

APPENDIX C

Infrastructure Studies



APPENDIX C1

Bulk Services Report





GAUTENG PROVINCE

HUMAN SETTLEMENTS
REPUBLIC OF SOUTH AFRICA

GAUTENG RAPID LAND RELEASE

BULK SERVICES AVAILABILITY REPORT

UNITAS PARK EXTENSION 16

PROJECT No.: G18110017/1

17 OCTOBER 2019



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Compiled By:	Rofhiwa Maboho		17 OCT 2019
	<i>Name & Surname</i>	<i>Signature</i>	<i>Date</i>
Reviewed & Checked By:	Sikelela Mnguni (Pr.Tech.Eng)		17 OCT 2019
	<i>Name & Surname</i>	<i>Signature</i>	<i>Date</i>
Client Approval:			
	<i>Name & Surname</i>	<i>Signature</i>	<i>Date</i>

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- Emfuleni Sewer Master Plan Layout
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- SMN/2012/03
- SMN/2012/04
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- FIGURE 7 3.1
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Volume A3: Photographic Report

1 INTRODUCTION

The purpose of this Bulk Services Availability Report is to determine the availability and capacity of existing bulk services with a view of servicing the proposed development. This report presents the findings of a preliminary site investigation relating to civil engineering bulk services, civil engineering internal services, road, traffic/transportation engineering, public transport and non-motorised Transport (NMT), storm water management and domestic solid waste management.

This Bulk Services Availability Report addressed the following:

- Bulk Potable Water and Internal reticulation
- Bulk Potable Sanitation and Internal reticulation
- Roads, Traffic and Transportation Engineering
- Public Transport and Non-Motorised Transport (NMT)
- Storm water Management
- Domestic Solid Waste Management
- Conclusion and Recommendation

This investigation will be based on available, local knowledge and discussions with the relevant officials as in **Volume A1: Approval Authorities Correspondences**.

2 SITE INFORMATION

The proposed residential development of Unitas Park Extension 16 is in the Sedibeng District Municipality under the Emfuleni Local Municipality. The Project involves Farm Portions within the Unitas Park eastern Suburbs in the Emfuleni Local Municipality's eastern suburbs. The proposed site is located adjacent the existing Houtkop Rd (R54) on the western side, this route is located where the future K180 will be positioned. Houtkop AH farm is on the eastern side, Unitas Park AH on the southern side and Unitas Park farm on the western side. Future K55 route also bounds the site to the south.

The property size is listed below:

- portion 222 (a portion of portion 221) of the farm Houtkop IQ 594 IQ 151 0900m²

The locality plan is attached as in **Volume A2: Book of Drawings**. and indicates these areas.

3 TOPOGRAPHY AND VEGETATION

Unitas Park Extension 16 site is predominantly flat. The lowest point on the site is recorded as being approximately 1470 metres above sea level, while the highest point is outside the site to the west and is recorded at 1481 metres above sea level. The gentleness of the terrain presents a positive attribute of the site as reduces the likelihood of intensive earthworks during construction within the area. A detailed topographical survey of the area to be developed is not available at present.

Unitas Park Extension 16 is in Vereeniging. The Vereeniging area normally receives about 559mm of rain per year, with most rainfall occurring during summer. It receives the lowest rainfall (0mm) in July and the highest (108mm) in January. The average midday temperatures for Vereeniging range from 17°C in June to 27.6°C in January. The region is the coldest during June when the mercury drops to 0°C on average during the night.

4 GEOLOGICAL AND GEOTECHNICAL ASPECTS

The only source of geo-technical information that is available at present is Engeodata Request (attached as **Volume A2: Book of Drawings**) geological survey mapping which shows that the proposed Unitas Park Ext.16 development is underlain by dolomite.

A detailed geotechnical investigation will be performed to determine the founding conditions for roads and housing developments especially if NHBRC approvals are required. Detailed investigations will also be required for structures such as double storey housing units or group housing. These investigations will also indicate whether excavated material may be used for other purposes (such as road building materials etc.).

5 ECOLOGY/ENVIRONMENTAL INFORMATION

A detailed investigation is being executed by Public Process Consultants and a report for an Environmental Impact Assessment is being prepared. Environmental and ecological details will be available in this investigation report.

6 WATER SUPPLY

6.1 Authority and Provider Arrangements

The proposed development area falls within the Emfuleni Local Municipality Metsi-A-Lekoa Water jurisdiction and the Municipality serves as both the Water Service Authority as well as the Water Service Provider.

The content of this section is based on information obtained from Emfuleni Spatial Development Framework 2017-2025, Compiled on Behalf of the Emfuleni Local Municipality by: Urban Dynamics Gauteng, dated September 2017 and Project 14/2006 Civil Engineering Services Master Planning Volume 1 Water Supply, Draft report compiled in April 2009 and updated in April 2013.

6.2 Description of Existing Water Infrastructure

The content on this section below is based on the information extracted from Emfuleni Spatial Development Framework 2017-2025 report under Municipal Services section. This section gives an insight on the conditions and status of the existing Bulk water infrastructure in Emfuleni, and the plans that Emfuleni Local Municipality have with regards to solving the problems they are currently facing with their old overworked bulk water infrastructure which does not have sufficient capacity to supply the current demand and also to accommodate future demand from future developments.

MUNICIPAL SERVICES

WATER SUPPLY

According to the **Figure 6.1** below, the majority of households that reside in Emfuleni have access to piped water. A relatively small number of households acquire water from other sources, such as such as boreholes.

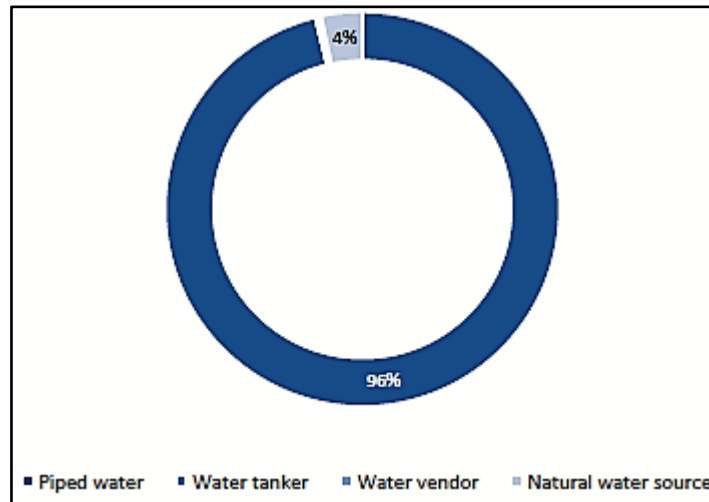


FIGURE 6.1: WATER SUPPLY

(CENSUS 2011)

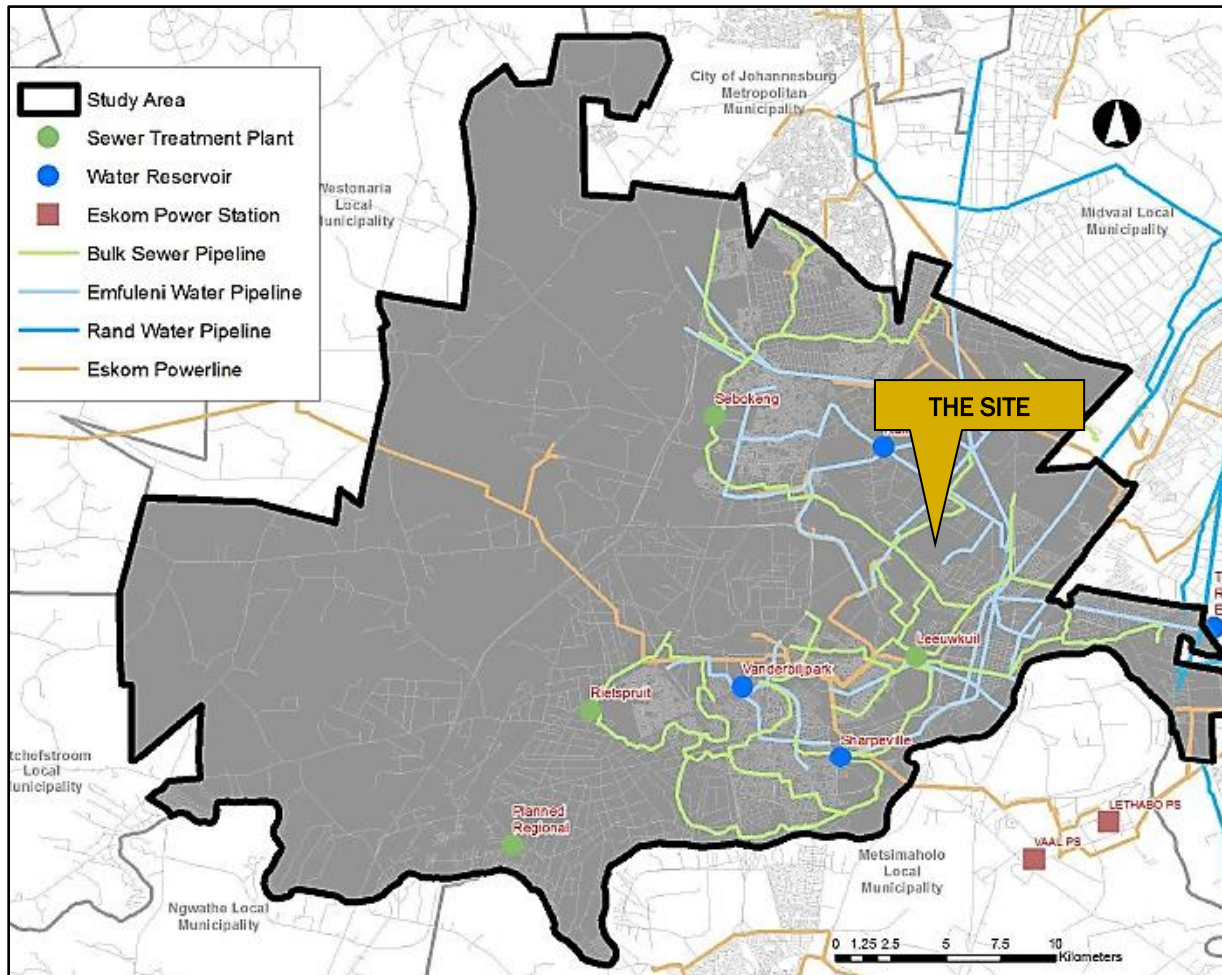


FIGURE 6. 2: BULK SERVICES

(EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2017-2025)

The water system consists of pipe networks, 9 reservoirs, and a small potable water treatment plant. Emfuleni borders the Vaal River and therefore extracts water from the river for consumption within Emfuleni. However, only a small amount of the required quantity is extracted from the Vaal River and purified at 0.2 MI/day. Most potable water required by Emfuleni is supplied by Rand Water (205 MI/day). The bulk water network is illustrated on **Figure 6.2**.

The bulk water network is old, and it is overworked due to the demand for potable water. The age of the networks varies between 60 -70 years across the municipal area. There are no backlogs in the supply of water connections. Additional water connections have largely been provided to informal settlement households to cope with growth of those settlements. In addition, water connections are continuously being provided to new housing development within Emfuleni.

EXISTING INFRASTRUCTURE

This information below was obtained from the Civil Engineering Services Master Planning Volume 1 Water Supply, Draft report

BULK WATER SUPPLY

Emfuleni, except for Vaaloewer, receives its bulk water supply from Rand Water. Various Rand Water pipelines traverse the municipal area from either Vereeniging or Suikerbosch. The Rand Water supply systems deliver either to Daleside Reservoirs (TWL 1528 m) or Eikenhof (TWL 1580 m). From the Daleside reservoirs the water gravitates to Swartkoppies from where it is pumped further.

STORAGE

- Vanderbijlpark reservoirs have some spare capacity, but the Rand Water connection and supply pipes are restrictive based on summer flow (PF) conditions.
- Sharpeville reservoirs are not utilized presently as the pump station feeding the water tower is out of operation. The supply line from Rand Water feeds directly into the Sharpeville Water Tower with top water level 1504,8m. As indicated above the Rand Water connection and supply pipe to Sharpeville is restrictive. Sharpeville water supply system was provided during the separate development policy period. Sharpeville falls within the Vanderbijlpark reservoir supply zone and should be incorporated in the Vanderbijlpark system.

- Langerand Reservoir belongs to Rand Water. Rand Water policy dictates that consumers, Emfuleni Municipality in this case, provide their own storage facilities. This requirement was waived to an extent because Langerand reservoir is located at the end of the Rand Water system and dedicated to the Sebokeng / Evaton / Orange Farm area. The reservoir is, however, over extended and need to be augmented. The supply level of the Langerand reservoir is too high to supply the area within the 90 m maximum pressure criterium. Additional reservoir capacity at a lower top water level is required.

DISTRIBUTION

The different distribution systems are discussed briefly separately.

a. Vanderbijlpark

The distribution system is conventional with a bulk supply point, bulk supply pipe to the reservoirs and a distribution network. The networks are supplied from the reservoirs with TWL 1528,5 m and the water towers with TWL 1548,8 m. The supply area includes Vanderbijlpark, Bophelong, Boipatong, Tshepiso, Zuurfontein, Bonane, Agricultural Holdings and a feed to Iscor.

The capacities of the distribution networks are within the design norms. The only area where supply is under limited stress is a small area in Bophelong. The lower laying areas along the Vaal River are fed via pressure reducing valves to stay within the 90 m maximum pressure limit. Matters of concern with regard to the Vanderbijlpark Park system are that it is only supplied from one source, Rand Water connection, and that the supply area is spread out.

This issue is being addressed by the installation of a 500 mm steel / mPVC pipeline from downstream side of the Langerand reservoir past Unitaspark, Solandpark and Tshepiso X4 up to the existing 300 mm Vanderbijlpark supply pipe to Tshepiso X3. This pipeline provides an additional supply to the Vanderbijlpark system. A 15 Mℓ reservoir with similar TWL as the existing Vanderbijlpark reservoirs is also provided along this new supply pipe.

b. Vereeniging Town

These areas are also supplied directly from the Rand Water pipelines without any balancing or storage. The capacities of these connections are sufficient for the foreseeable future. It is

anticipated that these connections and supply directly from the Rand Water lines will remain for the planning period of this report. The supply areas include Vereeniging Town, Leeuhof, Leeuwkuil, Peacehaven, Powerville, Duncanville, Arconpark, Dickensonville.

c. Solandpark / Dadaville, Roshnee and Rust-de-Vaal / Steelpark

These areas are supplied from the high-pressure Rand Water pipelines i.e. delivering to Eikenhof. Operating pressure in these pipelines is ± 1610 m. The areas are supplied via pressure reducing valves. The existing Rand Water connections and distribution networks have sufficient spare capacity for the short term. As for the other Vereeniging supply systems no balancing or storage are provided.

d. Unitaspark, Waldrif, Agricultural Holdings

These areas are supplied from the Helenasrust Rand Water connection. The pressures in the Rand Water pipes are limited (± 1550 m), The Rand Water connection is sufficient, but the network pipes must be augmented. No balancing and storage facilities are provided for.

6.3 Level of Service & Design Norms

The design norms and standards that have been utilized for this report are the:

- “Guidelines for Human Settlement, Planning and Design”, published by the Building and Construction Technology Division of the CSIR (also known as the Red Book).
- Any relevant published SANS documents.

The design parameters utilised to calculate the demand and requirements for civil services for this report are in accordance with the Guidelines for Human Settlement Planning and Design compiled by the Department of Housing and Construction Technology (2000) and other approved design specifications.

It must be noted that these standards have been utilised to obtain an indication of the size of the services only and they must therefore be confirmed through a preliminary and final design process.

6.4 Unitas Park Extension 16: Water Demand (Annual Average Daily Demand)

The following are assumed:

1. Demand rates are according to the Guidelines for Human Settlement.
2. Reticulation losses assumed at 15%
3. Emfuleni Local Municipality Metsi-A-Lekoa Design Criteria and Internal Services Standards

Table 6.1: Water Demand (Annual Average Daily Demand)									
Zoning	No of Stands	No of Dwellings	Area (ha)	AADD per Unit (l/day)	Unit	Average Water Demand (l/day)	Average Water Demand (l/s)	Peak Factor	Peak Demand (l/s)
High Density Mixed Use	1	7250	151	400	Dwelling per 100m ² of Gross Floor Area	6040000	69,91	4	279,630
TOTAL			151			6040000	69,91		279,630
SUB-TOTAL								279629,630kl/day	
PLUS, UAW (20% OF TOTAL AADD)								69907,407 kl/day	
TOTAL AVERAGE DEMAND (AADD)								349537,037 kl/day	
PEAK DEMAND (exc. Fire flow) PF = 4								4045,568 l/s	
FIRE FLOW PER HYDRANT (X4) - High risk								25 l/s	

Limited calculations to determine the demand for the various services were prepared to obtain an indication of the size of the services. The actual sizes of the services will have to be determined through a final design process after the relevant details (final site layout plan, number of units, size and coverage of the various land uses etc.) have been finalised.

6.5 Proposed Internal Water Supply

All pipes used must conform to SANS 1200 L and all other standards referred to in SANS 1200 L. This will include the use of uPVC, mPVC, steel and HDPE pipes.

The following is a summary of the design criteria, elements and standards that will be used:

WATER RETICULATION

Criteria:

A full water network, with individual connections to all erven.

Elements:

- Class 12 uPVC piping with a minimum size of 75mm dia
- Cast Iron waterworks anticlockwise closing type valves
- Underground Byonette type hydrant valves
- Erf connections using HDPE class 12 piping

Standards:

- | | |
|------------------------------------|---|
| • Average Daily Demand | 400 litres/100m ² /day of gross floor area |
| • Instantaneous demand peak factor | 4 |
| • Peak flow residual head | 24m |
| • Fire demand | High risk 15m |
| • Pipe material | uPVC class 9 / 12 SABS 966 approved
No solvent welding will be allowed |
| • Pipe size | 75mm dia. Minimum |
| • Pipe cover | 1.0m minimum |
| • Valves | AVK Waterworks type, Cast Iron, anticlockwise closing, opposite splay pegs,
Aqua-loc mono box type – blue lid colour |
| • Hydrants | Underground Byonette type opposite splay pegs,
Aqua-loc mono box type – red lid colour |
| • Residential connections | HDPE class 12
50mm single connections – small stands
100mm single connections – larger stands
Connection installed & tested up 1m outside erf boundary |
| • Hydrant spacing | 120m on 75mm dia. Minimum – high risk |

6.6 Standard Details

SANS 1200 (together with other applicable details) details will be used to prepare project-specific details and be submitted to Emfuleni Local Municipality Metsi-A-Lekoa for their approval.

The provision of SANS 1936 is also applicable to this project.

7 SANITATION

7.1 Authority and Provider Arrangements

The proposed development area falls within the Emfuleni Local Municipality Metsi-A-Lekoa Water jurisdiction and the Municipality serves as both the Water Service Authority as well as the Water Service Provider.

The content of this section is based on information obtained from Emfuleni Spatial Development Framework 2017-2025 (ESDF), Compiled on Behalf of the Emfuleni Local Municipality by: Urban Dynamics Gauteng, dated September 2017, Project SNM/2012 Civil Engineering Services Master Planning Volume 2 Sewage Disposal, first edition dated August 2013 and Southern Corridor Regional Implementation Plan.

7.2 Description of Existing Sewer Infrastructure

The content on this section below is based on the information extracted from Emfuleni Spatial Development Framework 2017-2025 report under Municipal Services section.

MUNICIPAL SERVICES

SANITATION SUPPLY

As depicted by the **Figure 7.1** below, flush toilets are the most common form of sanitation provision within Emfuleni. The only other significantly used sanitation system in use in Emfuleni is pit latrines, which is most probably used in the informal settlement of Emfuleni.

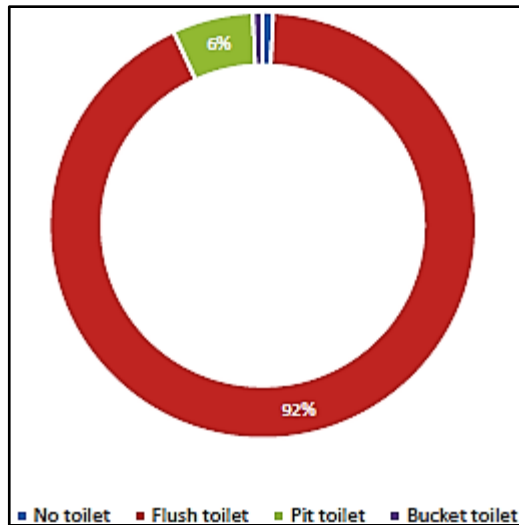


FIGURE 7.1: SANITATION SUPPLY

(CENSUS 2011)

The bulk sanitation network is illustrated on **Figure 6.2**. The sanitation system consists of gravity pipelines and, due to the flat terrain; it also consists of 49 sewage pump stations. The wastewater system consists of 3 wastewater treatment works. The Sebokeng wastewater treatment works, located in Sebokeng next to the Rietspruit, is the largest wastewater treatment works within Emfuleni.

This wastewater treatment facility has a capacity of 119 Ml/day. Significant parts of the sanitation system infrastructure, including the Rietspruit and Leeuwkuil wastewater treatment works, need to be upgraded and rehabilitated.

The bulk sanitation network is old, and it is overworked due to the demand for sanitation services. The age of the networks varies between 60 -70 years across the Municipal area. The short-term sanitation infrastructure plans involve the rehabilitation of existing infrastructure, including sewer pump stations to minimize sewer spills. While this will give a significant improvement to overall performance, problems which could result in raw sewage spillage cannot be ruled out. Existing sanitation infrastructure has reached the end of its lifespan and can only be kept operational with a high risk of sewer spills. New infrastructure needs to be constructed in order to prevent future sewer spills.

The long-term solution for the aging sewer network problem includes the elimination of sewer pump stations and the construction of a new gravity pipe next to the Klip and Vaal Rivers. The replacement of the 3 Emfuleni wastewater treatment plants (Sebokeng, Leeuwkuil and Rietspruit), as well as Midvaal's wastewater treatment plants that serves Roshnee, are also included in the long-term sanitation infrastructure plans. The long-term plans aim to reduce sewer spillages and reduce the high

bulk infrastructure costs associated with urban development in Emfuleni. The long-term solution is estimated to take at least 8-10 years to implement.

EXISTING INFRASTRUCTURE

The information below is obtained from Civil Engineering Services Master Planning Volume 2 Sewage Disposal report.

The different elements of the sewage disposal scheme will be addressed separately:

DRAINAGE AREAS

The Emfuleni Local Municipality sewage drain to four (4) wastewater treatment works, viz. Leeuwkuil WWTW`s, Rietspruit WWTW`s, Sebokeng WWTW`s and the Midvaal WWTW`s. The Leeuwkuil WWTW`s drainage area has 34 sub-drainage areas, the Rietspruit WWTW`s has 3 sub-drainage areas, the Sebokeng WWTW`s has 6 sub-drainage areas and the Midvaal WWTW`s drainage area has 1 sub-drainage area inside the Emfuleni Local Municipality area, which either drain to a pump station or to the water treatment works directly. Risiville, a portion of Duncanville and Lakeside Estates, which is located inside the Midvaal Municipal Area, Lenasia, Orange Farm and Savanna City, located in the Johannesburg Municipal area, also drain to the Emfuleni sewer system.

Drawing number **SMN/2012/01** and Figure 7.1.1 (attached as **Volume A2: Book of Drawings**) give an overall indication of the Northern Drainage Area serviced by the Sebokeng WWTW`s. Drawing number **SMN/2012/02** and Figure 7.1.2 (attached as **Volume A2: Book of Drawings**) give an overall indication of the Southern Drainage Area serviced by the Leeuwkuil WWTW`s in Vereeniging and the Rietspruit WWTW`s in Vanderbijlpark.

RETICULATION NETWORKS

The sewer network is conventional for the whole Emfuleni Local Municipality and was divided into 3 areas, the Southern Drainage area as per drawing number **SMN/2012/03** Southern Drainage Area, the Northern Drainage area as per drawing number **SMN/2012/04** Northern Drainage Area and Vaaloewer (attached as **Volume A2: Book of Drawings**). The Northern and Southern areas drain to the four-wastewater treatment works while no sewer system for Vaaloewer exist.

- **Southern Drainage Area**

The Southern drainage area as indicated on Figure 7.2.1 on **Annexure B** drain to two WWTW`s namely the Leeuwkuil WWTW in Vereeniging and the Rietspruit WWTW in Vanderbijlpark, this

figure 7.2.1 also show the existing pipe sizes of the network. The Southern drainage area was analysed using the Sewsan hydraulic model and the following links where less than 30 % spare capacity is available were identified. Drawing number **SMN/2012/05**, and Figure 8.1 on **Volume A2: Book of Drawings** shows the theoretical flows as per the hydraulic model done in April 2013.

SEDIBENG REGIONAL SANITATION SCHEME (SRSS)

The information in the section below was extracted from Southern Corridor Regional Implementation Plan.

A key requirement for the implementation of the majority of development proposals in the Sedibeng District, is the upgrade and implementation of the Sedibeng Sanitation Scheme.

A feasibility report has been prepared by GIBB SS&G Consortium dated 19 October 2016 which aimed to provide the planning of a detailed design and implementation plan of new infrastructure related to the sanitation scheme. The report has reviewed and assessed previous reports relating to the SRSS, and it recommends that it is necessary to expand on the previously proposed scheme of 2009, specifically with regard to the site selection and the need for a new wastewater treatment works (WWTW).

The feasibility report recommends that the Sebokeng and Meyerton WWTWs be retained to treat sewage generated in their respective catchments. Also, the Sebokeng WWTW must be upgraded to 200 Mℓ/d to accommodate flows from the northern part of Emfuleni. This WWTW will be upgraded in two phases, divided into Module 6 and 7 and are to be constructed using multiple contractors. Similarly, the Meyerton WWTW (which is currently being upgraded to a capacity of 25 Mℓ/d), should be kept operational to allow for the development along the R59 corridor.

The report also highlighted the urgent upgrade of Leeuwkuil WWTW (Emfuleni) with an additional 20Mℓ/d to accommodate flows from the planned university housing developments and other scheduled developments in Vereeniging.

Furthermore, the Rietspruit WWTW should ultimately be converted into a regional works with a 55 Mℓ/d expansion by 2035. This will accommodate sewerage flows from the south Sebokeng catchment, Vereeniging catchment and Vanderbijlpark catchment. The construction of pumping mains along the R59 into a bulk outfall sewer between Leeuwkuil WWTW and the Rietspruit WWTW should be carried out to transfer excess flows from Leeuwkuil WWTW to the Rietspruit WWTW.

7.3 Level of Service & Design Norms

The design norms and standards that have been utilized for this report are the:

- “Guidelines for Human Settlement, Planning and Design”, published by the Building and Construction Technology Division of the CSIR (also known as the Red Book).
- Any relevant published SANS documents.

The design parameters utilised to calculate the demand and requirements for civil services for this report are in accordance with the Guidelines for Human Settlement Planning and Design compiled by the Department of Housing and Construction Technology (2000) and other approved design specifications.

It must be noted that these standards have been utilised to obtain an indication of the size of the services only and they must therefore be confirmed through a preliminary and final design process.

7.4 Unitas Park Extension 16: Sanitation Demand Calculations

The following are assumed:

1. Demand rates are according to the Guidelines for Human Settlement.
2. Emfuleni Local Municipality Metsi-A-Lekoa Design Criteria and Internal Services Standards

Zoning	No of Stands	No of Dwellings	Area (ha)	ADWF per Unit (l/day)	Unit	Average Sewage Outflow (l/day)	Average Sewage Outflow (ADWF)(l/s)	Peak Factor	PWWF (l/s)
High Density Mixed Use	1	7250	151	300	Dwelling per 100m ² of Gross Floor Area	4530000	52,43	2,5	131,076
TOTAL			151			4530000	52,431		131,076
						Total incl.15% Extraneous flow		150,738	

Limited calculations to determine the demand for the various services were prepared to obtain an indication of the size of the services. The actual sizes of the services will have to be determined through

a final design process after the relevant details (final site layout plan, number of units, size and coverage of the various land uses etc.) have been finalized.

7.5 Proposed Internal Sanitation Drainage

All pipes used must conform to SANS 1200 L and all other standards referred to in SANS 1200 L. This will include the use of uPVC, mPVC, steel and HDPE pipes.

Below is a summary of the design criteria, elements and standards that will be used for new sewer reticulation networks:

SEWER NETWORK

Criteria:

A full waterborne sewerage system is proposed, with individual connections to all erven.

Elements:

- SABS approved piping with minimum size 160mm diameter.
- Concrete manholes with spacing of not more than 80m, installed at all direction changes and mains intersections
- 160mm dia. connection to all erven with a depth to ensure drainage of 100% of the stand.
- Erf connections end 1m inside the erf

Standards

- | | |
|-----------------|--|
| • Daily flow | 300 litres/100m ² /day of gross floor area |
| • Peak factor | Sliding scale as per Red Book – 2.5 maximum |
| • Pipe material | Any SABS approved piping |
| • Pipe size | 160mm minimum at head, 1.0m generally
1.4 under streets |
| • Pipe slopes | 1:80 at head
1:200 minimum for 160mm dia pipes
1:300 minimum for 200mm dia pipes
1:400 minimum for 250mm dia pipes
1:500 minimum for 300mm dia pipes |

- Minimum flow velocity 0.7 m/s at half full
- Manholes Concrete pre heavy-duty cast-in-situ, with step Irons and heavy-duty type concrete cover
Piping inside manhole Clay/Fibre Concrete
- Manhole spacing 80m maximum
- Manhole sizes 0m to 1.2m deep: 0.9m inside diameter chamber, no shaft; 1.21m to 3.5m deep: 1.25 inside dia. chamber, no shaft; deeper than 3,5m: 1,5m inside dia chamber, no shaft
- Erf connections 160mm dia minimum, SABS approved piping
- Erf connections slope 1.60 minimum
- Erf connections depths 500mm minimum cover at buildings

7.6 Standard Details

SANS 1200 (together with other applicable details) details will be used to prepare project-specific details and be submitted to Emfuleni Local Municipality Metsi-A–Lekoa for their approval.

The provision of SANS 1936 is also applicable to this project.

8 ROADS

8.1 Authority and Provider Arrangements

The Emfuleni Local Municipality is responsible for the provision and maintenance of roads and stormwater infrastructure in its area of jurisdiction.

8.2 Traffic Impact Study

A traffic impact assessment will be conducted. The existing 2019 scenario, the future 2024 scenario on the existing geometry and the 2024 future scenario on the upgraded geometry will be analysed.

8.3 Access

The existing road network in close proximity of the project is summarized in Table 8.1 below.

Table 8.1: Existing Access		
Road Name	Class	Description
Existing Houtkop Road (R54)	4	Local Distributor (Main Road) to the West of the proposed Site.
Future K180 Route	3	Minor arterial road which will bound the site on its western side and will be located where existing Houtkop Road (R54) currently running.
Future K55 Route	3	Minor arterial road which will bound the site on its southern side.

Unitas Park Extension 16 development will gain access to west from the existing Houtkop Road (R54) which will also be the future K180 Route. Future K55 route will be located on the southern side forming the southern boundary to the development. These access routes will serve as the main accesses to the site. The collector streets from the proposed development will connect to the future K-routes as in **Volume A3: Photographic Report**.

8.4 Road Networks

8.4.1 Existing Road Networks

Figure 8.1 depicts the road network serving Emfuleni area. The N1 freeway passes through the centre of Emfuleni, linking Emfuleni to Johannesburg and Soweto. The primary role of this freeway is link Gauteng Province to the Free State Province and the Western Province and therefore fulfills a through-traffic function, rather than serving Emfuleni specifically. The P156 freeway, on the other hand, primarily serves Emfuleni, linking Vanderbijlpark and Vereeniging to Ekurhuleni and the OR Tambo International Airport. Due to its function, corridor development is increasingly occurring along

the P156 freeway, especially in the Vereeniging and Meyerton areas. The P156 freeway is located on the eastern boundary of Emfuleni.

Most of Emfuleni's planned K-route network has been developed, although not all the K-routes have been developed to a dual carriageway level. Many of the K-routes are also in need of rehabilitation, especially K-routes such as the K174 (Barrage Road). Despite this, the complete K-route network allows urban infill and expansion to take place in almost any part of Emfuleni, providing the access infrastructure needed for urban development.

There are four K-routes that can be highlighted as prominent K-routes serving Emfuleni. The first is the K53 (Moshoeshoe Road that become the Golden Highway), which runs between Vanderbijlpark and Sebokeng. This is an important commuter spine serving Emfuleni. The second K-route worth mentioning is the K174 (Barrage Road), linking Vanderbijlpark to Vereeniging.

This road is a gateway route into Emfuleni and the Municipality is thus concerned over the type of development that take place along this route. The K178 links Sebokeng to Vereeniging and the shopping and employment opportunities found within Vereeniging. This K-route is expected to become a major commuter spine, as urban development intensifies along this route. The fourth K-route is the K164, which links Evaton to Meyerton. Savanna City (a 14000-residential unit development) will be situated on and have access from the K164, which will increase the prominence of this K-route.

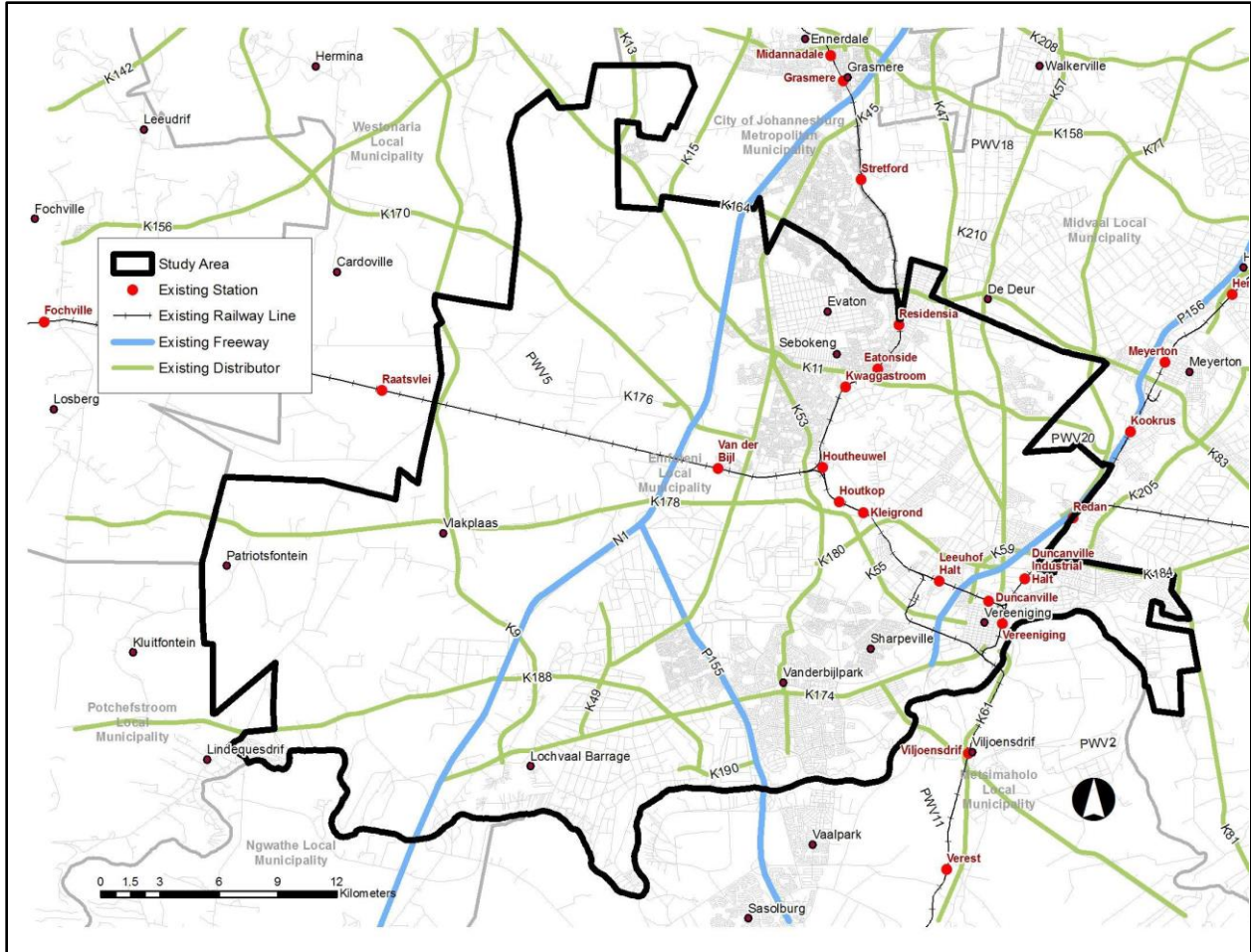


FIGURE 8.1: TRANSPORT NETWORK
(EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2017-2025)

8.4.2 Proposed Road Network Development

Most of the arterial network planned for Emfuleni has been developed. Of greater concern is the fact that much of this arterial network is in need of repair and even upgrading to modern K-route design standards. Barrage Road is one such a road that needs to be upgraded, especially if it is to fulfill a public transport function, as proposed in this Emfuleni SDF. The construction of the K55 arterial is of particular importance and should be given priority within Emfuleni.

The K55 will provide a needed north-south linkage between the Vaal University of Technology, Sharpeville, Boipatong, and Sonlandpark. The construction of this road will enable the northward expansion of the urbanised area into the Sonlandpark region, north of the Vereeniging-Johannesburg commuter railway line, as proposed in this Emfuleni SDF. This road will also intersect within the K180, providing the access needed to develop the proposed Sonlandpark Region Node on this intersection.

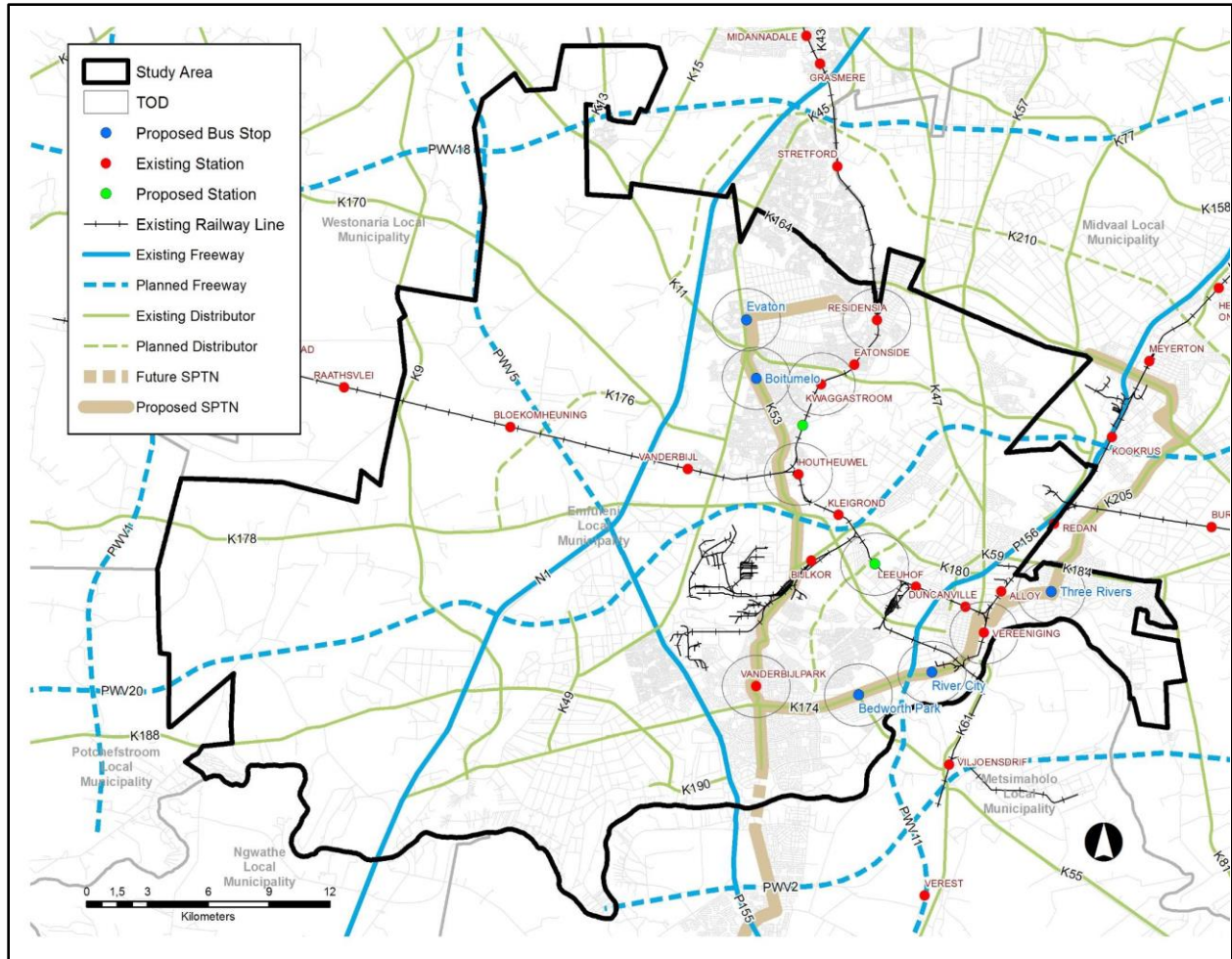


FIGURE 8.2: PROPOSED TRANSPORT NETWORK

(EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2017-2025)

8.5 Design Standards

The design norms and standards that have been utilized for this report are the:

1. “Guidelines for Human Settlement, Planning and Design”, published by the Building and Construction Technology Division of the CSIR (also known as the Red Book).
2. Any relevant published SANS documents.

9 Public Transport & Non-Motorised Transport (NMT)

9.1 Existing Public Transport and NMT Facilities

There is 1 formal taxi rank in Vereeniging which is 6.3km away from Unitas Park Extension 16. There are no Public transport lay-bys located on Houtkop Road (R54). There are no formal pedestrian sidewalks located along the development boundary.

One is mindful of the following:

- The likelihood exists that residents and workers of the proposed development would be making use of public transport for recreational, business or employment purposes.
- According to the NHTS, 1.5km is the ideal limit that one should expect a pedestrian to walk to a public transport facility.

The information below was obtained from Emfuleni Spatial Development Framework 2017-2025.

Emfuleni is served by a rail network that connects Emfuleni to neighboring areas in Gauteng and the Free State. As depicted by **Figure 9.1**, this rail network consists of 3 lines. The first rail line stretches along the P156 (R59) freeway and links Sasolburg to Vereeniging, Meyerton and Germiston. This rail line is primarily a freight line but does contain commuter railway stations along the line. The second railway line stretches from Sasolburg, via Vereeniging towards Sebokeng, Orange Farm and Johannesburg.

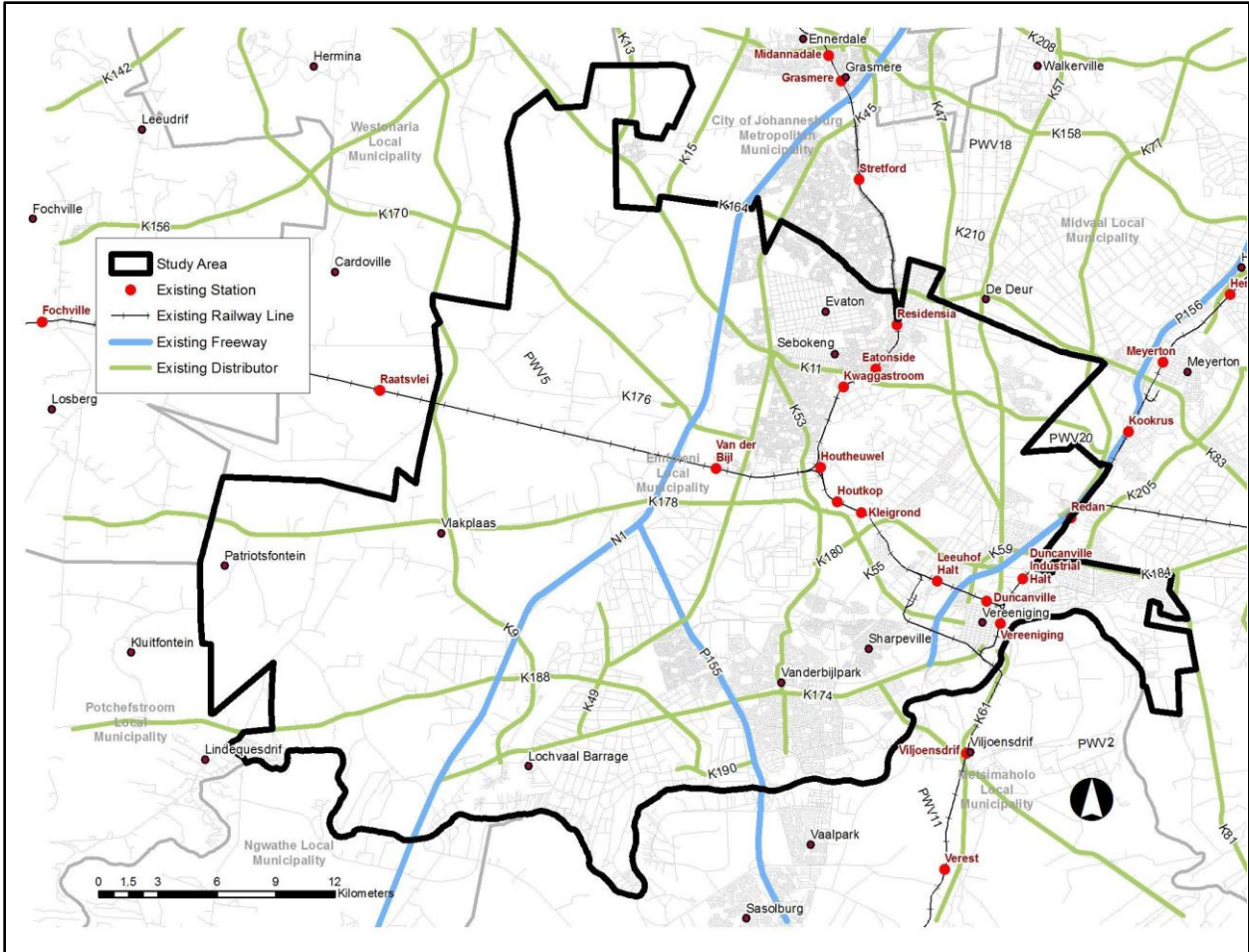


FIGURE 9.1: TRANSPORT NETWORK
 (EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2017-2025)

METRORAIL

Emfuleni is served by a commuter rail network that connects Emfuleni to neighbouring areas in Gauteng. This commuter rail network consists of 2 lines. The first rail line stretches from Vereeniging to Meyerton towards Germiston. This commuter railway line contains commuter railway stations, with prominent stations being the Vereeniging Station, the Duncanville Industrial Halt Station and the Meyerton Station.

The use of this railway line as a commuter railway line is limited due to fragmented urban development and low residential densities along this railway line. The second commuter railway line stretches from Vereeniging towards Sebokeng, Orange Farm and Johannesburg. Prominent stations along this line are Houtheuwel Station, Residensia Station and Stretford Station. This railway line traverses densely built-up urban areas, as is found in Sebokeng and Orange Farm, and it therefore fulfills a significant commuter railway line function.

However, the full potential of this railway line to function as a commuter railway line is impeded by the following factors:

- Large undeveloped areas between Vereeniging and Sebokeng, with low residential densities to support commuter rail.
- The lack of urban development on both sides of the railway line, in particular in the Sebokeng and Evaton region.
- Gaps in the spacing of commuter railway stations, in particular on the stretches of railway line between the Leeuhof Halt and Kleigroend Stations and between the Houtheuwel and Kwaggastroom Stations.

BUS NETWORK

Emfuleni comprises an extensive bus network that serves the municipal area. A prominent bus route is the bus route linking Vereeniging to Sebokeng along the K53 (Moshoeshoe Road) and the K45 (Golden Highway). This bus route links Evaton and Sebokeng to the Vereeniging CBD and the industrial areas located within Vereeniging. Other bus routes worth mentioning are the bus route linking Vereeniging to Meyerton, the bus route linking Vereeniging to Residentia Station, and the Bus route linking Evaton to Meyerton. Linking the bus network to the commuter rail network will enable the bus network to act as a feeder system to the commuter rail network. This will give Emfuleni access to an integrated hierarchy of public transport modes servicing different parts of the municipal are and it will greatly improve the current public transport network serving Emfuleni.

MINI-BUS TAXI NETWORK

Emfuleni comprises an extensive minibus taxi network. This network largely uses the same routes and serves the same areas within the municipal area that the bus network does. The only significant exception is that a minibus taxi route links the Vanderbijlpark CBD to Sebokeng via Mittal Steel; a route which the bus network does not serve. A disadvantage of the minibus taxi network is that the routes of this network are not fixed and can therefore change in future. Therefore, minibus taxi route does not indicate fixed locations where Emfuleni can develop. Bus routes and in particular commuter railway lines provide much better indication of where to densify Emfuleni.

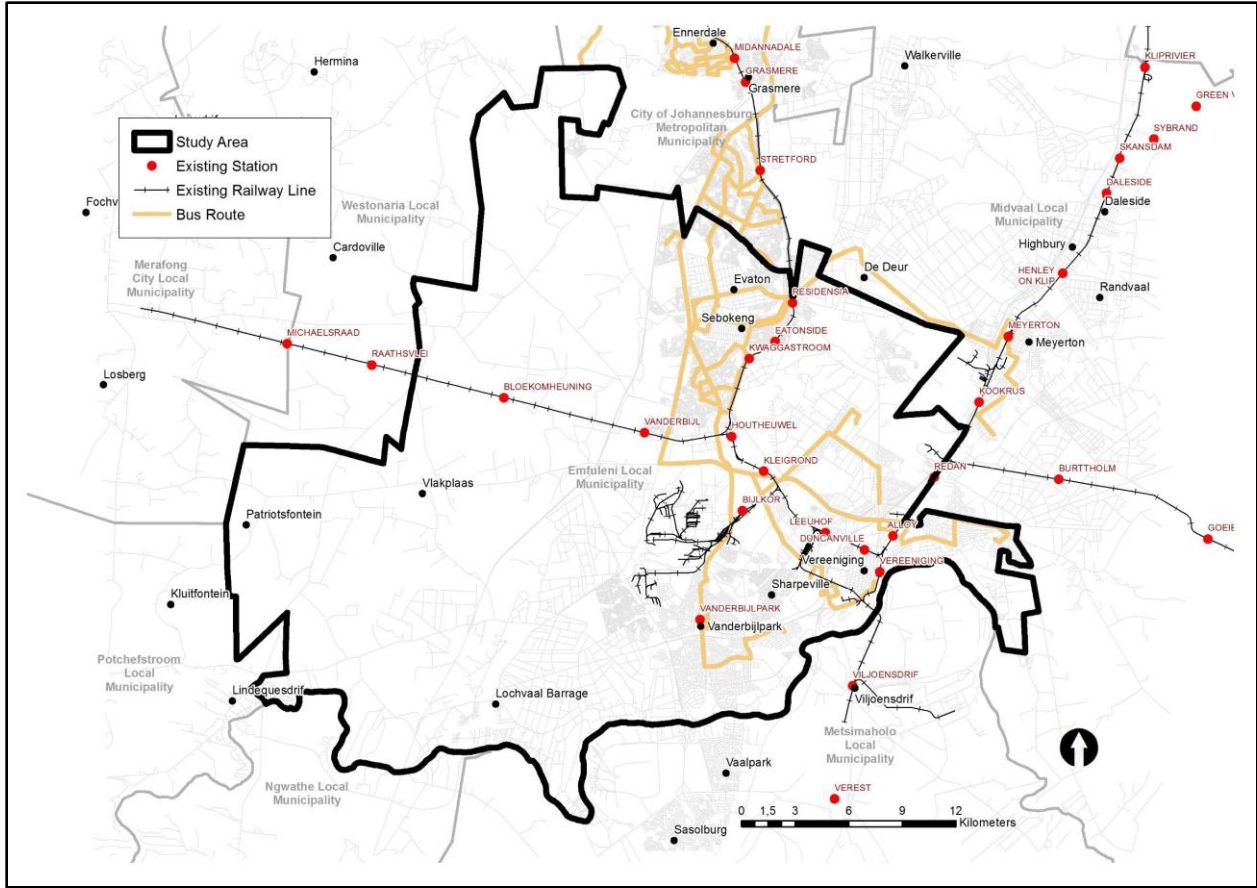


FIGURE 9.2: PUBLIC TRANSPORT
(EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2017-2025)

9.2 Public Transport Development

As was mentioned in the status quo section of this report, Emfuleni is served by a commuter rail network that connects Emfuleni to neighbouring areas in Gauteng. Prominent station along this line is Houtheuwel Station, Residensia Station and Stredford Station. Currently, the use of this railway line as a commuter railway line is limited due to fragmented urban development and low residential densities along this railway line. Urban development along the Vereeniging-Sebokeng-Orange Farm commuter railway line will provide the necessary commuter thresholds needed to ensure the viable operation and expansion of this commuter railway line.

With regard to further developing the Vereeniging-Johannesburg commuter railway line, it is proposed the 2 new stations are developed along this line to better serve envisaged urban expansion areas within Emfuleni. The first proposed station is located at the proposed Sonlandpark Regional Node and

will serve the Sonlandpark and Boipatong areas. The second proposed station is located north of Houtheuwel Station and will better serve the envisaged Lethabong extensions. The additional stations along this commuter rail line will provide opportunities for Transit Oriented Development (TOD). This will involve focusing new higher density, mixed-use development around these commuter rail stations. The layout of the land uses in relation to the stations are of critical importance, because it will determine the level of access that commuters will have to these stations. It should be noted that the station proposals above area Emfuleni SDF proposals and not PRASA proposals at this stage.

In addition to the above, a Strategic Public Transport Network (SPTN) is proposed by the Emfuleni SDF that will serve urban areas within Emfuleni that are not served by the Vereeniging-Johannesburg commuter railway line. Two SPTN routes have been identified. The first route links Vereeniging to Sebokeng along the K53 (Moshoeshoe Road) and the K45 (Golden Highway), and then turns eastward at Evaton towards Residentia Station. This SPTN route links Evaton and the Sebokeng CBD to the Vereeniging CBD. This route can be extended southwards across the Vaal River up to Sasolburg. The second SPTN route utilizes Barrage Road (K147) and links the Vanderbijlpark CBD, the Bedworthpark Regional Node, the proposed River City Node, the Vereeniging CBD, and the Three Rivers Node. This route can be extended northeastwards up to Meyerton.

A Strategic Public Transport Network (SPTN) is proposed by the Emfuleni SDF that will serve urban areas within Emfuleni that are not served by the Vereeniging-Johannesburg commuter railway line. Two SPTN routes have been identified. The first route links Vereeniging to Sebokeng along the K53 (Moshoeshoe Road) and the K45 (Golden Highway), and then turns eastward at Evaton towards Residentia Station. This SPTN route links Evaton and the Sebokeng CBD to the Vereeniging CBD. This route can be extended southwards across the Vaal River up to Sasolburg. The second SPTN route utilizes Barrage Road (K147) and links the Vanderbijlpark CBD, the Bedworthpark Regional Node, the proposed River City Node, the Vereeniging CBD, and the Three Rivers Node. This route can be extended northeastwards up to Meyerton.

Having a longer-term view of public transport network development will enable municipal planners to develop a land use structure that can support the envisaged public transport network in future. Municipal planners can promote the development of activity nodes at commuter railway stations and envisaged SPTN/BRT stations that would (a) apply higher land use densities, (b) a greater land use mix, and (c) a pedestrian-oriented structure.

These are all critical elements needed to support the viable operation of a public transport system and station.

SPTN Route/ railway line	Nodal Area	Station or Rank or Stop	Integration Principles
Vereeniging-Johannesburg commuter railway line	Vereeniging CBD	Existing Vereeniging commuter railway station Proposed bus station and minibus taxi rank at commuter railway station	Design and locate mixed land use at commuter railway station Design and construct pedestrian walkways to facilitate access to a commuter railway station
Vereeniging-Johannesburg commuter railway line	Sonlandpark Regional Node	Proposed Sonlandpark commuter railway station Proposed bus station and minibus taxi rank at commuter railway station	Design and locate mixed land use at proposed commuter railway station Design and construct pedestrian walkways to facilitate access to the proposed commuter railway station

Table 9.1: PROPOSED PUBLIC TRANSPORT ROUTES, STATIONS AND LAND USE INTEGRATION

(Source: Urban Dynamics Gauteng, 2017)

10 Stormwater Management

10.1 Natural River System and Flood lines

There are several natural low points (drainage areas) dividing the development in Unitas Park into different natural drainage areas. Natural drainage flow directions will be retained in the preliminary design of the stormwater infrastructure.

10.2 Design Norms and Standards

The design criteria are derived from the Guidelines for Human Settlement Planning and Design (Red Book) and the SANRAL Drainage Manual 5th Edition.

The Rational Method will be used to calculate the stormwater runoff for this site. The stormwater will be drained along the road reserve, mainly in open, unlined V-drain channels, with underground / piped systems only where surface drainage is not possible or deemed to be impractical.

Designs will be such that the canals can accommodate the 1:2-year minor storm and the 1:25 year major storm is accommodated in the road structure without overtopping.

10.3 Existing Stormwater Drainage Zones

There is currently no information available regarding existing stormwater infrastructure on existing areas adjacent to the planned developments. In order to tie into these existing systems, the positions, levels of these existing systems need to be confirmed in order to confirm functional designs.

11 Domestic Solid Waste

Domestic solid waste will be collected by the Municipality which will be established as part of this project. It is further envisaged that this will be an on-street collection system operating once a week using a Municipal Waste collection truck.

Disposal of collected waste will be via Emfuleni Local Municipality Waste Disposal who collect generated waste at pre-determined locations on the site and disposes it at their Landfill / Waste Disposal facility on a weekly basis.

Waste reduction through recycling at source will be encouraged to reduce the waste pile (e.g. bottles, tins and paper and cardboard) however given the nature of the development, it is not expected that there will be a huge reduction in volume.

12 Conclusions and Recommendations

The development of this site i.e. Unitas Park Extension 16 appear to be a viable proposition based on initial studies and investigations.

The following conclusions and recommendations are drawn:

- There is currently insufficient capacity in the existing reservoirs to accommodate the proposed development and densities. Additional studies will be required to determine a suitable reservoir to supply the proposed development or whether a new reservoir is needed.

- There is currently insufficient capacity in the wastewater treatment works to accommodate the proposed development and densities.
- There are no records of any service installed to accommodate this development and new water and sewer pipes will need to be installed to provide connections.
- Additional capacity analysis of the network pipes will be required with a GLS report to determine if and any upgrades that are required on the network pipes for both the water and sewer pipes. at the time of this report, the time and budget did not allow for this level of investigation.
- Additional services (roads, stormwater, water and Sewer) would need to be installed to accommodate the proposed development.
- A traffic impact assessment is required to determine any additional capacity required on the roads.
- No formal storm water exists, a masterplan and new infrastructure is required to support the development.

ANNEXURE A

WATER SUPPLY MASTER PLANNING VOLUME 1

ANNEXURE B

SEWER DISPOSAL MASTER PLANNING VOLUME 2

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APPENDIX C2

Bulk Electrical Services Report





GAUTENG PROVINCE
HUMAN SETTLEMENTS
REPUBLIC OF SOUTH AFRICA

BULK ELECTRICAL SERVICES REPORT

BULK ELECTRICAL SERVICES REPORT

UNITAS PARK EXTENSION 16

PROJECT No.: G18110017/1

25 SEPTEMBER 2019



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DOCUMENT CONTROL

Job Title	Gauteng Rapid Land Release	Job Number: 7001	
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Compiled By:	KENNETH CHITENHE		25/09/2019
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	<i>Name & Surname</i>	<i>Signature</i>	<i>Date</i>
Client Approval:			
	<i>Name & Surname</i>	<i>Signature</i>	<i>Date</i>

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LIST OF ABBREVIATIONS

A	Ampere
ADMD	After Diversity Maximum Demand
IDP	Integrated Development Plan
kV	Kilo Volt
kVA	Kilo Volt Ampere
LPU	Large Power User
LSM	Living Standards Measure
LV	Low voltage
MV	Medium voltage
MVA	Mega Volt Ampere
m ²	Square metre
mm ²	Square millimetre
NRS	National Rationalised Standard
OHL	Overhead Line
PILC	Paper Insulated Lead Covered
PVC	Polyvinyl Chloride
RMU	Ring Main Unit
SANS	South African National Standard
SPU	Small Power User
SWA	Steel Wire Armoured
VA	Volt Ampere
XLPE	Cross Linked Polyethylene

1 PROJECT INFORMATION

1.1. Background to the Gauteng Rapid Land Release Programme

In an effort to expedite the release and allocation of serviced stands to qualifying beneficiaries, the Gauteng Provincial Government approved the Gauteng Rapid Land Release Programme. The programme's main objective is to utilize state owned land as an initial quick win to make land immediately available to beneficiaries who are willing to put up top structures for themselves as opposed to receiving a house constructed by government. In addition to availing land for housing, the programme also seeks to make available land for other commercial uses including urban agriculture.

Against this background, a panel of Built Environment Service Providers was appointed to assist the Gauteng Department of Human Settlements with all pre-planning, planning, design and construction management associated with the release of housing opportunities on land so identified and to qualifying beneficiaries. Phumaf Holdings forms a part of the panel so appointed to undertake some of the projects under this programme.

1.2. Purpose of the Gauteng Rapid Land Release Programme

The programme is divided into three phases/Stages viz;

- **Stage 1 – Feasibility & Scoping;** whose main objective was to analyze the feasibility and readiness of various land parcels to commence with the installation of engineering services and propose the planning activities required to prepare the land for the installation of services.
- **Stage 2 – Planning & Design;** whose main objective is to undertake the planning and engineering activities to make the various land parcels ready for the installation of services and, in some cases, construction of walk-up units/flats.
- **Stage 3 – Construction Management;** whose main objective is to direct, manage, and coordinate the installation of services and, in some cases, construction of walk-ups/flats on chosen sites

1.3. Client Brief

One of the land parcels identified for the Gauteng Rapid Land Release Programme is Unitas Park Extension 16 in Vereeniging. The site is located on Portion 222 of Farm Houtkop 594 IQ in Emfuleni Local Municipality. The project is expected to yield approximately **7250** housing opportunities.

1.4. Project Site

The project is on Portion 222 of Farm Houtkop 594 IQ in Emfuleni Local Municipality, a land parcel which is 151.09 hectares in extent and is located in Vereeniging. The site has a pending township application with the Emfuleni Local Municipality for 2,679 stands. This however is being withdrawn and will be replaced by a development yielding 7,250 units. The portion of land is owned by the Gauteng Provincial Government and is currently vacant whilst being utilized for farming on an informal basis.

Fig 1.1 – Project Site



It is noted that the project site has a pending township application for 2,679 residential stands. However this will be changed to yield 7,250 dwelling units according to the Client Brief.

1.5. Existing Infrastructure

The project site is part of an existing township which falls under the jurisdiction of the Emfuleni Local Municipality. In terms of electricity supply the proposed development will be supplied directly by the Emfuleni Local Municipality. There is an existing municipal substation as shown below:

Fig 1.2 – Existing Sonland Milan 88/11kV Substation, Vereeniging



Fig 1.3 – Existing 88kV Incomer to Sonland Milan Substation



- a. The existing Sonland Milan 88kV Substation is operated by the Emfuleni Local Municipality and is situated about 1 kilometre from the proposed Unitas Park Extension 16 development.
- b. The Municipality advised that the substation has been recently upgraded from 5MVA to 10MVA to cater for the proposed Unitas Park Extension 16 development. However this will not be adequate and a further upgrade will be required.
- c. There is no MV reticulation to the proposed development and this will have to be installed from the substation to the new township. This will entail crossing the existing Houtkop Road via underground cable.

2 ELECTRICITY BULK SUPPLY DETERMINATION

2.1 Demand Calculation

The land use budget for the Project is primarily residential and is as indicated below. The electrical demand was estimated as per SANS 204: 2011 – Energy Efficiency in Buildings and the National Rationalized Specifications (NRS) 034-1:2007 Table 2 (Refer to Annexure A)

Individual dwelling units have been allocated an average load based on Urban Residential II Consumer Class (LSM 7 and 8), with a load of 3.54kVA ADMD. Because this is an Eskom area of supply the relevant tariff will be the Homelight 80, with a provision of an 80A supply circuit breaker for each dwelling unit.

The average 3.7kVA per housing unit is the 7-year projected load ADMD and this is in line with the National Rationalized Specifications (NRS) 034-1:2007 Table 2 (Refer to Annexure A) assuming that the development will consists of LSM 7 and 8 consumer classes.

In order to estimate the total load requirements for other consumers which are not housing unit stands, the following kVA/m² figures were adapted based on load densities in volt-ampere per meter square as stipulated by the NRS 069:2004 guidelines with specific reference to Annex B subsection B2 (refer to Annexure B);

- Business or office equivalent 0.08kVA/m²
- Light industrial or equivalent 0.04kVA/m²
- Industrial or equivalent 0.10kVA/m²

Demand Calculations

The estimated total electricity supply bulk requirement is given below:

Item	Description	Quantity / Area	Total Load (KVA)
1	Dwelling Units (@ 3.54kVA ADMD)	7,250	25,665
2	Streetlights (LED High masts 5kVA each)	60	300
3	Business / retail nodes	0	0
4	Institutional	0	0
5	Educational	0	0
TOTAL			25,965

The total bulk electricity requirements for the project is **25,965 kVA**. The required bulk capacity is currently not available for the development. Major capital works will have to be undertaken which will include the following:

- a. Substation upgrade on the Eskom-side of Sonland Milan substation to ensure a secure supply of 30MVA to the development. This might include strengthening of the 88kV incomer as well as upstream substations. Such works will have to be phased to ensure alignment with development project timelines.
- b. Substation upgrade by the Municipality on the 11-KV side of the substation to cater for the new development. Such works will have to be phased in line with the development project timelines.
- c. A new 11kV switching station may be required within the development area to enable efficient MV reticulation.
- d. New MV reticulation within the development consisting of 11kV underground cables, RMUs, minisubstations, and associated accessories.
, installation and commissioning of 2 (two) 1,000kVA 11/0.4kV minisubstations, including associated RMUs and underground 11kV XLPE cable. The extra capacity in the minisubstations will cater for limited future expansion of the project.
- e. All other works that may be deemed necessary when tying into the Eskom 88kV network in Vereeniging West.

The installation of street and area lighting will be done as part of the LV reticulation work package to the housing units. This will be carried out in line with Emfuleni Local Municipality specifications and standards.

2.2 Cost Estimate

All electricity customers (generators and loads) are required to make a contribution towards the utility for the provision of new or additional capacity or for direct services rendered to a customer such as, the provision of service mains, the installation of equipment in the customer's substation, for the taking of any special meter readings, for reconnection of the supply after disconnection (i) either at the request of the customer or (ii) caused by the customer in failure to carry out its obligations, and for special/additional work done for the customer by the utility. These charges are referred to as “standard charges/fees” and are raised in addition to the standard tariff prices. The charges and tariffs levied are dependent on whether the customer is an LPU or SPU.

The work required to provide bulk electricity supply to the development will involve both Eskom as well as Emfuleni Local Municipality. An accurate cost of such works will be determined at the detailed design stage or via a direct quotation from the supplier (Eskom or the Municipality). The following costs are therefore only a high-level budget estimate at this stage:

Total Electricity Bulk Supply Required (Firm)	: 30MVA @ 11kV
Substation HV-side Upgrade	: R50,000,000
Substation LV-side Upgrade (Emfuleni)	: R20,000,000
New Switching Station (Emfuleni)	: R10,000,000
MV Reticulation	: R15,000,000
Professional Fees	: R7,500,000
TOTAL COST ESTIMATE	: R102,500,000

The connection fees for the high mast lighting will be based on the actual cost incurred by Eskom, a quote of which will be given on request.

Depending on the specific arrangements and agreements the Department may enter into with the following charges may also be payable:

I. Bulk Contribution @ R2,000 per kVA	: R60,000,000
II. Eskom Cost Estimate Fee (Annexure C)	: R77,040

It is also noted that the estimated bulk contribution payable will be much less than the actual cost of the bulk infrastructure. The Municipality will however be able to recover a substantial portion of these costs from the Department of Energy as per the following Department of Energy policies:

- Bulk Infrastructure Guidelines for Integrated National Electrification Programme (Annexure D)
- Mixed Developments and Developer Projects Policy Guidelines for Integrated National Electrification Programme (Annexure E)

3 CONCLUSION & RECOMMENDATION

The project site is located in Evaton West in the Emfuleni Local Municipality and falls under the Eskom area of supply. The following items are noted in conclusion:

- a. The total electricity supply bulk requirement for the project is **25,965 kVA**.
- b. The existing Sonland Milan 88/11kV substation does not have enough capacity to supply the proposed development and will require major upgrade works.
- c. It will be necessary to construct a new MV network to supply the proposed development.
- d. The total cost estimate for supplying the required bulk capacity for the development is **R102,500,000**, to be borne by both Eskom and Emfuleni Local Municipality.
- e. The estimated bulk contribution payable by the Department to the Municipality is **R60,000,000**.
- f. Application for connection will be made once final approval for the development has been granted by the Client. It should be noted that any variations to the development which will result in changes to the application will result in extra charges being levied by Eskom.
- g. It is envisaged that on completion of the project each beneficiary will open an individual electricity account with the Municipality. The Municipality will therefore have to apply for bulk metering for the Eskom supply.
- h. The Municipality is eligible to apply to the Department of Energy for funding of the required bulk infrastructure in line with current policies. It will be a requirement that this project and related bulk infrastructure be included in the Municipality's IDP.
- i. Further design work will be dependent the approved township layout of site development plan, as well as overall project constraints.

4 ANNEXURES

- Annexure A - NRS Classification of Domestic Consumers
- Annexure B - NRS 069:2004 Annex – Network Standards
- Annexure C - Eskom Schedule of Standard Fees 2018/19
- Annexure D - Bulk Infrastructure Guidelines for Integrated National Electrification Programme
- Annexure E - Mixed Developments and Developer Projects Policy Guidelines for Integrated National Electrification Programme

ANNEXURE A

NRS CLASSIFICATION OF DOMESTIC CONSUMERS

ANNEXURE B

NRS 069:2004 ANNEX – NETWORK STANDARDS

ANNEXURE C

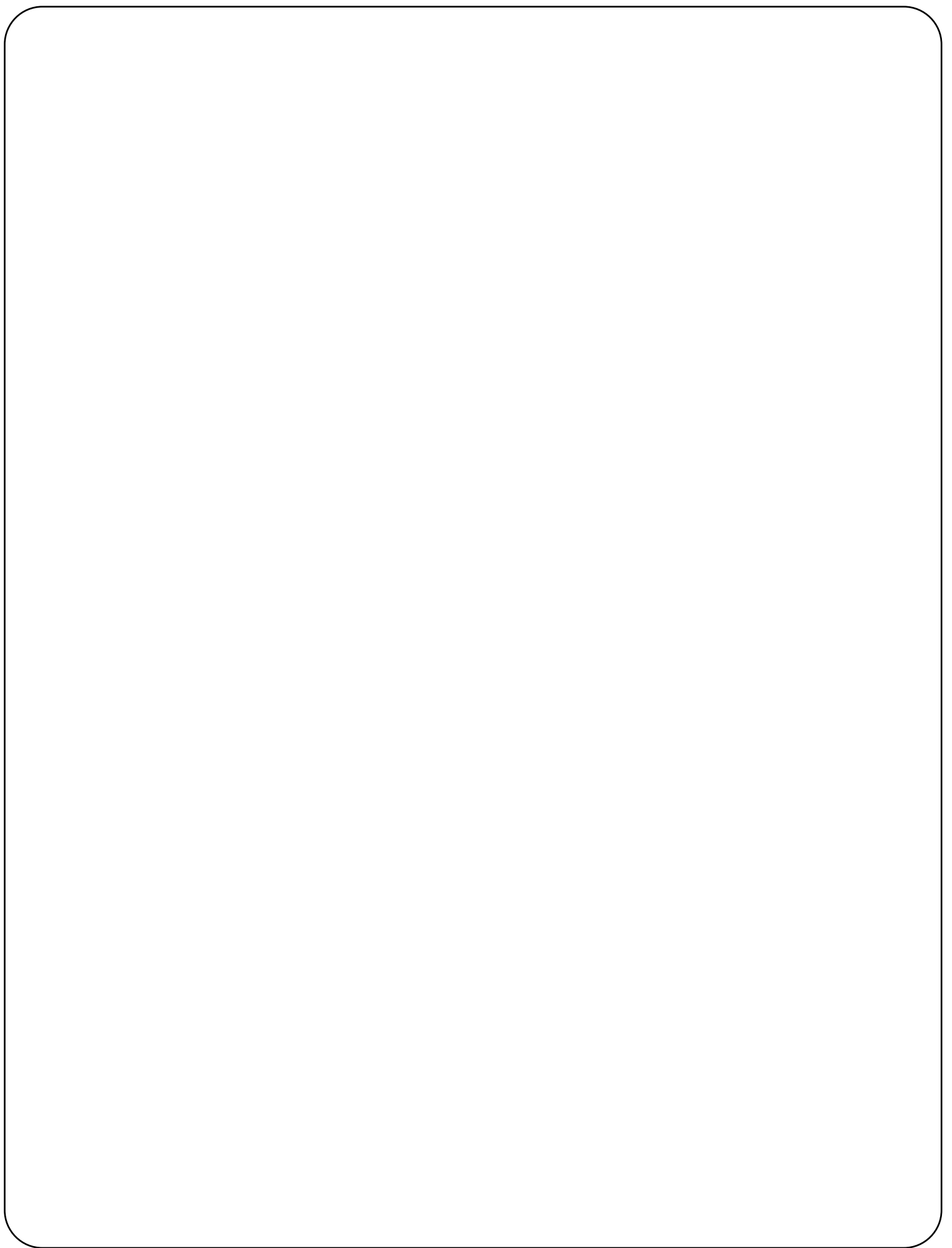
ESKOM SCHEDULE OF STANDARD FEES

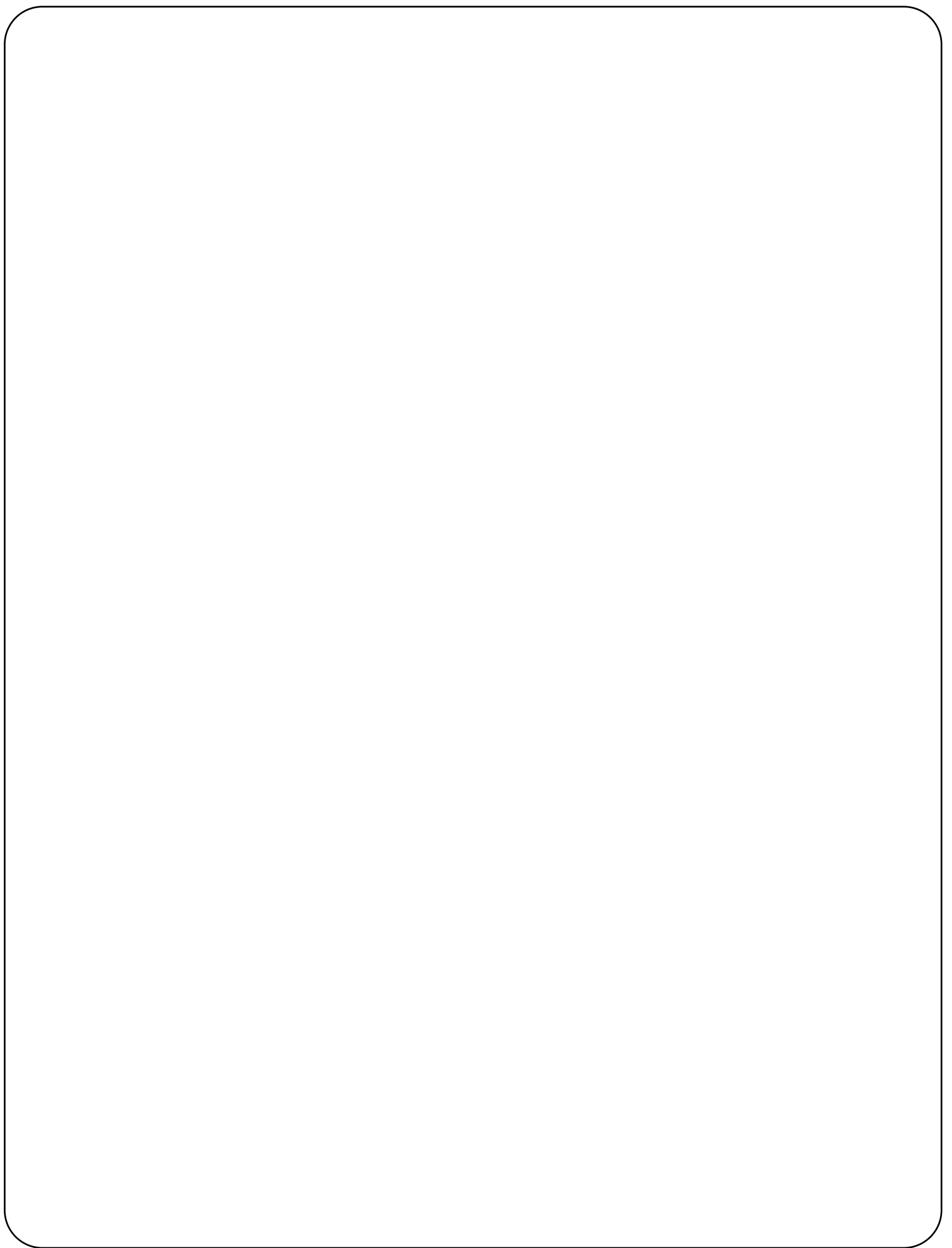
ANNEXURE D

BULK INFRASTRUCTURE GUIDELINES FOR INTEGRATED
NATIONAL ELECTRIFICATION PROGRAMME

ANNEXURE E

MIXED DEVELOPMENTS AND DEVELOPER PROJECTS POLICY
GUIDELINES FOR INTEGRATED NATIONAL ELECTRIFICATION
PROGRAMME





APPENDIX C3
Electrical Engineering Services Report





GAUTENG PROVINCE
HUMAN SETTLEMENTS
REPUBLIC OF SOUTH AFRICA

OUTLINE SCHEME REPORT

ELECTRICAL ENGINEERING SERVICES

UNITAS PARK EXTENSION 16

PROJECT No.: G18110017/1

22 MAY 2020



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P.O. BOX 4049, RANDBURG, 2125

VVM SENTRUM BUILDING

356 PRETORIA AVENUE

RANDBURG, 2194

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	Name & Surname	Signature	Date
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	Name & Surname	Signature	Date
Client Approval:	S Manyon		25/5/20
	Name & Surname	Signature	Date

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LIST OF ABBREVIATIONS

A	Ampere
ADMD	After Diversity Maximum Demand
IDP	Integrated Development Plan
kV	Kilo Volt
kVA	Kilo Volt Ampere
LPU	Large Power User
LSM	Living Standards Measure
LV	Low voltage
MV	Medium voltage
MVA	Mega Volt Ampere
m ²	Square metre
mm ²	Square millimetre
NRS	National Rationalised Standard
OHL	Overhead Line
PILC	Paper Insulated Lead Covered
PVC	Polyvinyl Chloride
RMU	Ring Main Unit
SANS	South African National Standard
SPU	Small Power User
SWA	Steel Wire Armoured
VA	Volt Ampere
XLPE	Cross Linked Polyethylene

1 PROJECT INFORMATION

1.1. Background to the Gauteng Rapid Land Release Programme

In an effort to expedite the release and allocation of serviced stands to qualifying beneficiaries, the Gauteng Provincial Government approved the Gauteng Rapid Land Release Programme. The programme's main objective is to utilize state owned land as an initial quick win to make land immediately available to beneficiaries who are willing to put up top structures for themselves as opposed to receiving a house constructed by government. In addition to availing land for housing, the programme also seeks to make available land for other commercial uses including urban agriculture.

Against this background, a panel of Built Environment Service Providers was appointed to assist the Gauteng Department of Human Settlements with all pre-planning, planning, design and construction management associated with the release of housing opportunities on land so identified and to qualifying beneficiaries. Phumaf Holdings forms a part of the panel so appointed to undertake some of the projects under this programme.

1.2. Purpose of the Gauteng Rapid Land Release Programme

The programme is divided into three phases/Stages viz;

- **Stage 1 – Feasibility & Scoping;** whose main objective was to analyze the feasibility and readiness of various land parcels to commence with the installation of engineering services and propose the planning activities required to prepare the land for the installation of services.
- **Stage 2 – Planning & Design;** whose main objective is to undertake the planning and engineering activities to make the various land parcels ready for the installation of services and, in some cases, construction of walk-up units/flats.
- **Stage 3 – Construction Management;** whose main objective is to direct, manage, and coordinate the installation of services and, in some cases, construction of walk-ups/flats on chosen sites

1.3. Client Brief

One of the land parcels identified for the Gauteng Rapid Land Release Programme is Unitas Park Extension 16 in Vereeniging. The site is located on Portion 222 of Farm Houtkop 594 IQ in Emfuleni Local Municipality. The project is expected to yield approximately **7250** housing opportunities.

1.4. Project Site

The project is on Portion 222 of Farm Houtkop 594 IQ in Emfuleni Local Municipality, a land parcel which is 151.09 hectares in extent and is located in Vereeniging. The site has a pending township application with the Emfuleni Local Municipality for 2,679 stands. This however is being withdrawn and will be replaced by a development yielding 7,250 units. The portion of land is owned by the Gauteng Provincial Government and is currently vacant whilst being utilized for farming on an informal basis.

Fig 1.1 – Project Site



It is noted that the project site has a pending township application for 2,679 residential stands. However this will be changed to yield 7,250 dwelling units according to the Client Brief.

1.5. Existing Infrastructure

The project site is part of an existing township which falls under the jurisdiction of the Emfuleni Local Municipality. In terms of electricity supply the proposed development will be supplied directly by the Emfuleni Local Municipality. There is an existing municipal substation as shown below:

Fig 1.2 – Existing Sonland Milan 88/11kV Substation, Vereeniging



Fig 1.3 – Existing 88kV Incomer to Sonland Milan Substation



- a. The existing Sonland Milan 88kV Substation is operated by the Emfuleni Local Municipality and is situated about 1 kilometre from the proposed Unitas Park Extension 16 development.
- b. The Municipality advised that the substation has been recently upgraded from 5MVA to 10MVA to cater for the proposed Unitas Park Extension 16 development. However this will not be adequate and a further upgrade will be required.
- c. There is no MV reticulation to the proposed development and this will have to be installed from the substation to the new township. This will entail crossing the existing Houtkop Road via underground cable.

2 ELECTRICITY POWER REQUIREMENTS

2.1 Demand Calculation

The land use budget for the Project is primarily residential and is as indicated below. The electrical demand was estimated as per SANS 204: 2011 – Energy Efficiency in Buildings and the National Rationalized Specifications (NRS) 034-1:2007 Table 2 (Refer to Annexure A)

Individual dwelling units have been allocated an average load based on Urban Residential II Consumer Class (LSM 7 and 8), with a load of 3.54kVA ADMD. Because this is an Eskom area of supply the relevant tariff will be the Homelight 80, with a provision of an 80A supply circuit breaker for each dwelling unit. In order to estimate the total load requirements for other consumers which are not housing unit stands, the following kVA/m² figures were adapted based on load densities in volt-ampere per meter square as stipulated by the NRS 069:2004 guidelines with specific reference to Annex B subsection B2 (refer to Annexure B);

- Business or office equivalent 0.08kVA/m²
- Light industrial or equivalent 0.04kVA/m²
- Industrial or equivalent 0.10kVA/m²

Demand Calculations

The estimated total electricity supply bulk requirement is given below:

Item	Description	Quantity / Area	Total Load (KVA)
1	Low Density Residential (@ 3.54kVA ADMD)	1727	6,113.58
2	Medium Density Residential (@ 2.5kVA ADMD)	1111	2,777.5
3	High Density Residential (@ 2.37kVA ADMD)	603	1,429.11
4	Mixed Use (@ 0.04kVA/m ²)	77,000 (m ²)	3,080
5	Student Village (@ 2.37kVA ADMD)	1110	2,630.7
6	Social (@ 0.02kVA/m ²)	26,000 (m ²)	520
7	Educational (@ 0.02kVA/m ²)	73,000 (m ²)	1,460
8	Streetlights (LED High Masts @ 5kVA each)	60	300
TOTAL			18,310.89

The total bulk electricity requirements for the project is **18,310.89 kVA**. The required bulk capacity is currently not available for the development. Major capital works will have to be undertaken for a total estimated firm capacity of **20 MVA**.

3 DESIGN METHODOLOGY

3.1 Standards

The most up to date versions of the following standards shall be used in the design and specification of all electrical services for the project:

- SANS 1019, Standard voltages, currents and insulation levels for electricity supply
- SANS 10142, The wiring of premises – LV installations
- SANS 1339, Electric cables – XLPE insulated cables for voltages from 3.8/6.6kV up to 19/33kV
- IEC 60287:2020 Series, Electric cables
- Eskom suite of distribution standards
- NRS standards
- SANS 60529, Degrees of protection provided by enclosures
- Occupational Health & Safety Act No. 85, 1993

3.2 Design Considerations

The following considerations will be taken into account for the design of the electrical services in the development:

i. **Medium Voltage Network**

The MV network will follow the approved road network in the development and will be by 11kV underground cable feeding a network of minisubstations ranging in size between 500kVA and 1,000 kVA. As much as possible the minisubstations and kiosks will be installed within the road reserve to minimize extra servitude requirements. The MV network will be designed according to Eskom standards.

ii. **Low Voltage Reticulation**

Low voltage reticulation to each site will be either directly from the minisubstation or from a kiosk and will be via underground PVC/SWA cable. The network will be designed according to Eskom and Emfuleni Local Municipality requirements. Prepaid and/or smart metering will be allowed for at each site or building unit.

iii. Electrical Building Services

Electrical buildings services will be designed to ensure that each building site and/or unit can be electrically isolated without affecting the rest of the installation. Building services will be designed in line with SANS and NHBRC regulations.

iv. Street and Area Lighting

Street and area lighting will be designed in line with Eskom and SANS requirements, with high mast lights used wherever possible. For energy efficiency purposes only LED lighting will be considered supported by PV solar wherever possible.

v. Constructability, Reliability, and Maintainability

The design of all electrical services will follow current best practice to ensure ease of construction and maintenance, as well as providing optimal reliability during the development life span.

3.3 Energy Efficiency

The design of all electrical services will be premised on the need to minimize the total electrical demand of the development. Energy saving measures (electrical and non-electrical) will be recommended for the development. Active and passive measures will include

- Use of solar heating and lighting wherever possible
- Energy efficient lighting – e.g. LED lamps
- Proper thermal insulation as required
- Optimal alignment of building structures.

4 PROJECT COST ESTIMATE

The project cost estimate is a first order estimate based on the available information and excludes all costs associated with internal building services. The cost estimate is made up as follows:

Bulk contribution (@ R2,000/kVA)	= R40,000,000
New switching station	= R10,000,000
MV Reticulation	= R15,000,000
LV Reticulation	= R25,000,000
Street and Area Lighting	= R5,000,000
Metering	= R15,000,000
Professional Fees	= R8,000,000
Total Project Cost Estimate	= R118,000,000

The estimate excludes VAT.

5 CONCLUSION & RECOMMENDATION

The project site is located in Evaton West in the Emfuleni Local Municipality and falls under the Eskom area of supply. The following items are noted in conclusion:

- a. The total electricity supply bulk requirement for the project is approximately **20,000 kVA**.
- b. The existing Sonland Milan 88/11kV substation does not have enough capacity to supply the proposed development and will require major upgrade works.
- c. It will be necessary to construct a new MV network to supply the proposed development.
- d. The total cost estimate for supplying the required bulk capacity as well as the related MV, LV, and metering infrastructure for the development is **R118,000,000**.
- e. Application for connection will be made once final approval for the development has been granted by the Client. It should be noted that any variations to the development which will result in changes to the application will result in extra charges being levied by Eskom.
- f. It is envisaged that on completion of the project each beneficiary will open an individual electricity account with the Municipality. The Municipality will therefore have to apply for bulk metering for the Eskom supply.
- g. The Municipality is eligible to apply to the Department of Energy for funding of the required bulk infrastructure in line with current policies. It will be a requirement that this project and related bulk infrastructure be included in the Municipality's IDP.
- h. Further design work will be dependent the approved township layout of site development plan, as well as overall project constraints.

6 ANNEXURES

- Annexure A - NRS Classification of Domestic Consumers
- Annexure B - NRS 069:2004 Annex – Network Standards
- Annexure C - Eskom Schedule of Standard Fees 2018/19
- Annexure D - Bulk Infrastructure Guidelines for Integrated National Electrification Programme
- Annexure E - Mixed Developments and Developer Projects Policy Guidelines for Integrated National Electrification Programme
- Annexure F - Proposed Draft Layout

ANNEXURE A

NRS CLASSIFICATION OF DOMESTIC CONSUMERS

ANNEXURE B

NRS 069:2004 ANNEX – NETWORK STANDARDS

ANNEXURE C

ESKOM SCHEDULE OF STANDARD FEES

ANNEXURE D

BULK INFRASTRUCTURE GUIDELINES FOR INTEGRATED
NATIONAL ELECTRIFICATION PROGRAMME

ANNEXURE E

MIXED DEVELOPMENTS AND DEVELOPER PROJECTS POLICY
GUIDELINES FOR INTEGRATED NATIONAL ELECTRIFICATION
PROGRAMME

ANNEXURE F

PROPOSED DRAFT LAYOUT