the proposed development site. From here it will discharge to a subsurface conservancy tank at the western edge of the site to be discussed in 7.2.3 below.

Furthermore, it is recommended that all sanitary wares be furnished with individual uPVC class 34 soil drainage pipe connections of no less than 50mm Ø, and no more than 110mm Ø, installed at adequate depths to ensure the drainage of sewer effluent from all parts of development at a minimum internal slope of no less than 1:60.

7.2.3. Proposed Conservancy Tank:

It is proposed that the sewer effluent from the proposed gravitational network be discharged to a new sub-surface conservancy tank situated at the lowest point of the proposed development site.

The red book states that conservancy tanks should be sized for a storage volume of minimum 5000ℓ or 48 hours pf IPDWF, witch ever is greater.

From the above, the proposed conservancy tank may be sized as:

- Cons. Tank Volume = (IPDWF) x (48 hours / 24 hours)
- Cons. Tank Volume = (12.303m³/day) x (2)
- Cons. Tank Volume = **24.61m³**

From above the conservancy tank may be sized at **25kℓ** for a duration of 48hours (2 days).

Furthermore, it is recommended that the conservancy tank be constructed of masonry walls and reinforced concrete floor- and cover slabs. See figure 8 below for typical detail of proposed conservancy tank.

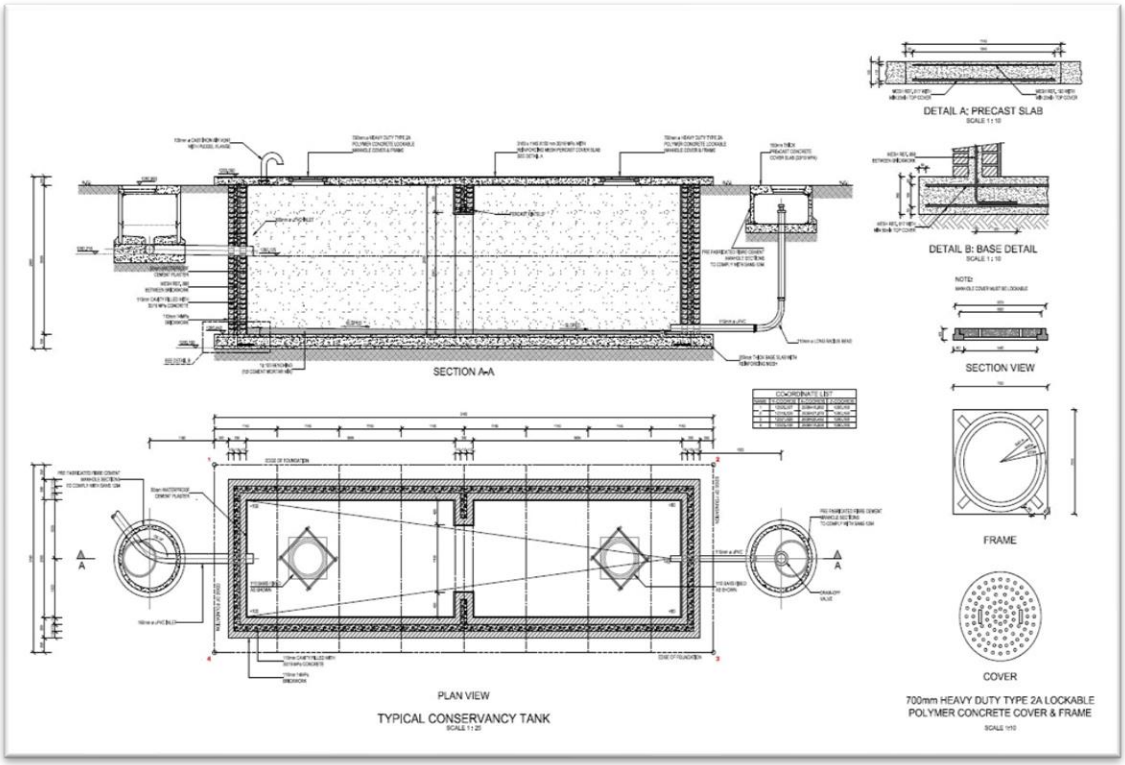

Figure 9: Typical Detail of Conservancy Tank

8. WATER

8.1. ANTICIPATED TOTAL DOMESTIC WATER DEMAND

The anticipated peak demand will be based on figures and peak factors as obtained from The Neighbourhood Planning and Design Guide, 2019 (a.k.a. the "Red Book") as set out in table 6-2, in conjunction with the elements of the proposed development that will generate the water demand.

The relevant elements of the proposed development to generate sewer effluent are:

- Filling Station: Total floor area : 1 167m^2

8.1.1. Annual Average Daily Demand (AADD):

The Total Annual Average Daily Demand (TAADD) for the proposed development as depicted in the table 8-1 below, amounts to **9.336m³/day (0.108ℓ/s)**.

Table 8-1: Annual Average Daily Demand (AADD)

Description	Capacity (ℓ/unit measurement/day)	Area (m^2)	Unit factor	m³/day
• Filling Station	800 ℓ/100m^2/day	1 167	11.67	9.336
TOTAL				**9.336**

8.1.2. Total Annual Average Daily Demand (TAADD):

Total Annual Average Daily Demand is determined by applying estimated water losses to the AADD as determined previously.

Assuming real losses to be 25% of AADD, TAADD may then be defined as:

- TAADD = AADD / (1-0.25)

Table 8-2: Total Annual Average Daily Demand (TAADD)					
Description	Capacity (ℓ/unit measurement/day)	Area (m^2)	Unit factor	% Losses	m^3/day
• Filling Station	800 ℓ/100m^2/day	1 167	11.67	25	12.448
TOTAL					**12.448**

Thus, TAADD amounts to **12.448m³/day (0.144ℓ/s)**.

Table 8-3: WATER: INSTANTANEOUS PEAK DEMAND (IPD)					
Description	**Capacity**	**Unit factor (No of units)**	**Losses %**	**Hourly Peak Factor**	**Total (m³/day)**
Filling Station	800 ℓ/100m^2/day	11.67	25	3.30	41.078
				TOTAL	**41.078**

The anticipated instantaneous peak flow rate (IPD) for the proposed development is **0.475 ℓ/s**, with an anticipated daily water demand of **12.448 kℓ/day** inclusive of allowance for losses.

8.1.3. Fire Flow:

The demand for fire suppression will be on figures as obtained from "SANS 10400-T:2011: Part T: Fire Protection" and reflected in table 6-2, is 1200ℓ/min/hydrant with a minimum of 2 hydrants in operation for a design fire duration of 2 hours.

From the above, design fire flow may be given as:

- Fire Flow = ((hydrant Flow Rate) x (Number of Hydrants)) / 60s
- Fire Flow = ((1200ℓ/min/hydrant) x (2)) / 60s
- Fire Flow = **40 ℓ/s**

8.2. PROPOSED INFRASTRUCTURE

From item 8.1 the design demand to be served by the proposed development is **40.144 ℓ/s** (TAADD + Fire Flow).

From the above, assuming a maximum flow velocity of 3.0m/s for fire flow, the size of required connection to the new bulk water main may be given as:

$$\begin{aligned} \text{If } Q &= v \times A \\ \text{and } A &= (\pi D^2)/4 \\ \text{Then } (\pi D^2)/4 &= Q / v \\ (\pi D^2)/4 &= (0.040 m^3/s) / 3.0 m/s \\ D^2 &= (0.0134\ m^2 \times 4) / \pi \\ D &= \sqrt{0.0169} \\ D &= 0.130m \end{aligned}$$

Thus, from above it is recommended that the site be provided with a bulk water connection of not less than 160 mm Ø to provide sufficient capacity for direct supply of fire suppression equipment.

8.3. BULK WATER SUPPLY

8.3.1. On-Site Storage

Cognisance must be taken that the site of the proposed development is in an area not serviced by the local municipality and a bore hole for water supply is the only option. The existing bore hole must be tested, and results evaluated to ensure the water is recommended for domestic and fire use. These hydrological studies are still to be completed.

All recommendations are based on the assumption that the water supplied by the bore hole will be sufficient for domestic use on site. To ensure the provision of potable water at sufficient pressure to the proposed development, it is recommended that the development be furnished with an on-site elevated storage tank. Additionally, it must be noted that as per the norm for developments of this nature, on-site storage of sufficient water for fire suppression measures will also be required.

Considering the above, taking cognisance of the demand figures as reflected in table 8-1 to 8-3, as per the NPDG the requirement for the storage of potable water is 24 to 48 hours of TAADD and greater that the instantaneous peak demand of the tan zone plus an allowance of 10%. The duration of storage is determined by the reliability of the source of supply to storage tank. Considering the source of supply is from an established borehole that can provide sufficient capacity, it may be recommended that the duration of storage is to maximum 48 hours.

Assuming 48 hours of storage, the required volume of potable water storage may be expressed as follows:

- Tank Supply = 1.1 x PF_{hour} x (TAADD x 48 hours)
- Required Storage = 1.1 x 3.30 x (12.448kℓ/day x 2 day)
- Required Storage = **90.372 kℓ**

Furthermore, capacity for the storage of water for fire suppression must be provided with in the proposed storage reservoir.

As per the requirements of "*SANS 10400-T:2011: Part T: Fire Protection"* a volume equivalent to the total demand for fire suppression measures must be provided and always be available. Considering this, an additional volume of **40 kℓ** (see table 6-2) must also be included in the proposed on-site elevated storage tank.

From the above, it is recommended that a 30m elevated on-site segmental steel storage tank of **2 x 8 x 8 panels** (2.44 x 9.76 x 9.76m; 232m^3) be provided. Taking into consideration "dead" storage volume of approximately 95 kℓ (top and bottom 0.5m), a minimum storage volume of no less than **137 kℓ** will be available for potable and fire water demands.

8.3.2. Internal Potable Water Reticulation

It is recommended that a 160mm Ø uPVC Class 9 distribution main from the proposed on-site elevated storage tank, reducing to a 110mm Ø uPVC Class 9 reticulation main be installed to carry potable water to all parts of the proposed development.

63mm Ø uPVC Class 9 connections will be provided from the 110mm Ø ring feed to the buildings at all service shafts.

In order to ensure adequate pressure to the proposed development, the 160mm Ø distribution main will be supplied from the on-site elevated storage tank designed to supply water at a residual head during peak flow at the highest point in the proposed development of no less than 30 m (3 bar).

8.3.3. Internal Fire Water Reticulation

It is recommended that a 110mm Ø uPVC Class 9 reticulation from the proposed on-site elevated storage tank be installed to carry water for fire suppression to all parts of the proposed development.

75mm Ø uPVC Class 9 connections will be provided from the 110mm Ø feed to the buildings at all service shafts for the provision of water to internally located fire hydrants and fire hose reals. Internal fire hydrants will be provided at a rate of 1 per 1000m2.

An 80mm Ø pedestal type fire hydrant complete with British quick coupling as well as a suction and booster point will be provided externally on the site of the proposed development as per standard 200m radius regulations.

All fire hydrants will be clearly signposted, and the signage installed will be in accordance with SANS 1186. External signs will be no less than 250mm x 250mm in dimension

9. ROADS, PARKING, PAVING AND WALKWAYS

A traffic impact assessment will be conducted by KMA consulting engineers, based on the site development plan as indicated in Annexure A. The conclusions will be detailed, outlined and form part of final designs once the traffic impact assessment have been completed.

General assumptions can be made based on experience and information available but al will have to be reviewed once the impact assessment have been completed.

9.1. Main Access and parking area

Pedestrian and Vehicular access will be provided from the southern side of the proposed development via Kolong st.

It is recommended that the main access road and parking area be constructed with 60mm interlocking paving overlaying adequately engineered sub-surface layer works.

The proposed road and parking layer works profile may be defined as follows:

- Wearing course:

  60 mm grey interlocking paving blocks; type S-A; 25 MPa on a 20 mm sand bed.

- Sub-base course:

  150 mm G5 quality natural gravel sub-base course layer stabilized with 3 % cement and compacted to a minimum of 95 % Mod AASHTO Density.

- In-situ material:

  150 mm in-situ material ripped and re-compacted to 93% Mod AASHTO Density.

The changes required to be done to the existing provincial road, will be determined in the traffic impact study as well as per Provincial Roads recommendations to facilitate the construction of the new access to the proposed development.

9.2. Paved areas and Walkways:

A number of paved areas and walkways intended for pedestrian foot traffic will be facilitated around the convenience store and ablution area of the proposed development.

It is recommended that these paved areas be constructed with 50mm interlocking paving overlaying adequately engineered sub-surface layer works.

The proposed paved area layer works profile may be defined as follows:

- Wearing course:

  50 mm grey interlocking paving blocks; type S-A; 20 MPa on a 20 mm sand bed.

- Sub-base course:

  150 mm G6 quality natural gravel sub-base course layer compacted to a minimum of 95 % Mod AASHTO Density.

- In-situ material:

  150 mm in-situ material ripped and re-compacted to 93% Mod AASHTO Density.

It must be noted that the above recommendations are preliminary recommendations based on previous experience in developments of this nature. ***Final layer works designs for the roads can only be finalized once the actual in-situ material composition and quality has been confirmed***. A detailed soil investigation to ascertain the said soil conditions within the road reserves along the proposed road centrelines must be undertaken and final layer works designs for individual roads must be determined individually based on the outcome and findings of this investigation.

10. STORM WATER

As indicated in item 3.5, the proposed development site is situated in the drainage path of a storm water catchment of approximately 664ha.

From the rational method for storm water run-off calculations for overland flow conditions, the estimated volume of storm water run-off to be experienced on site was determined to be approximately **0.953m^3/s for 1 in 10-year flood return period**.

Considering the above volume of anticipated storm water, it is recommended that measures be taken to protect the proposed development site from ingress of access storm water from nearby hill area.

To this end it is recommended that a drainage channel be constructed along the up-stream erf boundaries of the proposed development site. The channel will be located on the south-western and north-wester erf boundaries of the proposed site and will function to intercept and redirect storm water run-off around the development toward the lower laying north-eastern area, adjacent to the farmlands. The channel will then be formed through the trees towards the furthest discharge point where it can join the natural stream into the river.

Figure 10: Proposed Channel Alignment

11. REFERENCES

- *Department of Statistics South Africa Census 2011 Municipal Fact Sheet. Nama Khoi Municipality Draft Integrated Development Plan 2018/2019.*
- *Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development, 1994 as amended (a.k.a. the "Blue Book").*
- *Guidelines for Human Settlement Planning and Designs as published by the CSIR and will also refer to the local municipality's guidelines and standards (a.k.a. the "Red Book").*
- *South African Local Government Association (SALGA) Planning and Design Guidelines Part II; J-Water Supply; and K-Sanitation.*
- *COLTO 1984*

12. CONCLUSION

We trust this will enable you to make the necessary decisions. MVD Kalahari will gladly assist with additional information should the need arise.

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Consulting Engineers and Town Planners
Level 2 B-BBEE Contributor

/wk/10963-QR-Pampierstad - Bulk Services Report

ANNEXURES

ANNEXURE A:
SITE DEVELOPMENT PLAN