

KOPFONTEIN PORT OF ENTRY
BULK ENGINEERING SERVICES REPORT



FEBRUARY 2020, REV 0 DRAFT

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Abbreviations

| | | |
|----------------|---|------------------------------------|
| L/s | - | Litres per second |
| Mℓ /day | - | Mega litres per day |
| kℓ/day | - | Kilo Litres per day |
| kℓ | - | Kilo Litres |
| PSC | - | Project Steering Committee |
| WC | - | Water Committee |
| IDP | - | Infrastructure Development Plan |
| DWS | - | Department of Water and Sanitation |
| RWS | - | Regional Water Scheme |
| StatsSA | - | Statistics South Africa |
| m ³ | - | cubic metre |
| AADD | - | Average Annual Daily Demand |
| VIP toilet | - | Ventilated Improved Pit toilet |
| MAP | - | Mean Annual Precipitation |
| ADWF | - | Average Dry Weather Flow |

1 Executive summary

Kopfontein port of entry is situated 105km west from Zeerust along the R49 road, GPS coordinates: 24°42'28.64"S 26° 5'45.34"E. The port of entry experience high volume of people moving between South Africa and Botswana. During festive seasons the port of entry experience long queues due to inadequate infrastructure and thereby causing inefficiency. The department intends to improve the operational efficiency by providing adequate roads, offices, security check points, staff accommodation, parking bays, etc. The bulk services required for the upgrade are summarised below;

- 1000kℓ portable water storage
- 650kℓ fire-fighting water storage
- Sewer and water reticulation network, fire hydrants and connections
- Proposed wastewater treatment plant with a capacity of 600kℓ/d
- Road network upgrade
- Stormwater management

The above-mentioned bulk services are estimated to cost **R217 715 869.39** inclusive of VAT, contingencies, escalations and professional fees.

2 INTRODUCTION

Kopfontein port of entry is a border post linking South Africa and Botswana. The port of entry (POE) is to be upgraded to have adequate offices, parking bays, residential accommodation, lanes and security checks. The upgrade intends to equip the port of entry with adequate infrastructure to deliver its obligations efficiently.

This report outlines the engineering services needed for the port of entry, i.e. roads, water, sewer, platforms and electricity.

3 SITE DESCRIPTION

The Kopfontein POE is situated 31km east of Gaborone, Botswana on the R49 road, and also 105km west from Zeerust along the R49 road. It is a major port of entry between South Africa and Botswana. GPS coordinates of site are 24°42'28.64"S 26° 5'45.34"E. The locality map is presented on the figure below.



Figure 1: Locality plan

4 LAND USES

The port of entry is currently has the following land uses:

- The taxi rank,
- SAPS station, and
- Office buildings
- Houses

The port of entry is proposed to be upgraded as follows;

| BUILDINGS | | AREA |
|--|----------------------------------|--------------------|
| LIGHT VEHICLES LESS THAN 2 TONS | | |
| 1 | MAIN ADMIN BUILDING | 1922m ² |
| 2 | INSPECTION BUILDING (ARRIVALS) | 233m ² |
| 3 | INSPECTION BUILDING (DEPARTURES) | 221m ² |
| HEAVY VEHICLES MORE THAN 2 TONS/ FREIGHT | | |
| 4 | MAIN ADMIN BUILDING | 1117m ² |
| 5 | INSPECTION BUILDING (ARRIVALS) | 620m ² |
| 6 | INSPECTION BUILDING (DEPARTURES) | 620m ² |
| PEDESTRIANS, TAXIS AND BUSES | | |
| 7 | MAIN ADMIN BUILDING | 1666m ² |
| 8 | INSPECTION BUILDING (ARRIVALS) | 245m ² |
| 9 | INSPECTION BUILDING (DEPARTURES) | 245m ² |
| SUPPORT SERVICE BUILDINGS | | |
| 10 | WASTE | |
| 11 | CONFISCATED GOODS | |
| 12 | INCINERATOR | 70m ² |
| 13 | WORKSHOP | |
| 14 | OFFICES | |
| 15 | AGRICULTURE/ SAPS DOGS KENNELS | 436m ² |
| 16 | FIRE & RESCUE | |
| 17 | WEIGH BRIDGE | |
| 18 | TOILETS | 30m ² |
| 19 | TAXI RANK | |

Table 1 Land use

The proposed upgraded land use is shown in figure 2 on the next page.

5 TOPOGRAPHY AND ACCESS

The site is generally flat. The slopes allow for buildings and roads development with without the need for massive earthworks site earthworks, provided the bearing soil may not need replacement.



Figure 3 Topography

The existing development is accessed via Road R49. See the figures below.

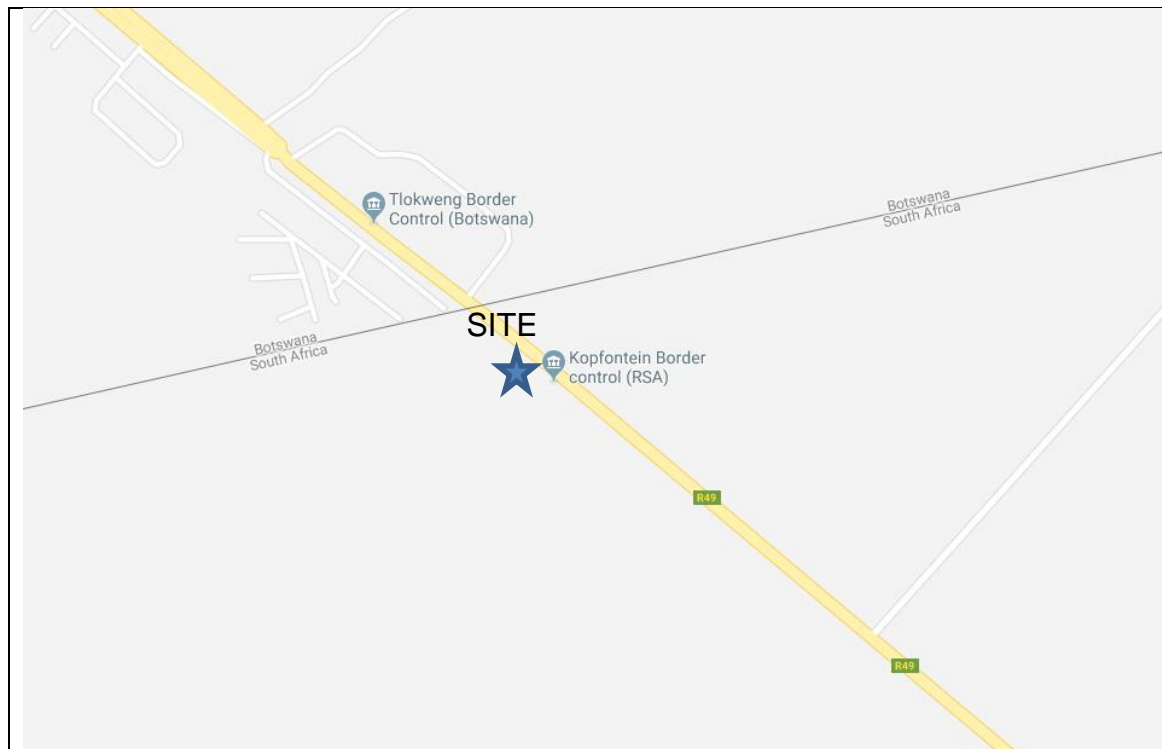


Figure 4 Roads

The port of entry internal road is paved with interlocking concrete. The road is shown on the figure below.



Figure 5 Internal road

6 WATER SERVICE

6.1 Water source

Water is sourced from the Gaborone water scheme in Botswana. Bulk supply line connects to a 160KL ground steel tank, water is then pumped from the sump to the adjacent 55kl elevated command elevated tank. The command tank feeds the rest existing four tanks onsite. The operator onsite indicated that the existing water source is reliable. There are no water meter readings records onsite.





There is a project currently underway to augment water source to the port. Madikwe Dam supplied pipeline construction is ongoing. The water from this source will be treated onsite through a packaged water treatment plant.



Figure 6 Storage locations

6.2 Storage Tanks

The storage tanks in Kopfontein port of entry are presented on the table below.

| Image | Capacity (KL) | Description |
|---|---------------|---|
|  | 160kℓ | Ground steel tank sump fed by the Gaborone water scheme in Botswana. Has a submersible water pump inside. This tank is to be abandoned as a replacement tank is under construction. |
|  | 55kℓ | Command elevated steel tank receiving water from the ground steel tank sump. This tank is to be abandoned as a replacement tank is under construction. |
|  | 70kℓ | Elevated steel tank feeding reticulation. |
|  | 70kℓ | Ground steel tank used for fire water |


| Image | Capacity (KL) | Description |
|---|---------------|--------------------------|
|  | 10kl & 20kl | 2 x Elevated steel tanks |

Table 2 Storages

6.3 Pump Station

A fire pump station is linked to the 70kl steel fire tank.



Figure 7: Pump station

6.4 Water Reticulation

The existing four elevated steel tanks supply the entire port of entry with water. Water is conveyed by an existing pipe network.

The water reticulation is described below.

- Water reticulation to existing buildings.
- Fire hydrants
- Fire flow network

6.5 Water design criteria

The water design criteria to be used is listed in the table below. The water demands and fire flow were adopted from document titled: *The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, Version 1.1, Printed July 2019.*

| Item | Design element | Criteria |
|--------|---|------------------------|
| i. | Average Annual Daily Demand (AADD), for residential 1 | 0.6kl/c/day |
| ii. | Average Annual Daily Demand (AADD), for residential 2 | 0.6kl/c/day |
| iii. | Average Annual Daily Demand (AADD), for business | 400l/100m ² |
| iv. | Average Annual Daily Demand (AADD), for park | 12.5-15kl/hectare |
| v. | Average Annual Daily Demand (AADD), for Municipal | 400l/100m ² |
| vi. | Average Annual Daily Demand (AADD), for Institutional | 400l/100m ² |
| vii. | Gross Average Annual Daily Demand (GAADD) | Allow 10% losses |
| viii. | Daily Instantaneous Peak Factor (DIPF) | 1.5 |
| ix. | Design Peak Flow Rate (DPFR) for domestic flows. | 25l/s |
| x. | Maximum static head | 90m |
| xi. | Minimum residual head under conditions of domestic peak flow | 10m |
| xii. | Maximum linear flow velocity under conditions of domestic peak flow | 3m/s |
| xiii. | Pipe type | uPVC |
| xiv. | Minimum pipe class | 9 |
| xv. | Fire flow at any one hydrant under the conditions of domestic peak flows (one hydrant at a time) | 15 l/s |
| xvi. | Minimum residual head (fire plus domestic peak flow) | 25m |
| xvii. | Maximum linear flow velocity under conditions of fire-fighting | 3m/s |
| xviii. | DWS storage reservoirs sizing criteria: 48 Hrs x AADD Pumped from One Source 36 Hrs x AADD Pumped from Multiple Sources 24 Hrs x AADD Gravity Source | |

Table 3 The water design criteria

6.6 Water demands

The estimated water demand for the township is shown in table below.

As per the table below, the water demand calculations indicate that the port of entry will require 527.6kl/d AADD and 580.3kl/d Gross Average Annual Daily Demand.

| Land Use | | Area (m ²) | Unit flow | Described demand applied | Demand | |
|---|-------|------------------------|-----------|--------------------------|--------|------|
| LIGHT VEHICLES LESS THAN 2 TONS | | | | | | |
| MAIN ADMIN BUILDING | 1 | 1 922.0 | 400 | ℓ/100m ² | 7.7 | kℓ/d |
| INSPECTION BUILDING (ARRIVALS) | 1 | 233.0 | 400 | ℓ/100m ² | 0.9 | kℓ/d |
| INSPECTION BUILDING (DEPARTURES) | 1 | 221.0 | 400 | ℓ/100m ² | 0.9 | kℓ/d |
| | | | | | | |
| HEAVY VEHICLES MORE THAN 2 TONS/ FREIGHT | | | | | | |
| MAIN ADMIN BUILDING | 1 | 1 117.0 | 400 | ℓ/100m ² | 4.5 | kℓ/d |
| INSPECTION BUILDING (ARRIVALS) | 1 | 620.0 | 400 | ℓ/100m ² | 2.5 | kℓ/d |
| INSPECTION BUILDING (DEPARTURES) | 1 | 620.0 | 400 | ℓ/100m ² | 2.5 | kℓ/d |
| | | | | | | |
| PEDESTRIANS, TAXIS AND BUSES | | | | | | |
| MAIN ADMIN BUILDING | 1 | 1 666.0 | 400 | ℓ/100m ² | 6.7 | kℓ/d |
| INSPECTION BUILDING (ARRIVALS) | 1 | 245.0 | 400 | ℓ/100m ² | 1.0 | kℓ/d |
| INSPECTION BUILDING (DEPARTURES) | 1 | 245.0 | 400 | ℓ/100m ² | 1.0 | kℓ/d |
| SUPPORT SERVICE BUIDINGS | | | | | | |
| INCINERATOR | 1 | 70 | 400 | ℓ/100m ² | 0.3 | kℓ/d |
| AGRICULTURE/ SAPS DOGS KENNELS | 1 | 436 | 400 | ℓ/100m ² | 1.7 | kℓ/d |
| TOILETS (ASSUMED PROCESSED PEOPLE PER DAY) | 8 000 | 30 | 60 | ℓ/c/d | 480.0 | kℓ/d |
| TAXI RANK | 1 | 6 000 | 300 | ℓ/100m ² | 18.0 | kℓ/d |
| | | | | | | |
| Totals | 10 | 6 959 | | | | |
| | | | | | | |
| Sub-total Average Annual Daily Demand (AADD) | | | | | 527.6 | kℓ/d |
| | | | | | | |
| Gross Average Annual Daily Demand (GAADD) (added 10%) | | | | | 580.3 | kℓ/d |
| Gross Average Annual Daily Demand (GAADD) (added 10%) | | | | | 6.7 | ℓ/s |
| | | | | | | |
| Peak Water Flow (Summer Peak Factor) | | | 1.5 | peak factor | 870.5 | kℓ/d |
| Peak Water Flow (Summer Peak Factor) | | | 1.5 | peak factor | 10.1 | ℓ/s |

Table 4 Water demand

The proposed development has an AADD water demand of 527.6kl/d.

As the point of entry receives water from a pumped source; the proposed development is to have a 48hour water storage.

Therefore, required domestic water storage = $48\text{hrs} \times (527.6\text{kl}) / 24\text{hrs} = 1,055.2\text{kl}$
= say 1100kl = 1.1Ml

The existing domestic water storage has 100kl in capacity.

Therefore, additional proposed domestic water storage = $1100\text{kl} - 100\text{kl} = \underline{1000\text{kl} = 1\text{Ml}}$

The Fire flow calculations are presented on the table below.

| RISK CLASSIFICATION | Total Fire Flow (l/s) | Duration of Fire flow (h) | Total Fire Flow (l/s) | Required Fire Flow Storage | |
|---|-----------------------|---------------------------|-----------------------|----------------------------|------|
| Moderate risk 1: Industrial, business, high rise flats ≥ four storeys | 50 | 4 | 50 | 720.0 | kl/d |

Table 5 Fire flow demands

The new development will require 720kl fire water storage. Fire hydrant pipelines should be designed to the capacity of 50l/s.

The existing fire storage has 70kl in capacity.

Therefore, additional proposed fire storage = $720\text{kl} - 70\text{kl} = \underline{650\text{kl}}$

7 SEWER SERVICE

7.1 EXISTING WASTE WATER TREATMENT WORKS

The port of entry uses septic tank system. Sewer flows gravitate to the septic tanks adjacent to the houses. The office buildings sewer flows gravitate into the sewer pump station, which in turn pumps the sewer the septic tanks adjacent to the houses.



Soak-away manhole



Septic tanks and soak-away area

Figure 8 Sewer manhole.

7.2 Bulk sewer

The design guidelines were adopted from the CSIR document titled: The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, Version 1.1, Printed July 2019.

The proposed development sewer flow calculations are shown in the table.

| LAND USE | SITE | Area (m ²) | Average daily water demand per unit | | Sewer Return | Sewer Flow | |
|---|------|------------------------|-------------------------------------|---------------------|--------------|---------------|-------------|
| LIGHT VEHICLES LESS THAN 2 TONS | | | | | | | |
| MAIN ADMIN BUILDING | 1 | 1922.0 | 400 | ℓ/100m ² | 85% | 7 | kℓ/d |
| INSPECTION BUILDING (ARRIVALS) | 1 | 233.0 | 400 | ℓ/100m ² | 85% | 1 | kℓ/d |
| INSPECTION BUILDING (DEPARTURES) | 1 | 221.0 | 400 | ℓ/100m ² | 85% | 1 | kℓ/d |
| | | | | | | | |
| HEAVY VEHICLES MORE THAN 2 TONS/ FREIGHT | | | | | | | |
| MAIN ADMIN BUILDING | 1 | 1117.0 | 400 | ℓ/100m ² | 85% | 4 | kℓ/d |
| INSPECTION BUILDING (ARRIVALS) | 1 | 620.0 | 400 | ℓ/100m ² | 85% | 2 | kℓ/d |
| INSPECTION BUILDING (DEPARTURES) | 1 | 620.0 | 400 | ℓ/100m ² | 85% | 2 | kℓ/d |
| | | | | | | | |
| PEDESTRIANS, TAXIS AND BUSES | | | | | | | |
| MAIN ADMIN BUILDING | 1 | 1666.0 | 400 | ℓ/100m ² | 85% | 6 | kℓ/d |
| INSPECTION BUILDING (ARRIVALS) | 1 | 245.0 | 400 | ℓ/100m ² | 85% | 1 | kℓ/d |
| INSPECTION BUILDING (DEPARTURES) | 1 | 245.0 | 400 | ℓ/100m ² | 85% | 1 | kℓ/d |
| | | | | | | | |
| SUPPORT SERVICE BUILDINGS | | | | | | | |
| INCINERATOR | 1 | 70 | 400 | ℓ/100m ² | 85% | 0 | kℓ/d |
| AGRICULTURE/ SAPS DOGS KENNELS | 1 | 436 | 400 | ℓ/100m ² | 85% | 1 | kℓ/d |
| TOILETS | 8000 | 30 | 60 | ℓ/c/d | 85% | 408.0 | kℓ/d |
| TAXI RANK | 1 | 6 000 | 300 | ℓ/100m ² | 85% | 15 | kℓ/d |
| | | | | | | | |
| Sub-total Sewer ADWF | | | | | | 448 | kℓ/d |
| | | | | | | | |
| 15% Extraneous flow | | | | | | 67.27 | kℓ/d |
| | | | | | | | |
| Gross Sewer | | | | | | 515.71 | kℓ/d |
| | | | | | | | |
| Gross Sewer flow | | | | | | 5.97 | ℓ/s |
| | | | | | | | |
| Peak Factor | | | | | | 2.5 | |
| | | | | | | | |
| Peak Sewer Flow | | | | | | 1289.27 | kℓ/d |
| Peak Sewer Flow | | | | | | 14.92 | ℓ/s |

Table 6 Sewer design flow

The new development will have a sewer ADWF flow of 448kℓ/d, and a gross sewer of 515.71kℓ/d. The sewerage pipes are to capacity to handle the peak sewer flow of 14.92ℓ/s.

Currently the sewer is handled by a maze of septic tanks and soakaways. It is proposed that a central wastewater treatment plant be build to cater for the sewer generated by the border post. The capacity of the wastewater treatment plant is to be the gross sewer of 515.71kℓ/d.

Say, the capacity of the wastewater treatment plant = 600kℓ/d.

7.3 Proposed Sewer

- New reticulation pipelines must be constructed to service the buildings, and toilets.
- Build a 600kℓ/d wastewater treatment plant to service the new development. That sewer plant would be more manageable rather that the multiplicity of septic tanks currently obtaining onsite.

8 Electricity

There is existing electrical infrastructure around Kopfontein point of entry. Electrical power supply comes from Zeerust Chrome sub-station. The feeder name is Zeerust chrome Nietverdiend 22kV. The capacity of sub-station is 2x20MVA/22kV. There is an existing 315kVA / 22kV transformer that is connected from the metering point to the electrical distribution kiosk.

9 TOWNSHIP ROADS

The road infrastructure to service the township will be the standards of the Red Book, TMH, TRH books and the local municipality.

Main access to the township is to be gained through existing bounding road.

An application to connect the township to the existing road has to be approved by road authorities prior to construction.

9.1 Classification of roads

| Description | Class no. | Function | Reserve width | Roadway width |
|-----------------------|-----------|------------------------------------|---------------|---------------|
| Access Road | 5d | Access from existing bounding road | 16m | 7.4m |
| Internal Service Road | 5f | Internal Road | 13 | 6m |
| Internal Service Road | 5f | Internal Road | 10 | 6m |

Table 7 Classification of roads

9.2 Geometric Design Standards

| | |
|----------------------------|----------------|
| Design speed | 60km/h |
| Minimum centre line radii | 50m |
| Minimum gradient | 0.5% |
| Favoured maximum gradient | 10% |
| Maximum grade/grade length | 12.5% over 70m |
| Maximum K-value : Crest | 16 |
| : Sag | 16 |

Table 8 Class 5d – Access road

| | |
|----------------------------|--------------|
| Design speed | 30km/h |
| Minimum centre line radii | 30m |
| Minimum gradient | 0.5% |
| Favoured maximum gradient | 12% |
| Maximum grade/grade length | 16% over 50m |
| Maximum K-value : Crest | 6 |
| : Sag | 8 |

Table 9 Class 5f – Internal roads

9.3 Pavement Design

The proposed pavement designs are based on anticipated traffic volumes and ground conditions, a detailed pavement design will require a geotechnical centreline investigation report.

The table below shows the proposed pavement design for the development.

| Design | Description |
|---------------------------------|--|
| Pavement | 50mm Premix Asphalt / 80mm Paving blocks / Concrete |
| Base | 150mm Thick commercially graded gravel G1 material compacted to Minimum of 88% of apparent relative density. |
| Subbase | 300mm Thick natural gravel stabilised with Cement to create C3 material compacted to 97% of Mod AASHTO |
| Upper Selected Layer | 150mm Thick Natural gravel G7 material compacted to 97% of Mod AASHTO Density. |
| Lower Selected Layer | 150mm Thick Natural gravel G7 material compacted to 97% of Mod AASHTO Density. |
| Roadbed & Fill (where required) | 150mm Thick layers compacted to 90% of Mod AASHTO Density. Minimum CBR= 3 at 90% of Mod AASHTO Density- G9 |

Table 10 Proposed pavement design

10 Stormwater Drainage

The stormwater will drain on according to the slope of the natural ground.

10.1 Stormwater systems

The terrain will be drained by V-drains or channelling of stormwater on the road surface to the natural low point. The stormwater will then flow over the veld to the stream. Stormwater discharge control will be applied in order to reduce the damaging effect of the increase in runoff due to densification.

10.2 Hydrology

The hydrological data used in the design of the stormwater drainage system is shown in the table below.

| Hydrological Data | |
|--|---|
| a) Flood return period | 1: 2 years for storm water pipe system. 1: 5 years for the combined storm water Pipe and road systems |
| b) Average yearly rainfall | 528mm |
| c) Minimum time of concentration and run | As per Local Municipality Guidelines |
| d) Design Method | Rational method |

Table 11 Hydrological data

10.3 Design Standards

The table below lists the standards to be used in the design of the stormwater drainage system:

| Design Element | Specification |
|--------------------------|---|
| a) Minimum pipe size | 600 concrete |
| b) Minimum pipe gradient | 0.67% |
| c) Storm water details | Local Municipal Standard Details |

Table 12 Stormwater design standard

11 SOLID WASTE

A regional landfill situated nearest the is used to dispose solid waste. The local municipality is responsible for connecting and disposing the solid waste.

Reference is made to: The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, Version 1.1, Printed July 2019.

The solid waste generation range from 0, 41 kg per capita per day in the poor areas, to 1.29 kg per capita per day.

People are anticipated to spend less than 8 hours in the port of entry and thus the 0.41kg/c/d was adopted. Solid waste will be generated by the development.

- Solid waste = 0.41kg/per person/day or (0.41kgx365 days)
- Waste generated per day = $0.41 \times 8000 = 3280 \text{ kg} = 3.28\text{t}$
- Waste generated per annum = $3280 \times 365 / 1000 = 1197.2\text{t}$

12 COST ESTIMATES

The total cost estimates excluding building works and electrical cost is presented in table 13 on the next page. It is estimated that the bulk infrastructure will cost **R217 715 869.39** inclusive of VAT, contingencies, escalations and professional fees.

| Item | Description | Unit | Qty | Rate | Amount (R) |
|-------|---|------|------|---------------|-----------------------|
| 1 | Preliminary and General | Sum | | | 13 659 006.34 |
| 1.1 | ROAD INFRASTRUCTURE | | | | |
| 1.2 | Internal road | km | 7.9 | 11 500 000.00 | 90 357 142.86 |
| 1.3 | Stormwater 600 diameter pipe | m | 5500 | 1 200.00 | 6 600 000.00 |
| 1.4 | Sub-Total A | | | | 110 616 149.20 |
| 2.0 | WATER INFRASTRUCTURE | | | | |
| 2.1 | 1000kl Elevated steel tank | no | 1 | 4 341 546.00 | 4 341 546.00 |
| 2.2 | 750kl Elevated steel tank for fire | no | 1 | 2 894 364.00 | 2 894 364.00 |
| 2.3 | Water reticulation pipe network: | | | | |
| 2.3.1 | 110mm dia uPVC class 9 pipe | m | 3300 | 520.00 | 1 716 000.00 |
| 2.3.2 | 160mm dia uPVC class 9 pipe | m | 450 | 580.00 | 261 000.00 |
| 2.3.3 | 200mm dia uPVC class 9 pipe | m | 100 | 595.00 | 59 500.00 |
| 2.3.4 | 250mm dia uPVC class 9 pipe | m | 2500 | 650.00 | 1 625 000.00 |
| 2.3.5 | 315mm dia uPVC class 9 pipe | m | 200 | 720.00 | 144 000.00 |
| 2.3.6 | Fire hydrants | no | 20 | 18 000.00 | 360 000.00 |
| 2.3.7 | Water connections | no | 56 | 6 000.00 | 336 000.00 |
| 2.4 | Sub-Total B | | | | 11 737 410.00 |
| 7.0 | SEWER INFRASTRUCTURE | | | | |
| 7.1 | Sewer reticulation: | | | | |
| 7.2 | 160mm dia uPVC class 51 pipe | m | 2550 | 880.00 | 2 244 000.00 |
| 7.3 | 200mm dia uPVC class 51 pipe | m | 320 | 900.00 | 288 000.00 |
| 7.4 | 250mm dia uPVC class 51 pipe | m | 630 | 950.00 | 598 500.00 |
| 7.5 | Construct a new centralised Septic tank | sum | 1 | 2 000 000.00 | 2 000 000.00 |
| 7.6 | Sub-Total C | | | | 5 130 500.00 |

| Item | Description | Unit | Qty | Rate | Amount (R) |
|------|-------------------------------------|-------|-----|------------|-----------------------|
| 8.0 | Sub-Total A + B + C | | | | 127 484 059.20 |
| | | | | | |
| 9.1 | Survey and pegging | sum | 1 | 350 000.00 | 350 000.00 |
| 9.2 | Geotech | sum | 1 | 180 000.00 | 180 000.00 |
| 9.3 | Professional fees and disbursements | % | 1 | 14% | 17 847 768.29 |
| 9.4 | Environmental Impact Assessment | sum | 1 | 500 000.00 | 500 000.00 |
| 9.5 | OHS monitoring | Month | 36 | 150 000.00 | 5 400 000.00 |
| 9.6 | Social consultation | Month | 36 | 130 000.00 | 4 680 000.00 |
| 9.7 | Environmental monitoring | Month | 36 | 130 000.00 | 4 680 000.00 |
| | | | | | |
| | | | | | |
| 9.5 | Sub-Total (C) | | | | 33 637 768.29 |
| | | | | | |
| 10.1 | Sub-Total (D) = (B) + (C) | | | | 161 121 827.49 |
| | | | | | |
| 10.2 | Contingencies | | | 10% | 16 112 182.75 |
| | | | | | |
| 10.3 | Escalation | % | | 7.5% | 12 084 137.06 |
| | | | | | |
| 10.4 | Total | | | | 189 318 147.30 |
| | | | | | |
| 10.5 | VAT | % | | 15% | 28 397 722.09 |
| | | | | | |
| 10.6 | GRAND TOTAL | | | | 217 715 869.39 |

Table 13 Cost estimates

13 Conclusion

The proposed upgrade will contribute towards providing appropriate and adequate infrastructure for the officials to perform their duties efficiently.

Signature:

Signed by:

PR No.:

For Dalimede Projects (PTY) Ltd

ANNEXURES

ANNEXURE 1 Layout Plan

ANNEXURE 2 Drawings