ELECTRICAL SERVICES REPORT

FOR

PROPOSED SASELAMANI TOWNSHIP DEVELOPMENT

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1. Executive Summary

Proposed Saselamani township development is situated at portion farm Tshikundus 262 MT. The area is administrated by Collins Chabane Municipality under Vhembe District Municipality. The proposed township consists of 1833 stands. All the stands are yet to be electrified. There is an existing MV feeder lines that are located along the tarred road. The MV line is Mink Conductor. Proposed Saselamani township will be taping from electrical pole no: MMI 347.

Mhinga 22kV feeder is fed from Malamulele substation and the capacity is 3x20MVA, 66/22kv. The current loading from Malamulele substation is 30MVA. The township can be connected to the existing network. MV feeder will be constructed within the township connecting the distribution transformer.

2. Introduction

This report outlines the design philosophy of the electrical MV and LV installation for the Proposed Saselamani township development. Proposed Saselamani township development is situated at portion farm Tshikundus 262 MT. The installation will be designed to ensure that the installation will comply with the South African national safety standard while meeting the objective of the development.

ITEM	DESCRIPTION	COMMENTS
1.	**DEMOGRAPHIC INFORMATION**	
Town Layout	Number of stands	1833
	Stand Density	Medium -10.1 hectare
	Town layout	Relatively Structured
	Classification of layout	Medium Density
Existing Infrastructure	Type of Road	Gravel
	Existence of Telephone Services	None
	Existence of Water Services	None
	Water reticulation	None
	Sewage infrastructure	None
	Others: Clinic	0
	Schools	0
	Churches	0
	Businesses	0
Site Conditions	Soil type	Red turf
	Climate	Temp: -5 to 33^{o}C
	Population	Estimated 9 530 people

ITEM	DESCRIPTION	COMMENTS
2	NETWORK INFORMATION	
2.1	Substation Source	Malamulele Substation
2.2	Substation MV transformer capacity	3x20MVA 66/22kv
2.3	Feeder Name	Mhinga 22Kv
2.4	MV CONDUCTOR TYRE AND SIZE	MINK
2.5	T-off point	MMI 347
2.6	Voltage level at take-off point	94.80%

Table 1 Demographic information

3. Development Proposal (Locality)

Proposed Saselamani township development is situated in portion farm Tshikundus 262 and 27.7km from Malamulele to Saselamani township via R524. The area is administrated by Collins Chabane Municipality under Vhembe District Municipality Limpopo Province 22°50'3.11"S 30°51'18.50"E as shown on the locality plan.

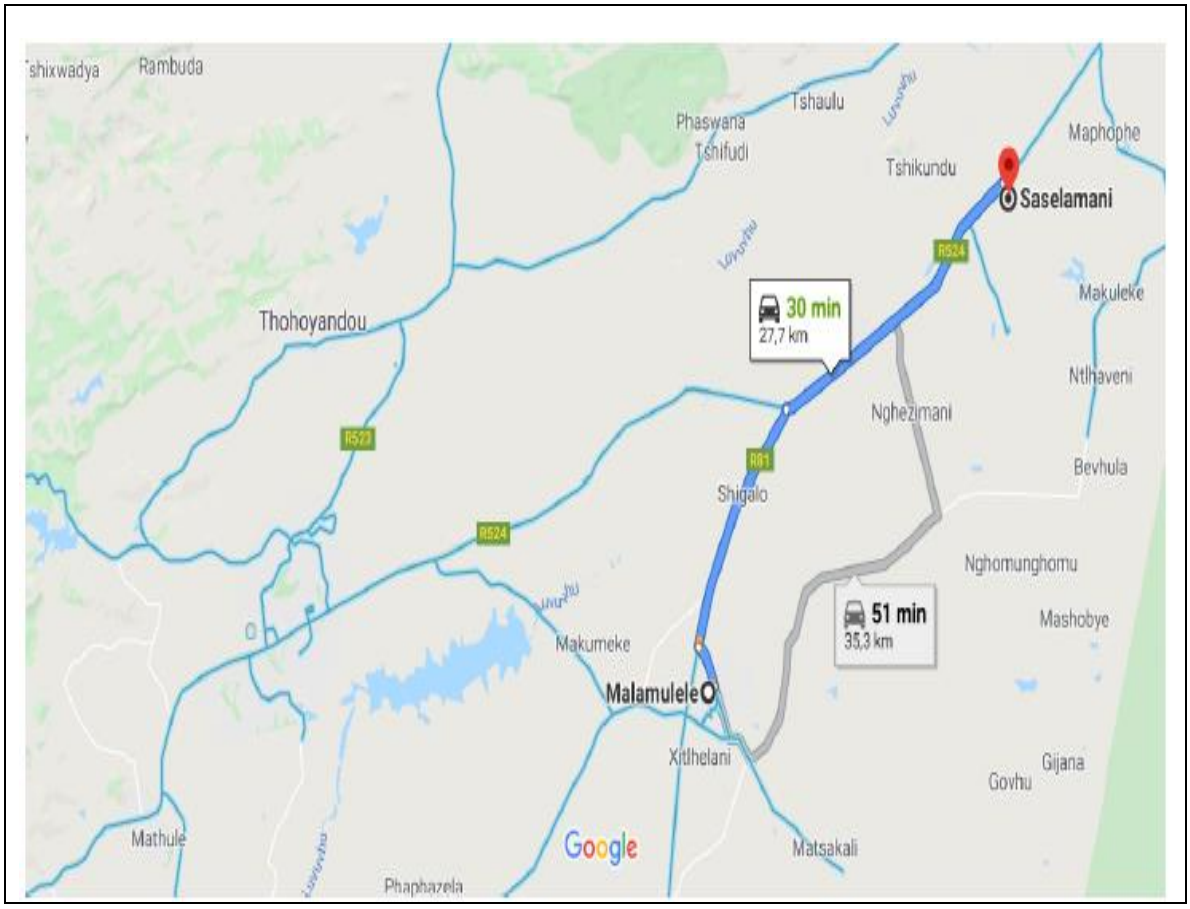

Figure 1 Locality

4. Distribution Network Model

4.1 MV Reticulation

There is an existing MV feeder line that are located along the tarred road R524. The MV line is Mink Conductor. Saselamani township will be connecting electricity from pole no: MMI 347 on 22kV. The Mhinga 22kV feeder is fed from Malamulele substation and the capacity is 3x20MVA, 66/22kV. The current loading from Malamulele substation is 30MVA.
MV feeder will need to be constructed within the township connecting the distribution transformer.

5. Distribution Model

The objective of this task is to develop an adequate network model representing the entire Saselamani township up to 22kV main feeder level. The main feeder is defined as the main feeder supply from Malamulele substation.

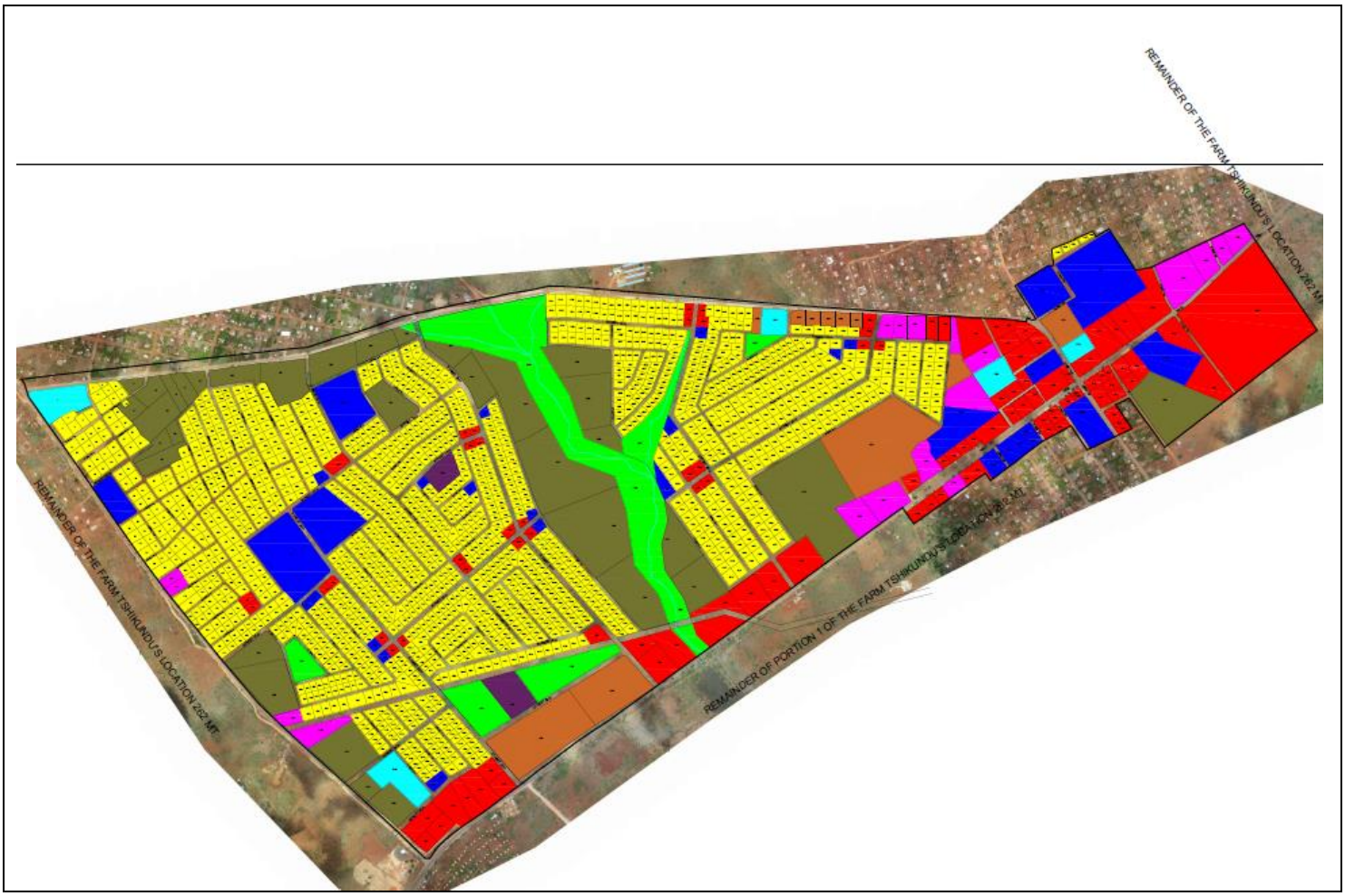

Figure 2 Proposed township development

6. Supply Authority (Licensed)

The area is situated within the electricity licensed area and supply by Eskom.

7. Reticulation Design

7.1 Method of Supply

MV feeder will be constructed within the township and connected to the distribution transformer. MV feeder (22kV) is located along the main road which could utilize for supply the area.
This is to determine the most cost-effective supply arrangement that is used and provide details of required in feed points. The following is included regarding to bulk supply:

- The planning capacity and bulk infrastructure.
- The quality of supply.
- Metering arrangement.
- Protection arrangement.
- The loss profile due to load.

7.2 Design Parameter

The Developer shall erect the MV and LV overhead line reticulation systems in accordance with Eskom's Electrification Standards (Wood Structures).
The internal MV distribution systems shall comprise of "Hare "aluminum conductor steel reinforced configuration on 11m or 9m wooden poles and shall be built to 22kV specifications.

The LV distribution systems shall comprise an aerial bundled conductor (ABC) system, of the supporting core type mounted overhead on either 7 or 9 meter wooden poles. LV distributor spurs shall extend within a radius of approximately 500m from transformer positions depending on individual voltage drop requirements. LV distributor spurs shall share pole structures with the MV system where these follow parallel routes providing clearance of LV can be achieved.

Transformers shall be of the pole mounted type suitably rated to serve anticipated individual LV distributor loads and shall be of the SABS 780 type. All materials supplied by the Developer shall conform to Eskom's Buyer's Guide (Part 9 of DT Standard).

The following design parameter is set:

- Medium voltage (Final Design)
  - ADMD 1.2kVA/stand
  - Spare capacity on feeder 0.5kVA/stand
  - Supply voltage 22kV-3 phase
  - Supply regulation(bulk) 100%(assumed)

The projected load for the final phase (at 1.2kVA per stand) is 46.5kVA. The transformer installed capacity is suitable for and can deliver an ADMD of 2.41kVA per stand.

- Low voltage (Final Design)
  - ADMD 0.65kVA/erf
  - Supply voltage 415/240 volt
  - Regulation +- 10%ase
  - Service connection(max) 20Amp

CART Parameters:

ADMD	Alpha	Beta
Initial	0.28	1.69
Final	0.36	1.03

Table 2 Design parameter

7.3 MV Design

The existing and proposed medium-voltage network is best described in terms of both geographic layout and electrical connection layout. The performance of the network is quantified by MV load flow studies, based on the loads described in the load forecast.

Medium Voltage supply consists of three phase mink conductor. The conductor shall be mounted on 9m wood poles and shall run street-front. A 780 pole mounted transformer shall be used to supply the stands. The transformer must not be loaded more than 108%.

All MV structures shall be constructed in accordance with Eskom Medium Voltage Distribution Standard and specifications.

The MV overhead feeder system shall comply with the requirements of Eskom's Distribution Technology, Electrification Standards and Guidelines as and where applicable for an urban concrete pole reticulation system.

a) Conductor

Type	:	Aluminium conductor steel reinforced.
Code Name	:	Hare/Fox-see Bill of Quantities/drawings
Mass	:	85kg/km / 149kg/km
Ultimate tensile strength	:	7 900 / 13 200 Newton
Max working tension	:	@ -5oC + wind 5 240 / 8760 Newton.
Mounting	:	See structure codes on drawings.

The maximum working tension may be exceeded only during the construction stages when the conductors are to be “over-tensioned” to 1.05 x MWT for a period of not less than 8 hours nor longer than 24 hours after which the tension is to be reduced to a figure not to exceed the stated maximum working tension of the conductor concerned.

b) Poles

Pole type	-	Wood
Pole lengths	-	7m for LV distributor 9m for LV road crossing, 11m for MV Line
Planting depth	-	1.5, 1.8 and 2m respectively
Pole marker	-	painted - black on yellow background.

c) Stays

Type	-	Fiber glass for MV and Porcelain of LV
Rods	-	M20 - 2000 long
Base plate	-	380 x 380 x 6 galvanized
Stay wire	-	7/4mm, 1100 MPA - galvanized
Planting depth	-	2m

d) Flying Stays

Flying stays shall be installed in the positions indicated on the drawings by the structure codes. Anchor poles shall be as specified for the line structures and of sufficient length to ensure the required ground clearance. Overhead stay wire shall be 7/4.00mm as specified for stays.

e) Struts

Struts shall be installed in the positions indicated on the drawings by the structure codes. Strut poles shall be as specified for the line structures. Line structure poles shall be fitted with suitable ground anchors at all strut positions. Struts shall be fitted with barbed wire anti climbing devices.

f) Insulators, Line Clamps and Other Line Components, Pole Dressing Hardware etc.

All in accordance with Eskom’s Distribution Reticulation Technology, Electrification Standards and Guidelines with particular reference to the detailed material take off sheets provided for the various line structures.

g) Sags and Tensions

The Developer shall provide suitable dynamometer sighting rods or other approved apparatus necessary for proper checking of the work. Dynamometers shall be calibrated in kg or kN.

h) Surge Arrestors

Surge arrestors shall be of the metal oxide outdoor hermetically sealed, vertical base mounted type, rated at 22kV, 10kA impulse current.

i) Sectionalizers

Dropout fuses shall be provided for each transformer zone.

7.3.1 Pole Mounted Transformers

Transformers shall generally comply with the following details:

Situation	:	Outdoors
Mounting outline)	:	Suitable for single pole structure (Transformer
Type	:	SABS 780
kVA rating	:	100/50 (as indicated on drawings)
No load voltage ratio	:	22000/415/231 volt
Vector group	:	Dyn 11
Parallel operation	:	Not required
MV & LV connections connections.	:	External bushings with suitable insulated

The transformers shall have connected on the MV side through the use of links or fuses.

7.4 LV Design

The low voltage feeders shall be three phase 4 core aerial bundle conductor with bare neutral and shall be 70 and 35mm². The LV network is to be constructed in mid-block layout on 7m wood poles. The feeders shall be fused at the transformer pole**.** All LV structures shall be constructed in accordance with Eskom Low Voltage Distribution Standard and specifications.

7.5 Service connection

The majority of customers are expected to purchase a 20 Amp supply. Service connections are to be made with a 10mm² concentric cables from a 4-way and 8-way distribution pole top boxes. The service connection shall be a concentric cable in accordance with SCSSCAAC7. For a 60A supply a 10mm² concentric cables shall be used. The concentric cable used on all new services shall be installed without joints from the pole-top distribution box into the standard passive unit base, which is mounted in the customer's premises.

Where the concentric cable enters the dwelling, suitable protection shall be applied around the cable to prevent damage to the insulation. The concentric cable shall form a "drip loop" before the attachment or entry point on the customer's wall as illustrated in drawings D-DT-0360 and D-DT-0361. The concentric cable entry point into the SPU shall be watertight.

The SPU consists of a standard dispenser socket (ED base) attached to a standard 110 mm x 110 mm socket outlet box as illustrated in D-DT-0347. The SPU shall be installed in every customer’s home regardless of the type of supply required. For customers with a 60A supply the standard 110mm X 110mm socket outlet box shall be removed from the SPU. The SPU shall comply with SCSSCAAJ1.

The SPU integrates the incoming service cable with the metering, protection and household distribution. It provides the separation of the earth and neutral for the customer's installation. The wiring between the standard dispenser terminals and the socket outlet box is part of the customer’s installation. The wiring shall be done with a separate earth and neutral wire.

The SPU shall be mounted at a position that is suitable for the customer and away from sources of heat and moisture. Refer to 7.9 in SABS 0142 for the positioning of distribution boards. On brick walls, a 6mm diameter "easy-drive" with screw (D-DT-3149) will be used to mount the SPU. In all other cases, a threaded rod with washers shall be used. A non-metallic cable gland (D-DT-3070) will be provided at the service cable entry point to the standard passive unit.

All services shall be in accordance with Eskom Distribution Services Standard and specifications.

8. Material and Equipment Specification.

The Developer will erect the MV and LV overhead line reticulation systems in accordance with Eskom’s Electrification Standards (Wood Structures). The internal MV distribution systems shall comprise of “Fox “aluminum conductor

steel reinforced configuration on 12m,11m or 9m wooden poles and shall be built to 11kV specifications.

The LV distribution systems shall comprise an aerial bundled conductor (ABC) system, of the supporting core type mounted overhead on either 7 or 9 meter wooden poles. LV distributor spurs shall extend within a radius of approximately 500m from transformer positions depending on individual voltage drop requirements. LV distributor spurs shall share pole structures with the MV system where these follow parallel routes providing clearance of LV can be achieved.

Transformers shall be of the pole mounted type suitably rated to serve anticipated individual LV distributor loads and shall be of the SABS 780 type. All materials supplied by the Developer shall conform to Eskom's Buyer's Guide (Part 9 of DT Standard).

9. Earthing and Lightning Protection System

In accordance with Eskom Distribution Standard Part 2, with particular reference to:

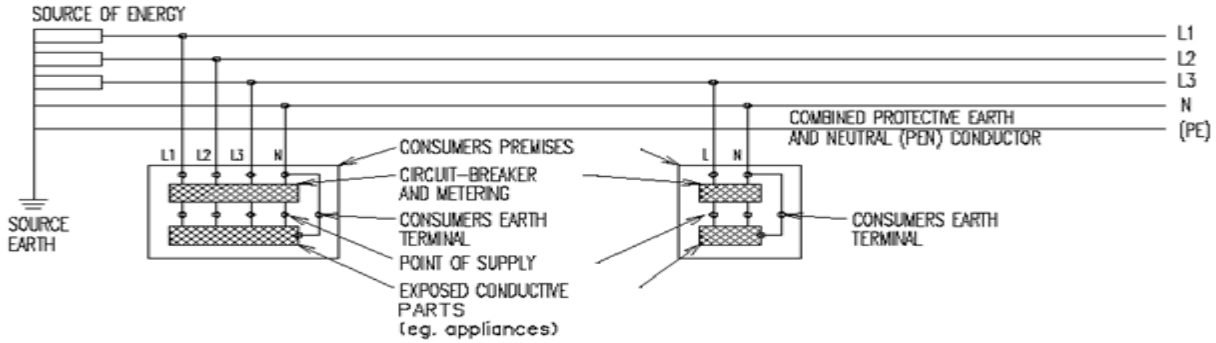

Figure 3 Consumer schematic

Results of soil resistivity survey at 2 points.
Min Cu area : 16mm² stranded
12mm² solid

- Low Voltage
  22 kV system : 70 Ohms
- Medium Voltage
  22kV system : 30 Ohms

10. Recommendation

MV feeder network that supply the township is Mhinga 22kV and substation name is Malamulele substation. The capacity is 3 x 20MVA, 66/22kV and Malamulele substation is currently loading 30MVA. MV line is mink conductor. It is recommended that the township can be connected from the existing network. Implementation network must be installing according to Eskom distribution network standard.

11. Cost Estimate

The estimated electricity infrastructure costs for the proposed development are shown the table below.

COST ESTIMATE FOR PROPOSED SASELAMANITOWNSHIP DEVELOPMENT		
ITEM	**DESCRIPTION**	**ESTIMATE AMOUNT**
a	Preliminaries and General	R 3,288,600.00
b	Pegging of works	R 863,833.34
c	Digging Holes	R 663,833.34
d	Plant poles	R 300,000.00
e	HV structure	R 543,833.34
f	MV stays	R 413,833.34
g	LV structures	R 190,000.00
h	LV stays	R 210,000.00
i	Service Boxes	R 1,013,833.34
j	Stringing	R2,063,833.34
k	Transformer Installation	R 2,500,000.00
l	Earthing Installation	R 200,000.00
m	Pole numbering	R 350,000.00
n	Commissioning	R 200,000.00
o	Other	R 350,000.00
p	House connections	R 1,900,000.00
q	Excavate and plant poles	R 350,000.00
r	Conductor	R 1,674,400.00
s	General	R 1,600,000,00
	SUB-TOTAL 1	**R18,676,000.00**
	Contingency @10%	R 1,867,600.00
	SUB-TOTAL 2	**R 20,543,600.00**
	Professional Fees @ 15%	R 3,081,540.00
	SUB-TOTAL 3	**R 23,625,140.00**
	VAT @ 15%	R 3,543,771.00
	GRAND TOTAL	**R 27,168,911.00**

Table 3 Cost estimate