PORTION 28 OF FARM WELMOED ESTATE

NO. 468, STELLENBOSCH

INFRASTRUCTURE REPORT

ELECTRICAL SERVICES

APRIL 2024

Report By:
DM Consulting Engineers Cape (Pty) Ltd

CONSULTING ENGINEERS
Office 112, The Cliffs 1, 3 Niagara Street,
Tyger Falls Boulevard, Bellville, 7530
+27 (0)21 914 1004 ✉ info@dmce.co.za
www.dmce.co.za
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1. Abbreviations

ADMD	:	After diversity maximum demand
ATS	:	Automatic Transfer Switch
BDMD	:	Before diversity maximum demand
c/kWh	:	cent per kilo-watt-per hour
CEF	:	Cost Estimate Fee
CEL	:	Cost Estimate Letter
CNC	:	Customer Network Centre
DB	:	Distribution Board
DMCE	:	DM Consulting Engineers Cape (Pty) Ltd
DMS	:	Department of Water and Sanitation
EMP	:	Environmental Management Plan
HV	:	High voltage
kV	:	kilovolt
kVA	:	kilo-volt-ampere
kW	:	kilowatt
kWh	:	kilo-watt-per hour
kWp	:	kilowatt-peak
LPU	:	Large Power User
LV	:	Low voltage
MD	:	Maximum Demand
MDB	:	Main Distribution Board
MSub	:	Miniature substation
MV	:	Medium voltage
NE	:	Northeast
NMD	:	Notified Maximum Demand
NW	:	Northwest
POC	:	Point of consumption
POS	:	Point of supply
PV	:	Photovoltaic
SANS	:	South African National Standards
SDP	:	Site development plan
SE	:	Southeast
SOC	:	State owned company
SW	:	Southwest

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4. Introduction

DMCE has been instructed by the client; Uniqon Developers (Pty) Ltd to report on the electrical infrastructure for PORTION 28 OF FARM WELMOED ESTATE NO. 468, STELLENBOSCH and compile an infrastructure report of the site, including load estimation and capacity confirmation of electrical services for the proposed development.

Figure 1: Location of site.

PORTION 28 LAND USE TABLE			
	Site area	45.48 Ha	
	Land use	Area	Units
	School Component (A2)	1.78 Ha	
	Commercial (A1,B5)	0.50 Ha	
	Clubhouse Component(B5)	0.18 Ha	
	Mixed Use Component (B1-4)	0.7 Ha	515 units
	Residential (@80 du/ha)	5.88 Ha	
	Residential (@40 du/ha)	8.74 Ha	355 units
	Alottment Villas	10.31 Ha	14 units
	Total (excluding areas below)	**28.09 Ha**	**884 units**
	Detention & SW area	1.15 Ha	
	Indigenous slopes	6.43 Ha	
	Roads & squares	4.86 Ha	
	Private open space	4.04 Ha	

Figure 2: Site development plan

5. Existing Infrastructure

a) Electrical supply from Eskom

There is currently an existing 11kV overhead Eskom line operating along the southeast side of the property, fed from Lynedoch Substation; feeder 1. Various transformers and switching points have been identified (See figure 3). The supply point, “FSARail” has been identified and communicated to Eskom for capacity simulations and confirmation (See Figure 4). The final point of supply (POS) will be determined, identified, and communicated by Eskom.

Figure 3: Existing Eskom network

Figure 4: Proposed POS

The development is expected to be fed from Lynedoch substation via Lynedoch Farmers 1 feeder. The Substation is equipped with one 10MVA 66/11kV transformer. A peak demand of 9.3MVA to date was recorded on the transformer. Lynedoch Farmers 1 will experience thermal and low voltage constraints should additional load be applied. Voltage regulators will be considered by Eskom. The load on the feeder is currently 4.5MVA and is expected to grow more than that as there are LPUs which are not fully utilising their capacity to date.

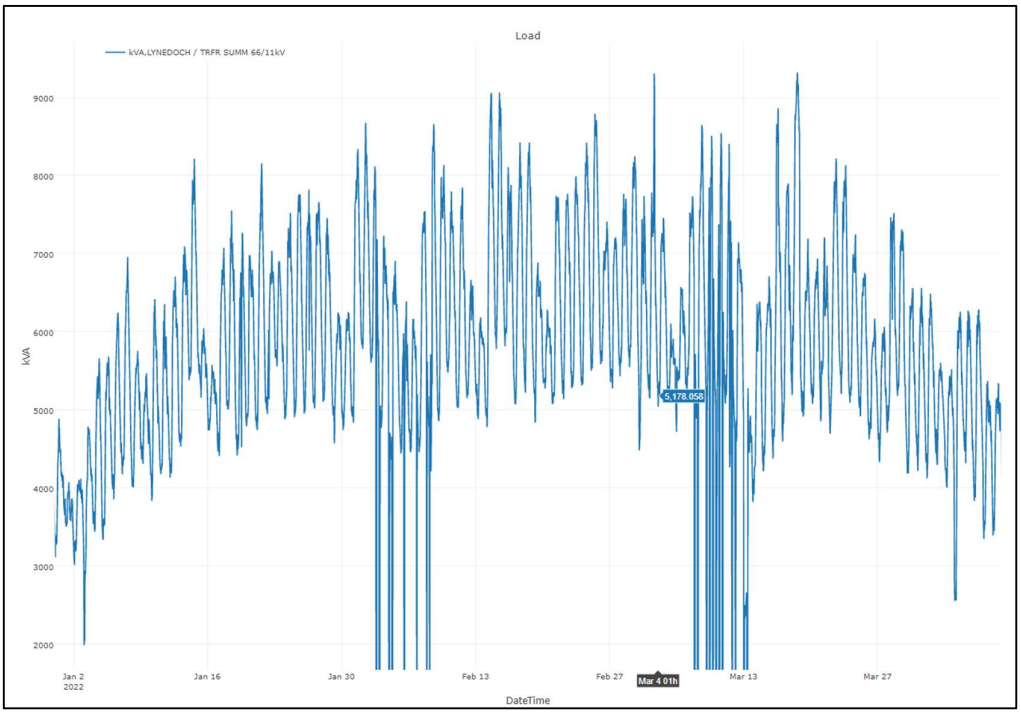

Figure 5: Lynedoch Substation load profile

The following strengthening options must be considered to make capacity available for Welmoed, Portion 28 development.

<u>Option 1</u>:

Transfer load to interconnecting feeders to de-load both the substation and Lynedoch farmers 1 feeder. The amount of load that can be transferred is limited due to the capacity limitations of the interconnecting feeders. This approach is considered a temporary solution and upgrading of the substation transformer will still be required eventually. Eskom confirms 650kVA can be made available of the required maximum demand (MD). See Annexure A.

Option 2:

Construct as second overhead feeder (approximately 4km) from Lynedoch substation to the development to share the current load. This option will also require upgrading of the Lynedoch Substation transformer.

This option will require an approved route between Lynedoch substation and Welmoed, Portion 28. Wayleaves assuring legal right of way will be required prior to construction. The overhead powerline will become Eskom property after construction. A selfbuild project may be considered to speed along the process. See figure 6.

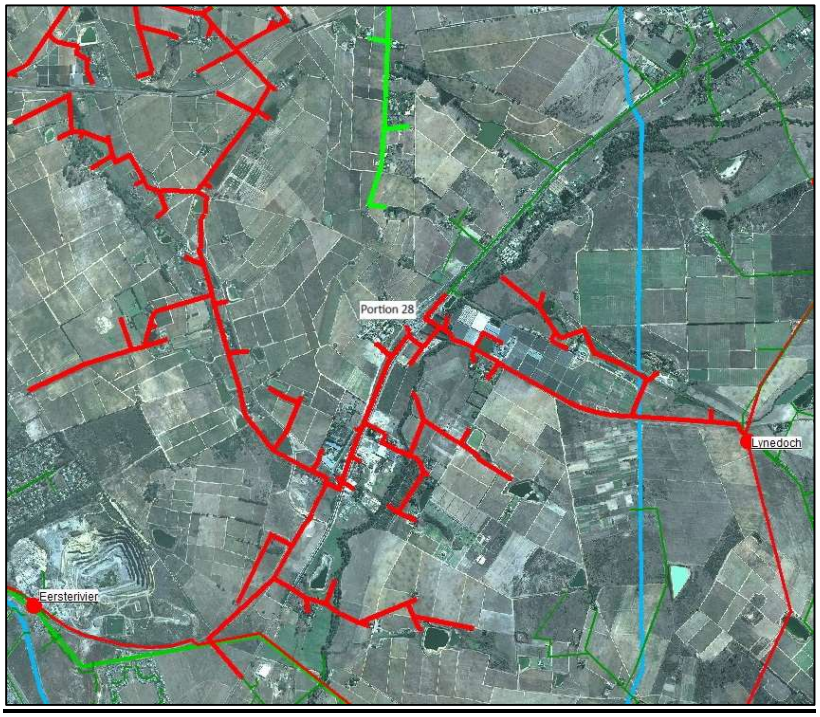

Figure 6: Eskom MV network

Option 3:

Construct as new overhead feeder (approximately 5km) from Eersterivier substation to Welmoed, Portion 28 to share the current load. Written confirmation of the viability of this option is still outstanding from the planner responsible for the Eersterivier Substation.

This option (as with option 2) will require an approved route between Eersterivier substation and Welmoed, Portion 28. Wayleaves assuring legal right of way will be required prior to construction. The overhead powerline will become Eskom property after construction. A selfbuild project may be considered to speed along the process. See figure 6.

A project evaluation model analysis will be conducted by Eskom to determine which option yields the least-life cycle cost between option 2&3. The analysis combined with the require confirmation from the network operator for Eersterivier substation will influence Eskom's preference between option 2 and 3 respectively.

6. Design development

a) Scope of works

The scope of works for the proposed development may be listed as follows:

1. Conduct a load estimation of the development.
2. Confirm sufficient capacity available from Eskom for the development.
3. Examine potential PV Solar generation for the development.
4. Apply for MV Bulk supply point from Eskom.
5. Provide recommendations.

7. Estimated load

The development allows for 886 residential dwellings with potential allowance for future density increase applications. A design load of 2.5kVA is calculated for each dwelling. The follow alternative energy measures will be employed at each dwelling to limit energy consumption form the national Eskom grid:

1. Gas stoves
2. Gas geyser
3. Gas ovens
4. 5kW PV Solar system

PV Solar efficiency of each induvial dwelling cannot be declared at present. Information such as roof structure, direction, roof tilt and shading information is not

available at present. Allowance for the PV Solar shortfalls have been made in the design load.

Item	Building Type	Block	Residential Type	Area (m²)	No. of Units	kVA/Unit	Total Load (kVA)
1	Residential	B1	Standard Unit		55	2,5	137,5
2	Residential	B2	Standard Unit		56	2,5	140
3	Residential	B3	Standard Unit		56	2,5	140
4	Residential	B4	Standard Unit		86	2,5	215
5	Residential	B5	Standard Unit		20	2,5	50
6	Residential	B6	Standard Unit		71	2,5	177,5
7	Residential	B7	Standard Unit		37	2,5	92,5
8	Residential	B8	Standard Unit		106	2,5	265
9	Residential	B9	Standard Unit		52	2,5	130
10	Residential	B10.1	Standard Unit	258200	4	2,5	10
11	Residential	B10.2	Standard Unit		5	2,5	12,5
12	Residential	B11	Standard Unit		23	2,5	57,5
13	Residential	B12	Standard Unit		46	2,5	115
14	Residential	B13	Standard Unit		48	2,5	120
15	Residential	B14	Standard Unit		105	2,5	262,5
16	Residential	B15	Standard Unit		30	2,5	75
17	Residential	B16	Standard Unit		49	2,5	122,5
18	Residential	-	Standard Unit		22	2,5	55
19	Residential	C1-14	Alottment Villa		14	2,5	35
					885		
			Total Load (KVA)				2212,50
			Diversity				0,90
			ADMD (KVA)				1991,25

Table 1: Load calculation – Residential

COMMERCIAL SPACES								
Item	Building	Level	Commercial Space Type	Qty	Area (m²)	VA/m²	Total Load (VA)	Total Load (KVA)
1	-	All	School component	1	17800	85	1513000	1513
2	-	All	Commercial component	1	5000	85	425000	425
3	-	All	Clubhouse component	1	1800	40	72000	72
4	-	All	Mixed use component	1	7000	65	455000	455
5	External lighting	-	-	1	-	-	-	5,00
					31600			
					Total Load (KVA)			2470,00
					Diversity			0,80
					ADMD (KVA)			1976,00
					Total Load (Residential + Commercial Spaces)			4188,50
					Diversity			0,50
					ADMD (KVA)			2094,25

Table 2: Load calculation – Commercial & Summary

Formal applications to Eskom for capacity allocations will increase over time in required NMD with relation to growth of the development. This allows time for Eskom to perform necessary upgrading and preparations towards 2.1MVA NMD. An increase NMD application for 2.6MVA will be submitted for future density increase applications after the designed number of consumers is reached (1500).

a) Capacity availability confirmation from ESKOM

A revised scope of works has been issued to Eskom following a meeting conducted on the 7th of June 2023. Eskom will provide feedback regarding the maximum allowed capacity available on the Lynedoch Substation Feeder 1 (See Annexure A).

b) Future After Diversity Maximum Demand (ADMD)

ADMD is the after diversified Maximum Demand (MD).

The ADMD is determined as follows:

1. The Maximum Demands (MD) for each dwelling is determined using appropriate kVA/dwelling values.
2. A diversity factor is factored in for the complete development (885 connections). The diversity factors decrease as the number of connections increases.

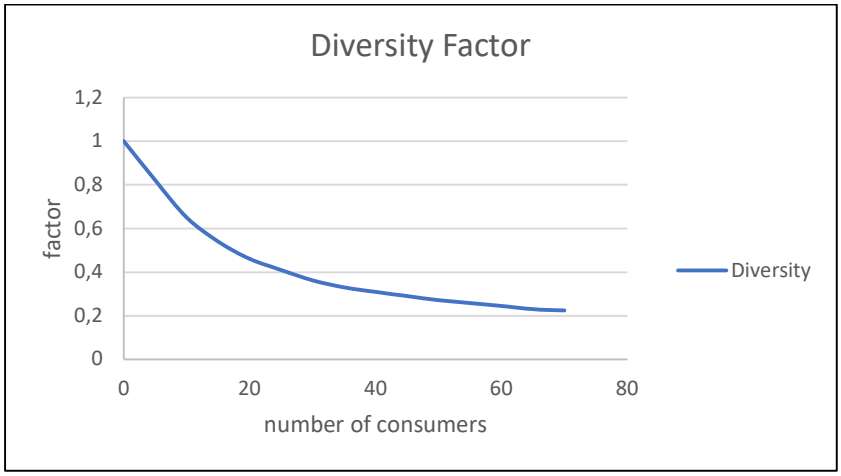

Figure 7: Diversity factor example

3. The MD and ADMD are determined from the sums of the separate dwelling MDs and ADMDs.

The site's MD is calculated at 4.2MVA (BDMD) and 2.1MVA (ADMD) respectively. As illustrated below in Table 3, the number of consumers is expected to be reached over a construction period of 6 years. The final phasing of the project to be confirmed by

the developer. Required application for a 2.1MVA NMD supply will follow the number of designed consumers (885) including the planned commercial area.

Phase	Expected year of construction	Number of Units	kVA required @ 2.5kVA design load	kVA demand with Diversity
Phase 1	2025	150	375	187.5
Phase 2	2026	150	375	187.5
Phase 3	2027	150	375	187.5
Phase 4	2028	150	375	187.5
Phase 5	2029	150	375	187.5
Phase 6	2030	135	340	170
		885	2 215	1 108

Table 3: Future expected load increase

c) PV Solar estimation

As previously mentioned, each dwelling will be equipped with a 5kW PV Solar system. Limiting factor cannot be declared at present. A design efficiency of 60% is selected to consider.

PORTION 28, WELMOED ESTATE

PV SOLAR CALCULATION 2023/07/18

Item No.	No of dwellings	Area	Design Load (kW)	(kW) - TOTAL
1	886	Portion 28, Welmoed Estate	5.0	4 430
A		Potential capacity		4 430
B		Expected supply capacity	60%	2 658

Table 4: Potential PV Solar generation

d) Eskom upgrading proposal.

A MV bulk supply point with metering will be supplied, installed, tested, and commissioned by Eskom for the development. Eskom is required to confirm capacity in writing (see annexure A).

8. Costing

a) Eskom estimation costs

A formal application was submitted to Eskom on the 22 of May 2023. A follow up meeting was conducted with members of Eskom on the 7th of June 2023 and a revised scope of works was issued to Eskom on the 10th of July 2023. Eskom is required to provide written confirmation of capacity available for the development on the supply feeder. Eskom-process can be summarised as follow:

Step 1	Submit application to Eskom
Step 2	Pay cost estimate (CE) fee – This fee can vary depending on the project R33 436,00. We will request an invoice and assigned reference number after submitting the application.
Step 3	Project is loaded on system and network planning is consulted about the project. Scope of works is advised.
Step 4	Cost Estimate Letter (CEL) is issued for payment by the customer. Amount depends on network planning and cannot be predicted in advance.
Step 5	Budget quotation is issued for payment by the customer. Cost Estimate Fee and Cost Estimate letter amount is deducted from this amount, and the difference is for the client's account. Amount depends on network planning findings and cannot be predicted in advance.
Step 6	Project is handed over to design, construction and closing.

Table 2: Eskom Process

Preliminary budget estimations

The following costs are estimated to be paid to Eskom for a MV Bulk point supply:

	Description	Amount
1	Cost estimation fee	R33 436.00
2	Cost estimation letter	R100 000.00
3	Budget quotation	R1 500 000.00
	Total (excl. VAT)	R1 633 436.00

Table 3: Eskom budget estimations

All amounts listed above are VAT excl.

This is a high-level cost estimation. Correspondence and approvals are still required from Eskom.

b) Direct construction cost estimation

The follow estimation is allowed for regarding direct construction cost for the development. The estimation only allows for MV underground reticulation up until each miniature substation. Final positions of the miniature substations will be identified and confirmed during construction phase of the development.

	Description	Amount
1	MV Cable	R3 060 000.00
2	5 Way RMU	R700 000.00
3	Miniature Substations	R5 635 000.00
4	Delivery	R89 800.00
5	Installations	R758 784.00
6	Prelim & Generals	R102 435.84
7	OHS	R30 000.00
8	Testing & Commissioning	R30 000.00
	Total (excl. VAT)	R10 406 019.84

Table 4: Direct construction cost estimation

This is a high-level cost estimation. More detailed design will be required to conclude a more accurate cost figure.

9. Conclusion

To conclude this report, the following is evident:

1. Alternative energy sources such as gas and PV Solar will be used for the development. LED street lightning recommended.
2. The NMD for the development will increase in relation to construction of the development. Application for increase to a 2MVA NMD supply will follow the completion of the designed consumers (886).
3. The annual energy consumed form the grid will be reduced by the proposed PV solar system.
4. Ring feed MV reticulation recommended for the development MV network.
5. MV underground armoured cable design has been allowed for. Overhead MV reticulation recommended as a more cost-effective approach, subject to development allowance for MV overhead line reticulation.
6. Option 1 is recommended to start the project and establish a point of supply for the development. Instruction to proceed required.
7. Option 2 is recommended to supply remaining demand to the development. Approved overhead line route to be confirmed.

Compiled by:

JP LOURENS
SENIOR PROJECT ENGINEER

Approved by:

D. R. MÜLLER
Pr Eng

DM CONSULTING ENGINEERS CAPE (PTY) LTD

10. Annexure A

Eskom

Mr. Jaco van Rooyen
DM Consulting Engineers Cape
PO Box 3125
DURBANVILLE
7551

Date:
17 August 2023

Enquiries: JP Du Preez
Tel +27 21 915 2076

Dear Mr. Van Rooyen

SUPPLY OF ELECTRICITY
PROPOSED SUPPLY: PTN 28 OF THE FARM 468, WELMOED ESTATE, STELLENBOSCH

With reference to your ENQUIRY at Eskom, I advise that Eskom is the licensed Distributor to the property above.

Capacity of 650 kVA can be made available on the Lynedoch / Farmers 1 feeder to supply the initial load.

The method of supplying the electricity will be determined once details are made available. The formal quote process will confirm spare capacity available and a proposal to supply such development. Execution of making supply available will only be initiated on acceptance of a formal budget quote. The date to make a point of supply available will be confirmed during this process.

Should you require any further information please contact Pieter du Preez on the telephone numbers mentioned above, and be assured of Eskom's best service at all times.

Yours faithfully

JP Du Preez
Key Customer Relations Officer

Group Customer Service
60 Voortrekker Road, Bellville, 7530
P.O. Box 2100, Bellville, 7535 SA
Tel +27 86 003 7566 www.eskom.co.za

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