

LANGEBERG MUNICIPALITY



ELECTRICITY MASTERPLAN

Ashton Area of Supply

P302015-ELE-MPL-002-B

SEPTEMBER 2022

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1 EXECUTIVE SUMMARY

An electricity master plan report is a long-term planning document that investigates the current infrastructure and status of the electrical network, which forms the basis for future planning and network upgrade recommendations. Information on the changes to existing 11 kV networks were obtained from Langeberg Municipality.

This report deals with the electrical infrastructure in the Ashton supply area of Langeberg Municipality. The current notified maximum demand is 10.5MVA which was decreased from 12MVA due to decline in demand. The recent maximum demand peaked at 9.4MVA. The load growth is forecasted at 1.26% per year based on historical average. Several housing developments are planned and should they take off the NMD might be exceeded by 2026.

The impact of the load growth and new developments on the existing infrastructure was determined and recommendations were made on how to make sure that the electricity supply for the whole area remains reliable and of an acceptable quality.

Proposed capital projects are the replacement of 11kV switchgear in the main switching station. Furthermore, several 11kV overhead lines are earmarked for upgrading to underground cables.

Service delivery, demand side management initiatives, assessment of asset condition and economic development and alternative sources of energy are also discussed.

The projects completed to date have been updated as applicable.

P302015-ELE-MPL-002-B

REV	DESCRIPTION	ORIG	REVIEW	iXengineers APPROVAL	DATE	CLIENT APPROVAL	DATE
A	Issued for approval	 W Steyn	 W Snyman	N/A	2022-06-27		
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ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

CONTENTS

1	EXECUTIVE SUMMARY	1
2	INTRODUCTION.....	2
3	EXISTING INFRASTRUCTURE	2
3.1	BULK SUPPLY.....	3
3.2	11KV INFRASTRUCTURE.....	4
3.3	ASSET CONDITION ASSESSMENT	5
3.3.1	SWITCHGEAR.....	5
3.3.2	MINIATURE SUBSTATIONS.....	5
3.3.3	TRANSFORMERS.....	6
3.3.4	CONSUMER METERS	6
4	ASSESSMENT OF EFFICIENCY LEVELS AND SERVICE DELIVERY	6
4.1	OPERATIONS.....	6
4.2	LEVELS OF SERVICE.....	8
4.3	DEMAND SIDE MANAGEMENT	9
5	ENERGY LOSSES.....	9
5.1	BACKGROUND OBJECTIVE METHODOLOGY.....	9
5.2	ASHTON TECHNICAL LOSSES	10
6	PREVIOUS COMPLETED PROJECTS.....	11
7	ASSESSMENT OF ECONOMIC DEVELOPMENT	11
8	ALTERNATIVE SOURCES OF ENERGY	12
8.1	CURRENT SSEG INSTALLATIONS	12
8.2	SSEG IMPACT ON MUNICIPAL REVENUE	13
8.3	ALTERNATIVE ENERGY SUPPLY FOR MUNICIPAL BUILDINGS	14
8.4	ALTERNATIVE ENERGY SUPPLY OPTIONS FOR MUNICIPAL FEED IN POINTS.....	15
9	FUTURE DEVELOPMENTS / LOAD GROWTH FORECAST	17
9.1	HISTORIC LOAD GROWTH TREND	17

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

9.2	PROPOSED DEVELOPMENTS	19
10	LOAD FLOW ANALYSIS	21
10.1	METHODOLOGY	21
10.2	RESULTS OF LOAD FLOW ANALYSIS.....	21
10.2.1	CURRENT MAXIMUM DEMAND LOAD FLOW	22
10.2.1.1	PROSPECTIVE FAULT CURRENT STUDY	22
10.2.1.2	VOLTAGE LEVEL STUDY	22
10.2.1.3	CONDUCTOR THERMAL CAPACITY STUDY	23
10.2.2	5-YEAR MAXIMUM DEMAND LOAD FLOW	23
10.2.2.1	VOLTAGE LEVEL STUDY	24
10.2.2.2	CONDUCTOR THERMAL CAPACITY STUDY	25
10.2.3	10-YEAR MAXIMUM DEMAND LOAD FLOW	25
10.2.3.1	VOLTAGE LEVEL STUDY	26
10.2.3.2	CONDUCTOR THERMAL CAPACITY STUDY	26
10.2.4	VARIOUS CONTINGENCIES	27
11	RECOMMENDED CAPITAL UPGRADES.....	28
12	CONCLUSIONS	29
13	RECOMMENDATIONS.....	29
	APPENDIX 1 – ASHTON 11KV ELECTRICAL DISTRIBUTION NETWORK LAYOUT.....	30
	APPENDIX 2 – ASHTON 11KV SINGLE LINE DIAGRAM	31
	APPENDIX 3 – SIMPLIFIED 11KV SINGLE LINE DIAGRAM	32
	APPENDIX 4 – ASSET CONDITION ASSESSMENT	33
	APPENDIX 5 – NETWORK TECHNICAL LOSSES CALCULATION	34
	APPENDIX 6 – SSEG IMPACT ON MUNICIPAL REVENUE	35
	APPENDIX 7 – ALTERNATIVE ENERGY SUPPLY OPTION FOR MUNICIPAL FEED IN POINTS	36
	APPENDIX 8 – PROPOSED DEVELOPMENTS	37
	APPENDIX 9 – LOAD GROWTH FORECAST	38
	APPENDIX 10 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS	39

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 11 – PROSPECTIVE FAULT LEVEL STUDY	40
APPENDIX 12 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY 41	
APPENDIX 13 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY	42
APPENDIX 14 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS	43
APPENDIX 15 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY ...	44
APPENDIX 16 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY	45
APPENDIX 17 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS	46
APPENDIX 18 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY .	47
APPENDIX 19 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY	48
APPENDIX 20 – RECOMMENDED CAPITAL UPGRADES	49

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

LIST OF ABBREVIATIONS

ACSR	Aluminium Conductor Steel Reinforced
ADMD	After Diversity Maximum Demand
IDP	Integrated Development Plan
LED	Local Economic Development
LV	Low Voltage
kVA	kilovolt Ampere: Apparent Power
kW	kilowatt: Real Power
kWh	kilowatt hour
MFMA	Municipal finance management act
MV	Medium Voltage
MVA	Megavolt Ampere: Apparent Power
MW	Megawatt
NDP	National Development Plan
NMD	Notified Maximum Demand
NRS	National Rationalised Specifications
N/C	Normally Closed
N/O	Normally Open
PILC	Paper Insulated Lead Covered
PV	Photovoltaic
SALGA	South African Local Government Association
SANS	South African National Standards
SDBIP	Service Delivery Budget Implementation Plan
SDF	Spatial Development Framework
SS	Substation
SSEG	Small Scale Embedded Generation
SWH	Solar Water Heater
TID	Token Identifier
XLPE	Cross-linked Polyethylene

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ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

2 INTRODUCTION

iX Engineers (Pty) Ltd was appointed to compile a new master plan which includes updates to the previous master plan on the electricity infrastructure in the Langeberg Municipal area.

The contents of this report will cover the Ashton area of supply. The other supply areas will be covered in separate reports.

This master plan report must be read in conjunction with the drawings and other information available in the Appendices.

3 EXISTING INFRASTRUCTURE

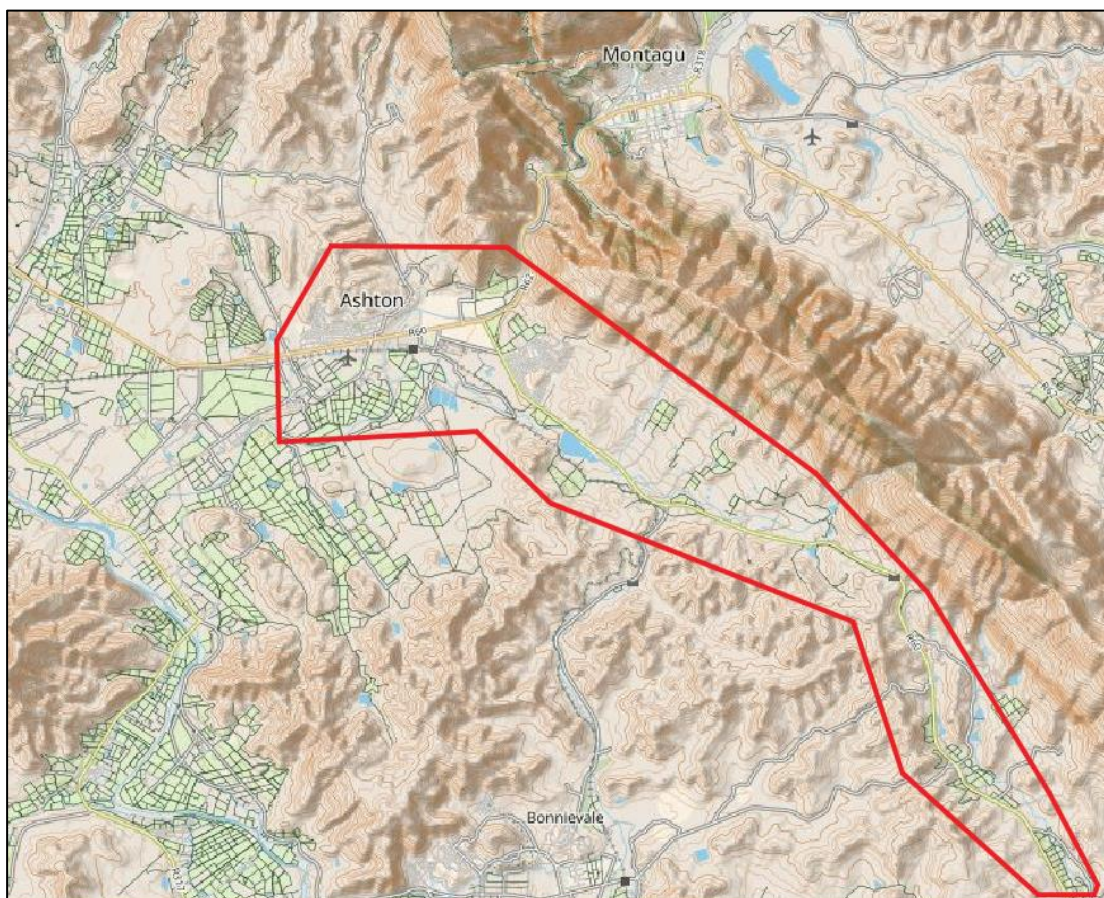


Figure 1: Ashton Distribution Area

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3.1 BULK SUPPLY

Ashton is currently supplied in bulk from the Eskom 132 / 66 kV Ashton substation. The 132 kV line feeds from Boskloof Substation via Klipdrif Substation. There is currently only one 20 MVA 66/11kV transformer installed with a standby 5 MVA 66/11kV transformer in the Eskom Substation.

Ashton area is on the Megaflex tariff.

Supply Conductor	Supply Conductor Capacity (MVA)	Supply Voltage (kV)	Maximum Demand (MVA)	Notified Maximum Demand (MVA)
2 x 2 x 150mm ² PILC Cu	23.24 (11.62 per feeder)	11	9.4*	10.5

*Maximum demand figure from Feb 2022.

Historical maximum demand and notified maximum figures for Ashton are shown in the chart below:

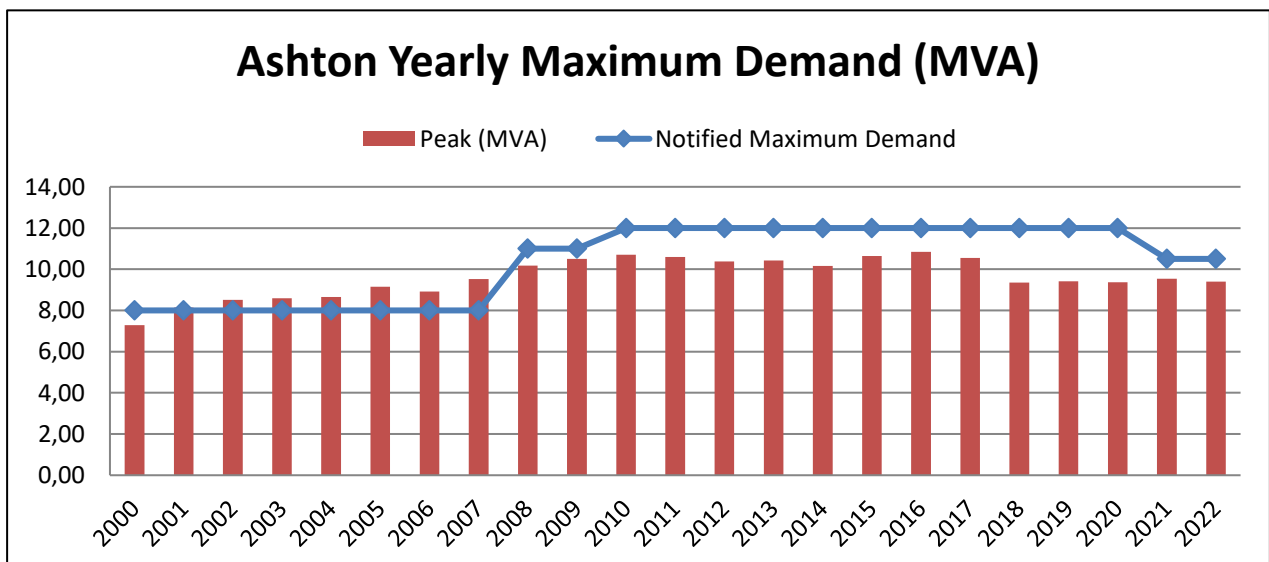


Figure 2: Ashton Yearly Maximum Demand Figures

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Ashton has shown steady growth up until 2010, where after the demand levelled out and no significant increase has been seen since.

The current notified maximum demand (NMD) is 10.5 MVA. This was recently decreased due to the decline in demand.

The monthly maximum demand figures are included below indicating that Ashton area of supply reaches its peak during the month of February / March each year.

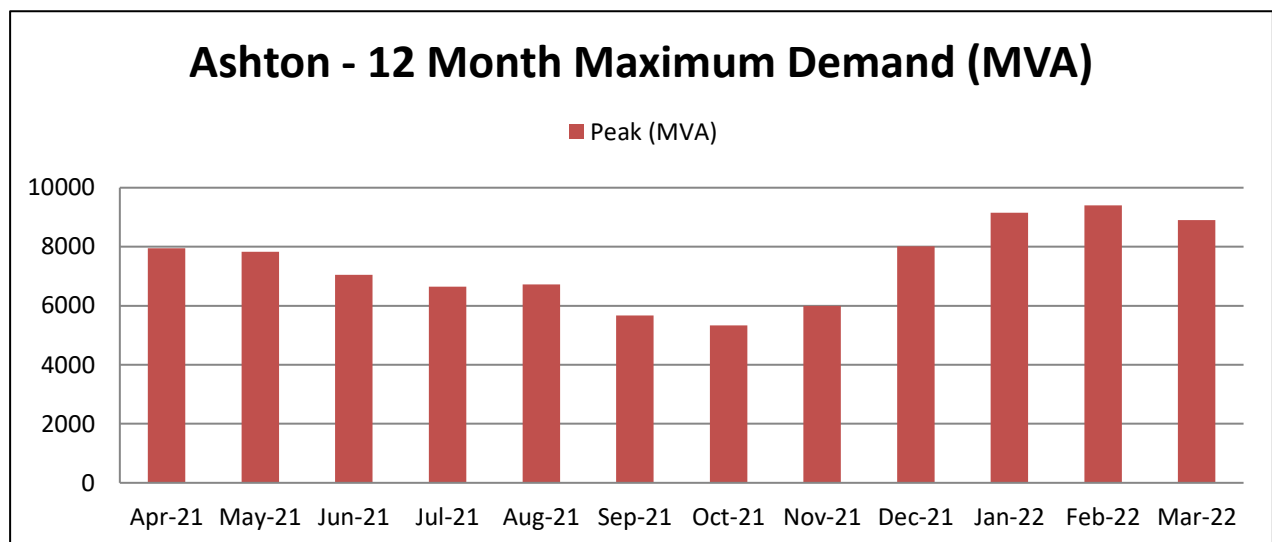


Figure 3: Ashton Monthly Maximum Demand Figures

3.2 11kV INFRASTRUCTURE

The Ashton supply is taken at 11kV from the Eskom Ashton Substation. There are two incomers that feed the Ashton 11kV main switching station.

The bus section in the switching station is operated normally closed.

The 11kV ring feeders from Ashton main switching station are well established and create several switching scenarios to supply power to the large power users should faults on certain parts of the network occur.

The town area majorly consists of underground cable networks with short sections of overhead lines that can be replaced in future to further strengthen the network. The outskirts of the town area and industrial area are fed from overhead lines.

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The 11kV cable feeders used in Ashton area consist of both XLPE and PILC types. The overhead lines consist of ACSR, ABC and bare copper conductors.

The 11kV electrical distribution network layout for Ashton is included in Appendix 1 and the single line diagram is included in Appendix 2.

The simplified 11kV single line diagram for the Ashton area is included in Appendix 3.

3.3 ASSET CONDITION ASSESSMENT

The information of existing assets was obtained from the municipal asset register.

The asset condition assessments for the various equipment are included in Appendix 4.

The expected useful life for the different asset types are indicated below as published in the Municipal Finance Management Act Guidelines.

Asset Type	Expected Useful Life (Years)
MV Transformer	45
MV Cables and Lines	45
MV Substation and Switchgear	45
LV Network	50
Consumer Meters	15

Table 1: MFMA – Local Government Capital Asset Management Guideline

3.3.1 SWITCHGEAR

The 11kV switchgear in the main switching station was installed in 1970, 1980 with some additions in the early 2000's. Some of the switchgear have exceeded their expected useful life and should be replaced.

3.3.2 MINIATURE SUBSTATIONS

The majority of the miniature substations are all still within their expected useful life with the oldest miniature substation due for replacement in 2026. One miniature substation has however already exceeded its expected useful life.

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3.3.3 TRANSFORMERS

The assessment indicates that 21 transformers are over their expected useful life as and will need to be replaced urgently. When replacing these transformers, allowance should be made for installation of surge arrestors as some pole mounted transformers do not have surge arresters installed and are thus vulnerable to damage due to lightning strikes on the overhead line.

3.3.4 CONSUMER METERS

Langeberg Municipality is on a continued meter replacement programme. In the financial year 2020/21, 385 meters were replaced with prepaid meters for the entire Langeberg municipal area.

All STS prepayment meters will be affected by the Token Identifier (TID) rollover happening on 24 November 2024. Any tokens generated after this date will be rejected by the meter as being old tokens. The current TID base date that is used to generate tokens is 1993.

To overcome this issue, all STS prepayment meters will require a key change token to be entered into the meter and be accepted by the meter. After the key change has been accepted, the new tokens will be calculated from a 2014 base date and will have a lifespan up to 2045.

4 ASSESMENT OF EFFICIENCY LEVELS AND SERVICE DELIVERY

4.1 OPERATIONS

The effectiveness of operations was assessed in accordance with the requirements of the Integrated Development Plan (IDP). Basic service delivery objectives were set at restoring 95% of municipal interruptions within 4 hours and 98% within 24 hours after complaints have been received according to NRS 047 Electricity Supply – Quality of Service and Reporting Guidelines. From the below chart it is evident that both objectives have been surpassed.

For Ashton area all restorations were done within 7.5 hours.

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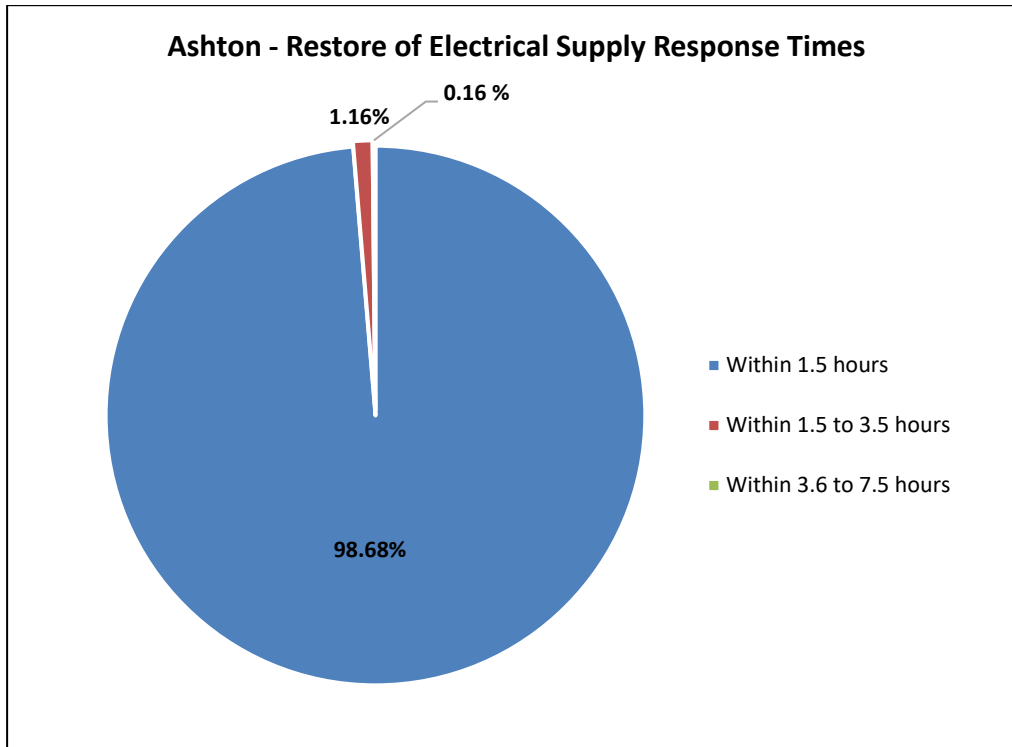


Figure 4: Electricity Supply Restore Response Times (Jan 20 – Sep 21)

The IDP also sets out an objective to provide quotations for new electricity connections (within 10 days) where existing network is being used, and within 30 days where extensions must be done.

The chart below indicates the response time success percentages per category. Deviations are indicated as 4% which is within the recommended target percentage success rate (at least 90% as stated in NRS 047) for providing quotations timeously.

The figures are for the whole of the Langeberg Municipal area.

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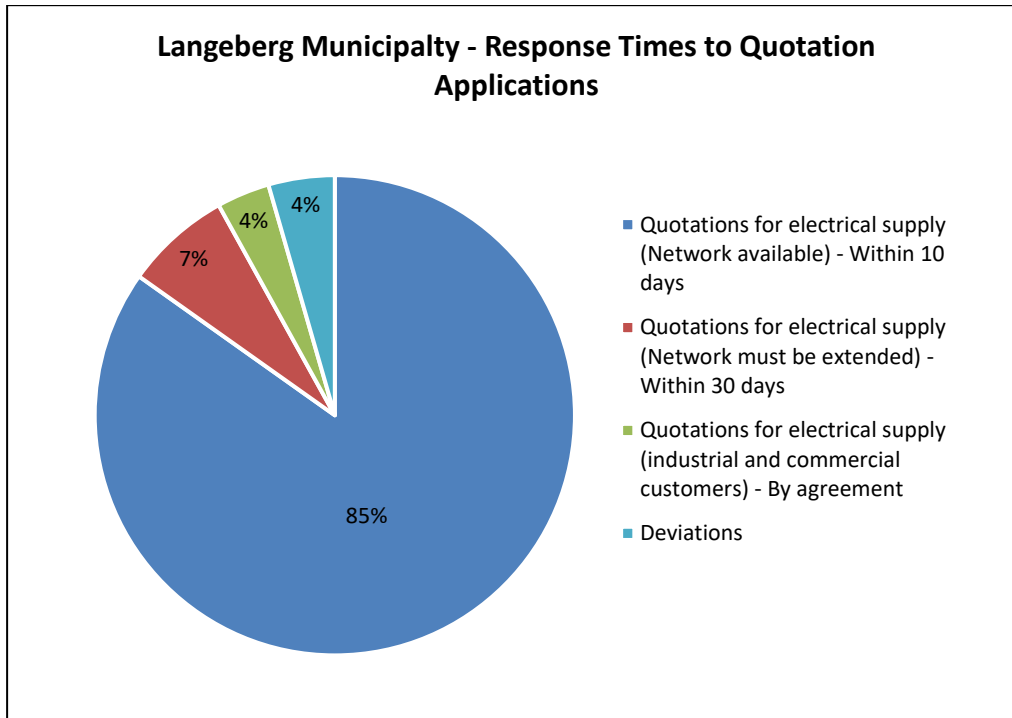


Figure 5: Quotation Application Response Times (Jun 20 – Jul 21)

4.2 LEVELS OF SERVICE

The possibility to restrict residential consumers by lowering the 60A rating of circuit breakers was also considered in this report.

According to the SDBIP figures, there are 17,804 (30 June 2021) formal residential properties connected to the municipal network which are billed.

To replace these circuit breakers will require substantial resources from the municipality to implement. If implemented, the lowered rating could cause nuisance tripping due to established consumer load profiles.

An option that could be considered is to implement the setting of meters, where applicable, to a certain amperage to trip and reset after a certain period and evaluate the response from consumers.

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4.3 DEMAND SIDE MANAGEMENT

The following are forms of demand side management initiatives that can be implemented / expanded on to further reduce the demand of the municipality:

- Set limits on meters,
- Installation of high efficiency motors,
- Installation of variable speed drives, where feasible to reduce,
- Installation of power factor correction equipment where low power factor measurements are experienced to reduce reactive energy supply from municipal network,
- Solar water heater installations / retrofit,
- SSEG installations with backup battery systems to reduce the reliance on the municipal network during peak periods,
- Replacement of street light lamps with LED.

5 ENERGY LOSSES

5.1 BACKGROUND OBJECTIVE METHODOLOGY

The transfer of electricity from generation to the end-users involves losses in energy volumes (electrical or technical losses) that reduce the amount of electricity volumes available for sale to end-customers. In addition, other energy losses may also occur due to non-metered usage related to electricity theft (non-technical).

Energy loss is an intrinsic risk in the electricity business and utilities globally have the challenge to address this issue.

Technical losses include resistive losses of the primary feeders, the distribution transformer losses (resistive losses in windings and the core losses), resistive losses in the secondary network, resistive losses in service cables and losses in and due to kWh meter accuracy. Losses are inherent to the distribution of electricity and cannot be eliminated.

The calculation of technical losses can be done using various approaches with different degrees of accuracy. Technical losses in distribution systems are directly related to consumers' load curves, which vary due to seasonality and / or changes in load over the year. For the management of technical losses, a balance between absolute calculation accuracy and the effort must prevail. Acceptable approaches to calculate

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technical losses of an electricity distribution network can be divided into two groups. These are the full accuracy methods and methods of representative load profiles.

5.2 ASHTON TECHNICAL LOSSES

An investigation was done to determine the level of technical losses in the Ashton networks. The total losses were calculated by using the representative load profiles as the sum of all loads and no load losses. The table below summarises the contribution of each element in the network to the total technical loss, refer to Appendix 5 for the technical losses calculation.:

Network Element	% loss contribution
Transformers No Load Losses	1.03
Transformers Partial Load Losses	1.43
HV & MV Network Losses	1.46
LV Network Losses	2.45
Total losses	6.37

The estimated technical loss factor for Ashton is therefore 1.064. The Ashton network can be classified as a mixed load between industrial, urban (residential and small holdings) and rural. Using this classification and comparing the above calculated load factor to the NRS 080 table 1(a) and 1(b) guideline indicates the calculated value is within the guideline values.

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6 PREVIOUS COMPLETED PROJECTS

The following capital projects were executed since 2017:

Project Description		Year	Reference numbers	Budget spent (VAT excluded)
1.	Replacement of Prepaid Meters	Continuous		
2.	Replacement of 11kV Switchgear in Ashton Main Switching Station	2019/2020	T54/2018	R5,578,240.00
3.	Replace 11kV Oil Insulated Switchgear (Ward 9 & 10)	2019/2020	T66A/2018	R448,000.00
4.	Upgrade 11kV Line to Stockwell, Ashton	2019/2020	T62/2018	R 266,300.00
Total				R6,292,540.00

7 ASSESSMENT OF ECONOMIC DEVELOPMENT

The Local Economic Development Strategy must form an integral part of the assessment, latest version available is dated May 2018.

The LED strategy is aligned with the national and provincial planning framework.

The following are requirements set out in the National Development Plan (NDP) relating to electricity needs and supported by the LED strategy of Langeberg Municipality:

Objective (NDP)	Action proposed	Langeberg Municipality Status	Objective achieved / Action required
Economic Infrastructure	90% of people with access to the electricity grid by 2030	LED strategy confirmed that 94% of households used electricity as energy source for lighting. (2017)	Objective Achieved, continuously monitor new developments and provide electricity supply as required.
	Move to less carbon-intensive electricity production (renewable)	Refer to section on Alternative Sources of Energy in the masterplan for	Continuous development, Langeberg Municipality to be included in future SWH programmes.

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	energy), including solar water heating	description. SSEG grid connection allowed.	
	Establish a national, regional and municipal fibre-optic network to provide the base for broad band access and attract private investment	N/A	Fibre-optic ducts could be installed, at relatively low cost, with new or replacement of existing cables on strategic routes to reduce double excavations.
Environmental Sustainability and Resilience	Municipal regulations to stimulate renewable energy	Guidelines currently in place for SSEG connection to grid	Objective achieved
	All new buildings to meet the energy-efficiency criteria set out in South African National Standard 204	Energy efficiency conditions included in Langeberg Municipality: Land Use Planning By Law Clause 66 (2) (h)	Land use Planning Bylaw dated 2015 includes "energy efficiency" as a condition of approval. Reference to SANS 204 "Energy efficiency in buildings" to be included.
Inclusive Rural Economy	Improved infrastructure and service delivery to activate rural economies	Installation of networks as required.	Continuous implementation.
Social Protection	Design and implement mechanisms to assist the unemployed to access the labour market	Contract Participation Goals (CPG) and Extended Public Works Programme (EPWP) requirements to be included in tender conditions	Continuous implementation and reporting in projects.

8 ALTERNATIVE SOURCES OF ENERGY

8.1 CURRENT SSEG INSTALLATIONS

There are currently 49 SSEG installations exporting into the Langeberg Municipal network. Below is a trend indicating the growth of SSEG installations.

Ashton area of supply has one SSEG installation with a total of 3 kW installed capacity. The total installed capacity of SSEG's in Langeberg Municipal area is 1,863.28kW.

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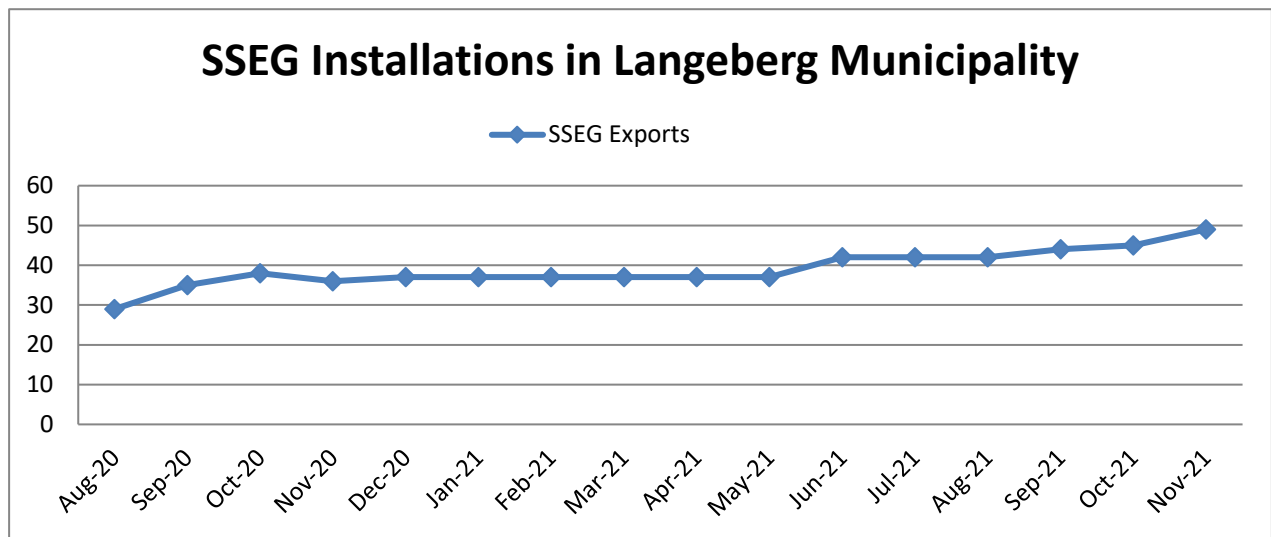


Figure 6: SSEG Installations

8.2 SSEG IMPACT ON MUNICIPAL REVENUE

A business case study on the impact of SSEG installations on municipal revenue was done and included in Appendix 6. Residential, Small Business, Medium Business and Large Business installations were considered.

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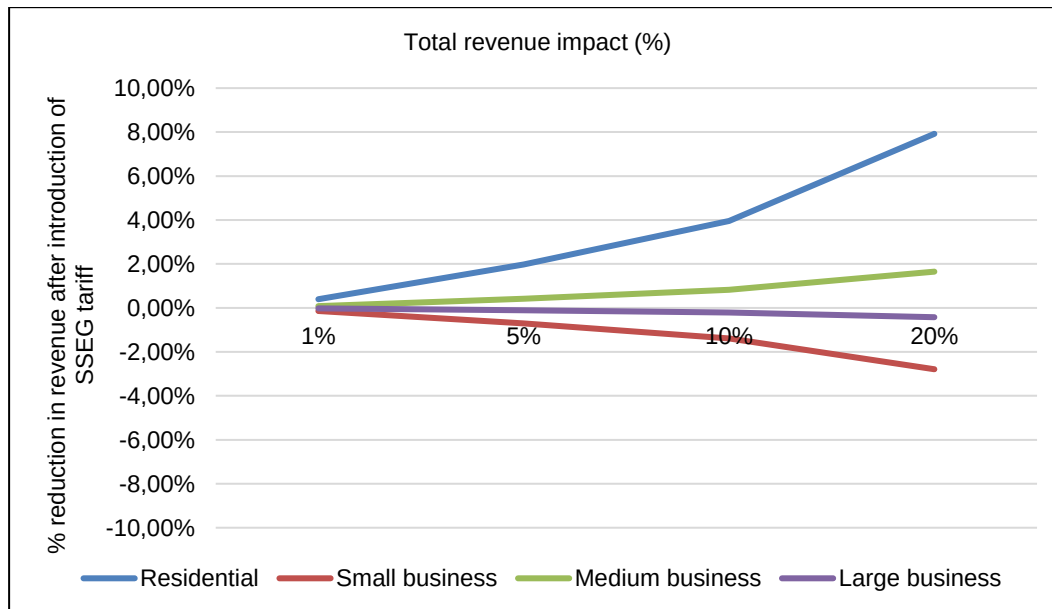


Figure 7: Revenue Impact of SSEG Installations

8.3 ALTERNATIVE ENERGY SUPPLY FOR MUNICIPAL BUILDINGS

An high level investigation into the possibility of supplying municipal buildings with alternative energy supply was undertaken. The Robertson municipal offices in Kerk Street was taken as an example study area for a solar PV system installation and report included in the Robertson area of supply masterplan report.

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8.4 ALTERNATIVE ENERGY SUPPLY OPTIONS FOR MUNICIPAL FEED IN POINTS

A high-level investigation into the possibility of implementing a 2MWp (DC) solar PV plant at the Ashton Main substation has been undertaken. The area directly adjacent of the substation was used as a hypothetical area that could be utilised for the plant. An area of approximate 1.9 Ha would be required and the estimated annual production would be around 3.5GWh, refer to Appendix 7 for the simulation report.

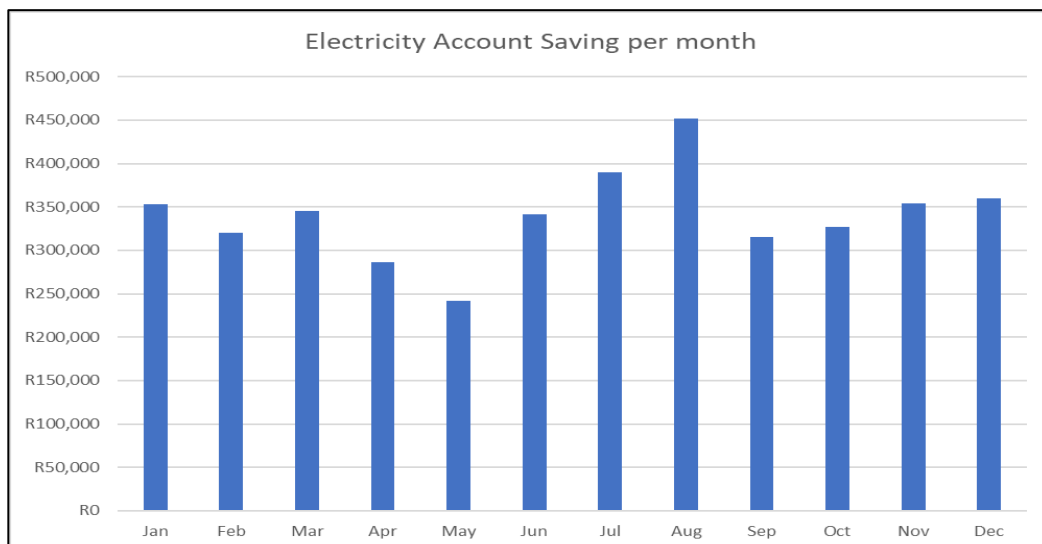
Below is a high-level cost estimate of both the capital and operation costs:

Capital Costs	
Solar PV Plant	Total
- Solar PV	24,000,000
-Perimeter Fence (electrified)	2,211,036
- CCTV	1,000,000
- Sundries	500,000
- Contingencies	2,771,104
Sub-total 1:	30,482,139
Grid Connection	
- Cable works	375,000
- Substation works	1,000,000
- Contingencies	137,500
Sub-total 2:	1,512,500
Professional Fees and Costs	
- Professional Fees	2,879,518
- Professional Costs	287,952
Sub-total 3:	3,167,469
Total (Sub-total 1+2+3)	35,162,108
Operational Costs per Annum	700,000

By applying the hourly production figures for a typical year to the applicable Eskom tariff (Megaflex 2022) and assuming no energy will be exported to the Eskom grid, the estimated monthly electricity account savings for the first year would be R4.09million. The chart below indicates the estimated saving per month:

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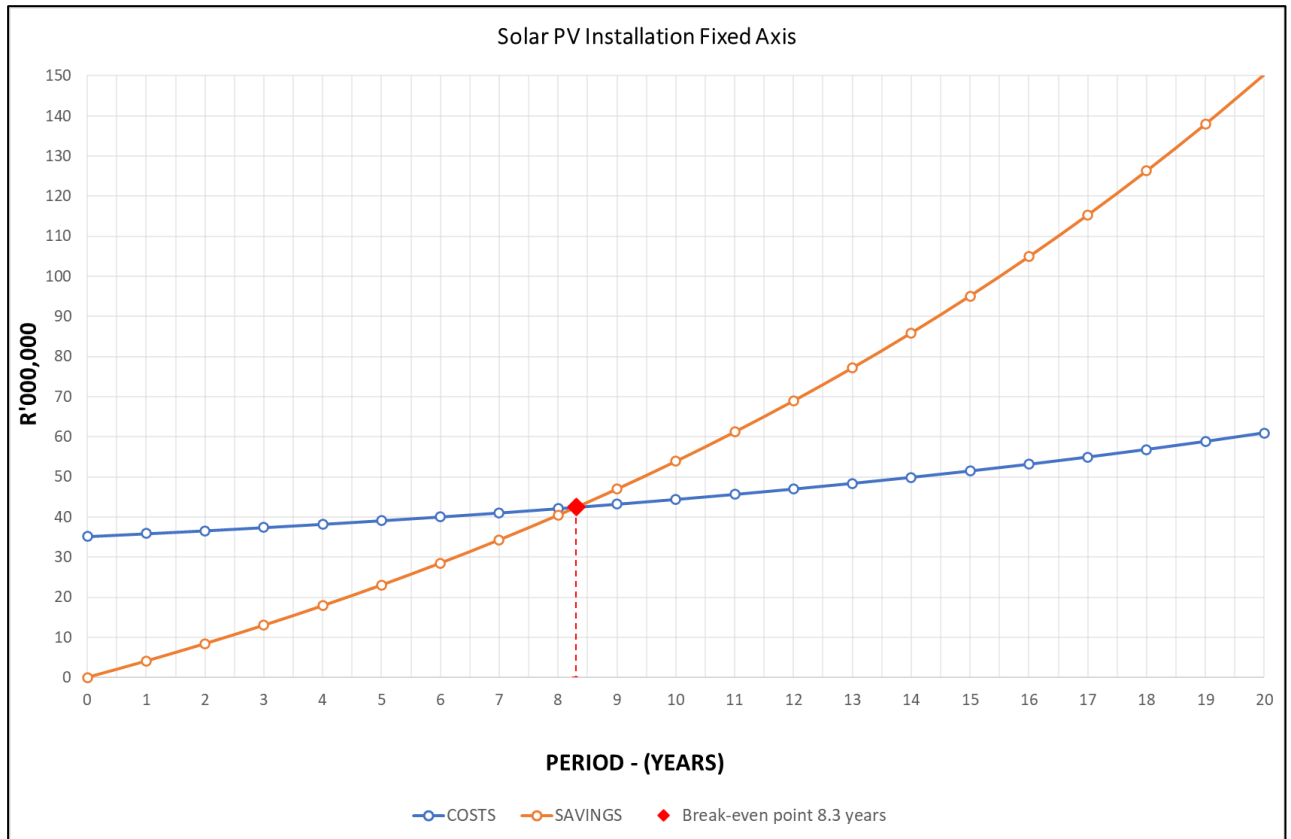


From the above a simple payback has been calculated without accounting for the costs of capital or the time cost of money. An annually compounded inflation rate of 6% has been assumed for both the O&M costs as well as tariff increases. The calculation indicates a break-even point of 8.304 years:

Solar PV - Fixed Axis					
PERIOD	Costs (R 'million)		Savings (R 'million)		NET Cashflow (R 'million)
	OPEX	Cum total	Annual	Cum total	
0		35.16		0	35.162
1	0.700	35.86	4.087	4.087	31.776
2	0.742	36.60	4.332	8.418	28.186
3	0.787	37.39	4.592	13.010	24.381
4	0.834	38.22	4.867	17.877	20.347
5	0.884	39.11	5.159	23.037	16.072
6	0.937	40.04	5.469	28.505	11.540
7	0.993	41.04	5.797	34.302	6.736
8	1.053	42.09	6.145	40.447	1.643
9	1.116	43.21	6.513	46.960	-3.754
10	1.183	44.39	6.904	53.865	-9.476
11	1.254	45.64	7.318	61.183	-15.541
12	1.329	46.97	7.758	68.941	-21.970
13	1.409	48.38	8.223	77.164	-28.784
14	1.493	49.87	8.716	85.880	-36.007
15	1.583	51.46	9.239	95.120	-43.664
16	1.678	53.13	9.794	104.913	-51.780
17	1.778	54.91	10.381	115.295	-60.384
18	1.885	56.80	11.004	126.299	-69.503
19	1.998	58.79	11.665	137.964	-79.169
20	2.118	60.91	12.364	150.328	-89.416

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9 FUTURE DEVELOPMENTS / LOAD GROWTH FORECAST

9.1 HISTORIC LOAD GROWTH TREND

Historic maximum demand figures for the Ashton network:

- Year 2000 : 7.29MVA
- Year 2005 : 9.14MVA
- Year 2010 : 10.71MVA
- Year 2015 : 10.64MVA
- Year 2020 : 9.37MVA

The historic maximum demand figures are based on the statistical metering data obtained from the Eskom Bulk Supply Point, as received from Langeberg Municipality.

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ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

Analysis of this data reveals a historical growth of 1.26% year on year average. This information can however not be reliable used as the Ashton area had steady growth up until 2010 whereafter the demand started to decrease.

Using the historical figures, a graph was compiled to forecast future growth and included below:

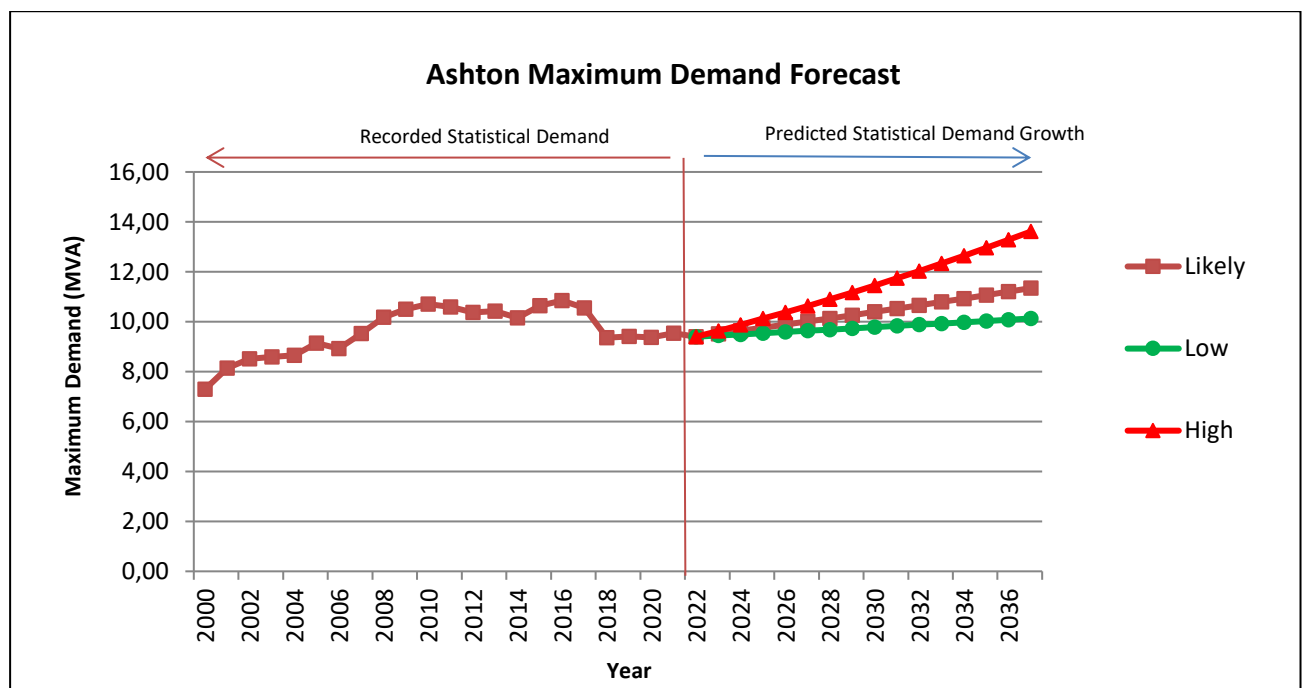


Figure 8: Ashton Maximum Demand Forecast based on historic growth

Predicted maximum demand figures for low, likely and high demand predictions are as follows:

Growth Prediction	Current	2027	2032
Low (0.5%)	9.40 MVA	9.64 MVA	9.88 MVA
Likely (1.26%)		10.08 MVA	10.66 MVA
High (2.5%)		10.64 MVA	12.03 MVA

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ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

The Ashton area of supply would most likely follow the low growth prediction trend for the near future as no new electricity supply applications have been submitted to the electricity department to date and the SDF report also indicates a decline in population for the area. There is a housing waiting list that needs to be addressed according to the SDF.

It should be noted that these figures are conservative given the additional demand requirements for the Ashton area discussed hereafter.

9.2 PROPOSED DEVELOPMENTS

The proposed future developments as indicated on the layout in Appendix 8 and detailed forecast in Appendix 9 is a combination of information received from the Langeberg Municipality's Spatial Development Framework and correspondence with large power users. No new electricity supply applications were received for Ashton area. The response from large powers users did not indicate any major planned upgrading in the near future.

A summary of the forecast is included on the next page.

The Ashton area is earmarked for several housing projects to accommodate the housing waiting list as described in the SDF report. Other than the housing projects, there are no other developments that need to be prioritised in terms of electricity supply.

Only loads of significant size are demonstrated separately, the remaining form part of the "Other Load Growth". Due to the recent growth trend of the area, only a 1.26% growth factor was included.

Applying the above load growth forecasting, it is forecasted that the current NMD of 10.5 MVA will be reached by 2026.

ADMD loads for the above table were calculated as per NRS 034-1 guidelines for classification of domestic consumers. The bulk loads indicated are indications obtained from the developer.

The following classifications were used, as detailed in NRS 034-1:

- Township area – 2.37 kVA / erf
- Urban Residential 1 – 3.59 kVA / erf
- Urban Residential 2 – 4.72 kVA / erf

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ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

Summary of Load Growth Forecast:

Layout / Reference Number	Possible Developments	Area (Ha)	Number of erven	Total Load (kVA)	Growth	Coinc. Factor	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Developments as per detailed Appendix																
	Other Load Growth			13,437	1.26%	0.7	13,437	13,606	13,778	13,951	14,127	14,305	14,486	14,668	14,853	15,040	15,230
	Total undiversified						13,437	13,663	14,124	14,730	15,390	16,147	16,847	17,564	18,284	19,006	20,031
	Total diversified (kVA)						9,406	9,564	9,887	10,311	10,773	11,303	11,793	12,295	12,799	13,304	13,811
	Total diversified (MVA)						9.41	9.56	9.89	10.31	10.77	11.30	11.79	12.29	12.80	13.30	13.81
	Notified Maximum Demand						10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50

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10 LOAD FLOW ANALYSIS

10.1 METHODOLOGY

The simulation software used to perform the load flow analysis is ReticMaster® Electrical Network Software for Distribution Systems.

The existing information was obtained from single line diagrams as well as technical input from the Langeberg Municipality for the following areas:

- Ashton

The load flow simulations were performed on the network to provide insight into the Ashton MV Network as it currently appears, and how it will perform with the addition of the known 5 and 10 year loads as well as the 1.26% per annum increase for average load growth.

The following load flow simulations were performed:

- Simulation 1: Current Maximum Demand;
- Simulation 2: 5 Year Maximum Demand;
- Simulation 3: 10 Year Maximum Demand;
- Simulation 4: Various Contingencies.

10.2 RESULTS OF LOAD FLOW ANALYSIS

The Ashton network represents a diversified maximum demand of 9.406 MVA (measured in March 2022).

The Ashton Network has a total installed capacity of 26.730MVA. Therefore, the Ashton network appears relatively lightly loaded, with a demand factor of approximately 0.35 (9.406 / 26.730).

The total connected load per individual transformer was entered into the simulation software and a scaling factor was introduced to all loads to bring the maximum demand on the network in line with load growth

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ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

predictions to evaluate the effects on the network. This scenario was then simulated as the current status of the network and forms the basis for the future forecasting.

A coincidental factor of 0.7 was used as all the loads do not peak simultaneously.

The 5- and 10-year simulations were then prepared using scaling factors to coincide with the growth predictions and any known 5- and 10-year loads were added separately.

The following reports were then prepared for each scenario, where applicable and discussed:

- Prospective fault current study,
- Voltage level study (The NRS 034-1 stipulate that a voltage drop in the order of up to 3% to be acceptable in MV distributor cables),
- Conductor thermal capacity study.

10.2.1 CURRENT MAXIMUM DEMAND LOAD FLOW

Simulation 1 was based on the normal network configuration and operating conditions. The N/O and N/C points reflect the actual network status. There is one 20MVA 66/11kV transformer which supplies the Ashton MV network with a standby 5MVA 66/11kV transformer.

The simulation was performed applying a scaling factor of 0.495 to all the loads, which returned a maximum demand of 9.43 MVA compared to the actual maximum demand of 9.406 MVA. A difference of 24kVA, which is an acceptable difference.

Refer to Appendix 10 for the current maximum demand load flow analysis.

10.2.1.1 PROSPECTIVE FAULT CURRENT STUDY

The prospective short circuit fault current study was performed, and results included in Appendix 11. The study was only performed once as adding additional loads to the system will not affect the values. The equipment ratings exceed the prospective fault current values and no issues were identified.

10.2.1.2 VOLTAGE LEVEL STUDY

Refer to Appendix 12. The BIB-SUB feeder exceeds the voltage limits, the highest percentage voltage drop is indicated below:

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ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

Feeder	Load	Percentage
BIB SUB (From Main Switching Station)	WATERWERKE 1	4.70%

The other feeders are all within limits.

10.2.1.3 CONDUCTOR THERMAL CAPACITY STUDY

Refer to Appendix 13. All feeders are well within their thermal capacity limits, percentage loading indicated below:

Main Switching Station Feeders	Thermal Loading
TIGER	25.9%
STASIE WEG	27.2%
EXTRACT	15.8%
ZOLANI-IND	53.8%
BIB-SUB	29.5%

The remainder of the feeders operate within their thermal limits.

10.2.2 5-YEAR MAXIMUM DEMAND LOAD FLOW

Simulation 2 was performed applying a scaling factor of 0.535 to all the loads, which returned a maximum demand of 10.20 MVA compared to the predicted maximum demand of 10.08 MVA. This was done prior to the adding of any known future loads

The following loads were added:

Description – 5 Year	kVA
Mixed Income Residential (1)	$71 \times 0.7 = 50\text{kVA}$
Mixed Use (2)	$102 \times 0.7 = 71.4\text{kVA}$
Mixed Income Residential (3)	$357 \times 0.7 = 250\text{kVA}$

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Mixed Income Residential (4)	$343 \times 0.7 = 240\text{kVA}$
Mixed Use (5)	$591 \times 0.7 = 414\text{kVA}$
Residential (6a)	$282 \times 0.7 = 197.4\text{kVA}$
Total	$1,746 \times 0.7 = 1,222\text{kVA}$

The housing projects were included in the additional bulk loads although their exact dates of implementation are not known, this will give an indication of what upgrades are required should they be implemented.

Refer to Appendix 14 for the 5-year maximum demand load flow analysis.

10.2.2.1 VOLTAGE LEVEL STUDY

Refer to Appendix 15. The BIB-SUB feeder exceeds the voltage limits, the highest percentage voltage drop is indicated below:

Feeder	Load	Percentage
BIB SUB (From Main Switching Station)	BIB SUBSTATION	4.68%
VOORTREKKER (From BIB-SUB)	WATERWERKE 1	5.39%
PARK (From BIB-SUB)	PARK	4.68%
STEEG (From BIB-SUB)	STATION	5.05%

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ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

10.2.2.2 CONDUCTOR THERMAL CAPACITY STUDY

Refer to Appendix 16. All feeders are well within their thermal capacity limits, percentage loading indicated below:

Main Switching Station Feeders	Thermal Loading
TIGER	28.1%
STASIE WEG	30.7%
EXTRACT	17.1%
ZOLANI-IND	78.1%
BIB-SUB	34.6%

10.2.3 10-YEAR MAXIMUM DEMAND LOAD FLOW

Simulation 3 was performed applying a scaling factor of 0.56 to all the loads, which returned a maximum demand of 10.7 MVA compared to the predicted maximum demand of 10.66 MVA. This was done prior to the adding of any known future loads

The following loads were added, where existing 5 year loads were already present, these were adjusted to total indicated below:

Description – 10 Year	kVA
Mixed Income Residential (1)	$190 \times 0.7 = 133\text{kVA}$
Mixed Use (2)	$359 \times 0.7 = 251\text{kVA}$
Mixed Income Residential (3)	$952 \times 0.7 = 666\text{kVA}$
Mixed Income Residential (4)	$428 \times 0.7 = 300\text{kVA}$
Mixed Use (5)	$1,329 \times 0.7 = 930\text{kVA}$
Residential (6a)	$282 \times 0.7 = 197\text{kVA}$
Industrial (6b)	$500 \times 0.7 = 350\text{kVA}$
Housing (7)	$559 \times 0.7 = 391\text{kVA}$
Total	$4,599 \times 0.7 = 3,218\text{kVA}$

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Refer to Appendix 17 for the 10-year maximum demand load flow analysis.

10.2.3.1 VOLTAGE LEVEL STUDY

Refer to Appendix 18.

The BIB-SUB feeder exceeds the voltage limits, the highest percentage voltage drop is indicated below:

The STASIE WEG feeder also slightly exceeds the limit with the highest percentage voltage drop at MS SKOOL (3.03%).

Feeder	Load	Percentage
BIB SUB (From Main Switching Station)	BIB SUBSTATION	5.51%
VOORTREKKER (From BIB-SUB)	WATERWERKE 1	6.56%
PARK (From BIB-SUB)	PARK	5.51%
STEEG (From BIB-SUB)	STATION	5.66%

10.2.3.2 CONDUCTOR THERMAL CAPACITY STUDY

Refer to Appendix 19. All feeders are well within their thermal capacity limits with the exception of the ZOLANI-IND feeder (70mm² XLPE to overhead line). Percentage loading is indicated below:

Main Switching Station Feeders	Thermal Loading
TIGER	29.5%
STASIE WEG	41.8%
EXTRACT	17.9%
ZOLANI-IND	103.3%
BIB-SUB	41.8%

The percentage thermal loading for ZOLANI-IND marginally exceeds the limit. Action should be taken should any additional loads be connected.

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The remainder of the feeders operate within their thermal limits.

10.2.4 VARIOUS CONTINGENCIES

The purpose of Simulation 4 is to determine the effect various contingencies (switching requirements) will have on the Ashton Network, with respect to existing N/O and N/C points, in order to assess network viability in the event of network faults occurring.

The results of the simulation are contained in the table below.

#	Critical Supply Scenarios	Action Required	Effect on Network
1	Fault on Feeder: Stasie Weg	1] Close N/O point Station MS	A] Tiger Feeder remains at 25.9% thermal capacity
			B] Zolani Feeder remains at 53.9% thermal capacity
			C] Extract Feeder remains at 15.8% thermal capacity
			D] BIB Sub Feeder from 29.5% to 41.6% thermal capacity
2	Fault on Feeder: Tiger	1] Close N/O point: Tiger RMU	A] Stasie Weg Feeder remains at 27.2% thermal capacity
			B] Zolani Feeder remains at 53.9% thermal capacity
			C] Extract Feeder remains at 15.8% thermal capacity
			D] BIB Sub Feeder from 25.9% to 46.9% thermal capacity
3	Fault on Feeder: Zolani	1] Close N/O point: Zolani	A] Stasie Weg Feeder from 27.2% to 85.9% thermal capacity
			B] Tiger Feeder remains on 25.9% thermal capacity
			C] Extract Feeder remains at 15.8% thermal capacity
			D] BIB Sub Feeder remains at 29.5% thermal capacity

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#	Critical Supply Scenarios	Action Required	Effect on Network
4	Fault on Feeder: Extract	1] Close N/O point: Hoofweg	A] Stasie Weg Feeder remains at 27.2% thermal capacity
			B] Tiger Feeder remains at 25.9% thermal capacity
			C] Zolani Feeder remains at 53.9% thermal capacity
			D] BIB Sub Feeder from 29.5% to 36.2% thermal capacity
5	Fault on Feeder: BIB Sub	1] Close N/O point: Tiger RMU	A] Stasie Weg Feeder remains at 27.2% thermal capacity
			B] Tiger Feeder from 25.9% to 75.4% thermal capacity
			C] Zolani Feeder remains at 53.8% thermal capacity
			D] Extract Feeder remains at 15.8% thermal capacity

The Ashton Network has sufficient capacity to accommodate the critical supply scenarios as simulated above.

11 RECOMMENDED CAPITAL UPGRADES

Refer to Appendix 20 for list of recommended upgrades.

The capital projects are included as per the municipal plan for upgrading of the networks.

Masterplan recommendations were also included and indicated separately.

LANGEBERG MUNICIPALITY**ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY**

12 CONCLUSIONS

The following conclusions can be made for the Ashton area of supply:

- The current maximum demand of 9.406MVA is within the notified maximum demand of 10.5MVA,
- The Ashton network is relatively lightly loaded, with a demand factor of 0.35. Total installed capacity of 26.730MVA,
- The current network load flow analysis indicated that the Voortrekker feeder from BIB Substation exceeds the voltage limits (WATERWERKE – 4.7%),
- All feeders operate within their conductor thermal limits for current status,
- ZOLANI feeder (70mm² XLPE cable to overhead line) exceeds thermal limits with 10 year forecast
- There are spur feeders on the network that need to be converted to ring networks;
- There are sections of overhead line that can be replaced with underground cables,
- The network has sufficient capacity to accommodate the critical supply scenarios;

13 RECOMMENDATIONS

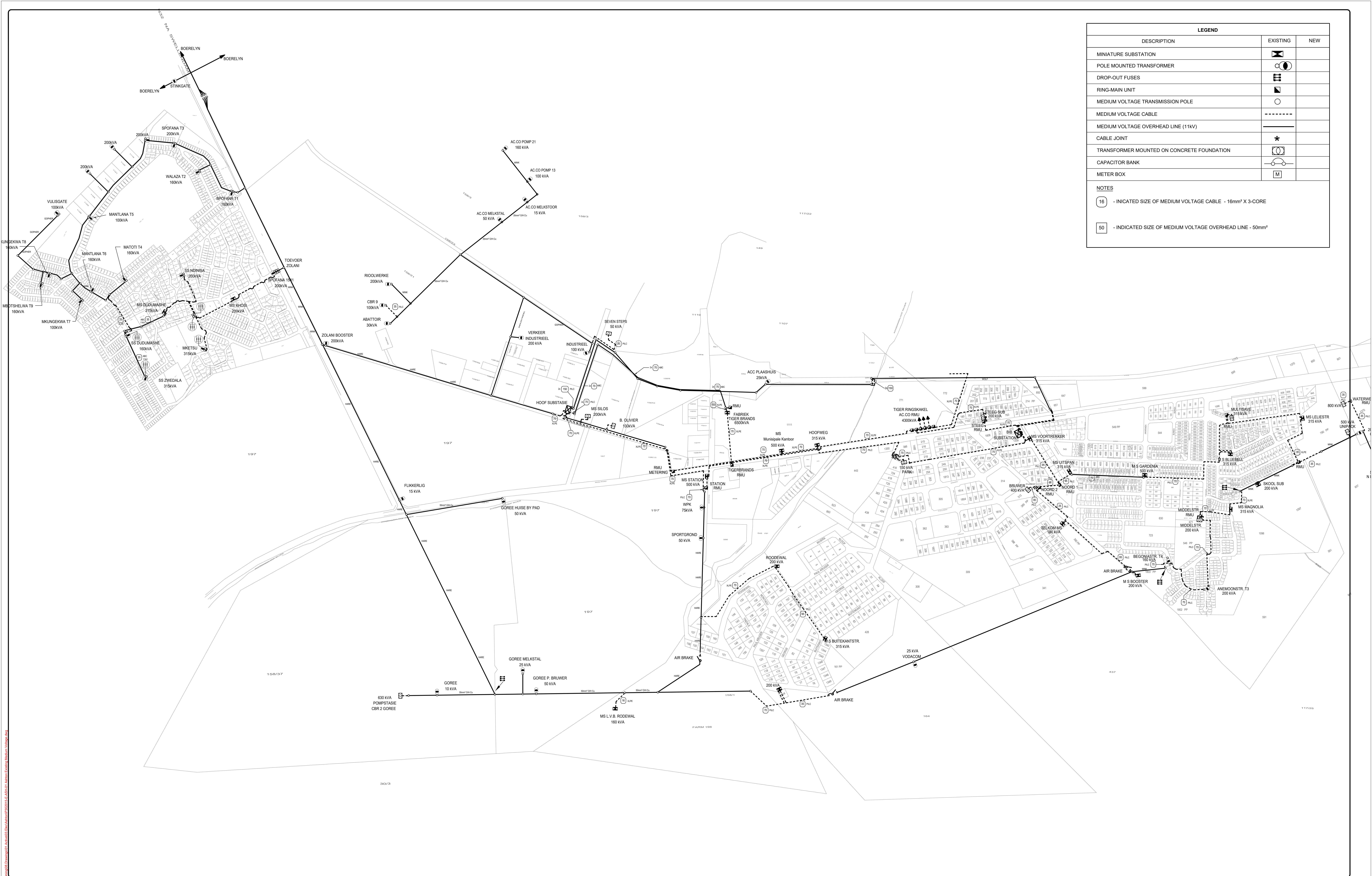
The following recommendations are made:

- Upgrading and replacement of network infrastructure as per the recommended capital project upgrades and masterplan recommendations,
- Regular updating of asset register,
- Information shortcomings were identified on existing layouts and schematics. Field studies to be conducted and all drawings to be updated,
- All infrastructure to be recorded on a GIS (geographic information system) and be updated regularly as projects are completed to keep an up to date database,
- An in-depth field study to determine the installation date of the different equipment types in the network to provide an accurate database of expected useful life remaining and phased replacement plan,
- Replacement of equipment that have exceeded their expected useful life as per asset condition assessment,
- Meter logging of municipal buildings electricity supply for implementation into study report for alternative energy supply e.g solar PV system,
- Installation of maximum demand meters on feeders in main switching station.

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ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 1 – ASHTON 11KV ELECTRICAL DISTRIBUTION NETWORK LAYOUT



LEGEND		
DESCRIPTION	EXISTING	NEW
MINIATURE SUBSTATION		
POLE MOUNTED TRANSFORMER		
DROP-OUT FUSES		
RING-MAIN UNIT		
MEDIUM VOLTAGE TRANSMISSION POLE		
MEDIUM VOLTAGE CABLE		
MEDIUM VOLTAGE OVERHEAD LINE (11kV)		
CABLE JOINT		
TRANSFORMER MOUNTED ON CONCRETE FOUNDATION		
CAPACITOR BANK		
METER BOX		
NOTES		
16 - INDICATED SIZE OF MEDIUM VOLTAGE CABLE - 16mm² X 3-CORE		
50 - INDICATED SIZE OF MEDIUM VOLTAGE OVERHEAD LINE - 50mm²		

NOTES

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CLIENT

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PO BOX 52, ROBERTSON - 6705
TEL: (023) 626 - 2426 - FAX: (023) 626 - 8200

PROJECT

ELECTRICAL DISTRIBUTION NETWORK

DRAWING DESCRIPTION

EXISTING 11kV MEDIUM VOLTAGE LAYOUT

SCALE FOR REDUCED PLAN

DATE: JUNE 2022

SCALE: NTS

ORIGINAL SIZE: A0

DRAWING NUMBER: P302015-E-ASH-01

REV: 0

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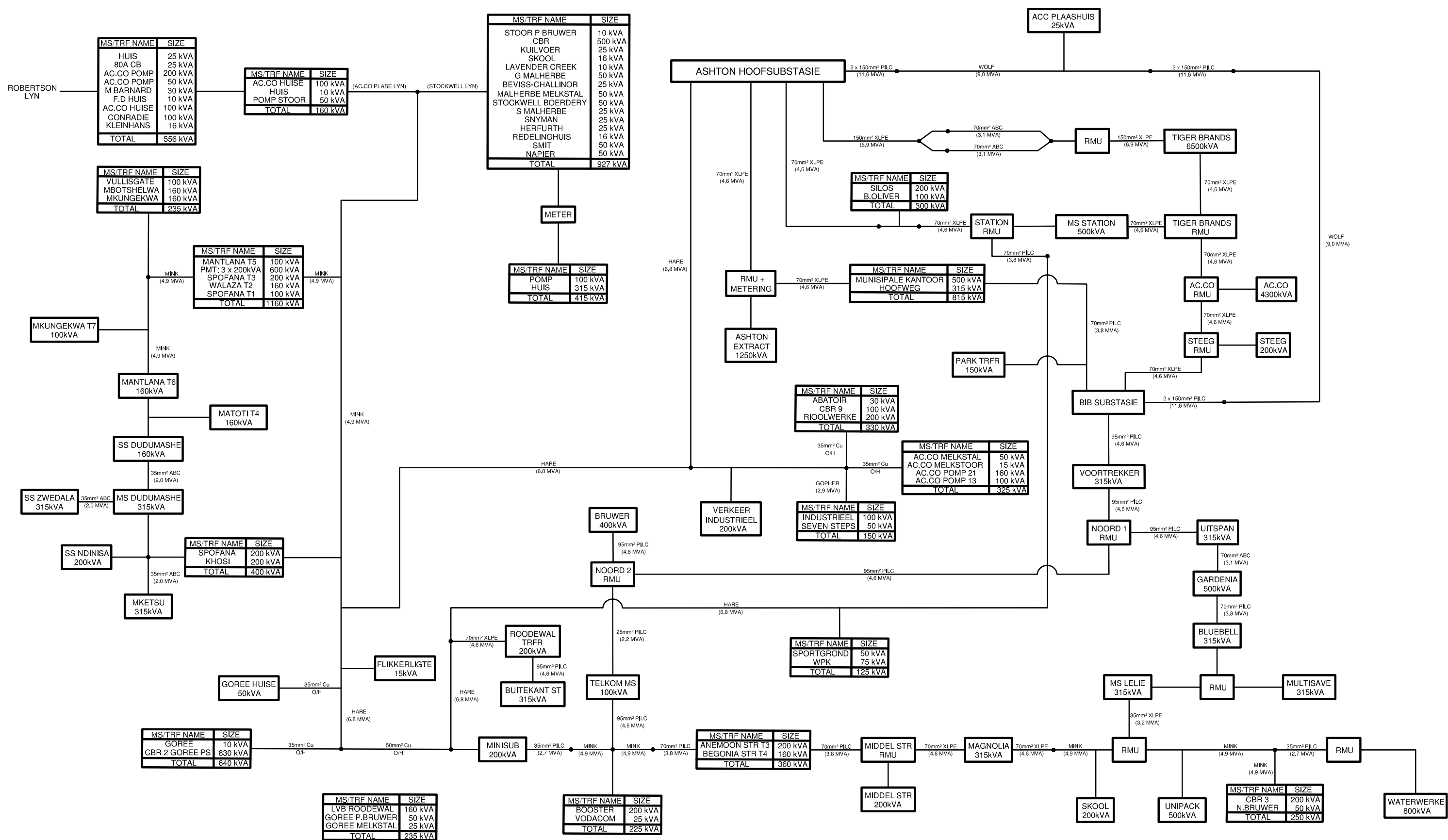
APPENDIX 2 – ASHTON 11KV SINGLE LINE DIAGRAM

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APPENDIX 3 – SIMPLIFIED 11KV SINGLE LINE DIAGRAM

SIMPLIFIED 11kV NETWORK IN ASHTON



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ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 4 – ASSET CONDITION ASSESSMENT

Ashton 11kV Switchgear Asset Condition

Area (Suburb)	Asset Location	Name	Function	Installation Date	Replacement Date	Replacement Cost
Ashton	Ashton SS	MVSG E.S.C INCOMER 1	INCOMER	2002	2047	650,000.00
Ashton	Ashton SS	MVSG BIBIOTEEK SUB	FEEDER	2001	2046	450,000.00
Ashton	Ashton SS	MVSG POLE LINE LANGERBERG	FEEDER	1980	2025	400,000.00
Ashton	Ashton SS	MVSG RING FEEDER TO POLE LINE	FEEDER	1970	2015	400,000.00
Ashton	Ashton SS	MVSG BUSBAR COUPLER	FEEDER	1970	2015	450,000.00
Ashton	Ashton SS	MVSG RING FEEDER TO LANGERBERG	FEEDER	1970	2015	400,000.00
Ashton	Ashton SS	MVSG E.S.C INCOMER 2	INCOMER	1970	2015	650,000.00
Ashton	Ashton SS	MVSG INDUSTRIAL ZOLANI	FEEDER			400,000.00
						3,800,000.00

Ashton Miniature Substation Asset Condition

Area (Suburb)	Name	Rating	Installation Date	Replacement Date	Replacement Cost
Ashton	MS ASHTON BOOSTER	200	1972	2017	450,000.00
Ashton	MS Vuilwater	160	1981	2026	450,000.00
Ashton	MS SKOOL	200	1986	2031	450,000.00
Ashton	MS GARDENIA STR	500	1995	2040	575,000.00
Ashton	MS BLUEBELLS	315	2004	2049	525,000.00
Ashton	MS BUITEKANT STR	315	1998	2043	525,000.00
Ashton	MS LELIE STR	315	2005	2050	525,000.00
Ashton	MS WATERWERKE	800	2006	2051	625,000.00
Ashton	MS STATION	500	2009	2054	575,000.00
Ashton	MS VOORTREKKER	315	2007	2052	525,000.00
Ashton	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	525,000.00
Ashton	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	525,000.00
Ashton	UNKNOWN	200	UNKNOWN	UNKNOWN	525,000.00
Ashton	MS Bruwer STR	100	UNKNOWN	UNKNOWN	525,000.00
Ashton	MS Uitspan Street	315	2005	2050	525,000.00
Ashton	MS Magnolia Street	315	2003	2048	525,000.00
Ashton	Ms Dudumashe	315	UNKNOWN	UNKNOWN	525,000.00
Ashton	MS Khosi	200	1983	2028	450,000.00
Ashton	Hoofweg-Rivier-Mini-Sub	500	2003	2048	575,000.00
Ashton	Ms Hoofweg	315	1982	2027	525,000.00
					10,450,000.00

Ashton Transformer Asset Condition

Area (Suburb)	Name	Type of Transformer	Rating	Installation Date	Replacement Date	Replacement Cost
Ashton	PTRF SHEILAM	POLE MOUNTED	50	1951	1996	55,000.00
Ashton	PTRF VREDELUS STORE	POLE MOUNTED	50	1966	2011	55,000.00
Ashton	PTRF VAALVERDRIET WORKER HOUSES 1	POLE MOUNTED	15	1966	2011	20,000.00
Ashton	PTRF KLAASVOOGDS COTTAGE 1	POLE MOUNTED	50	1966	2011	55,000.00
Ashton	PTRF SPORTGROND	POLE MOUNTED	50	1970	2015	55,000.00
Ashton	PTRF SOEKERSHOF 2	POLE MOUNTED	10	1970	2015	20,000.00
Ashton	Abbatoir TRF	POLE MOUNTED	50	1971	2016	55,000.00
Ashton	PTRF KLAASVOOGDS GAME RESERVE HOUSE 2	POLE MOUNTED	15	1971	2016	20,000.00
Ashton	PTRF ROSENDAL HOUSE 1	POLE MOUNTED	16	1971	2016	20,000.00
Ashton	PTRF KLAASVOOGDS PUMP 2	POLE MOUNTED	100	1972	2017	75,000.00
Ashton	PTRF VREDELUS HOUSE	POLE MOUNTED	10	1973	2018	20,000.00
Ashton	PTRF KLEIN KLASIE	POLE MOUNTED	25	1973	2018	40,000.00
Ashton	PTRF BERGFARM ASSEGAI HOUSE	POLE MOUNTED	50	1974	2019	55,000.00
Ashton	Industreel GMT	FLOOR STANDING	100	1975	2020	464,288.00
Ashton	PTRF SOEKERSHOF 3	POLE MOUNTED	10	1975	2020	20,000.00
Ashton	PTRF DIE HEUWEL WORKER HOUSES 1	POLE MOUNTED	50	1975	2020	55,000.00
Ashton	PTRF VAALVERDRIET PUMP 1	POLE MOUNTED	75	1975	2020	75,000.00
Ashton	PTRF FRAAI UITZICHT PUMP 1	POLE MOUNTED	15	1976	2021	20,000.00
Ashton	PTRF KRANSKOP MAIN HOUSE 2	POLE MOUNTED	16	1976	2021	20,000.00
Ashton	Zolani Booster Pump	POLE MOUNTED	200			130,000.00
Ashton	Gorree MelkStaal	POLE MOUNTED	20	1977	2022	20,000.00
Ashton	PTRF KLAASVOOGDS LINE 3	POLE MOUNTED	16	1977	2022	20,000.00
Ashton	PTRF RUSTICUS WINE CELLAR PUMP 1	POLE MOUNTED	25	1978	2023	40,000.00
Ashton	PTRF VREDELUS WORKERS HOUSES	POLE MOUNTED	25	1979	2024	40,000.00
Ashton	PTRF BUIE VERWACHT PUMP 4	POLE MOUNTED	50	1980	2025	55,000.00
Ashton	PTRF RIETVALLEI HOUSE 1	POLE MOUNTED	16	1981	2026	20,000.00
Ashton	PTRF OLIVE GARDEN PUMP 1	POLE MOUNTED	50	1981	2026	55,000.00
Ashton	Vodacom TRF	POLE MOUNTED	50	1982	2027	55,000.00
Ashton	Gorree/CBR 2 TRF	POLE MOUNTED	10	1983	2028	20,000.00
Ashton	PTRF RUSTICUS WINE CELLAR	POLE MOUNTED	25	1983	2028	40,000.00
Ashton	PTRF MARBRIN OLIVES PETER AND CHRISTINE COETZEE HOUSE 1	POLE MOUNTED	50	1983	2028	55,000.00
Ashton	PTRF BUIE VERWACHT PUMP 3	POLE MOUNTED	50	1985	2030	55,000.00
Ashton	PTRF MALLOWDEEN GARDENS	POLE MOUNTED	10	1987	2032	20,000.00
Ashton	PTRF BUIE VERWACHT PUMP 2	POLE MOUNTED	16	1987	2032	20,000.00
Ashton	PTRF BUIE VERWACHT PUMP 1	POLE MOUNTED	50	1987	2032	55,000.00
Ashton	PTRF NEEDLING BRUWER	POLE MOUNTED	50	1988	2033	55,000.00
Ashton	PTRF ASHTON LINE 25	POLE MOUNTED	50	1990	2035	55,000.00
Ashton	PTRF MKETSU STR	POLE MOUNTED	315			190,000.00
Ashton	PTRF NDINISA	POLE MOUNTED	200			130,000.00
Ashton	PTRF KRANSKOP HOUSE 3	POLE MOUNTED	16	1991	2036	20,000.00
Ashton	PTRF KLAASVOOGDS PRIMARY SCHOOL	POLE MOUNTED	25	1992	2037	40,000.00
Ashton	PTRF ZWEDALA	POLE MOUNTED	315			190,000.00
Ashton	PTRF KLAASVOOGDS HOUSE 2	POLE MOUNTED	50	1993	2038	55,000.00
Ashton	PTRF DUDUMASHE	POLE MOUNTED	200			130,000.00
Ashton	PTRF UITKYK JANSE VAN RANSEBERG 1	POLE MOUNTED	100	1995	2040	75,000.00
Ashton	PTRF KRANSKOP MAIN HOUSE 1	POLE MOUNTED	25	1995	2040	40,000.00
Ashton	PTRF CROXLEY FARM PUMP 03	POLE MOUNTED	25	1995	2040	40,000.00
Ashton	PTRF BERGFARM NEUISENBERG HOUSE	POLE MOUNTED	25	1995	2040	40,000.00
Ashton	PTRF	POLE MOUNTED	50	1995	2040	55,000.00
Ashton	P. Bruwer	POLE MOUNTED	50	1996	2041	55,000.00
Ashton	PTRF BOGONIA STR	POLE MOUNTED	160	1997	2042	130,000.00
Ashton	PTRF ANNEMOON STR	POLE MOUNTED	200	1997	2042	130,000.00
Ashton	PTRF CBR HUGO BRUWER	POLE MOUNTED	200	1997	2042	130,000.00
Ashton	PTRF ASHTON LINE 55	POLE MOUNTED	16	1997	2042	20,000.00
Ashton	PTRF ASHTON LINE 54	POLE MOUNTED	100	1997	2042	75,000.00
Ashton	PTRF KLAASVOOGDS LINE 9	POLE MOUNTED	50	1997	2042	55,000.00
Ashton	PTRF SPOFANA T1	POLE MOUNTED	100			75,000.00
Ashton	PTRF WALAZA T2	POLE MOUNTED	160	1998	2043	130,000.00
Ashton	PTRF SPOFANA T3	POLE MOUNTED	200	1998	2043	130,000.00
Ashton	PTRF MANTLANA T5	POLE MOUNTED	100	1998	2043	75,000.00
Ashton	PTRF MANTLANA T6	POLE MOUNTED	160	1998	2043	130,000.00
Ashton	PTRF MATOTI T4	POLE MOUNTED	160	1998	2043	130,000.00
Ashton	PTRF MKUNGEKWA T7	POLE MOUNTED	100	1998	2043	75,000.00
Ashton	PTRF MKUNGEKWA T8	POLE MOUNTED	160	1998	2043	130,000.00
Ashton	PTRF MPOTSHELWA T9	POLE MOUNTED	160	1998	2043	130,000.00
Ashton	PTRF KRANSKOP PUMP 1	POLE MOUNTED	100	1998	2043	75,000.00
Ashton	PTRF FRAAI UITZICHT HOUSE 1	POLE MOUNTED	100	1998	2043	75,000.00
Ashton	PTRF FAIRVIEW FARM 1	POLE MOUNTED	50	1998	2043	55,000.00
Ashton	PTRF SOEKERSHOF 1	POLE MOUNTED	50	1998	2043	55,000.00
Ashton	PTRF BUIE VERWACHT STORE 1	POLE MOUNTED	75	1998	2043	75,000.00
Ashton	PTRF KRANSKOP STORE 1	POLE MOUNTED	50	2000	2045	55,000.00
Ashton	CBR 9 TRF	FLOOR STANDING	100	2001	2046	464,288.00
Ashton	Rioolwerke	POLE MOUNTED	200	2002	2047	130,000.00
Ashton	PTRF KLAASVOOGDS LINE 8	POLE MOUNTED	100	2003	2048	75,000.00
Ashton	PTRF MIDDELPUNT WORKER HOUSES 1	POLE MOUNTED	50	2003	2048	55,000.00

Ashton	PTRF VULLISTEREIN	POLE MOUNTED	10			20,000.00
Ashton	PTRF NO NAME	POLE MOUNTED	100	2004	2049	75,000.00
Ashton	PTRF ROSENDAL HOUSE 01	POLE MOUNTED	100	2004	2049	75,000.00
Ashton	PTRF KLAASVOOGDS GAME RESERVE HOUSE 1	POLE MOUNTED	100	2005	2050	75,000.00
Ashton	PTRF KLAASVOOGDS PUMP 1	POLE MOUNTED	50	2005	2050	55,000.00
Ashton	Verkeer	POLE MOUNTED	200			130,000.00
Ashton	Gorree Huis	POLE MOUNTED	50	2008	2053	55,000.00
Ashton	PTRF RIETVALLEI	POLE MOUNTED	50	2009	2054	55,000.00
Ashton	Tokwe TRF	POLE MOUNTED	200	2010	2055	130,000.00
Ashton	PTRF ANTON CONRADIE VERVOER	POLE MOUNTED	50	2009	2054	55,000.00
Ashton	Cnr Mantlana/Spofana TRF	POLE MOUNTED	200	2010	2055	130,000.00
Ashton	Msizi TRF	POLE MOUNTED	200	2010	2055	130,000.00
Ashton	PTRF OLIVE GARDENS HOUSE 1	POLE MOUNTED	50	2009	2054	55,000.00
Ashton	TRF STEEG WEG	FLOOR STANDING	200	1975	2020	464,288.00
Ashton	TRANSFORMER	FLOOR STANDING	200	1975	2020	464,288.00
Ashton	TRANSFORMER	GROUND MOUNTED	150	1975	2020	464,288.00
Ashton	SS ROODEWAL	FLOOR STANDING	200			464,288.00
Ashton	TRANSFORMER	FLOOR STANDING	500			520,381.40
Ashton	1725 VERKEER	POLE MOUNTED	100			75,000.00
Ashton		POLE MOUNTED	50			55,000.00
Ashton		FLOOR STANDING	0			464,288.00
Ashton		POLE MOUNTED	25			40,000.00
Ashton	Primary	POLE MOUNTED	16			20,000.00
Ashton		POLE MOUNTED	15			20,000.00
Ashton		POLE MOUNTED	100			75,000.00
Ashton	ZOLANI ROMMEL	POLE MOUNTED	100			75,000.00
Ashton		POLE MOUNTED	16			20,000.00
Ashton		POLE MOUNTED	25			40,000.00
Ashton	SS MULTI SAVE	FLOOR STANDING	315			20,000.00
Ashton		FLOOR STANDING	630			575,542.00
Ashton		POLE MOUNTED	75			75,000.00
Ashton		POLE MOUNTED	15			20,000.00
Ashton		POLE MOUNTED	100			75,000.00
Ashton		POLE MOUNTED	25			40,000.00
Ashton		POLE MOUNTED	25			40,000.00
Ashton		FLOOR STANDING	50			464,288.00
Ashton		POLE MOUNTED				75,000.00
Ashton		POLE MOUNTED	100			75,000.00
Ashton		POLE MOUNTED	50			55,000.00
Ashton		POLE MOUNTED	50			55,000.00
Ashton		POLE MOUNTED	25			40,000.00
Ashton		FLOOR STANDING	500			520,381.40
Ashton		POLE MOUNTED	25			40,000.00
Ashton		POLE MOUNTED	100			75,000.00
Ashton		POLE MOUNTED	25			40,000.00
Ashton		FLOOR STANDING				464,288.00
Ashton		POLE MOUNTED	25			40,000.00
Ashton		POLE MOUNTED	100			75,000.00
Ashton		POLE MOUNTED	15			75,000.00
Ashton		POLE MOUNTED	25			40,000.00
Ashton		POLE MOUNTED	100			75,000.00
Ashton		POLE MOUNTED	25			40,000.00
Ashton		POLE MOUNTED	50			55,000.00
Ashton	PTRF ASHTON LINE 54	POLE MOUNTED	100	1997	2042	75,000.00
Ashton		POLE MOUNTED	200			130,000.00
						13,384,896.80

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 5 – NETWORK TECHNICAL LOSSES CALCULATION

				Langeberg Municipality - Energy Losses	
0 0		Langeberg Municipality - Ashton		PAGE	
		0		2	
		iX P302015		REV. 0	

Calculation of network losses in support of NRS 080 Reporting

CALCULATION SHEET NOTES

Langeberg Municipality - Energy Losses

NETWORK ANALYSIS AND ENERGY LOSSES

Energy losses calculation

Notes:

Energy losses comprises:

- 1 System losses due to I^2R losses in distribution networks as calculated by loadflow analysis
- 2 No load losses of inductive element's magnetic circuits.
- 3 Load losses of transformers proportional to loading
- 4 Partial discharge losses - not considered due to destructive nature and maintenance requirements
- 5 Dielectric losses - Not considered
- 6 Similar network LV distribution losses used, no information available on LV Network

Calculation base:

- 1 Network I^2R losses derived from network load-flow analysis
- 2 Network I^2R losses adjusted for averaged load
- 3 Monthly maximum demand and energy statistics required

Definitions

- 1 Demand - Apparent power drawn from supply network
- 2 Load (Connected, etc) - The total connected load on the system.
- 3 Load Factor (LF) - The average power in the typical monthly period divided by the peak apparent power
- 4 Demand factor (DF) - The maximum demand divided by the connected load (indicative of reserve capacity)

PREPARED FOR:



Langeberg Municipality
Private Bag X2
ASHTON

Telephone: +27 (0) 23 615 8000

PREPARED BY:



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e-mail: wynand.s@ixengineers.co.za

Ashton

PAGE

3

REV.

0

Date

6/17/2022

MV Network losses

Simu- lato	Network peak power:	P kW		8936
	Network losses from load flow:	P _{loss} kW		130.53
Network Average power		kVA		4614
Total electrical losses		kW	kWh/month	% loss
Transformer No load Losses		47.6	34748	1.03%
Transformer Partial Load losses		65.9	48107	1.43%
HV & MV Network system losses pm		67.4	49173	1.46%
LV Network losses calculated pm			82516	2.45%
Total losses			214544	6.37%
Technical Loss Factor tlf :				1.064

Billing/log data

Month	Demand kVA	Energy kWh	Load factor	Demand Factor
Apr	7953	3677711	0.63	0.46
May	7834	3433141	0.60	0.45
Jun	7050	2796645	0.54	0.40
Jul	6649	3114461	0.64	0.38
Aug	6721	2997393	0.61	0.38
Sep	5676	2545323	0.61	0.33
Oct	5330	2511225	0.64	0.31
Nov	5997	2359686	0.54	0.34
Dec	8011	3556313	0.61	0.46
Jan	9153	4787838	0.72	0.52
Feb	9406	4622867	0.67	0.54
Mar	8908	4013548	0.62	0.51
Avg demand	7391	3368013	0.62	0.42
Avg power	4614			

Notes:

- 1) Transformer quantities from single line diagram
- 2) Billing/Logs Eskom period Apr 2021 to Mar 2022.

Installed Transformer and reactor losses

Qty	kVA	Losses/unit kW		Total loss kW	
		No load	Load	No load	FL loss
21	16	0.095	0.41	1.995	8.61
18	25	0.12	0.57	2.16	10.26
36	50	0.18	1	6.48	36
24	100	0.3	1.7	7.2	40.8
8	160	0.44	2.4	3.52	19.2
19	200	0.52	2.7	9.88	51.3
0	250	0.62	3.2	0	0
11	315	0.72	3.8	7.92	41.8
0	400	0.91	5.4	0	0
5	500	1.1	5.4	5.5	27
1	630	1.3	6.4	1.3	6.4
1	800	1.6	8	1.6	8
0	1000	1.9	9.5	0	0
0	1600	2.75	13.5	0	0
0	2000	3.25	16	0	0
144				47.555	249.37

Total installed capacity kVA 17461

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 6 – SSEG IMPACT ON MUNICIPAL REVENUE

This report was generated on	5/25/2022
For	Langeberg Municipality

Developed by

G:ENESIS
UNLOCKING VALUE

8 SALGA
SOUTH AFRICAN LOCAL
GOVERNMENT ASSOCIATION
Inspiring service delivery

**german
cooperation**
DEUTSCHE ZUSAMMENARBEIT

represented by
giz
German Technical Cooperation
for Sustainable Development

Table 1: SSEG tariffs chosen by the municipality

		Summer				Winter			
		Residential	Small business	Medium business	Large business	Residential	Small business	Medium business	Large business
Tariff type	TOU or flat tariff structure	Flat	Flat	TOU	TOU	Same as summer			
	Monthly or annual clearing of balances	Monthly clearing	Monthly clearing	Monthly clearing	Monthly clearing				
	Payment of credit balances to customers	No payments	No payments	No payments	No payments				
	Escalation of export tariff	Changes over time	Changes over time	Changes over time	Changes over time				
TOU tariffs	Import tariff								
	Fixed charge (R/m)			2,368	2,368			2,368	2,368
	Monthly demand charge (R/kVA)			276	254			276	254
	Peak (c/KWh)			94	93			94	93
	Standard (c/KWh)			94	93			94	93
	Off-peak (c/KWh)			94	93			94	93
	Export tariff								
	Peak (c/KWh)			68	68			68	68
	Standard (c/KWh)			68	68			68	68
Off-peak (c/KWh)			68	68			68	68	
Flat tariffs	Import tariff								
	Fixed charge (R/m)	1,538	1,538			1,538	1,538		
	Monthly demand charge (R/kVA)	-	-			-	-		
	Variable charge (c/KWh)	190	190			190	190		
	Export tariff								
	Variable charge (c/KWh)	68	68			68	68		

Table 2: Total revenue impact * (%)

% of customers on the relevant tariff that install rooftop PV	Residential	Small business	Medium business	Large business	Total
1%	0.40%	-0.14%	0.08%	-0.02%	0.25%
5%	1.98%	-0.70%	0.41%	-0.11%	1.23%
10%	3.96%	-1.40%	0.83%	-0.21%	2.46%
20%	7.92%	-2.79%	1.65%	-0.42%	4.91%

Notes: * Total revenue impact = (Reduction in municipal revenue + Value of Solar)/Municipal revenue prior to introduction of Solar PV SSEG tariffs

Chart 1: Total revenue impact (%)

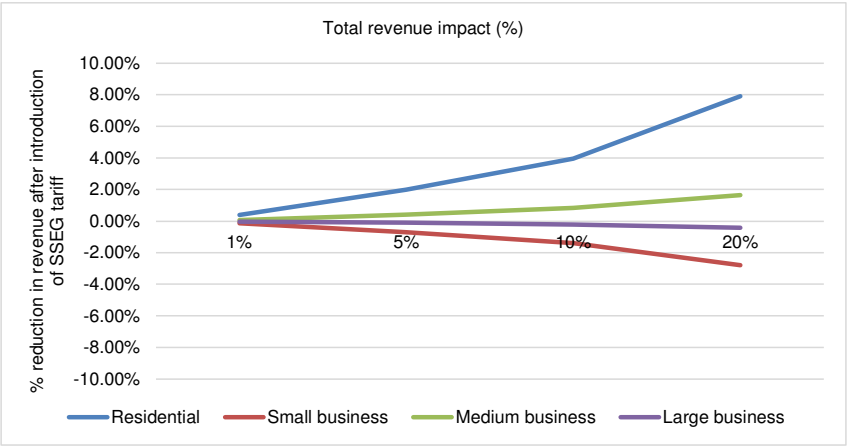


Table 3: Reduction in revenue, Value of Solar and Total effect (Rm)

	Residential	Small business	Medium business	Large business	Total
1% of customers install rooftop PV					
Reduction in revenue (Rm) (A)	1.1	-0.2	-0.2	-0.1	0.6
Value of Solar (Rm) (B)	0.6	0.1	0.3	0.1	1.0
Total effect (Rm) (A + B)	1.8	-0.1	0.0	0.0	1.7
5% of customers install rooftop PV					
Reduction in revenue (Rm) (A)	5.6	-1.2	-1.0	-0.3	3.1
Value of Solar (Rm) (B)	3.2	0.5	1.3	0.3	5.2
Total effect (Rm) (A + B)	8.8	-0.7	0.2	-0.1	8.3
10% of customers install rooftop PV					
Reduction in revenue (Rm) (A)	11.3	-2.3	-2.1	-0.7	6.2
Value of Solar (Rm) (B)	6.3	0.9	2.6	0.5	10.4
Total effect (Rm) (A + B)	17.6	-1.4	0.5	-0.1	16.5
20% of customers install rooftop PV					
Reduction in revenue (Rm) (A)	22.5	-4.6	-4.2	-1.4	12.3
Value of Solar (Rm) (B)	12.7	1.8	5.1	1.1	20.7
Total effect (Rm) (A + B)	35.2	-2.8	0.9	-0.3	33.0

Table 4: Business case for the Solar PV customer for the chosen SSEG tariffs

	Residential	Small business	Medium business	Large business	Key for PBP and IRR results:	Key for NPV results:
Net present value (Rands)	-263,700	648,328	409,308	4,101,820	Unfavourable	Negative
Pay-back period (PBP) (Years)	>26	3	11	6	Average	Positive
Internal rate of return	0%	36%	10%	19%	Very good	
LCOE (Rands)	0.94	1.04	0.97	0.89		
Monthly bill for one Solar PV customer (Rands)	R 2,608	R 11,891	R 8,485	R 259,127		

Table 5: Average electricity consumption per annum, average solar self-consumption rate per annum and peak demand per season

	Residential	Small business	Medium business	Large business
Avg elect cons/annum (KWh/a)	10,853	87,831	92,013	2,415,350
Avg solar self-cons rate/annum*	71%	100%	43%	100%
Summer peak demand (kW)	2.21	12.19	12.78	346.05
Winter peak demand (kW)	3.36	17.13	17.95	503.08

Notes: * Avg solar self-cons rate/annum = Rooftop PV electricity consumed on-site/Total rooftop PV electricity produced

Chart 2: Energy balances

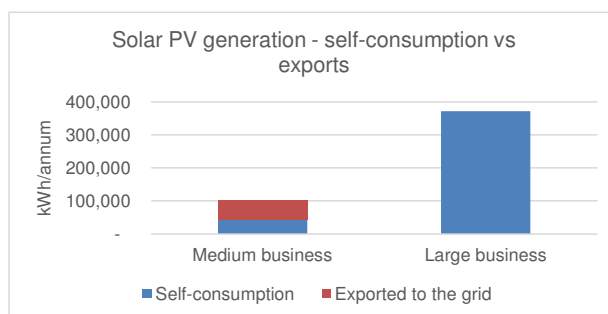
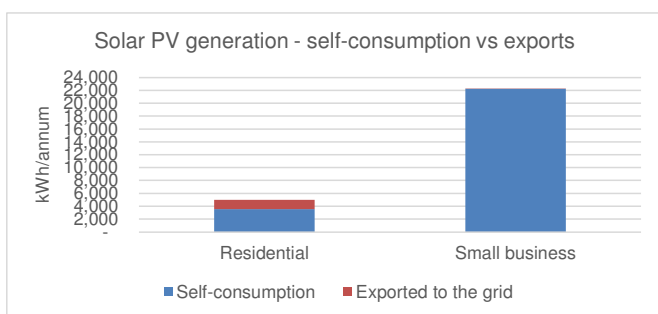


Table 6: Revenue Available for Network Costs and Average Bulk Energy Costs

		Residential	Small business	Medium business	Large business
Revenue per customer available for Network Costs (ZAR/month)	non-SSEG	R 1,280	R 9,688	R 7,482	R 132,456
	SSEG*	R 2,028	R 7,545	R 5,219	R 126,505
Average Bulk Purchase Costs (c/kWh)	non-SSEG	88.51	78.15	78.15	77.28
	SSEG	93.56	79.53	77.14	77.86

*Includes value of solar exports

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 7 – ALTERNATIVE ENERGY SUPPLY OPTION FOR MUNICIPAL FEED IN POINTS

Ashton 2MWp Langeberg Masterplan, Robertson, South Africa

Report

Project Name	Langeberg Masterplan
Project Address	Robertson, South Africa
Prepared By	Wiets Snyman info@ixengineers.co.za



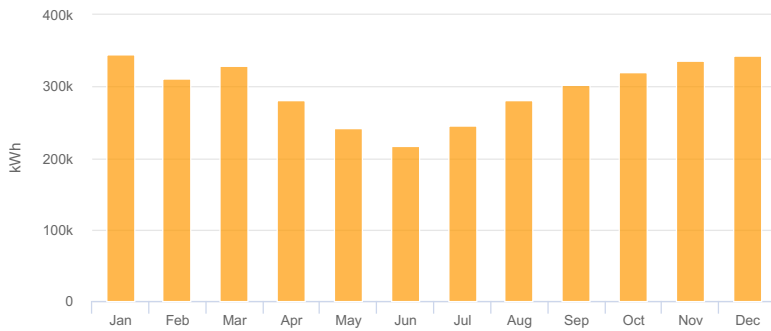
System Metrics

Design	Ashton 2MWp
Module DC Nameplate	2.01 MW
Inverter AC Nameplate	1.61 MW Load Ratio: 1.25
Annual Production	3,552 GWh
Performance Ratio	80.9%
kWh/kWp	1,765.0
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)
Simulator Version	4e8ad109b5-7184273f86-abd41a2ac5-1253cc88f6

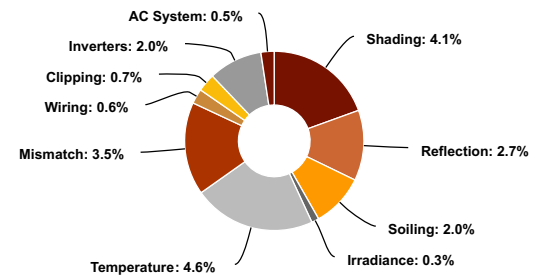
Project Location



Monthly Production



Sources of System Loss



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m ²)	Annual Global Horizontal Irradiance	1,902.8	
	POA Irradiance	2,181.1	14.6%
	Shaded Irradiance	2,092.3	-4.1%
	Irradiance after Reflection	2,036.8	-2.7%
	Irradiance after Soiling	1,996.0	-2.0%
	Total Collector Irradiance	1,995.9	0.0%
Energy (kWh)	Nameplate	4,019,567.4	
	Output at Irradiance Levels	4,008,218.1	-0.3%
	Output at Cell Temperature Derate	3,823,276.3	-4.6%
	Output After Mismatch	3,689,464.5	-3.5%
	Optimal DC Output	3,668,822.5	-0.6%
	Constrained DC Output	3,643,962.5	-0.7%
	Inverter Output	3,569,974.8	-2.0%
	Energy to Grid	3,552,125.0	-0.5%
Temperature Metrics			
	Avg. Operating Ambient Temp		20.3 °C
	Avg. Operating Cell Temp		30.3 °C
Simulation Metrics			
	Operating Hours	4607	
	Solved Hours	4607	

Condition Set

Description	Condition Set 1											
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)											
Solar Angle Location	Meteo Lat/Lng											
Transposition Model	Perez Model											
Temperature Model	Sandia Model											
Temperature Model Parameters	Rack Type	a	b	Temperature Delta								
	Fixed Tilt	-3.56	-0.075	3°C								
	Flush Mount	-2.81	-0.0455	0°C								
Soiling (%)	J	F	M	A	M	J	J	A	S	O	N	D
	2	2	2	2	2	2	2	2	2	2	2	2
Irradiation Variance	5%											
Cell Temperature Spread	4° C											
Module Binning Range	-2.5% to 2.5%											
AC System Derate	0.50%											
Module Characterizations	Module	Uploaded By						Characterization				
	CS3W-440MB-AG (Canadian Solar)	HelioScope						Spec Sheet Characterization, PAN				
Component Characterizations	Device	Uploaded By						Characterization				
	Sunny Tripower 24000TL-US (SMA)	HelioScope						Modified CEC				

Components		
Component	Name	Count
Inverters	Sunny Tripower 24000TL-US (SMA)	67 (1.61 MW)
Strings	10 AWG (Copper)	286 (18,131.5 m)
Module	Canadian Solar, CS3W-440MB-AG (440W)	4,574 (2.01 MW)

Wiring Zones			
Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	4-19	Along Racking

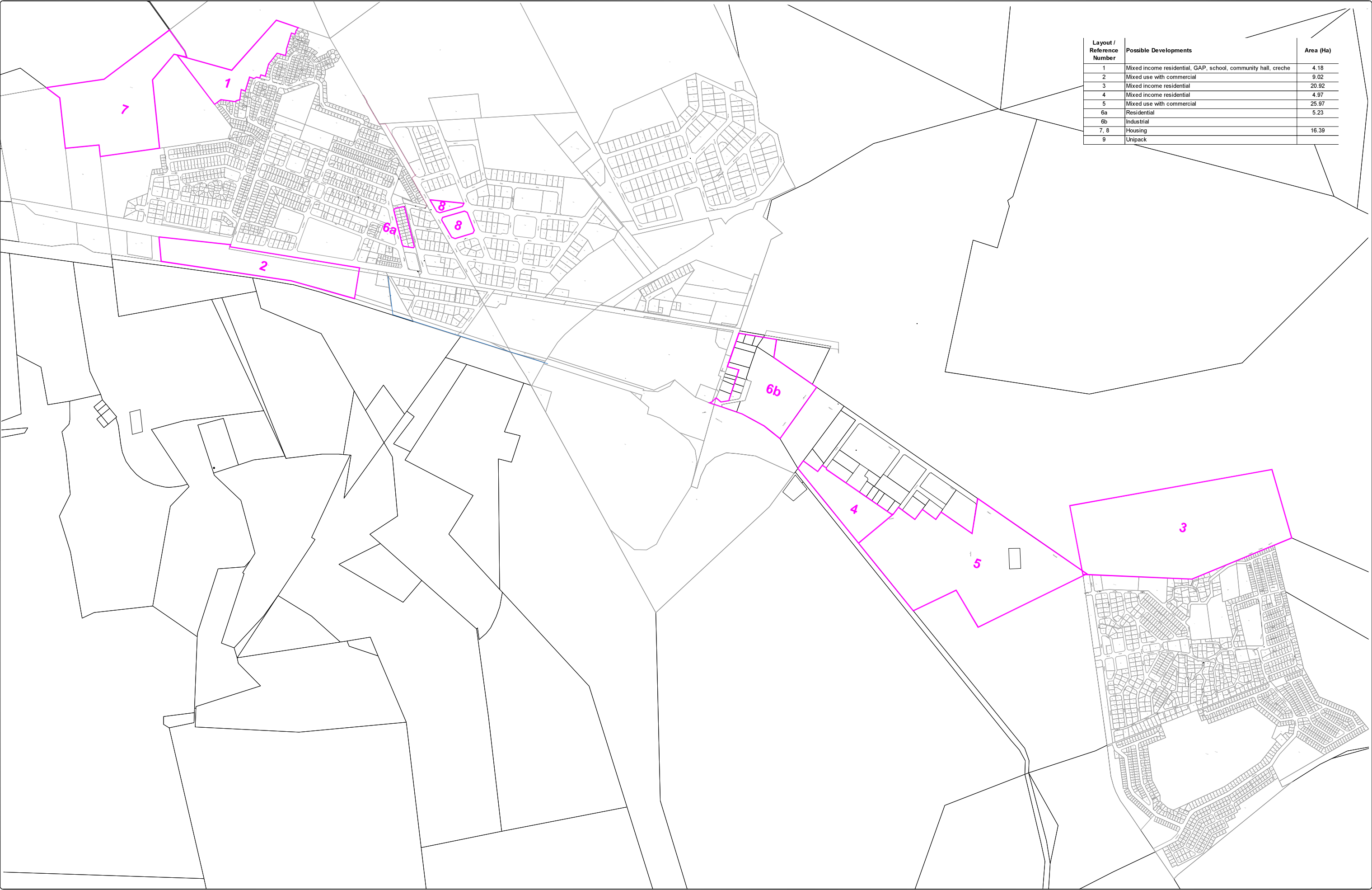
Field Segments									
Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Landscape (Horizontal)	32°	0°	2.0 m	2x1	2,287	4,574	2.01 MW



LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 8 – PROPOSED DEVELOPMENTS



Layout / Reference Number	Possible Developments	Area (Ha)
1	Mixed income residential, GAP, school, community hall, creche	4.18
2	Mixed use with commercial	9.02
3	Mixed income residential	20.92
4	Mixed income residential	4.97
5	Mixed use with commercial	25.97
6a	Residential	5.23
6b	Industrial	
7, 8	Housing	16.39
9	Unipack	

NOTES

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REVISION SCHEDULE

No	DATE	DESCRIPTION	DRW	CHK
1				
2				
3				
4				
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6				
7				
8				
9				

CONSULTING ENGINEER

20050166		SEPTEMBER 2021	
SIGNATURE		DATE	
CLIENT			
SIGNATURE		DATE	
DESIGNED	DRAWN	CHECKED	
WS	WS	WMS	

CONSULTANT

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CLIENT

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PO BOX 62 • ROBERTSON • 6105
TEL: (023) 626 • 2426 • FAX: (023) 626 • 8200

PROJECT

ASHTON

DRAWING DESCRIPTION

FUTURE DEVELOPMENTS

SCALE FOR REDUCED PLAN

DATE: SEP'2021 SCALE: 1: 5000 ORIGINAL SIZE: A0

DRAWING NUMBER: P302015-E-ASH-01 REV: 0

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

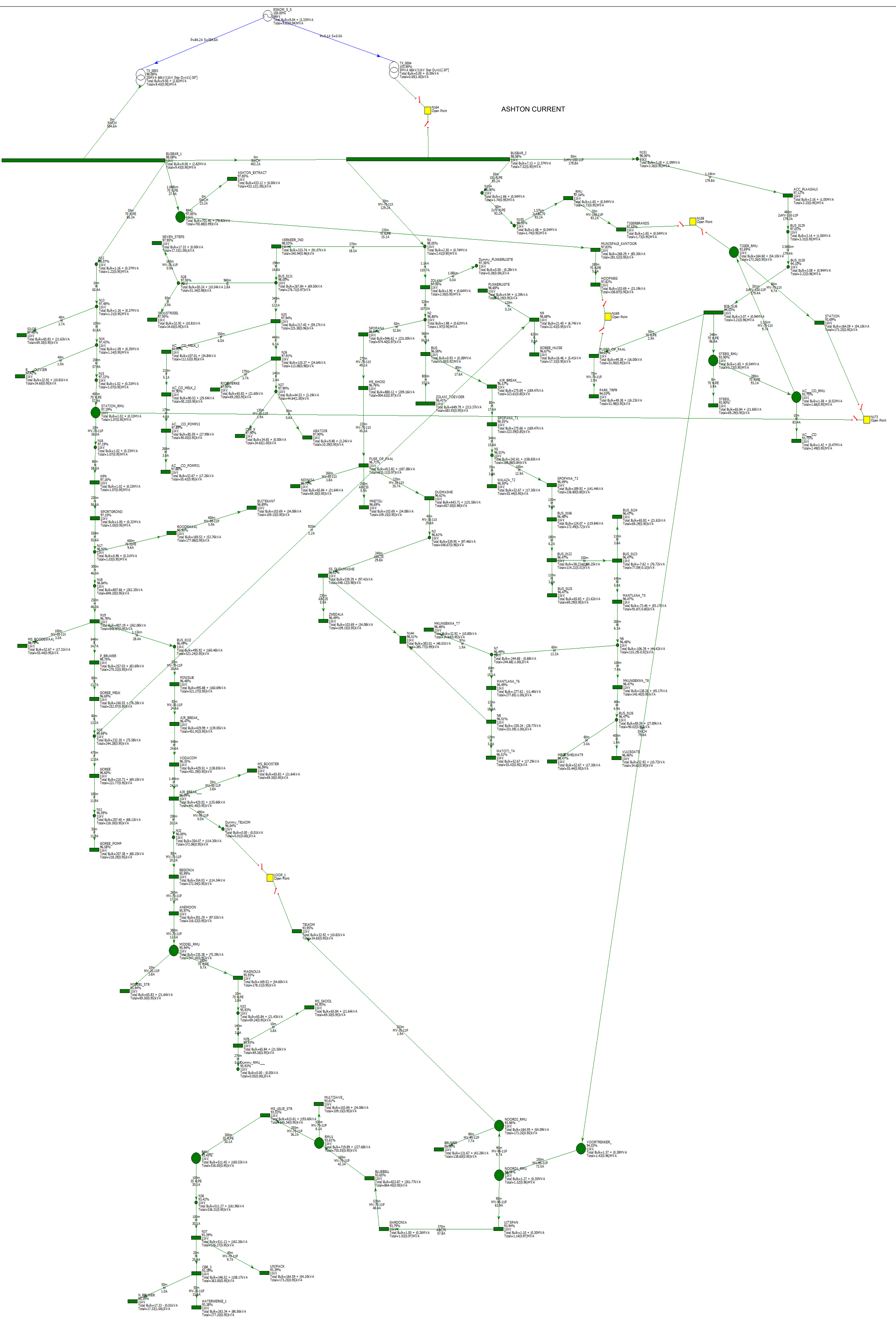
APPENDIX 9 – LOAD GROWTH FORECAST

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ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 10 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS



LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 11 – PROSPECTIVE FAULT LEVEL STUDY

Ashton Prospective Fault Level Study

SUBSTATION/TRANSFORMER	3ø Fault (kA)	ø-G Fault (kA)
ESKOM_S_S	9.39	0.33
TX_0003	9.39	0.33
BUSBAR_1	9.34	0.33
BUSBAR_2	9.34	0.33
N154	9.28	0.33
N1	8.37	0.33
VERKEER_IND	7.57	0.33
N155	7.54	0.32
_RMU	7.53	0.32
BUSBAR_1	7.16	0.32
RMU	7.16	0.32
RMU	6.73	0.32
MUNISPALE_KANTOOR	6.4	0.32
N1	6.15	0.32
BUS_0121	6.07	0.32
N151	5.87	0.32
ACC_PLAASHUI	5.81	0.32
N12	5.58	0.32
N13	5.48	0.32
N14	5.24	0.32
ZOLANI	4.9	0.31
N14	4.89	0.31
N25	4.88	0.31
N2	4.81	0.31
SPOFANA	4.58	0.31
N15	4.51	0.31
STATION_RMU	4.5	0.31
ZOLANI	4.46	0.31
MS_KHOSI	4.42	0.31
N16	4.41	0.31
N26	4.33	0.31
AC__CO_MELK_1	4.33	0.31
N26	4.29	0.31
WPK	4.18	0.31
FUSE_OP_PAAL	4.18	0.31
N27	4.17	0.31
DUDMASHE	4.15	0.31
N27	4.13	0.31
N2	4.12	0.31
FUSE_OP_PAAL	4.09	0.31
FUSE_OP_PAAL	4.06	0.31
AC_CO_MELK_2	4.06	0.31
BUS	4.05	0.31

_AIR_BREAK___	3.99	0.31
MANTLANA_T6	3.91	0.31
N3	3.91	0.31
SS_DUDUMASHE	3.91	0.31
N7	3.85	0.31
N6	3.82	0.3
SPOFANA_T1	3.8	0.3
MANTLANA_T5	3.79	0.3
N5	3.77	0.3
N8	3.75	0.3
SPOFANA_T3	3.73	0.3
BUS_0123	3.72	0.3
N5	3.71	0.3
BUS_0106	3.71	0.3
BUS_0122	3.71	0.3
AC___CO_POMP13	3.71	0.3
N7	3.7	0.3
BUS_0121	3.7	0.3
SPORTGROND	3.67	0.3
N6	3.67	0.3
MKUNGEKWA_T8	3.62	0.3
N28	3.59	0.3
SS_DUDUMASHE	3.59	0.3
BUS_0122	3.58	0.3
BUS_0123	3.58	0.3
BUS_0126	3.53	0.3
N28	3.53	0.3
N17	3.44	0.3
BUS	3.44	0.3
N17	3.43	0.3
ROODEWAAL	3.28	0.3
N18	3.27	0.3
N19	3.18	0.3
BUS_0126	2.95	0.3
N19	2.91	0.29
P_BRUWER	2.87	0.29
GOREE_MELK	2.83	0.29
BUS_0129	2.6	0.29
BIB_SUB	2.59	0.29
BUS_0130	2.59	0.29
BIB_SUB	2.58	0.29
FUSES_OP_PAAL	2.57	0.29
VOORTREKKER_	2.55	0.29
NOORD1_RMU	2.53	0.29
BIB_SUB	2.53	0.29
STEEG_RMU	2.53	0.29
NOORD2_RMU	2.52	0.29

STEEG_RMU	2.46	0.29
AC___CO_RMU	2.46	0.29
N19	2.45	0.29
BUS_0132	2.44	0.29
N10	2.44	0.29
UITSPAN	2.43	0.28
MINISUB	2.42	0.29
N10	2.4	0.29
N9	2.39	0.28
GARDONIA	2.34	0.28
GOREE	2.33	0.28
BLUEBELL	2.32	0.28
RMU1	2.3	0.28
N11	2.29	0.28
RMU1	2.25	0.28
N9	2.22	0.28
AC___CO_RMU	2.21	0.29
TIGER_RMU	2.19	0.29
AIR_BREAK_	2.16	0.28
MS_LELIE_STR	2.15	0.28
RMU___	2.11	0.28
N36	2.07	0.28
N37	2.06	0.28
N37	2.06	0.28
CBR_3	2.05	0.28
CBR_3	2.04	0.28
VODACOM	1.68	0.27
AIR_BREAK___	1.67	0.27
AIR_BREAK___	1.63	0.27
N32	1.62	0.27
BEGONIA	1.59	0.27
ANEMOON	1.55	0.26
MIDDEL_RMU	1.55	0.26
MIDDEL_RMU	1.53	0.26
MAGNOLIA	1.53	0.26
N33	1.5	0.26
N39	1.5	0.26
N39	1.45	0.26

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 12 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY

Ashton Current Voltage Level Study

Node Name	Min Voltage	Difference
ESKOM_S_S	98.08%	
BUSBAR_1	98.08%	0.00%
BUSBAR_2	98.08%	0.00%
N154	98.05%	0.03%
N1	98.03%	0.05%
VERKEER_IND	98.00%	0.08%
BUS_0121	97.95%	0.13%
N28	97.95%	0.13%
BUS_0121	97.94%	0.14%
N25	97.91%	0.17%
N26	97.90%	0.18%
N27	97.90%	0.18%
N26	97.90%	0.18%
AC__CO_MELK_1	97.90%	0.18%
N27	97.90%	0.18%
AC_CO_MELK_2	97.89%	0.19%
AC__CO_POMP13	97.88%	0.20%
BUSBAR_1	97.85%	0.23%
RMU	97.85%	0.23%
MUNISPALE_KANTOOR	97.82%	0.26%
N155	97.54%	0.54%
_RMU	97.53%	0.55%
N12	97.48%	0.60%
N13	97.48%	0.60%
N14	97.42%	0.66%
N1	97.36%	0.72%
ZOLANI	97.36%	0.72%
N14	97.32%	0.76%
N15	97.19%	0.89%
STATION_RMU	97.19%	0.89%
N16	97.16%	0.92%
N151	97.12%	0.96%
WPK	97.10%	0.98%
ACC_PLAASHUI	97.01%	1.07%
SPORTGROND	96.92%	1.16%
N17	96.90%	1.18%
ROODEWAAL	96.89%	1.19%
ZOLANI	96.86%	1.22%
N17	96.84%	1.24%
N2	96.84%	1.24%
N18	96.78%	1.30%
N19	96.78%	1.30%
SPOFANA	96.76%	1.32%

MS_KHOSI	96.71%	1.37%
N19	96.70%	1.38%
FUSE_OP_PAAL	96.70%	1.38%
P_BRUWER	96.69%	1.39%
GOREE_MELK	96.68%	1.40%
N9	96.68%	1.40%
N10	96.68%	1.40%
N9	96.67%	1.41%
FUSE_OP_PAAL	96.62%	1.46%
DUDMASHE	96.61%	1.47%
N10	96.60%	1.48%
GOREE	96.59%	1.49%
N11	96.58%	1.50%
N2	96.58%	1.50%
BUS	96.57%	1.51%
_AIR_BREAK_	96.55%	1.53%
SPOFANA_T1	96.51%	1.57%
MANTLANA_T6	96.51%	1.57%
N8	96.51%	1.57%
N3	96.51%	1.57%
SS_DUDUMASHE	96.51%	1.57%
N5	96.50%	1.58%
N19	96.49%	1.59%
N5	96.49%	1.59%
N6	96.49%	1.59%
N7	96.49%	1.59%
SPOFANA_T3	96.48%	1.60%
MANTLANA_T5	96.48%	1.60%
N7	96.48%	1.60%
MINISUB	96.47%	1.61%
BUS_0106	96.47%	1.61%
BUS_0122	96.47%	1.61%
BUS_0123	96.47%	1.61%
N6	96.47%	1.61%
MKUNGEKWA_T8	96.47%	1.61%
BUS_0126	96.47%	1.61%
BUS	96.41%	1.67%
AIR_BREAK_	96.35%	1.73%
VODACOM	96.04%	2.04%
N32	95.99%	2.09%
BEGONIA	95.97%	2.11%
ANEMOON	95.94%	2.14%
MIDDEL_RMU	95.94%	2.14%
MAGNOLIA	95.93%	2.15%
N33	95.93%	2.15%
N39	95.93%	2.15%
BUS_0129	94.10%	3.98%

BIB_SUB	94.03%	4.05%
FUSES_OP_PAAL	94.03%	4.05%
BUS_0130	94.03%	4.05%
VOORTREKKER_	93.96%	4.12%
NOORD1_RMU	93.96%	4.12%
NOORD2_RMU	93.96%	4.12%
BIB_SUB	93.90%	4.18%
STEEG_RMU	93.90%	4.18%
UITSPAN	93.79%	4.29%
STEEG_RMU	93.75%	4.33%
AC___CO_RMU	93.75%	4.33%
TIGER_RMU	93.69%	4.39%
GARDONIA	93.65%	4.43%
BLUEBELL	93.61%	4.47%
RMU1	93.61%	4.47%
MS_LELIE_STR	93.45%	4.63%
RMU___	93.42%	4.66%
N36	93.39%	4.69%
N37	93.39%	4.69%
CBR_3	93.39%	4.69%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 13 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY

Ashton Current Feeder Loading

Feeder to	Feeder % Loading
N1	53.83%
TX_0003	48.07%
ACC_PLAASHUI	47.57%
BUS_0130	47.45%
N2	41.15%
STEEG_RMU	40.39%
AC___CO_RMU	38.79%
AC___CO	32.08%
NOORD1_RMU	31.96%
ZOLANI	30.75%
TIGERBRANDS	30.57%
N151	29.48%
BIB_SUB	29.41%
BUS_0129	29.40%
N16	28.98%
GARDONIA	28.88%
UITSPAN	27.76%
N12	27.23%
N154	25.89%
N13	25.13%
SS_DUDUMASHE	24.84%
BLUEBELL	24.22%
STATION_RMU	24.14%
N14	23.70%
_RMU	23.31%
N15	22.27%
RMU1	21.17%
DUDMASHE	20.99%
BUS	20.96%
MS_KHOSI	20.45%
SPOFANA	20.31%
N155	19.42%
FUSE_OP_PAAL	18.89%
MS_LELIE_STR	18.11%
N36	17.72%
RMU___	17.71%
AIR_BREAK_	17.56%
N3	17.53%
WPK	16.10%
RMU	15.78%
SPORTGROND	15.71%
N17	15.45%
MINISUB	14.18%

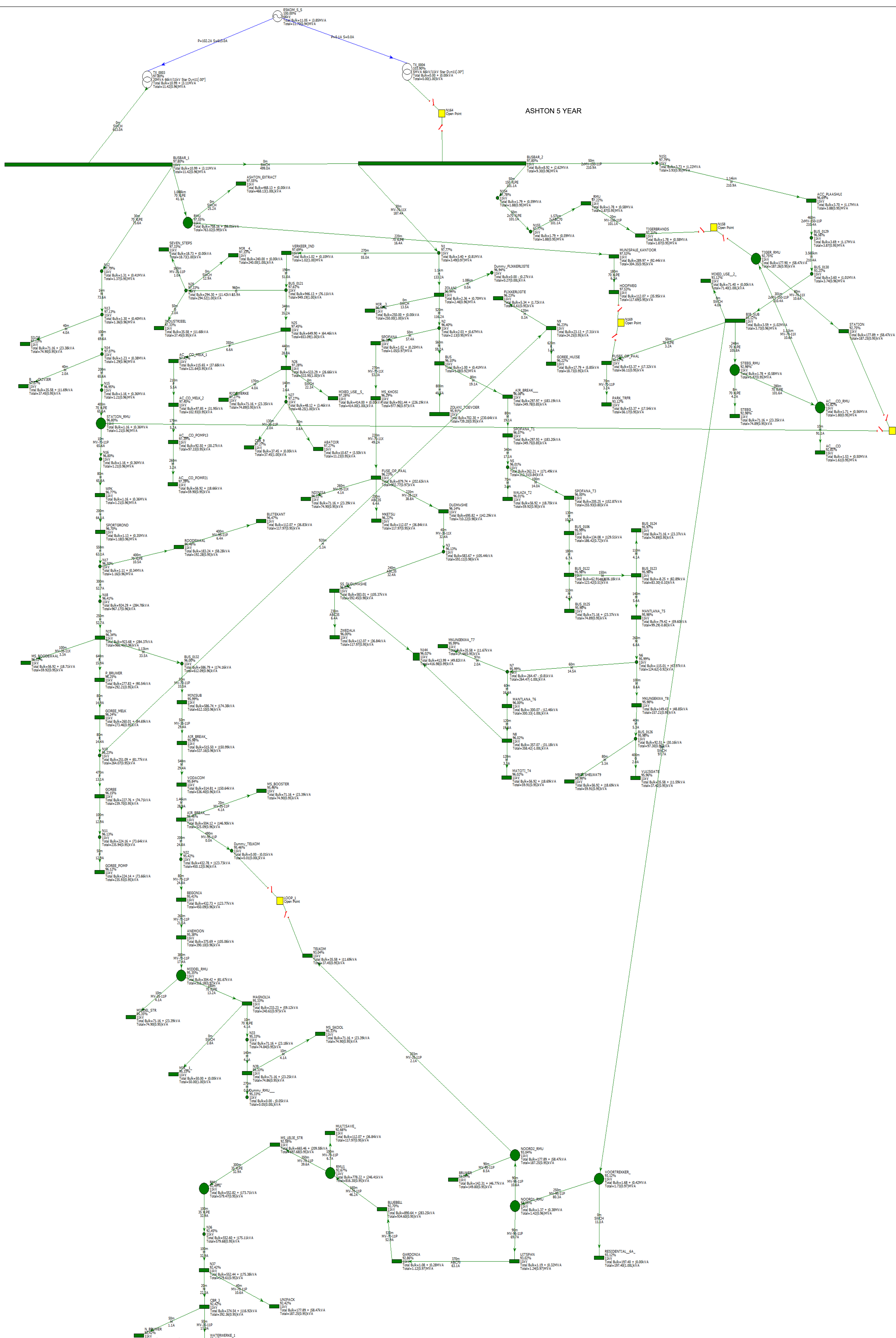
N19	12.79%
N18	12.78%
N37	11.59%
WATERWERKE_1	11.13%
BUS_0132	10.90%
ZOLANI_TOEVOER	10.34%
BEGONIA	10.17%
BUSBAR_1	10.09%
VODACOM	9.46%
AIR_BREAK___	9.28%
ANEMOON	8.66%
BUSBAR_2	8.04%
CBR_3	7.85%
N32	7.82%
N8	6.94%
SPOFANA_T1	6.77%
MIDDEL_RMU	6.76%
_AIR_BREAK___	6.76%
N25	6.36%
GOREE	6.34%
MUNISPALE_KANTOOR	6.29%
N11	6.24%
GOREE_POMP	6.24%
P_BRUWER	6.11%
N5	6.06%
MANTLANA_T6	5.81%
GOREE_MELK	5.72%
BUS_0121	5.70%
N10	5.53%
VERKEER_IND	5.15%
N7	5.12%
SPOFANA_T3	4.95%
ZWEDALA	4.95%
MKETSU	4.94%
UNIPACK	4.87%
NOORD2_RMU	4.21%
MAGNOLIA	4.06%
TIGER_RMU	4.04%
STATION	4.04%
ROODEWAAL	4.01%
BUS_0106	3.61%
BRUWER	3.37%
N26	3.19%
AC___CO_MELK_1	3.17%
MULTISAVE_	3.06%
MKUNGEKWA_T8	3.04%
MIDDEL_STR	2.71%

MS_BOOSTER	2.71%
AC_CO_MELK_2	2.69%
BUITEKANT	2.57%
HOOFWEG	2.43%
N6	2.41%
BUS_0122	2.39%
NDINISA	2.21%
MANTLANA_T5	1.92%
BUS_0126	1.88%
AC_CO_POMP13	1.86%
N28	1.83%
MS_ROODEWAAL	1.77%
BUS_0123	1.61%
STEEG_	1.61%
VOORTREKKER_	1.59%
N33	1.58%
N39	1.46%
MS_SKOOL	1.46%
BUS_0125	1.45%
PARK_TRFR	1.45%
BUS_0124	1.45%
SILOS	1.44%
RIOOWERKE	1.43%
TELKOM	1.38%
CBR_9	1.33%
VULISGATE	1.26%
N27	1.26%
INDUSTRIEEL	1.24%
FUSES_OP_PAAL	1.21%
WALAZA_T2	1.16%
MBOTSHELWAT9	1.16%
MATOTI_T4	1.16%
AC_CO_POMP21	1.14%
MKUNGEKWA_T7	0.72%
B_OLIVIER	0.72%
SEVEN_STEPS	0.66%
ASHTON_EXTRACT	0.46%
GOREE_HUISE	0.39%
N_BRUWER	0.37%
N9	0.34%
ABATOIR	0.29%
FLIKKERLIGTE	0.08%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 14 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS



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ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 15 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY

Ashton 5 Year Voltage Level Study

Node Name	Min Voltage	Difference
BUSBAR_1	97.80%	
BUSBAR_2	97.80%	
N12	97.79%	0.01%
N151	97.79%	0.01%
N154	97.78%	0.02%
N1	97.77%	0.03%
N155	97.77%	0.03%
VERKEER_IND	97.69%	0.11%
BUS_0121	97.61%	0.19%
RMU	97.55%	0.25%
ASHTON_EXTRACT	97.55%	0.25%
MUNISPALE_KANTOOR	97.53%	0.27%
HOOFWEG	97.53%	0.27%
N25	97.45%	0.35%
AC__CO_MELK_1	97.42%	0.38%
AC_CO_MELK_2	97.40%	0.40%
AC__CO_POMP13	97.39%	0.41%
AC__CO_POMP21	97.39%	0.41%
N28	97.33%	0.47%
INDUSTRIEEL	97.33%	0.47%
SEVEN_STEPS	97.33%	0.47%
MIR__4__	97.33%	0.47%
N26	97.28%	0.52%
MIXED_USE__5__	97.28%	0.52%
N27	97.27%	0.53%
ABATOIR	97.27%	0.53%
RIOOWERKE	97.27%	0.53%
CBR_9	97.27%	0.53%
_RMU	97.22%	0.58%
TIGERBRANDS	97.21%	0.59%
N13	97.13%	0.67%
SILOS	97.13%	0.67%
N14	97.07%	0.73%
B____OLIVIER	97.07%	0.73%
N15	96.95%	0.85%
ZOLANI	96.94%	0.86%
Dummy_FLIKKERLIGTE	96.94%	0.86%
MIR__3__	96.94%	0.86%
STATION_RMU	96.80%	1.00%
N16	96.80%	1.00%
WPK	96.77%	1.03%
SPORTGROND	96.70%	1.10%
ACC_PLAASHUI	96.69%	1.11%

BUS_0129	96.56%	1.24%
N17	96.50%	1.30%
ROODEWAAL	96.48%	1.32%
BUITEKANT	96.47%	1.33%
N18	96.41%	1.39%
N2	96.40%	1.40%
SPOFANA	96.38%	1.42%
N19	96.34%	1.46%
MS_ROODEWAAL	96.33%	1.47%
MS_KHOSI	96.29%	1.51%
P_BRUWER	96.25%	1.55%
GOREE_MELK	96.24%	1.56%
N10	96.23%	1.57%
FUSE_OP_PAAL	96.23%	1.57%
FLIKKERLIGTE	96.23%	1.57%
N9	96.23%	1.57%
NDINISA	96.22%	1.58%
MKETSU	96.22%	1.58%
GOREE_HUISE	96.22%	1.58%
GOREE	96.15%	1.65%
DUDMASHE	96.14%	1.66%
N11	96.13%	1.67%
N3	96.13%	1.67%
GOREE_POMP	96.12%	1.68%
BUS	96.10%	1.70%
_AIR_BREAK_	96.08%	1.72%
SPOFANA_T1	96.07%	1.73%
N8	96.02%	1.78%
MATOTI_T4	96.02%	1.78%
SS_DUDUMASHE	96.02%	1.78%
N144	96.02%	1.78%
N5	96.01%	1.79%
WALAZA_T2	96.01%	1.79%
BUS_0132	96.00%	1.80%
SPOFANA_T3	96.00%	1.80%
MANTLANA_T6	96.00%	1.80%
ZWEDALA	96.00%	1.80%
MINISUB	95.99%	1.81%
BUS_0106	95.99%	1.81%
N6	95.99%	1.81%
N7	95.99%	1.81%
MKUNGEKWA_T7	95.99%	1.81%
AIR_BREAK_	95.98%	1.82%
BUS_0122	95.98%	1.82%
BUS_0125	95.98%	1.82%
BUS_0123	95.98%	1.82%
MANTLANA_T5	95.98%	1.82%

MKUNGEKWA_T8	95.98%	1.82%
BUS_0126	95.98%	1.82%
MBOTSHELWAT9	95.98%	1.82%
BUS_0124	95.97%	1.83%
VULISGATE	95.96%	1.84%
ZOLANI_TOEVOER	95.91%	1.89%
VODACOM	95.84%	1.96%
AIR_BREAK___	95.46%	2.34%
MS_BOOSTER	95.46%	2.34%
Dummy_TELKOM	95.46%	2.34%
N32	95.42%	2.38%
BEGONIA	95.41%	2.39%
ANEMOON	95.38%	2.42%
MIDDEL_RMU	95.35%	2.45%
MIDDEL_STR	95.35%	2.45%
MAGNOLIA	95.33%	2.47%
N33	95.33%	2.47%
N39	95.33%	2.47%
MS_SKOOL	95.33%	2.47%
Dummy_RMU___	95.33%	2.47%
MIR__1__	95.33%	2.47%
BUS_0130	93.21%	4.59%
VOORTREKKER__	93.12%	4.68%
PARK_TRFR	93.12%	4.68%
FUSES_OP_PAAL	93.12%	

CBR_3	92.42%	5.38%
UNIPACK	92.42%	5.38%
N_BRUWER	92.42%	5.38%
WATERWERKE_1	92.41%	5.39%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 16 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY

Ashton 5 Year Feeder Loading

Feeder to	Feeder % Loading
N1	78.09%
TX_0003	58.39%
ACC_PLAASHUI	55.78%
BUS_0130	55.65%
N2	44.70%
STEEG_RMU	44.09%
AC__CO_RMU	42.35%
ZOLANI	37.00%
AC__CO	35.03%
NOORD1_RMU	34.90%
N151	34.57%
BUS_0129	34.49%
BIB_SUB	34.49%
TIGERBRANDS	33.15%
N16	32.81%
GARDONIA	31.54%
N12	30.68%
UITSPAN	30.32%
N13	28.32%
N154	28.08%
STATION_RMU	27.33%
SS_DUDUMASHE	26.99%
N14	26.77%
BLUEBELL	26.46%
_RMU	25.28%
N15	25.21%
RMU1	23.12%
DUDMASHE	22.81%
BUS	22.77%
MS_KHOSI	22.21%
SPOFANA	22.07%
N155	21.06%
AIR_BREAK_	20.98%
FUSE_OP_PAAL	20.52%
MS_LELIE_STR	19.78%
BUS_0121	19.63%
N36	19.36%
RMU__	19.34%
N3	19.05%
N25	18.51%
WPK	18.23%
SPORTGROND	17.80%
N17	17.52%
RMU	17.11%

MINISUB	16.73%
VERKEER_IND	15.27%
N26	15.16%
N18	14.63%
N19	14.63%
BUS_0132	12.87%
N37	12.66%
BEGONIA	12.38%
BUSBAR_1	12.26%
WATERWERKE_1	12.15%
VODACOM	11.30%
ZOLANI_TOEVOER	11.24%
AIR_BREAK_	11.10%
ANEMOON	10.73%
N28	10.59%
BUSBAR_2	9.98%
N32	9.52%
MIDDEL_RMU	8.68%
CBR_3	8.57%
N8	7.54%
_AIR_BREAK_	7.35%
SPOFANA_T1	7.35%
GOREE	6.89%
MUNISPALE_KANTOOR	6.82%
N11	6.78%
GOREE_POMP	6.78%
P_BRUWER	6.64%
N5	6.59%
MANTLANA_T6	6.32%
GOREE_MELK	6.21%
N10	6.00%
N7	5.56%
MAGNOLIA	5.52%
SPOFANA_T3	5.38%
ZWEDALA	5.37%
MKETSU	5.36%
UNIPACK	5.32%
NOORD2_RMU	4.59%
TIGER_RMU	4.42%
STATION	4.42%
ROODEWAAL	4.36%
BUS_0106	3.92%
BRUWER	3.67%
AC_CO_MELK_1	3.45%
MULTISAVE_	3.34%
MKUNGEKWA_T8	3.31%

MIDDEL_STR	2.95%
MS_BOOSTER	2.94%
AC_CO_MELK_2	2.92%
BUITEKANT	2.79%
HOOFWEG	2.64%
N6	2.62%
BUS_0122	2.60%
NDINISA	2.40%
MANTLANA_T5	2.09%
BUS_0126	2.05%
AC_CO_POMP13	2.02%
VOORTREKKER_	1.95%
MS_ROODEWAAL	1.92%
STEEG_	1.76%
BUS_0123	1.75%
N33	1.72%
N39	1.59%
MS_SKOOL	1.59%
BUS_0125	1.58%
PARK_TRFR	1.58%
BUS_0124	1.58%
SILOS	1.56%
RIOOWERKE	1.55%
TELKOM	1.51%
CBR_9	1.44%
N27	1.37%
VULISGATE	1.36%
INDUSTRIEEL	1.35%
FUSES_OP_PAAL	1.32%
WALAZA_T2	1.26%
MBOTSHELWAT9	1.26%
MATOTI_T4	1.26%
AC_CO_POMP21	1.24%
MKUNGEKWA_T7	0.79%
B_OLIVIER	0.78%
SEVEN_STEPS	0.72%
ASHTON_EXTRACT	0.50%
MIXED_USE_5_	0.45%
GOREE_HUISE	0.43%
N_BRUWER	0.41%
N9	0.37%
ABATOIR	0.32%
MIR_3_	0.27%
MIR_4_	0.26%
RESIDENTIAL_6A_	0.22%
FLIKKERLIGTE	0.08%
MIXED_USE_2_	0.08%
MIR_1_	0.06%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 17 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 18 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY

Ashton 10 Year Voltage Level Study

Node Name	Min Voltage	Difference
BUSBAR_1	97.49%	
BUSBAR_2	97.49%	
N12	97.47%	0.02%
N151	97.47%	0.02%
N154	97.47%	0.02%
N155	97.46%	0.03%
N1	97.45%	0.04%
VERKEER_IND	97.33%	0.16%
RMU	97.23%	0.26%
ASHTON_EXTRACT	97.23%	0.26%
MUNISPALE_KANTOOR	97.21%	0.28%
HOOFWEG	97.20%	0.29%
BUS_0121	97.20%	0.29%
N25	96.91%	0.58%
_RMU	96.88%	0.61%
TIGERBRANDS	96.87%	0.62%
AC___CO_MELK_1	96.87%	0.62%
N28	96.86%	0.63%
AC_CO_MELK_2	96.86%	0.63%
MIR_4_	96.86%	0.63%
INDUSTRIEEL	96.85%	0.64%
AC___CO_POMP13	96.85%	0.64%
SEVEN_STEPS	96.85%	0.64%
AC___CO_POMP21	96.84%	0.65%
N13	96.60%	0.89%
SILOS	96.59%	0.90%
N26	96.57%	0.92%
MIXED_USE_5_	96.57%	0.92%
N27	96.56%	0.93%
ABATOIR	96.56%	0.93%
RIOOWERKE	96.56%	0.93%
CBR_9	96.56%	0.93%
N14	96.51%	0.98%
B___OLIVIER	96.51%	0.98%
ZOLANI	96.47%	1.02%
Dummy_FLIKKERLIGTE	96.47%	1.02%
MIR_3_	96.47%	1.02%
N15	96.35%	1.14%
INDUSTRIAL_6B_	96.35%	1.14%
STATION_RMU	96.19%	1.30%
N16	96.18%	1.31%
ACC_PLAASHUI	96.18%	1.31%
WPK	96.15%	1.34%

SPORTGROND	96.07%	1.42%
BUS_0129	96.02%	1.47%
N2	95.89%	1.60%
SPOFANA	95.87%	1.62%
N17	95.85%	1.64%
ROODEWAAL	95.82%	1.67%
BUITEKANT	95.81%	1.68%
MS_KHOSI	95.78%	1.71%
N18	95.75%	1.74%
FUSE_OP_PAAL	95.72%	1.77%
NDINISA	95.71%	1.78%
MKETSU	95.70%	1.79%
N19	95.66%	1.83%
MS_ROODEWAAL	95.66%	1.83%
DUDMASHE	95.62%	1.87%
N3	95.61%	1.88%
P_BRUWER	95.58%	1.91%
BUS	95.58%	1.91%
GOREE_MELK	95.57%	1.92%
N10	95.56%	1.93%
_AIR_BREAK_	95.56%	1.93%
SPOFANA_T1	95.55%	1.94%
FLIKKERLIGTE	95.55%	1.94%
N9	95.55%	1.94%
GOREE_HUISE	95.54%	1.95%
N8	95.50%	1.99%
SS_DUDUMASHE	95.50%	1.99%
N144	95.50%	1.99%
N5	95.49%	2.00%
WALAZA_T2	95.49%	2.00%
MATOTI_T4	95.49%	2.00%
SPOFANA_T3	95.48%	2.01%
MANTLANA_T6	95.48%	2.01%
ZWEDALA	95.48%	2.01%
GOREE	95.47%	2.02%
N7	95.47%	2.02%
MKUNGEKWA_T7	95.47%	2.02%
BUS_0106	95.46%	2.03%
N6	95.46%	2.03%
N11	95.45%	2.04%
BUS_0122	95.45%	2.04%
BUS_0125	95.45%	2.04%
BUS_0123	95.45%	2.04%
MANTLANA_T5	95.45%	2.04%
MKUNGEKWA_T8	95.45%	2.04%
BUS_0126	95.45%	2.04%
MBOTSHELWAT9	95.45%	2.04%

GOREE_POMP	95.44%	2.05%
BUS_0124	95.44%	2.05%
VULISGATE	95.43%	2.06%
ZOLANI_TOEVOER	95.38%	2.11%
BUS_0132	95.27%	2.22%
MINISUB	95.26%	2.23%
AIR_BREAK_	95.24%	2.25%
VODACOM	95.08%	2.41%
AIR_BREAK__	94.63%	2.86%
MS_BOOSTER	94.63%	2.86%
Dummy_TELKOM	94.63%	2.86%
N32	94.58%	2.91%
BEGONIA	94.56%	2.93%
ANEMOON	94.53%	2.96%
MIDDEL_RMU	94.48%	3.01%
MIDDEL_STR	94.48%	3.01%
MAGNOLIA	94.46%	3.03%
N33	94.46%	3.03%
N39	94.46%	3.03%
MS_SKOOL	94.46%	3.03%
Dummy_RMU__	94.46%	3.03%
MIR_1_	94.46%	3.03%
BUS_0130	92.08%	5.41%
VOORTREKKER_	91.98%	5.51%
PARK_TRFR	91.98%	5.51%
FUSES_OP_PAAL	91.98%	5.51%
BIB_SUB	91.98%	5.51%
MIXED_USE_2_	91.98%	5.51%
RESIDENTIAL_6A_	91.98%	5.51%
NOORD1_RMU	91.88%	5.61%
TELKOM	91.87%	5.62%
NOORD2_RMU	91.87%	5.62%
BRUWER	91.87%	5.62%
UITSPAN	91.84%	5.65%
STEEG_RMU	91.83%	5.66%
STEEG_	91.83%	5.66%
AC__CO_RMU	91.66%	5.83%
AC__CO	91.65%	5.84%
GARDONIA	91.61%	5.88%
TIGER_RMU	91.59%	5.90%
STATION	91.58%	5.91%
BLUEBELL	91.38%	6.11%
RMU1	91.32%	6.17%
MULTISAVE_	91.32%	6.17%
MS_LELIE_STR	91.17%	6.32%
RMU__	91.01%	6.48%
HOUSING_7_	91.01%	6.48%

N36	90.98%	6.51%
N37	90.95%	6.54%
CBR_3	90.94%	6.55%
UNIPACK	90.94%	6.55%
N_BRUWER	90.94%	6.55%
WATERWERKE_1	90.93%	6.56%

LANEGERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 19 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY

Ashton 10 Year Feeder Loading

Feeder to	Feeder % Loading
N1	103.27%
ACC_PLAASHUI	67.39%
BUS_0130	67.25%
N2	47.05%
STEEG_RMU	46.74%
NOORD1_RMU	46.60%
AC___CO_RMU	44.89%
ZOLANI	44.84%
GARDONIA	44.52%
N12	41.84%
UITSPAN	41.76%
N151	41.76%
BUS_0129	41.67%
BIB_SUB	41.67%
BLUEBELL	39.02%
N13	38.63%
AC___CO	37.13%
N14	37.00%
N16	36.77%
RMU1	35.50%
N15	35.36%
TIGERBRANDS	34.82%
N25	33.68%
RMU___	33.47%
BUS_0121	32.05%
MS_LELIE_STR	31.97%
STATION_RMU	30.63%
N26	30.19%
N154	29.49%
SS_DUDUMASHE	28.40%
_RMU	26.55%
AIR_BREAK_	25.25%
VERKEER_IND	24.29%
DUDMASHE	24.01%
BUS	23.97%
MS_KHOSI	23.38%
SPOFANA	23.22%
N155	22.12%
FUSE_OP_PAAL	21.59%
N36	20.59%
WPK	20.43%
N3	20.05%
SPORTGROND	19.98%

MINISUB	19.83%
N17	19.68%
RMU	17.97%
N18	16.63%
N19	16.63%
BUS_0132	15.25%
BEGONIA	15.24%
BUSBAR_1	15.02%
VODACOM	13.60%
ANEMOON	13.51%
N37	13.47%
AIR_BREAK___	13.39%
WATERWERKE_1	12.93%
N28	12.90%
BUSBAR_2	12.16%
ZOLANI_TOEVOER	11.83%
N32	11.73%
MIDDEL_RMU	11.34%
CBR_3	9.12%
N8	7.93%
SPOFANA_T1	7.74%
_AIR_BREAK___	7.73%
MAGNOLIA	7.65%
GOREE	7.26%
MUNISPALE_KANTOOR	7.17%
N11	7.15%
GOREE_POMP	7.15%
P_BRUWER	7.00%
N5	6.93%
MANTLANA_T6	6.65%
GOREE_MELK	6.55%
N10	6.33%
N7	5.85%
UNIPACK	5.66%
SPOFANA_T3	5.66%
ZWEDALA	5.66%
MKETSU	5.64%
NOORD2_RMU	4.87%
TIGER_RMU	4.68%
STATION	4.68%
ROODEWAAL	4.59%
BUS_0106	4.13%
BRUWER	3.89%
AC___CO_MELK_1	3.63%
MULTISAVE_	3.55%
MKUNGEKWA_T8	3.48%
MIDDEL_STR	3.11%

MS_BOOSTER	3.11%
AC_CO_MELK_2	3.07%
BUITEKANT	2.94%
HOOFWEG	2.77%
N6	2.76%
BUS_0122	2.73%
NDINISA	2.53%
VOORTREKKER_	2.50%
MANTLANA_T5	2.20%
BUS_0126	2.15%
AC_CO_POMP13	2.12%
MS_ROODEWAAL	2.02%
STEEG_	1.87%
BUS_0123	1.84%
N33	1.81%
MS_SKOOL	1.68%
PARK_TRFR	1.68%
N39	1.67%
BUS_0125	1.66%
BUS_0124	1.66%
RIOOWERKE	1.64%
SILOS	1.64%
TELKOM	1.60%
CBR_9	1.52%
VULISGATE	1.44%
N27	1.44%
INDUSTRIEEL	1.42%
FUSES_OP_PAAL	1.40%
WALAZA_T2	1.33%
MBOTSHELWAT9	1.33%
MATOTI_T4	1.33%
AC_CO_POMP21	1.31%
MIXED_USE_5_	1.01%
MKUNGEKWA_T7	0.83%
B_OLIVIER	0.82%
SEVEN_STEPS	0.76%
MIR_3_	0.73%
ASHTON_EXTRACT	0.53%
GOREE_HUISE	0.45%
HOUSING_7_	0.45%
N_BRUWER	0.44%
N9	0.39%
INDUSTRIAL_6B_	0.38%
ABATOIR	0.34%
MIR_4_	0.33%
MIXED_USE_2_	0.29%
RESIDENTIAL_6A_	0.23%

MIR__1_	0.15%
FLIKKERLIGTE	0.09%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - ASHTON AREA OF SUPPLY

APPENDIX 20 – RECOMMENDED CAPITAL UPGRADES

Langeberg Municipality Electrical Engineering Services Infrastructure: Capital Projects - Ashton

Priority	Ward	Project Description As per masterplan	Budget 2022/23	Budget 2023/24	Budget 2024/25	Budget 2025/26	Budget 2026/27	Budget 2027/28	Budget 2028/29	Budget 2029/30	Budget 2030/31	Budget 2031/32	Project Total
1. CAPITAL PROJECTS													
													R0.00
1.1		Replacement of Prepaid Meters (PLC)											R0.00
1.2		Replace existing street lights with LED street lights		R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R900,000.00
1.3		Upgrade and Extend 11 kV network to North-West & Waterworks		R1,500,000.00	R1,000,000.00								R2,500,000.00
													R0.00
2. MASTERPLAN RECOMMENDATIONS													R0.00
													R0.00
2.1		Replacement of 11kV switchgear in main switching station		R3,000,000.00									R3,000,000.00
2.2		Replacement of transformers		R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00			R2,100,000.00
2.3		Replacement of miniature substations		R450,000.00			R450,000.00					R450,000.00	R1,350,000.00
2.4		Replace 70 ABC overhead line to underground cable (MS Uitspan to MS Gardenia)						R450,000.00					R450,000.00
2.5		Replace Mink conductor in Gladiolo Street to underground cable							R475,000.00				R475,000.00
2.6		Replace 70mm² XLPE cable feeder when required due to housing developments										R60,000.00	R60,000.00
		Total	R0.00	R5,350,000.00	R1,400,000.00	R400,000.00	R850,000.00	R850,000.00	R875,000.00	R400,000.00	R100,000.00	R610,000.00	R10,835,000.00