Annexure J – Engineering Service Report

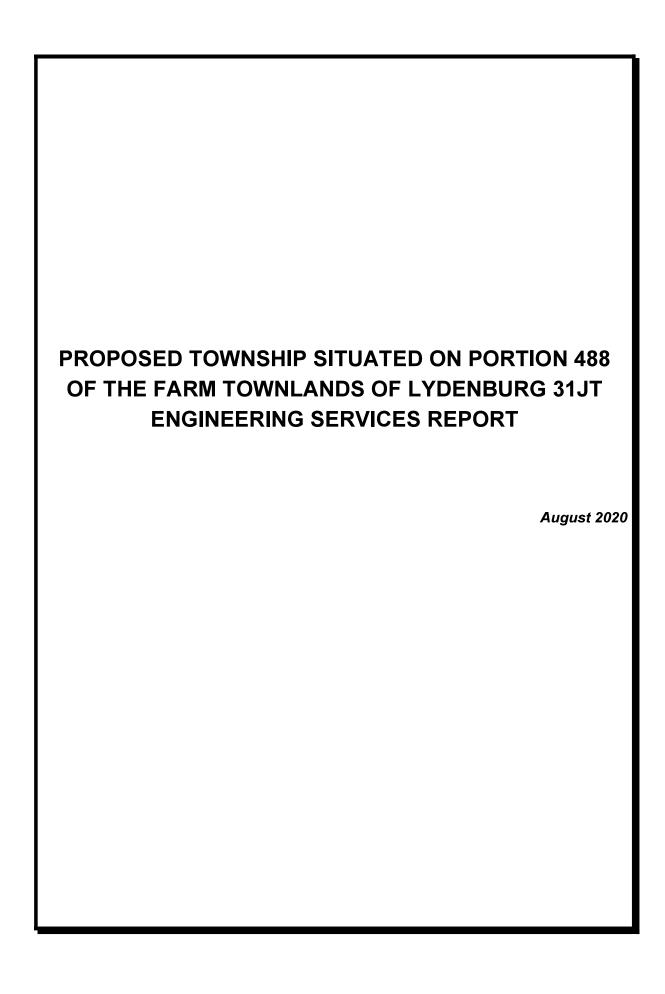


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APPENDICES

Appendix A: Town Planner's Layout

Appendix B: Site and General Layout of Proposed Services

1 INTRODUCTION AND BACKGROUND

1.1 Introduction

This report provides an overview of the engineering services (i.e. roads and civil engineering services) to be constructed for the proposed residential development on Portion 488 of Portion 453 of the farm Lydenburg 32– JR, in Lydneburg/Mashishing town.

The report is aimed only at providing scoping level detail for inclusion in each of:

- The environment scoping report, and
- The planning approval application process being prepared by town planners

1.2 Study area

The development falls inside the jurisdiction of the Thaba Chewu Local Municipality. The site is situated on Portion 488 of Portion 453 of the farm Lydenburg 32– JR, south of Lydenburg Town. The site is 17 hectares in size. The co-ordinates of the site are 25° 6'32" South and 30°26'21" East.



Figure 1: Locality Plan

1.3 Other Contextual Information

The report is to be read in the context of the following information.

- Town Planner Layout Elmon Consulting
- Geotechnical Investigations: Portion 453 Townlands of Lydenburg 31JR –
 MWEM PTY Limited
- Floodlines assessments for the unnamed stream adjacent to the proposed Pentagon Business and Development (PBRD) – Gomelelo Environmental & Management Consulting

2 SITE DESCRIPTION

Based on the available information, the following site characteristics are summarised:

2.1 Topography and Drainage

The site is located between 1455 masl and 1380 masl. The site slopes down in a southern direction towards Dorpsrivier stream. Existing natural drainage is in the form of sheetflow or overland flow.

2.2 Geology

The geotechnical investigation indicate that the site is typically underlain by sandy clay classified as ML (Silt), MH (Silt of high plasticity and elastic silt) and SM (Silty sand).

2.3 Hydrology

No development is allowed below the 1:100 year flood line. The flood line study (done by others) confirmed the position of the 1:100 year flood line. The delineated 1:100 year floodlines indicates that the project boundary for the proposed development lies outside the delineated floodlines. Thus the proposed development poses no risk on the adjacent water resource in terms of flooding while the development the development itself will also not be exposed to the risk of flooding during high rainfall events.

2.4 Land Use

The land use table for the proposed township is indicated on table and figure below:

Land Use-Zoning	Erven	Area (Ha)
Dwelling Houses	251	7.36
Dwelling Units/Flats	1	1.22
Shopping Center, Commercial Uses and other Business	2	0.90
Uses		
School	1	0.33
Parks, Sports Field and other recreational or related uses	2	2.98
Clinic	1	0.76
Filing Station	1	0.35
Streets & Roads	N/A	4.80

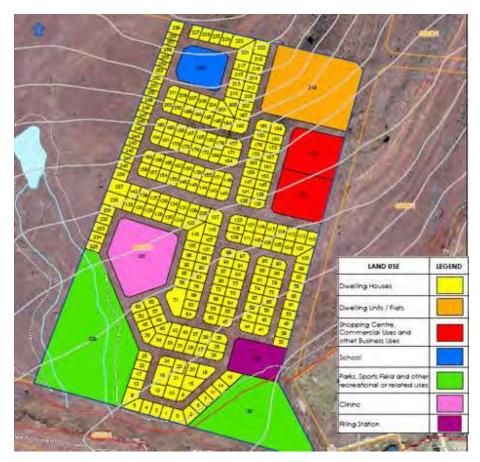


Figure 2: Proposed Site Plan

2.5 Engineering Services Required

Annexure B provided an overview of the site and a general layout of the services proposed for the overall development.

The services are to be designed to standards similar to those adopted at Lydenburg Town. In general, these are to be typical of most up-market residential developments and are guided by the standards adopted by the Thaba Chewu Local Municipality.

All roads and services infrastructure will be signed off in accordance with Municipal requirements, and SANS 10400 where applicable, by the design Engineer concerned.

Construction of the roads and services will be done by medium to large, experienced specialist contractors, with construction monitoring by the respective Professional Engineer for each discipline.

3 WATER SUPPLY (POTABLE AND FIRE)

3.1 Existing Infrastructure

The property to be developed is currently vacant land. The site is currently undeveloped, and no water services have been installed on the site. The only existing water related infrastructure is the existing pipeline connecting to the houses on 5th Street about 2km from the proposed development.

3.2 Design Layout

Pipelines will largely run within road reserves. **Appendix B** indicates a preliminary system layout with pipelines following the road network.

3.3 Water Design Criteria

The following standards will be used in the design of the water reticulation:

Average annual daily demand (AADD)

Dwelling Houses : 0.8 kl/unitDwelling Units/Flats : 0.6 kl/unit

o Business, Commercial and schools : 50 kl per hectare

• Clinic :500l/day for 100m² of gross floor

area

Street : N/A

Peak hour demand

Peak hour factor (PHF) : 4.6

Peak hour demand : PHF x AADD

System heads

Maximum static head (no demand) : 90 m

Minimum residual head under conditions of peak hour demand at erf

boundary : 24 m

Fire - fighting

Fire risk category : Category C (residential)

Total fire flow : 15 ℓ/s
 Flow at any one hydrant : 15 ℓ/s
 Minimum pressure at fire : 8 m

Minimum pressure rest of system : 5 m

Spacing of fire hydrants : 240 m max

Linear pipeline velocity

Maximum under conditions of peak hour : 1.8 m/s
 Maximum under conditions of firefighting : 2.2 m/s

 uPVC ring main feeding the various residential areas, and providing fire fighting supply (110mm – 160mm diameter)

 Pipe material for pipes and fittings < 50 mm Ø: HDPE PE 100 to SANS ISO 4427 reticulation pipework and house connection

Minimum pipe class : PN 12 (or higher-pressure class if required)

Supply lengths : 12 m minimum

Joints : Butt–welded to SANS 10268

• Boundary roughness (k-value) : 0.1 mm

Flow formula : D'Arcy Weissbach

Depth of cover below final ground level

On sidewalks
 Across streets
 1.0 m(min) – 1.5 m(max)
 1.0 m(min) – 1.5 m(max)

Placement of pipes inside 13 m to 25 m road reserves

2.2 m from erf boundary on high side of road (16 m road reserves)

1.8 m from erf boundary on high side of road (13 m road reserves)

Placement of isolating valves

 Opposite splay corner pegs in networks so that not more than 4 valves have to be shut off to isolate any part of the network.

Placement of hydrants

o Fire Department to specify type and placement

 Opposite the communal erf pegs and between 0.3 m and 0.5 m away from them not closer than one erf length to any intersection

3,4 Water Demand Calculations

Land Use-Zoning	Erven	Area (m²)	Units	% of Township	Measuring unit/day	Unit Water Consumption (kl)	ADD (kl/day)	Peak hourly factor	Peak Domestic Consumpt ion (I/s)
Shopping Center, Commercial Uses and other Business Uses	2	0006	2	%9	kl per hectare	95	45	4.6	2.28
School (day School)	1	3300	1	2%	kl per hectare	20	17	4.6	0.83
Dwelling Houses	251	73600	251	23%	kl per unit	0.8	<u>201</u>	4.6	10.16
Dwelling Units/Flats	1	12200	1	%6	kl per unit	9.0	1	4.6	0.03
Clinic	1	0092	_	2%	kl per m2(100m2 per Gross Area)	0.005	38	4.6	1.92
Filing Station	_	3500	_	3%	kl per m2(100m2 per Gross Area)	0.004	14	4.6	0.71
Park	1	29800	1	21%	kl per hectare	20	149	4.6	7.54
Total	258	139000	258	100%			464		23.47

AADD: Average annual daily demand

3.5 Fire flow under peak

Flow Condition			Min/Max. Pressure	Absolute Min/Max. Pressure
			(m)	(m)
Peak hour demand-minimum			20 to 24	16 to 20
Static (no demand) -maximum			06	120
Fire flow (@peak hour demand)			See below	
Area where fire occurs	Total fire flow (I/s)	Flow at hydrant (I/s)	Flow at hydrant Min. pressure at (I/s)	Min. pressure rest of system (m)
Residential 3	15	15	8	5

4 SEWER DRAINAGE

4.1 Existing Infrastructure

The property to be developed is currently vacant land. The site is currently undeveloped, and no existing sewer reticulation have been installed on the site. The only existing outfall sewer runs along 5th Street and 1st Street about 2km from the proposed development.

4.2 Design Layout

Appendix B shows the proposed wastewater reticulation system layout. The system comprises of a full water borne gravity reticulation system network of 110mm to 200mm uPVC pipelines which collects all flows to the existing network system.

4.3 Sewer Design Criteria

The following standards will be used in the design of the water reticulation:

Average annual daily demand (AADD)

Dwelling Houses : 0.6 kl/unitDwelling Units/Flats : 0.6 kl/unit

Business, Commercial and schools : 30 kl per hectare

o Clinic :300l/day for 100m² of gross floor area

o Street : N/A

• Peak factor :2,5

• Sewer capacity : Pipes shall be designed to run

at 70% full, measured in terms of flow depth

Provision for stormwater infiltration : The remaining 10%

• Flow formula : Manning with n = 0.013

• Minimum velocities in sewers : 0.75 m/s at full flow with

absolute minimum 0.6 m/s

• Fall through manholes : 80 mm (for sewers <315mm dia)

Minimum pipe size for reticulation pipes : 145mm internal diameter

- Sewer erf connections : 110mm diameter at the lowest point of each erf in the case of Res 1 erven and to a distance of 500 mm inside the erf boundary and not less than 1m from side boundary.
- Minimum gradients

Nominal Ø (mm)	Minimum grade with depth of flow = $^{1}/_{5}$ D and V = 0.6 m/s	Minimum grade with depth of flow = $\frac{1}{2}$ D and V = 0.82 m/s
160	1/80 (for fewer than 24 dwelling units connected)	1/100
200	1/120	1/200
250	1/160	1/240
315	1/200	1/300

• Depth of sewer

o In mid-blocks : 1.2m depth to invert

In street reserves : 1.5m depth to invert

- Sewer system in mid-blocks or street reserves: Mid-block system acceptable if sewers are not installed deeper than 2 m and the main sewer not deeper than 3 m, otherwise a double system may be considered depending on costs.
- Maximum manhole spacing : 110m
- Placement of sewers inside 13 m to 25 m road reserves:
 - o 2.85 m from erf boundary on high side of road (16 m road reserves)
 - 2.45 m from erf boundary on high side of road (13 m road reserves)
- Placement of sewers inside mid-blocks : 1.2 m from erf boundary
- 110mm-200mm uPVC full waterborne gravity reticulation network
- Supply lengths :12m minimum
- Sewer manholes : Precast concrete rings with "Pro-Struct 687" sealant at joints

4.4 Sewer Outflow Calculations

Land Use- Zoning	Area (m²)	Units	% of Township	Measuring unit/day	Sewer Flow (kl)	AADD (kl/day)	Instantaneous Peak Factor	Instantaneous Peak (kl/day)
Shopping Center, Commercial Uses and other	0006	2						
Business Uses			11%	kl per hectare	28	25	3.4	98
School (day School)	3300	T	%8	kl per hectare	40	13	3.4	45
Dwelling Houses	73600	251	40%	kl per unit	0.64	161	3.4	546
Dwelling Units/Flats	12200	T	10%	kl per unit	0.48	ō	3.4	2
Clinic	7600	_	2%	kl per m2(100m2 per Gross Area)	0.004	30	3.4	103
Filing Station	3200	_	1%	kl per m2(100m2 per Gross Area)	0.0032	11	3.4	38
Park	29800	_	1%	kl per hectare	40	119	3.4	405
Total	139000	258	100%			360		1225

5 STORMWATER

5.1 Existing stormwater

The property to be developed is currently vacant land. The site is currently undeveloped and no existing stormwater reticulation have been installed on the site. The stormwater runoff is proposed to be discharge to the nearby Dorpsrivier stream.

5.2 Design Layout

Stormwater infrastructure will largely run within road reserves. **Appendix B** indicates a preliminary system layout.

5.3 Storm water infrastructure:

Rainfall:

The rainfall station that are located closed to the site are shown on table below:

Table 1: Rainfall Station Close to the proposed site

Station Name	SAWS	Distance	Record	Latitude	Longitude	MAP	Altitude
	Number	(km)	(Years)	(-) (')	(-) (')	(mm)	(m)
LYDENBURG							
(POL)	0554786_W	2.5	89	25 5	30 27	681	1372
LYDENBURG-							
VIS.	0554816_A	3.6	23	25 6	30 28	670	1423
LEIDENBURG							
111	0554752_W	7.2	62	25 2	30 26	703	1356

a) Design philosophy:

The removal of storm water from the entire development for that matter will be via a combination of surface channels, road and pipe network. The discharge of storm water will be into the nearby Dorpsrivier stream.

The proposed stormwater control system aims at:

 Reducing runoff peaks as a result of an increase in hardened across the site such that post-development flows into receiving streams are no higher than predevelopment flows.

• Preventing scour and erosion on steep slopes from flow concentrations.

b) Design Flood Calculations

The following table indicate some of the typical guidelines used for run-off calculations:

Table 2: Design flood frequencies for minor systems

Design flood frequencies for	or minor systems
Land use	Design flood recurrence interval
Residential	1 - 5 years
Institutional	2-5 years
General commercial	5 years
CBD	5 – 10 years

The Rational Method using 5 year Design flood recurrence interval would used for the determination of stormwater run-off.

5.4 Pre-Development Runoff

The runoff for the pre-developed site was calculated by using the following hydrological and hydraulic parameters:

- Stormwater modelling using the Rational method. However, during the detailed design the EPA-SWMM would be used for the modeling.
- Design storms: Design Rainfall Depth Grid At grid position 25° 6' South and 30°26' East (closest position to proposed site)

The pre-development stormwater modelling results are provided in Table 3.

Table 3: Predevelopment stormwater

		pinioni otonii			
	RI	2	5	10	20
0 (3/0)	HRU	0.6	0.8	1.06	1.4
Q _⊤ (m³/s) Duration = tc=27min	Adamson	0.7	1.03	1.3	1.6
	Alexander	0,5	0.9	1.3	1.7

5.5 Post Development Runoff

The runoff for the post -developed site was calculated by altering the catchment parameters to include for the construction of buildings and surfacing of previously natural ground covered areas.

The impervious areas consist of proposed building footprints, proposed road and parking areas.

The percentage impervious area per catchment is provided with post development results.

The un-attenuated post development stormwater modelling results are provided in Table 4.

Table 4: Post Development Stormwater

	र।	2	5	10	20
O (m ³ /o)	HRU	0.9	1.2	1.4	1.8
Q _⊤ (m³/s) Duration = tc	Adamson	1.1	1.5	1.8	2.1
Duration – to	Alexander	0.8	1.3	1.7	2.1

5.6 Major System

The road network would be utilized for the drainage of excess runoff not entering the underground system.

The proposed development allows for overland stormwater to be channelled along the internal road network and discharges into the proposed stormwater management facility such as ponds areas.

The road network makes allowance for stormwater runoff in excess of 1:5 year RI.

5.7 Attenuation Pond

The proposed stormwater control system is designed to negate the increase in peak flows from hardened areas by passing flows through a retention/detention facility.

The attenuation pond size is required to cater for post development 1 in 5 Year peak of 1.2 m3/s to 0.8m3/s predevelopment.

The pond size and stormwater layout would be finalised during the detailed design of the project.

6 ROADS, ACCESS AND PARKING

The road hierarchy and access to the development would be based on the

recommendations covered in the Traffic Impact Assessment.

6.1 Access

Access to the site will be via the existing roads 5th street or 1st street, running adjacent to

the site. The proposed access road will be off the existing access road to the proposed

development as indicated on the attached drawing see Annexure B.

Alternatively, access will be via the main road with access stream crossing or bridge

constructed over Dorpsrivier stream.

6.2 Internal Network

The geometric design, cross section and structural design of the roads will be based on

accepted standards for the class of road proposed.

The road layer works will be finalised during the detail design stage of the project.

SERVICES AGREEMENTS

Discussions with Municipality indicated an adequate availability of bulk water and sewer

from their system. A dedicated bulk connection will be installed by the Municipality on application by the developer. This can only be done once plans or final development are

approved for the development.

A formal services agreement may be required between the Developer and the

Municipality prior to final development approval. This would be to cover sewer, water

supply arrangements, as well as arrangements for fire-fighting infrastructure provisions.

Report by: M Makhabane (Pr Eng No. 20110268)

MLINCO PROJECTS (Pty) Ltd

Signed:

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ANNEXURE B:	SITE AND GE	NERAL LAYOU	JT OF PROPOSE	ED SERVICES	

