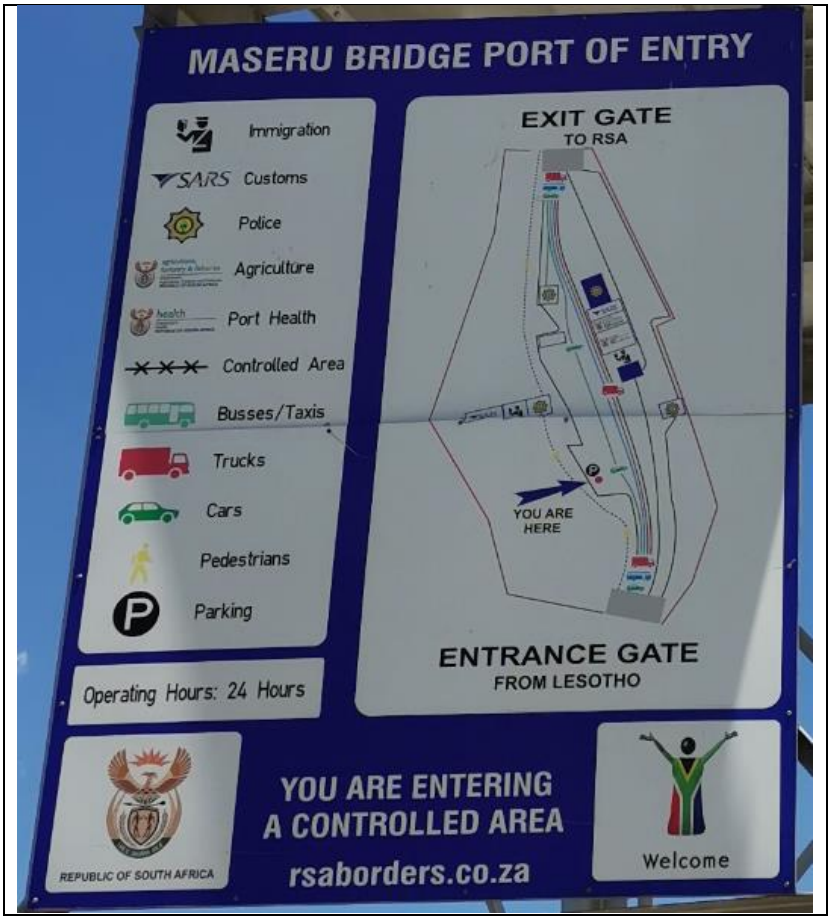
MASERU PORT OF ENTRY

BULK ENGINEERING SERVICES REPORT



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PREPARED BY:

NHLATSE
Planning Consultants
making the future look better

Nhlatse Planning Consultants
25B Excelsior Street
P.O. Box 4865
Polokwane, 0700

Tel: 015 297 8673
Fax: 015 297 8673
Email: mmaphuti@telkomsa.net

PREPARED FOR:

public works
Department:
Public Works
REPUBLIC OF SOUTH AFRICA

Department of Public Works
256 Madiba Street, Pretoria
Private Bag X65, Pretoria, 0001

Tel: 012 406 1046
Fax: 086 758 0245

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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
m3	-	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

Maseru port of entry is situated 15km south east of Ladybrand town, GPS coordinates: 29°17'51.32"S 27°27'8.79"E. The port of entry processes high volumes of people and cargo moving between South Africa and Lesotho. During festive seasons the port of entry experiences even longer queues due to inadequate infrastructure and thereby causing inefficiency. The department intents improve the operational efficiency by providing adequate roads, security check points, staff accommodation, parking bays. The bulk services required for the upgrade are summarised below.

- 1000kl domestic portable water storage needed
- 750kl fire fight water storage needed
- Storage for both domestic and fire to be combined into one 2000kℓ reservoir
- Sewer and Water reticulation network and connections
- Upgrading Water Treatment plant to handle 526kℓ/D (GAADD)
- Upgrade Waste water treatment plant to 467kℓ/D
- Road network expansion
- Stormwater management

The above-mentioned bulk services are estimated to cost **R401,418,997.43** inclusive of VAT, contingency, escalation, specialist services and professional fees.

2 INTRODUCTION

Maseru port of entry is a border post linking South Africa and Lesotho. The port of entry is to be upgraded to have adequate offices, parking bays, residential accommodation, lanes and security checks. The upgrade intent to equip the port of entry with adequate infrastructure to deliver on 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

Maseru port of entry is situated 15km south east of Ladybrand town along theR26 and the N8 roads. The area is administered by Mantsopa Local Municipality, under the Thabo Mofutsanyane District Municipality. GPS coordinates of site are 29°17'51.32"S 27°27'8.79"E. The locality map is presented on the image below.

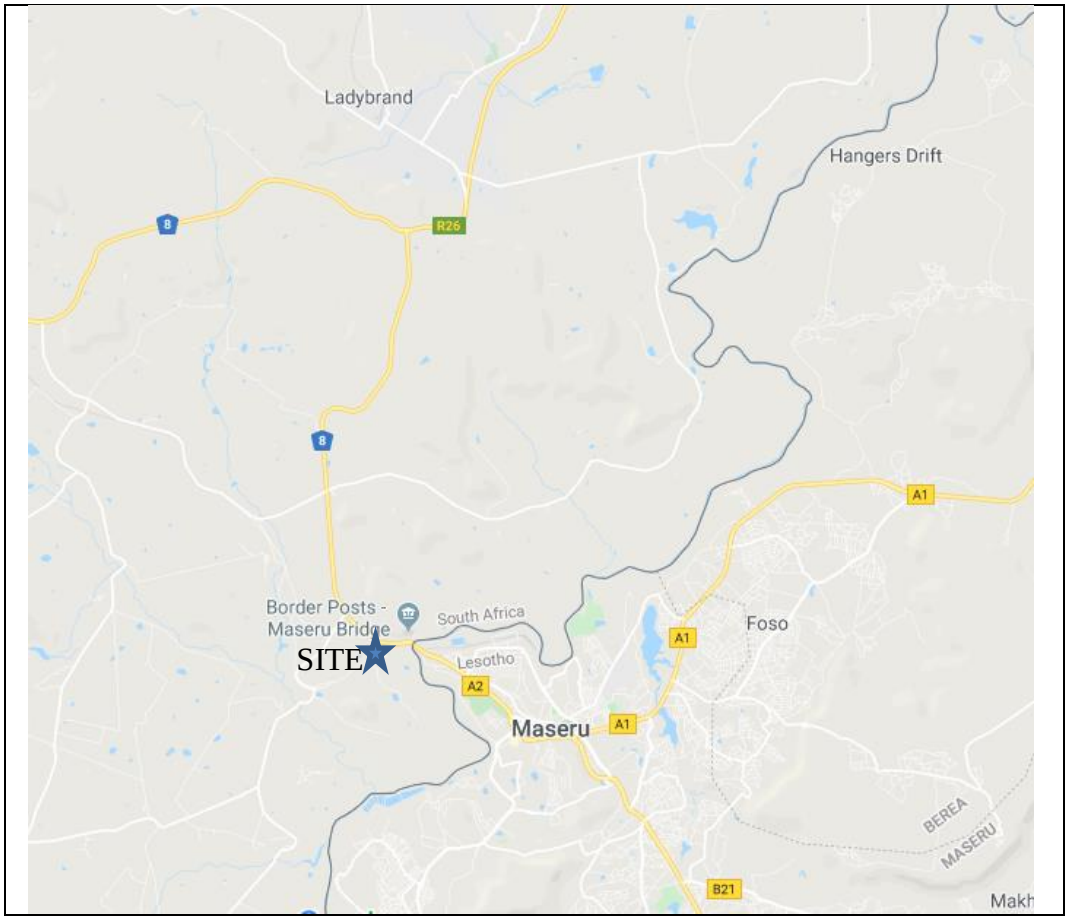


Figure 1: Locality plan

4 PROPOSED LAND USED FOR THE EXPANSION OF THE PORT

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

	BUILDINGS	AREA
	LIGHT VEHICLES LESS THAN 2 TONS	
1	MAIN ADMIN BUILDING	1920m^2
2	INSPECTION BUILDING (ARRIVALS)	233m^2
3	INSPECTION BUILDING (DEPARTURES)	233m^2
	HEAVY VEHICLES MORE THAN 2 TONS/ FREIGHT	
4	MAIN ADMIN BUILDING	1835m^2
5	INSPECTION BUILDING (ARRIVALS)	465m^2
6	INSPECTION BUILDING (DEPARTURES)	465m^2
	PEDESTRIANS, TAXIS AND BUSES	
7	MAIN ADMIN BUILDING- 1246m^2	1246m^2
8	INSPECTION BUILDING (ARRIVALS)	400m^2
9	INSPECTION BUILDING (DEPARTURES)	400m^2
	SUPPORT SERVICE BUILDINGS	
10	WASTE	900m^2
11	CONFISCATED GOODS	240m^2
12	INCINERATOR	94m^2
13	WORKSHOP	
14	OFFICES	
15	AGRICULTURE/ SAPS DOGS KENNELS	586m^2
16	FIRE & RESCUE	675m^2
17	WEIGH BRIDGE	
18	TOILETS	16m^2
19	TAXI RANK	

Table 1 Land use

The proposed and use image is shown in figure 2 on the next page.

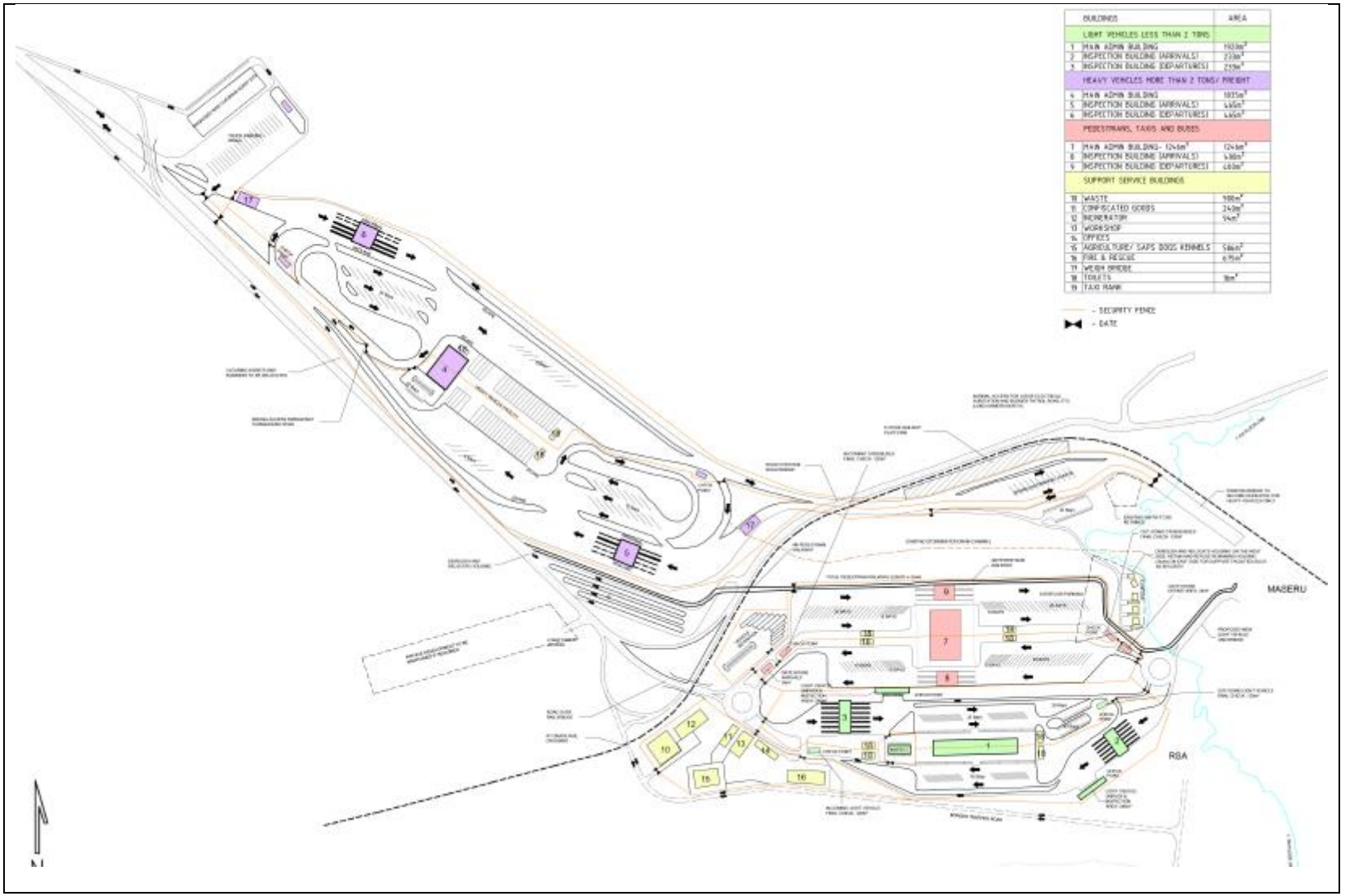


Figure 2: Proposed land use

5 TOPOGRAPHY AND ACCESS

The site slopes are a mixture of flat, hilly and steep. The slopes allow for buildings and roads with medium site earthworks.

Figure 3 Topography

The existing development can be accessed via road N8. See the figures below.

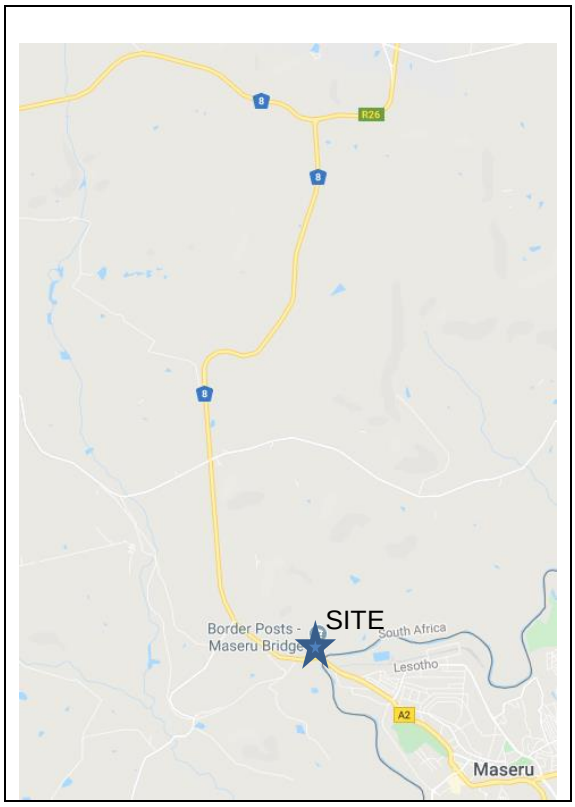


Figure 4 Roads

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

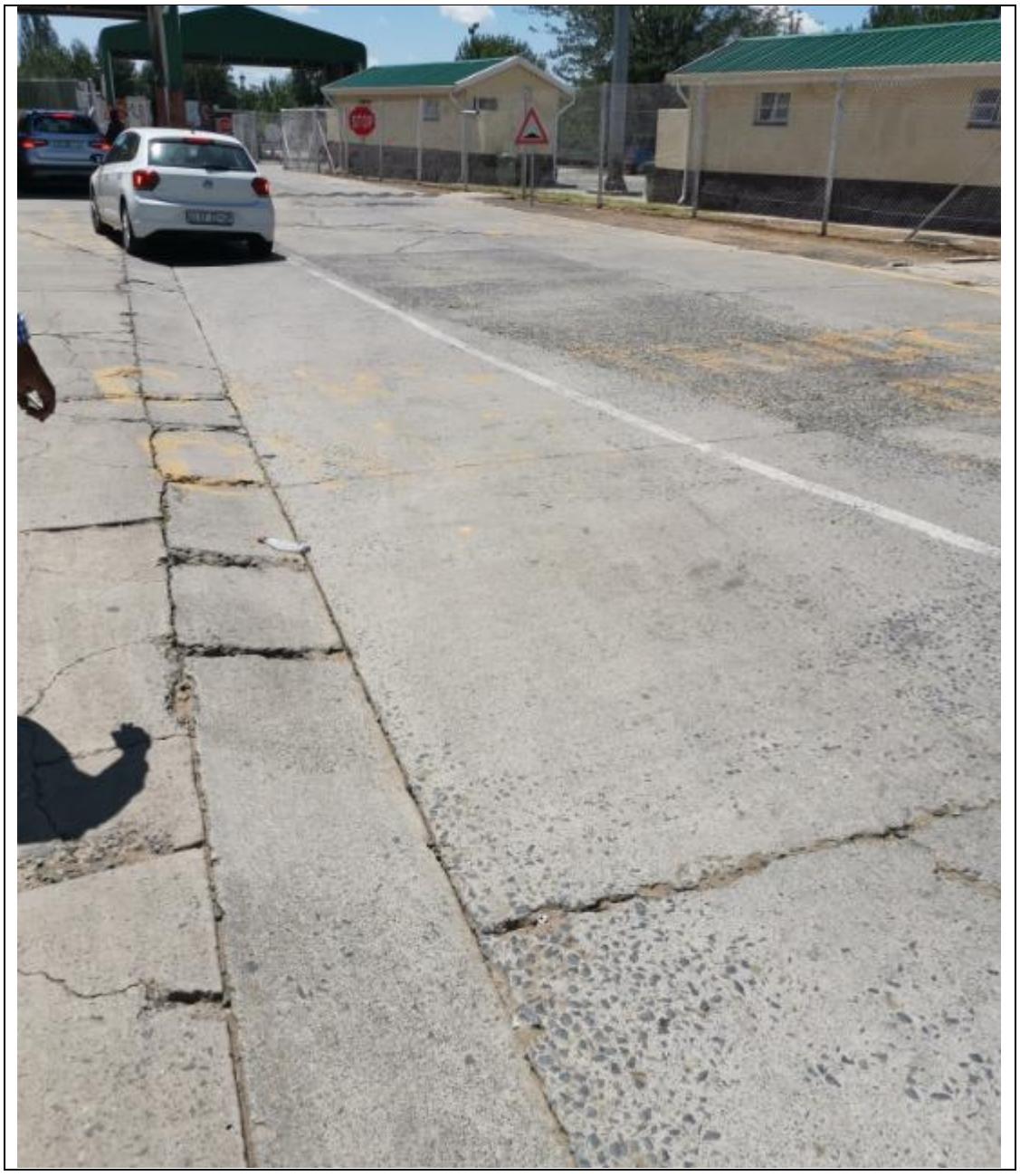


Figure 5 Internal road

6 WATER SERVICE

6.1 Water source

The Maseru port of entry has got its own Water Treatment plant. Water is abstracted from Caledon River and pumped, through a 75mm diameter pipe, into 250kl raw water reservoir and also directly into the water treatment plant. The purified water gravitates to a 302kℓ concrete clear well reservoir. Water is pumped from the clear well to the elevated tanks onsite. Water meter records are available onsite.

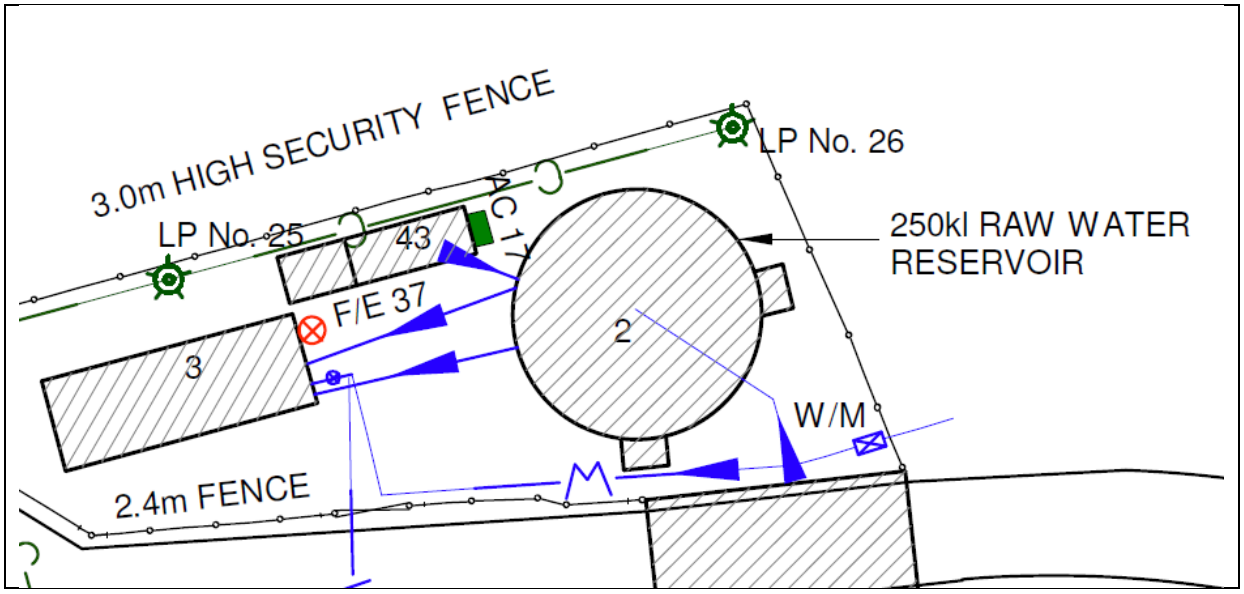


Figure 6 Water Source

6.2 Storage Tanks

There are 6 water storage tanks in the facility, the storage tanks are presented on the table below.

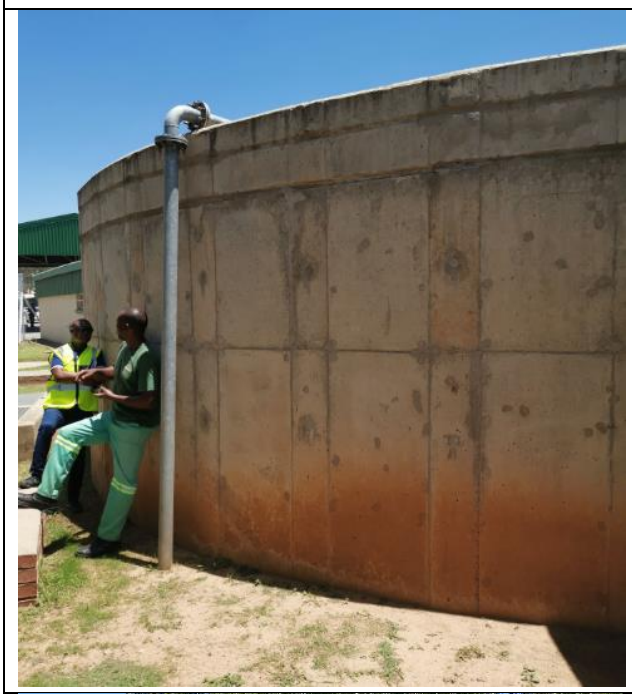
Image	Storage Size (kℓ)	Description
	250kℓ	Raw water concrete storage
	302kℓ	Clear well concrete reservoir feeding the high lift pump station and low elevation areas

Image	Storage Size (kℓ)	Description
	29.05kℓ	Water tank for ablutions
	14.53kℓ	Water tank for admin buildings and the houses

Image	Storage Size (kℓ)	Description
	49.03kℓ	Elevated tank at the barracks.
	29.05kℓ	Fire hydrant water tank on ground, at the barracks. Feeds the adjacent connected fire hydrant booster pump building

Table 2 Storage tanks

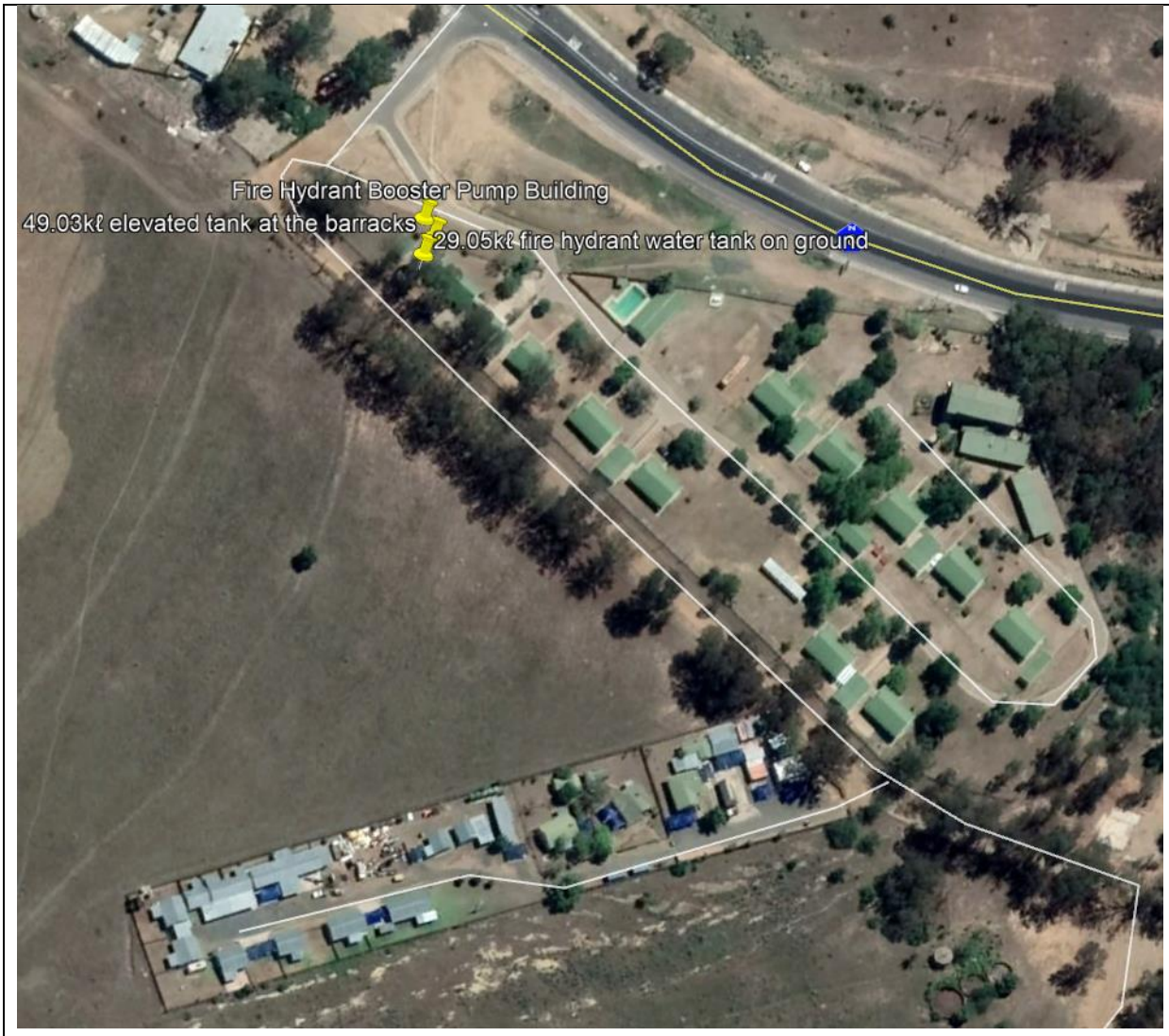


Figure 7: Storage tank, pumps layout

6.3 Pump stations

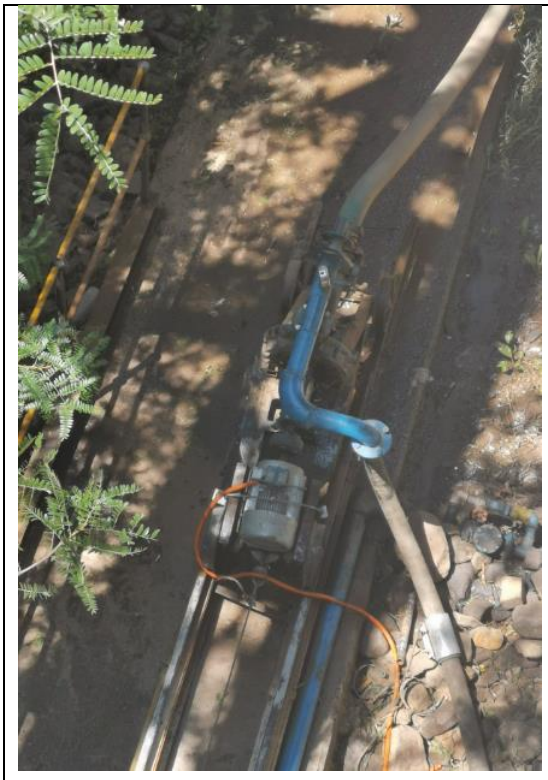
Pumps for potable water and fire water are installed in the high lift pump station bulding. High lift water pumps are used to supply elevated storage tanks. The images depicting inside the pump house is shown below.

High lift pump station building

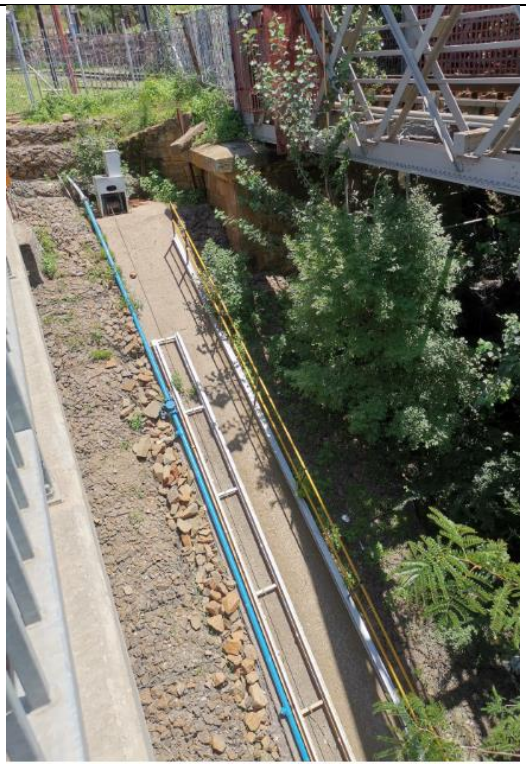
HTP1:
Pumps to the 14.53kℓ elevated water tank for admin buildings and the houses.
Two pumps, one duty and one standby.

Fire water pumps

HTP2:
Pumps to the barracks 49.03kℓ elevated tank



Raw water pump. Only one pump.



Raw water pump lift mechanism

Figure 8: Pumps

6.4 Water Reticulation

The port of entry is reticulated with a combination of uPVC, galvanised steel and HDPE pipes.

The water reticulation is described below.

- Water reticulation to existing buildings.
- Fire hydrants.

6.5 Water design criteria

The water design criterion 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, ISBN: 978-0-6399283-2-6 © 2019, 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/100m2
iv.	Average Annual Daily Demand (AADD), for park	12.5-15kℓ/hectare

v.	Average Annual Daily Demand (AADD), for Municipal	400ℓ/100m2
vi.	Average Annual Daily Demand (AADD), for Institutional	400ℓ/100m2
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 development is shown in table below.

As per the table below, the water demand calculations indicate that the port of entry will require 477.6kℓ/d AADD and 525.4 kℓ/d Gross Average Annual Daily Demand.

Table 4 Water demand

Land Use	No. of Erven	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	233.0	400	ℓ/100m^2	0.9	kℓ/d
HEAVY VEHICLES MORE THAN 2 TONS/ FREIGHT						
MAIN ADMIN BUILDING	1	1 835.0	400	ℓ/100m^2	7.3	kℓ/d
INSPECTION BUILDING (ARRIVALS)	1	465.0	400	ℓ/100m^2	1.9	kℓ/d
INSPECTION BUILDING (DEPARTURES)	1	465.0	400	ℓ/100m^2	1.9	kℓ/d
PEDESTRIANS, TAXIS AND BUSES						
MAIN ADMIN BUILDING	1	1 246.0	400	ℓ/100m^2	5.0	kℓ/d
INSPECTION BUILDING (ARRIVALS)	1	400.0	400	ℓ/100m^2	1.6	kℓ/d
INSPECTION BUILDING (DEPARTURES)	1	400.0	400	ℓ/100m^2	1.6	kℓ/d
SUPPORT SERVICE BUIDINGS						
INCINERATOR	1	94	400	ℓ/100m^2	0.4	kℓ/d
AGRICULTURE/ SAPS DOGS KENNELS	1	586	400	ℓ/100m^2	2.3	kℓ/d
TOILETS (ASSUMED PROCESSED PEOPLE PER DAY)	14 270	16	30	ℓ/c/d	428.1	kℓ/d
TAXI RANK	1	6 000	300	ℓ/100m^2	18.0	kℓ/d
Totals	10	7 293				
Sub-total Average Annual Daily Demand (AADD)					477.6	kℓ/d
Gross Average Annual Daily Demand (GAADD) (added 10%)					525.4	kℓ/d
Gross Average Annual Daily Demand (GAADD) (added 10%)					6.1	ℓ/s
Peak Water Flow (Summer Peak Factor)			**1.5**	**peak factor**	**788.1**	kℓ/d
Peak Water Flow (Summer Peak Factor)			**1.5**	**peak factor**	**9.1**	**ℓ/s**

The proposed development has an AADD water demand of 477.6kℓ/d.
As the point of entry water distribution is from a pumped source; the proposed development is to have a 48hour water storage.

Therefore, required domestic water storage = 48hrs x (477.6kℓ) / 24hrs = 955.2kℓ
= say 1000kℓ = 1Mℓ

The existing domestic water storage has 92.61kℓ in capacity. However, the new development eliminates this existing storage to 0kℓ.
Therefore, additional proposed domestic water storage = 1000kℓ - 0kℓ = 1000kℓ = 1Mℓ

The Fire flow calculations are presented on the table below

FIRE FLOW DEMANDS

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 720 kℓ water storage to fight fire. Fire flow pipelines should be designed to the capacity of 50l/s.

It is proposed to combine the domestic and fire storage into one reservoir = 1000kℓ + 720kℓ = 1720kℓ
= <u>say 2000kℓ = 2Mℓ</u>

7 SEWER SERVICE

7.1 EXISTING WASTE WATER TREATMENT WORKS

Maseru port of entry has a functioning waste water treatment works located within the perimeter of the port.
From previous reports on the plant, the wastewater treatment works capacity was estimated to be 238m^3 /day.

64kl septic tank and muncher. Waste water is conveyed by 110mm diameter clay pipes to be treated.
.

Figure 9 Waste water treatment plant.

The Maseru port of entry currently has registered water use licence for discharging wastewater effluent into the Caledon / Mohokare River to a maximum volume of 18250m^3 per year. Meaning, the volume of wastewater effluent being discharged into the river to be average less than 50 m^3 per day.

There is a maintenance team onsite for the plant. There is a working wastewater meter which is read daily.
From the meter records the following was observed;

- Wastewater influent into the plant typically ranged from 50 to 210 m³ per day.
- Wastewater effluent from the plant typically ranged from 40 to 220 m³ per day.

The current location of the sewer treatment works inhibits potential expansion of the border post due to the works being centralised. Ideally, the sewer treatment works should be decentralised to allow growth of the border post and appurtenant structures. It should be noted that old sewer pipe works south of the port of entry beyond the security fence exist. These pipe works have been disregarded for an extended period of time and are currently dilapidated and in a state of disrepair. However, the decentralised location could potentially be an ideal position for a new waste water treatment works as part of the future expansion of the border post.

7.2 Bulk sewer

Sewerage effluent is conveyed by 110mm diameter to the septic tank and muncher. The proposed upgrades will require the sewer infrastructure to be upgraded.

The design guidelines were adopted from the CSIR document titled: Guidelines for Human settlement planning and design volume 2, Reprint 2005. The proposed development sewer flow calculations are presented upon finalising the cadastral layout plan

LAND USE	***SITE***	**Area (m^2)**	***Average daily flow per unit***		***Sewer Return***	***Sewer Flow***	
LIGHT VEHICLES LESS THAN 2 TONS							
MAIN ADMIN BUILDING	1	1922	400	ℓ/100m^2	85%	7	kℓ/d
INSPECTION BUILDING (ARRIVALS)	1	233	400	ℓ/100m^2	85%	1	kℓ/d
INSPECTION BUILDING (DEPARTURES)	1	233	400	ℓ/100m^2	85%	1	kℓ/d
HEAVY VEHICLES MORE THAN 2 TONS/ FREIGHT							
MAIN ADMIN BUILDING	1	1835	400	ℓ/100m^2	85%	6	kℓ/d
INSPECTION BUILDING (ARRIVALS)	1	465	400	ℓ/100m^2	85%	2	kℓ/d
INSPECTION BUILDING (DEPARTURES)	1	465	400	ℓ/100m^2	85%	2	kℓ/d
PEDESTRIANS, TAXIS AND BUSES							
MAIN ADMIN BUILDING	1	1246	400	ℓ/100m^2	85%	4	kℓ/d
INSPECTION BUILDING (ARRIVALS)	1	400	400	ℓ/100m^2	85%	1	kℓ/d
INSPECTION BUILDING (DEPARTURES)	1	400	400	ℓ/100m^2	85%	1	kℓ/d
0	0	0	0				
SUPPORT SERVICE BUIDINGS	0	0	0				
INCINERATOR	1	94	400	ℓ/100m^2	85%	0	kℓ/d
AGRICULTURE/ SAPS DOGS KENNELS	1	586	400	ℓ/100m^2	85%	2	kℓ/d
TOILETS (ASSUMED PROCESSED PEOPLE PER DAY)	14270	16	30	ℓ/c/d	85%	363.9	kℓ/d
TAXI RANK	1	6000	300	ℓ/100m^2	85%	15	kℓ/d
Sub-total Sewer ADWF						**406**	**kℓ/d**

15% Extraneous flow						60.90	kℓ/d
Total Sewer						466.87	kℓ/d
Sewer Flow						5.40	ℓ/s
Peak Factor						2.5	
Peak Sewer Flow						**1 167.17**	**kℓ/d**
Peak Sewer Flow						**13.51**	**ℓ/s**

Table 6 Sewer design flow

The new development will have a sewer ADWF of 406 kℓ/d and a gross sewer flow of 466.87kℓ/d.

7.3 Sewer reticulation

- New reticulation pipelines must be constructed to supply the office buildings and toilets.

8 Electricity

Eskom is the supplier of electricity for the area. The existing electrical infrastructure network consists of an 11 kV (medium-voltage) distribution and 400 V low-voltage (LV) reticulations to the metered supply points. The network and infrastructure was reported as being in a good working condition.

Eskom has an 88/11kV substation, the Maseru rural 88/11 kV substation, to the north east of the border post.

The port of entry's power is currently fed from the branch line that runs east, and the MV line's route is well suited for the planned expansion areas of the Maseru Port of Entry.

The LV reticulation is done via underground cabling to the buildings from the two transformers located inside the port area (Maseru-Bridge Port of Entry transformer and the Maseru Barracks transformer) have spare capacities for expansion.
During the site walkabout two diesel generators were identified as a secondary supply should the power fail.

9 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.

The entrance to the site is located towards the western side of the site, with access being provided by the N8 national road. The existing network of the entire site consists of 285 m paved roadway connecting the site entrance to the border post of Lesotho.

The Maseru port of entry has a total area of approximately 477 m^2 of formal parking. The primary part of this area (402 m^2) consists of open plan short term parking areas. While the remaining 75 m^2 of the area is designated to staff parking behind existing office buildings. Staff parking bays is sheltered by awnings. It has been noted that there exists a great shortage of adequate staff parking areas due to the limited area of the current border post.

The topography of the site promotes the stormwater run-off effectively towards the eastern side of the site. This flow is intercepted by various stormwater infrastructure components situated around the existing buildings and along the roadway at local low points. They then channel the stormwater to subsurface stormwater drains.
The stormwater is disposed of at the eastern side of the site into the Caledon River.

Figure 10 Stormwater outlet structure

Further development of the site will result in an increase of an impermeable surface area, resulting in an increase of the stormwater runoff. Therefore, the current stormwater network will inevitably have to be upgraded to accommodate any changes.

9.1 Classification of roads

Description	Class no.	Function	Reserve width	Roadway width	Length (km)
Access Road	5d	Access from existing bounding road	16m	7.4m	1.95
Internal Service Road	5f	Internal Road	13	6m	1.45
Internal Service Road	5f	Internal Road	10	6m	8.01

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	755mm
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 RAILWAY LINE

There is an existing that traverses on the northern boundary of the Maseru point of entry. There is an existing gate that is opened by an official to allow formal passage.

Figure 11 Rail way line

Trains carry only freight and are not inspected at the port of entry. Freight is sealed and processed by the inland port at Bloemfontein.

The railway line crosses the N8 main road near the border gate at a non-signalised level crossing which is stop sign controlled. It appears that the typical rail demand is low with only one or two trains per day per direction so that roadway capacity is not significantly affected. Train operating speeds are also very low at this point as trains also need to come to a full stop at the port of entry to wait for the gate to be opened.

As the rail level crossing on the N8 road is in close proximity to the port of entry; it is not deemed desirable and impacts on the port of entry operations and public safety.

12 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.
The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, ISBN: 978-0-6399283-2-6 © 2019, 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 = 0.41x 14270 = 5851 kg = 5.851 5t
- Waste generated per annum = 5.851x365 =2136t/year

13 COST ESTIMATES

The total cost estimates excluding building works and electrical cost is presented in the table below. It is estimated that the bulk infrastructure will cost **R401,418,997.43** inclusive of VAT, contingency, escalation, specialist services and professional fees.

Item	Description	Unit	Qty	Rate	Amount (R)
1	Preliminary and General	Sum			26 436 310.01
1.1	**ROAD INFRASTRUCTURE**				
1.2	Internal roads	km	15.7	11 500 000.00	180 714 285.71
1.3	Stormwater 900 diameter pipe	m	9428.6	1 200.00	11 314 285.71
1.4	**Sub-Total A**				**218 464 881.44**
2.0	**WATER INFRASTRUCTURE**				
2.1	**Storage**				
2.1.1	2Mℓ Concrete reservoir	no	2	4 341 546.00	8 683 092.00
2.1.2	Mountain gravel access road to reservoir	km	1.5	850 000.00	1 275 000.00
2.2	**Water reticutation pipe network:**				
2.2.1	75mm dia uPVC class 9 pipe	m	1020	450.00	459 000.00
2.2.2	90mm dia uPVC class 9 pipe	m	2610	620.00	1 618 200.00
2.2.3	110mm dia uPVC class 9 pipe	m	350	680.00	238 000.00
2.2.4	160mm dia uPVC class 9 pipe	m	126	720.00	90 720.00

Item	Description	Unit	Qty	Rate	Amount (R)
2.2.5	200mm dia uPVC class 9 pipe	m	1500	900.00	1 350 000.00
2.2.6	250mm dia uPVC class 9 pipe	m	3000	940.00	2 820 000.00
2.2.7	315mm dia uPVC class 9 pipe	m	1300	1 000.00	1 300 000.00
2.2.8	Fire hydrants	no	30	18 000.00	540 000.00
2.2.9	Water connections	no	38	6 000.00	228 000.00
2.2.10	Upgrade the exisiting water treatment works	sum	1	2 500 000.00	2 500 000.00
2.3	**Sub-Total B**				**21 102 012.00**
2.4	**SEWER INFRASTRUCTURE**				
2.4.1	Sewer reticutation:				
2.4.2	160mm dia uPVC class 51 pipe	m	3760	850.00	3 196 000.00
2.4.3	200mm dia uPVC class 51 pipe	m	700	880.00	616 000.00
2.4.4	250mm dia uPVC class 51 pipe	m	400	900.00	360 000.00
2.4.5	Upgrade the existing sewer treatment plant	sum	1	3 000 000.00	3 000 000.00
2.5	**Sub-Total C**				**7 172 000.00**
2.6	**Sub-Total A + B + C**				**246 738 893.44**
2.6.1	Survey and pegging	sum	1	350 000.00	350 000.00
2.6.2	Geotech	sum	1	180 000.00	180 000.00
2.6.3	Professional fees and disbursements	%	1	14%	34 543 445.08
2.6.4	Environmental Impact Assessment	sum	1	500 000.00	500 000.00
2.6.5	OHS monitoring	Month	36	150 000.00	5 400 000.00
2.6.6	Social consultation	Month	36	130 000.00	4 680 000.00
2.6.7	Environmental monitoring	Month	36	130 000.00	4 680 000.00
2.7	**Sub-Total (C)**				**50 333 445.08**
2.8	**Sub-Total (D) = (B) + (C)**				**297 072 338.52**
	Contingencies			10%	**29 707 233.85**
	Escalation	%		7.5%	**22 280 425.39**
	Total				**349 059 997.76**
	VAT	%		15%	52 358 999.66

Item	Description	Unit	Qty	Rate	Amount (R)
	GRAND TOTAL				**401 418 997.43**

Table 13 Cost estimates

14 Conclusion

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

ANNEXURES