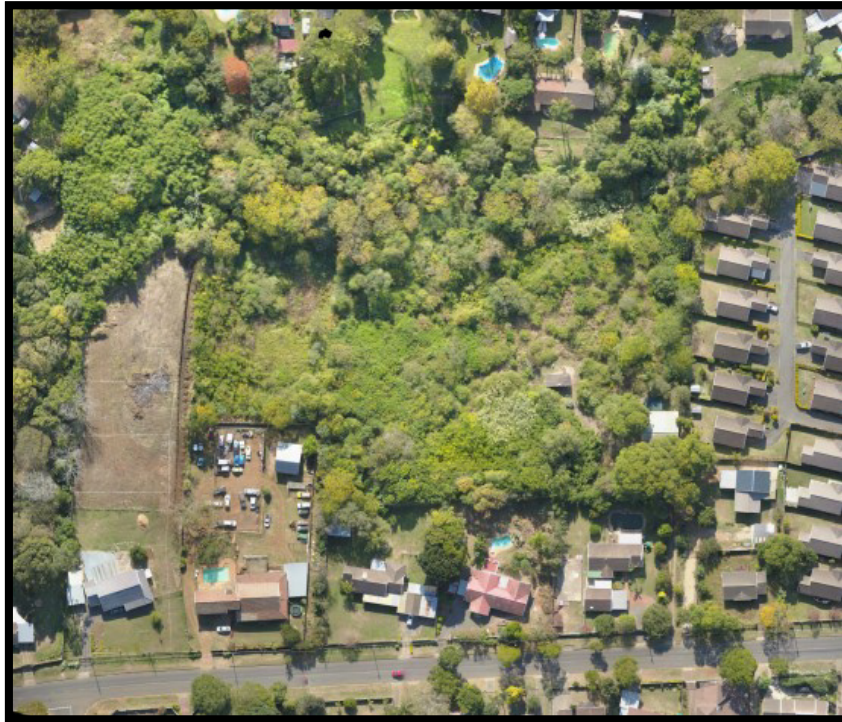


APPENDIX 5: ENGINEERING REPORT

**ERF 61 LINCOLN MEADE
PIETERMARITZBURG**

RESIDENTIAL DEVELOPMENT



**BULK AND INTERNAL SERVICES
ENGINEERING REPORT
REVISION 0**



PO Box 68, Merrivale 3291
Phone: 033-330 8386
Fax: 086 667 9713

JUNE 2018

**ERF 61 LINCOLN MEADE
PIETERMARITZBURG**

RESIDENTIAL DEVELOPMENT

**BULK AND INTERNAL SERVICES
ENGINEERING REPORT
REVISION 0**

I N D E X

1.	INTRODUCTION	3
2.	LOCATION AND ACCESS	3
3.	ENGINEERING DEVELOPMENT PROPOSAL	
3.1	General	3
3.2	Roads	4
3.3	Sewer	5
3.4	Water	6
3.5	Storm water	7
3.6	Refuse	8
3.7	Electricity	8
4.	CONCLUSION	8
ANNEXURE A	LOCALITY PLAN	9
ANNEXURE B	SITE DEVELOPMENT PLAN	10
ANNEXURE C	SITE PHOTOGRAPHS	11

1. INTRODUCTION

Umsunguli Project Management cc was appointed by Mr Bruce Campbell from Person Drive Trading (Pty) Ltd to investigate and prepare a report on the bulk and internal service requirements for a 24 residential site development on Erf 61 along Grimthorpe Avenue, Lincoln Meade, Pietermaritzburg.

This report will assess the availability of all existing infrastructure services and elaborate on the design criteria and specifications that will be applied in the detail design process.

2. LOCATION AND ACCESS

The proposed development is situated in the southern suburb of Pietermaritzburg known as Lincoln Meade. Access to the site will be gained approximately 835m's along the left-hand side of Grimthorpe Avenue, travelling from Murray Road toward Les De Jager Drive.

The GPS co-ordinates at the approximate entrance of the site is 29° 37' 11" S and 30° 26' 6.7" E. A locality plan is provided as Annexure A of this document.

3. ENGINEERING DEVELOPMENT PROPOSAL

3.1 General

Best practise requirements require that services be designed to connect to the existing municipal services infrastructure in order to accommodate the service requirements for developments of this nature. The internal services will be according to accepted engineering specifications and principles as well as acceptable environmental requirements and environmental management plans.

The following engineering design criteria will apply and assumptions made:

- (a) Where bulk services are not available, the infrastructure will be provided by the Developer.
- (b) The provision of services to the proposed development will be designed to norms and standards in accordance with the "*Guidelines for Human Settlement Planning and Design*" (Red Book).
- (c) Percolation tests are not required for this development unless in the unlikely event of the municipal sewer reticulation system not being able to accommodate the daily sewer demand of the proposed development.

Existing Services

The following existing services were observed during the site inspection conducted on 08 June 2018, namely

- **Roads** Grimthorpe Avenue is a 7m wide surfaced residential collector street stretching from Murray Road to Rogers Avenue which thereafter transitions from a surfaced road to a gravel road up until the causeway traversing over the Msunduzi River.
- **Water** There is an existing 225mm Ø distribution main on Erf 61s' side of Grimthorpe Avenue and an existing 150mm Ø reticulation pipe on the adjacent side of the road.
- **Sanitation** The surrounding properties have linked into an existing 150mm Ø gravity fed sewer line, the aforementioned sewer line gravitates along the lower portion of Erf 61.
- **Storm water** There are no existing storm water systems in place on site, although there is a small stream on the lower end.

3.2 Roads

3.2.1 Bulk Road Network

The access to the site is along Grimthorpe Avenue, which is a 7m wide surface road serving most of the surrounding residential sites in the area. Grimthorpe Avenue is not a through road although it does gain access to a small agricultural community known as Bishopstowe on the adjacent side of the Msunduzi River.

The proposed entrance to the development is approximately 835m from the intersection between Murray Road and Grimthorpe Avenue. The site layout shows a separate entrance and exit off Grimthorpe Avenue, which shall be able to accommodate the expected traffic volumes generated from the proposed development although the access bellmouths to the development shall need to be upgraded to meet required municipal standards.

3.2.2 Internal Roads

All internal roads and parking areas will be constructed to suit the anticipated traffic to the development, which is expected to be low and limited to approximately 60 trips per day, using 2.5 trips per household per day.

Due to the fact that the proposed development shall have an entrance and an exit gate, the entrance and exit roads shall only need to be designed to cater for a singular vehicle forward movement with no oncoming obstructions, thus allowing for designs to suite existing surroundings and ensuring no crossing of neighbour's boundaries or servitudes.

The vehicular access gates must be set back off Grimthorpe Avenue to prevent stacking of vehicles on the main road. The access off Grimthorpe Avenue into the entrance/exit should be constructed in a manner to prevent stormwater off Grimthorpe Avenue to enter the development and continue along the main road towards Msunduzi River and other municipal stormwater systems.

The following criteria will be used in the design of the roads applicable to the development:

Internal Roads	:	5m wide road
Design Speed	:	20 km/hr
Cross Fall	:	2%
Min K-Value	:	4
Min Vertical Length	:	20m
Maximum Load	:	10t
Pavement Design	:	30mm Asphalt (minimum) 125mm G2 base 150mm G5 subbase 150mm G7 selected subgrade 150mm insitu material

Alternatives to asphalt surfacing are concrete and interlocking pavers with associated layerworks.

3.3 Sewer

The proposed development is situated within an established residential suburb where there are existing sewer reticulation lines serving the residential properties. Lincoln Meade area have a sewer pumpstation on the embankment of the Msunduzi River, pumping effluent to the nearby Darville Wastewater Treatment Site.

As can be seen in the topographical layout of the existing sewer lines below, Erf 61 is situated above an existing 150mm Ø gravity fed line which shall be simplistic to tie into if the line can accommodate our expected effluent flows, the spare capacity of the line shall need to be confirmed by the local Msunduzi Municipality.



3.3.1 Internal Reticulation

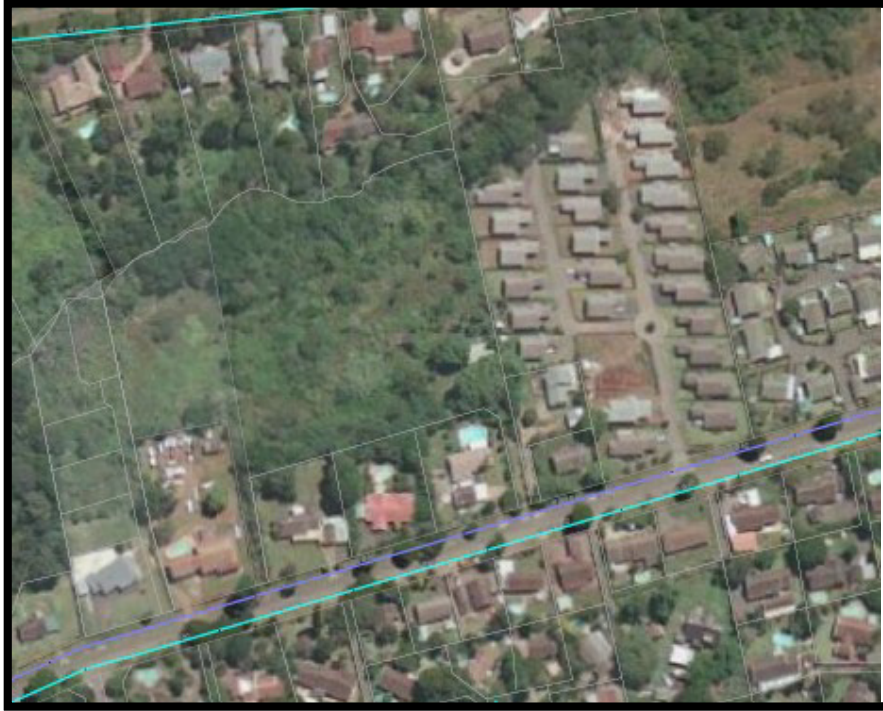
The internal reticulation will operate as a gravity main conveying raw effluent from each dwelling which shall link into the main municipal 150mm Ø line. It is likely that this sewerline is a vetro-clay line, due to the description being 150mm in diameter, although new sewerpipes will be uPVC.

The standards for the internal sewer reticulation to be installed with the proposed development can be summarised as follows:

- | | | | |
|---|----------------|---|---|
| ➤ | Pipe Material | : | uPVC |
| ➤ | Pipe class | : | Class 34 (300 kPa) |
| ➤ | Pipe diameters | : | 160mm |
| ➤ | Minimum Grade | : | 1:150 |
| ➤ | Maximum Grade | : | 1:10 |
| ➤ | Bedding | : | Flexible (SABS1200LB) |
| ➤ | Manholes | : | Precast Concrete Manholes (1m dia) and Rodding Eyes, where needed |
| ➤ | Minimum Cover | : | 600mm |

3.4 Water

There is an existing 225mm Ø distribution main which has been laid along Erf 61's side of the Grimthorpe Avenue and an existing 150mm Ø reticulation pipe on the adjacent side of road as can be seen in the topographical layout below.



The proposed development comprises of 24 units, which includes an existing dwelling, which is assumed to be a 2-bedroom unit. The proposed development is expected to have a daily water demand of 34kl at 0,394l/s, which is calculated using the following expected water consumption per dwelling (based on 250l/c/d):

- 4 x 2-bedroom units, using 1000litres per household per day
- 20 x 3-bedroom units, using 1500litres per household per day

Water will be reticulated through the development using 75mm uPVC Class 12 pipes and each dwelling will be provided with an individual watermeter. Fire hydrants shall be positioned at a maximum spacing of 80m, with the provision of a booster head on the outside of the development, adjacent to the gatehouse. The Home Owners Association shall be responsible to reconcile the water usage measured at the bulk water meters against each individual water meter within the development.

3.5 Storm Water

3.5.1 Internal Storm Water System

The storm water management strategy will be to manage and collect all surface runoff in a conventional storm water system that will gravitate via stormwater pipes or swales and discharge into two stormwater attenuation ponds located at two outlet points along the site.

The internal roads of Erf 61 shall be designed with crossfalls to direct the stormwater into kerb and channels, which shall divert the stormwater into grid/kerb inlets and be diverted into the stormwater attenuation ponds. The stormwater will be released from the attenuation ponds and dispersed into

natural drainage areas. The use of rainwater harvesting tanks are encouraged to all home owners, as this could also form the first portion of attenuation.

The stormwater attenuation ponds shall be earth lined structures designed to contain volumes of stormwater generated by a 1:50 year rainfall over a 15-minute period. The ponds shall be designed to receive stormwater from the development at a post-development flow and must be able to release the stormwater at a pre-development flow through stormwater pipe outlets.

The standards for the storm water infrastructure to be installed within the proposed development can be summarised as follows:

- Pipe Material : Concrete
- Pipe class : 100D in road reserve and parking areas
- Pipe diameters : min. 300mm diam.
- Bedding : Class C
- Inlets : Grids / Kerb / Catchpit / Manhole

The storm water infrastructure will be constructed in accordance with the “*Guidelines for Human Settlement Planning and Designs*”, but will include service agreements concluded, where applicable.

3.5.2 Storm Water Management

The traditional design for storm water drainage systems has been to collect and convey storm water runoff as rapidly as possible to a suitable location where it can be discharged accordingly.

The objective of a storm water management plan should be to manage the storm water resources of the collective watersheds to:

- Prevent flood damage
- Preserve the natural and beneficial functions of the natural drainage system downstream
- Preserve and enhance storm water quality

The two proposed stormwater attenuation ponds shall be located along the lower end of the internal roads and shall blend into the natural environment. The ponds shall be constructed to minimise the impact within the buffer zones, but must be located outside the 1:100 year floodline of the main channel of the stream. The ponds will form part of the rehabilitation of the wetland area along the main stream, but shall not interfere with the streamflow.

Further details of specific stormwater management strategies, attenuation and assessing the existing stormwater system is contained in the Storm Water Management Plan, which is provided separately.

3.6 Refuse

The Home Owner’s Association will be responsible for the weekly collection and disposal of refuse to a registered landfill site, whilst recycling would be encouraged.

3.7 Electricity

There is an existing electrical connection to the site as there is an existing dwelling on the property and other infrastructure is available along Grimthorpe Avenue. The Developer will however have to apply to Msunduzi Municipality for an increase in bulk supply, which will be distributed after the bulk connection to each of the dwellings within the development.

It is recommended that the Developer investigate the use of solar power within the development, including other mechanisms such as heat pumps and LED lights, which should form part of the building and architectural code.

4. CONCLUSION

This report has been prepared to assess the availability and access to bulk infrastructures services for the proposed development, whilst confirming the level of service for all internal services. The conclusion is that the development can proceed, subject to the following conditions:

- Application to Msunduzi Municipality for an increase electricity supply
- Concluding a Service Level Agreement with Msunduzi Municipality in relation to the provision of water and sewer connections
- Preparation of a Storm Water Management Plan (SWMP)
- Taking into consideration the 1:100 year floodline and environmental buffers to position the two stormwater attenuation ponds

ANNEXURE A

LOCALITY PLAN



ANNEXURE C

SITE PHOTOGRAPHS



This photo shows Grimthorpe Avenue, travelling from Murray Road toward Les De Jager Drive



This photo shows Grimthorpe Avenue, travelling from Les De Jager Drive toward Murray Road.



This photo shows the existing overhead electrical cable situated along Grimthorpe Avenue



This photo shows the newly laid asphalt where the 225mm Ø distribution main was laid