22 May 2024

The Director: Services and Infrastructure
Bitou Local Municipality
Private Bag X1002
Plettenberg Bay
6600

Attention: Ms. Asiphe Mgoqi

Dear Ma'am,

ELECTRICITY CAPACITY INVESTIGATION FOR THE RESIDENTIAL DEVELOPMENT AT ERF 6503 IN PLETTENBERG BAY: CAPACITY ANALYSIS OF THE BULK ELECTRICAL SERVICES

The request by Mr. Jonathan Edwards of Sutherland Engineers for GLS Consulting to investigate and comment on the bulk electricity services for the proposed development project on Erf 6503 Plettenberg Bay, refers.

This document should inter alia be read in conjunction with the Electrical Master Plan (performed for the Bitou Municipality) dated December 2022.

The proposed development on Erf 6503 was not taken into consideration in the December 2022 Master Plans for the existing and future electrical networks. This document should inter alia be read in conjunction with the following documents:

- Electrical Load Schedule – Project ERF 6503 (Sutherland Engineers)
- Site Layout – Pr2309PB6503L06
- Electrical Master Plan (performed by GLS Consulting for the Bitou Local Municipality) dated December 2022.
- NRS 034-1 (2007) /SANS 507 (2007): Electricity distribution — Guidelines for the provision of electricity distribution networks in residential areas
- NRS 048-2: Quality of Supply.
- Geo-based Load Forecast Standard – Eskom Group Technology Guideline Document
- Information document no. 1: Bitou Local Municipality zoning scheme by-law November 2016 Bitou Local Municipality Development Charges Policy
- Latest electrical network diagrams for Bitou Local Municipality from Lyners and Partners:
  - *20076E-003 – Plettenberg Bay SLD (Existing)*
  - *3-601-DIAG-REV S - Sept 2019*

The electrical load schedule of the proposed development on Erf 6503 was provided Sutherland Engineers on behalf of the developers via email. The proposed development will be situated on Erf 6503, which is situated along the N2 & Beacon Way next to Plettenberg Bay Primary School. No provision was however made in the December 2022 Electrical Master Plan for the additional load from this development on this erf. The site plans provided indicate that the erven will be used for residential purposes, and therefore can be classified under a residential zone and landuse.

1. Distribution Zone

The proposed residential development is located near the N2 & Beacon Way, east of Plettenberg Bay Primary School. The suburb falls within SS-1 Main (Ferdinand) distribution zone. Supply to the proposed development area should be accommodated within the SS-1 distribution zone. SS-1 currently has two incoming feeders from the Eskom Plett Main Substation supplying the substation at 11kV.

The substation is currently shared with Eskom, the portion belonging to BLM is the 11kV switching section. The installed capacity of the substation is 20MVA with 2x10MVA transformers belonging to Eskom supplying the substation. The Notified Maximum Demand (NMD) for the substation is 15.5 MVA.

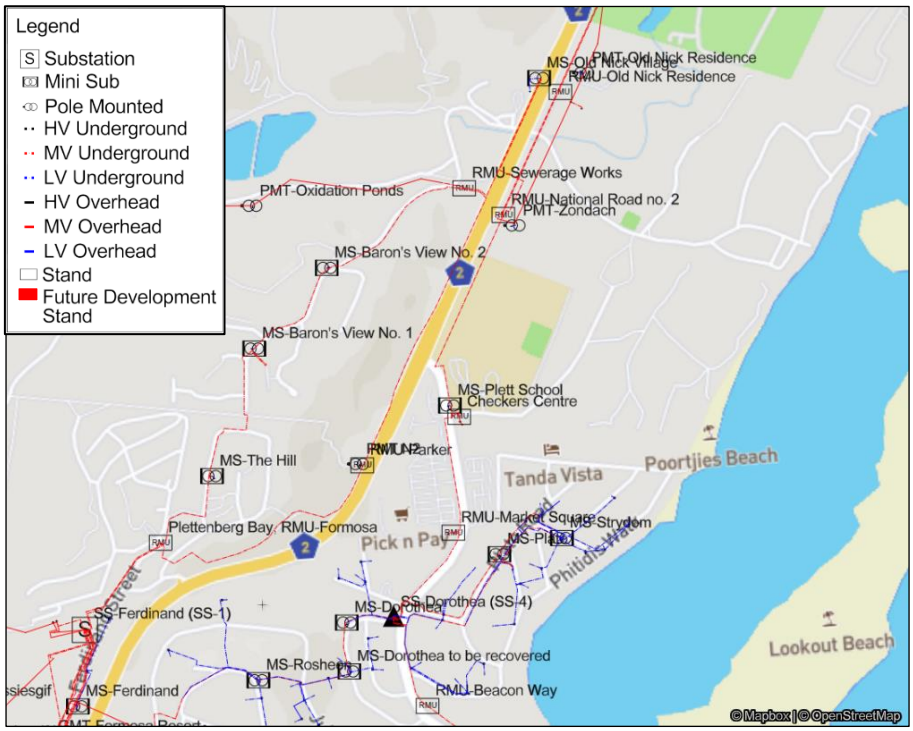


Figure 1: Distribution network of SS-1 Main (Ferdinand)

As per the latest MV reticulation diagrams created by Lyners and Partners, SS-1 receives the incoming 11kV and distributes the power through 11 outgoing feeders. The incoming feeders are 11 kV 183mm^2 Cu XLPE conductors from Eskom's Plett Main Substation. The outgoing feeders from the substation are either 11kV 95mm^2 and 70mm^2 Aluminium PILC underground cables. The substation provides electricity to the Plettenberg Bay CBD, a portion of Bossiesgif, Piesang Valley, Signal Hill and all the way north past Goose Valley along Keurbooms river. Of the 10 outgoing feeders from SS-1 Main, there are two 11kV 95mm^2 Cu PILC conductors running along Beacon Way. Within close proximity to Erf 6503, these conductors supply power to Plett School and Checkers Centre located on Beacon Way. The nearest LV reticulation conductors supply the neighbouring residential area on Plato Road. Presently, there is no direct supply to the development.

2. Electrical Demand

Additional electricity supply provision at Erf 6503 was not catered for in the updated Bitou Electricity Master plan of December 2022. This study therefore investigates the supply capacity of the development. For this re-analysis study, an estimated maximum demand of 800kVA for the proposed residential development was taken from the supplied Electrical Load Schedule. Table 1 below shows

a summary of the loadings across various residential zones within the proposed development.

Table 1: ADMDs per residential zone

Zoning	Units	ADMD [kVA]	Estimated Total Demand [kVA]
Residential Zone I	9	7.95	71.55
Residential Zone II	28	7.95	222.6
Residential Zone IV	1 2-5	24.24 32.32	153.52
Retail / Clubhouse	1	91.99	91.99
Total	**43**		**539.66**

Considering the proposed development's location and intended land use, the likelihood of backyard dwellers occupying this development erf is low. It was also confirmed that no expansions are expected on the development leading to an increased demand. Therefore, there is no anticipated increase in demand due to additional unregistered electricity users occupying this erf. For this report, a demand of 800 kVA will be used to investigate the capability of the existing MV electricity infrastructure to supply this additional load.

There are four load profiles allocated to this erf as derived from the 2022 electrical master plan for residential developments within the SS-1 Main (Ferdinand) distribution zone as well as the Eskom Geo-Based Load Forecast Standard. Figure 2 displays the daily load profile within the SS-1 Main distribution zone for Residential Zone I outlined in the Electrical Load Schedule. Units in this area are defined as Formal Urban in Eskom's Geo-Based Load Forecast Standard as they are between 740 - 1132 m^2

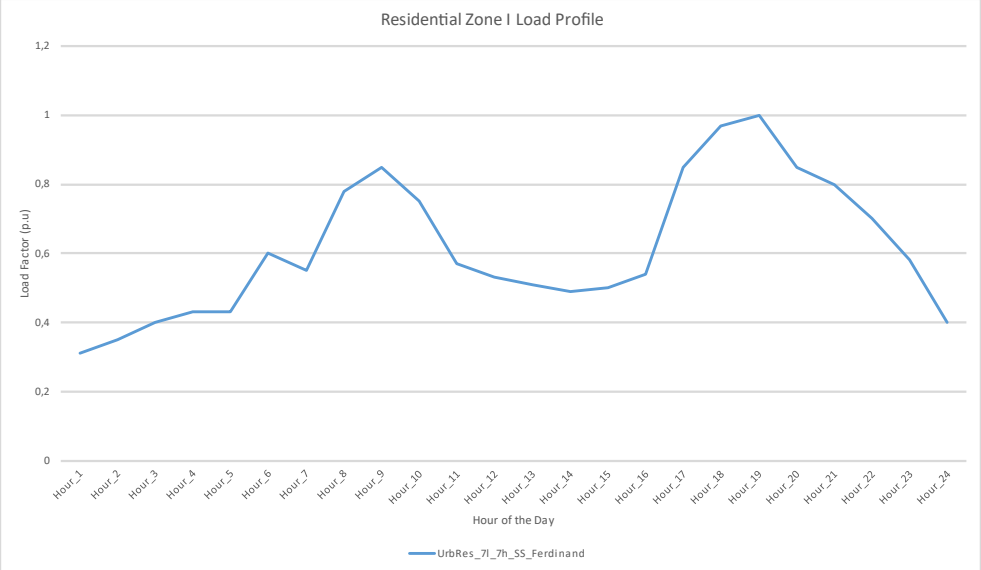


Figure 2: Residential Zone I Load Profile

Residential Zone II is made up of cluster townhouses, as per Eskom's GLF Standard. The load profile shown in the figure below is also derived from the 2022 electrical master plan for residential developments within the SS-1 Main (Ferdinand) distribution zone.

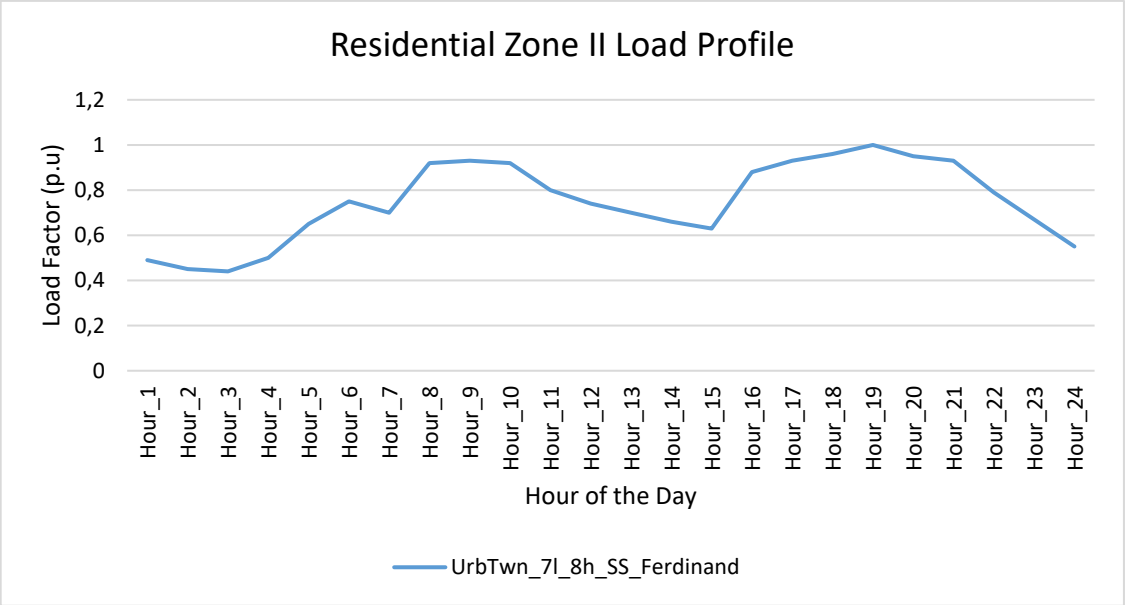


Figure 3: Residential Zone II Load Profile

Residential Zone IV consists of five 100 m^2 apartments with the below load profile.

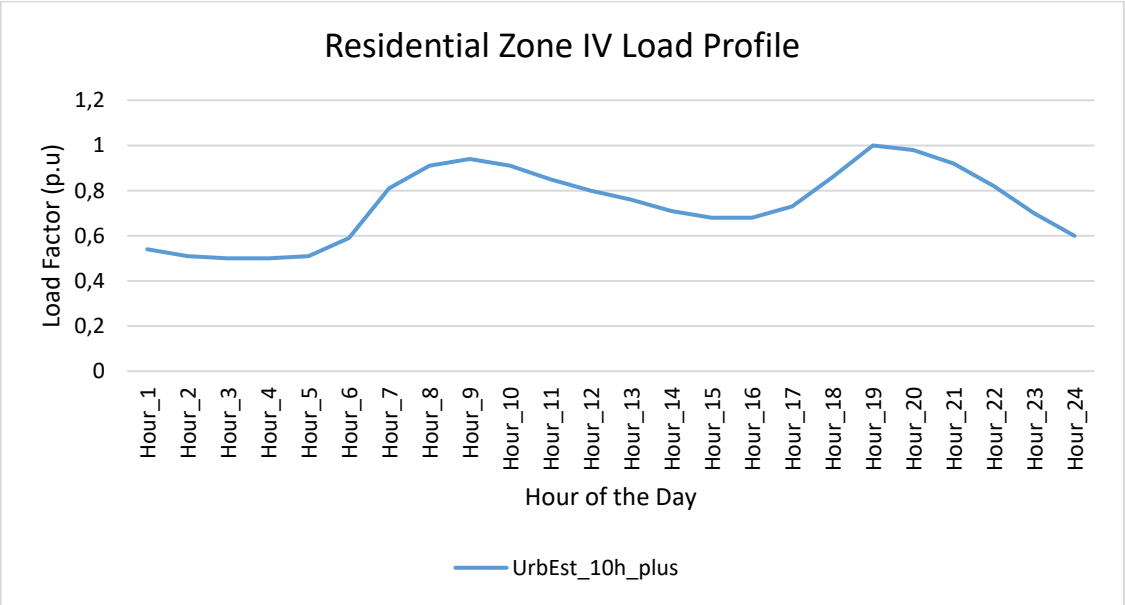


Figure 4: Residential Zone IV Load Profile

The last load profile is for the clubhouse / retail centre within the development. The Commerce/retail load profile is assigned to this portion of the development.

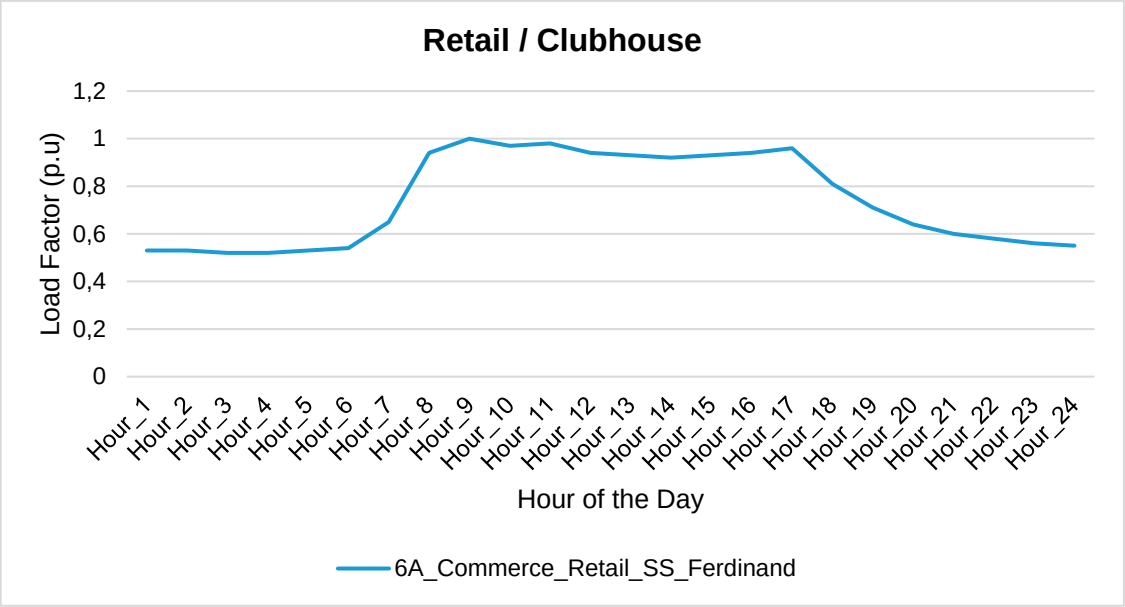


Figure 5: Retail / Clubhouse Load Profile

3. Status Quo Analysis

3.1. Reticulation Network

The Plettenberg Bay area is supplied from SS-1 Ferdinand. The network is mainly configured with interconnected rings made up of underground conductors. The supply area is mainly residential with ring main units switching power supply of the MV reticulation and miniature substations stepping down the 11 kV supply to a 400 V three phase supply that is either directly supplying customers, or in most cases, has the phases further split to provide 230 V low voltage supply to the residents.

Erf 6503: The proposed development is located within the Plettenberg Bay near the N2 & Beacon Way, east of Plettenberg Bay Primary School. The area has the below MV infrastructure:

- 1x 200 kVA miniature substation that is located on Beacon Way, namely, MS-Plett School,
- 1 x RMU located on Beacon Way, namely Checkers Centre
- 1 x RMU located on the N2, namely RMU-National Road no. 2. This RMU supplies PMT-Zondach
- 1x 500 kVA miniature substation, MS-Old Nick Village, that is located on the N2 at the Old Nick Shopping Mall.
- 1 x RMU located on the N2, namely RMU-Old Nick Residence.
- 2 x 500 kVA miniature substation, MS-Baron's View No. 1 and MS-Baron's View No. 2, located on Castelo Branco Avenue.

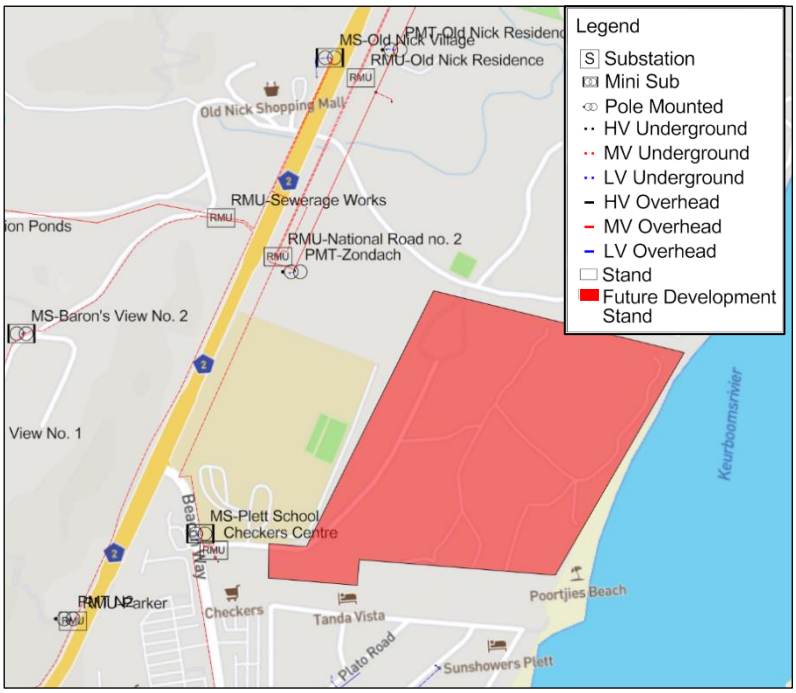


Figure 6: Map Diagram of Erf 6503's surrounding electrical network

The total installed capacity of the transformers within proximity of the proposed development area is 1 700 kVA. The estimated electrical maximum demand for the development is 800 kVA. The existing installed capacity caters for the surrounding residential homes, residential flats, commercial properties, and holiday accommodations. The planning criteria documented in the December 2022 Electrical Master Plan advises that under normal operating conditions, the thermal loading of the transformer should not exceed the nominal manufacturers name plate rating, whilst under contingency conditions, the transformer should not exceed the nominal manufacturers name plate by 20%. Where more than one customer is supplied from a transformer, a project should be initiated when the distribution transformer reaches 80% of its capacity.

A condition assessment was conducted by Lyners and Partners as part of the December 2022 Electrical Master Plan, where the condition of distribution equipment was visually inspected and reported on. Below are the results of the assets from condition assessment conducted on the transformers within the proximity of the proposed development that were allocated a rating of below 3 and require attention from the municipality's side:

Table 2: SS-1 Main Condition assessment

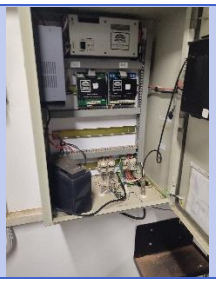
Asset ID	Description	Rating/Type	Location	Comment
32029	SS-Ferdinand (SS-1) Batteries 01		Plettenberg Bay	BTUs and batteries in poor condition. Some batteries standing loose in building on floor.
Images				
				
Asset ID	**Description**	**Rating/Type**	**Location**	**Comment**
?	SS-Ferdinand (SS-1) Switchgears	11kV Oil Circuit Breakers	Plettenberg Bay	Several loose circuit breakers in building (Laying around)
Images				
				
Asset ID	**Description**	**Rating/Type**	**Location**	**Comment**
32034	SS-Ferdinand (SS-1) Telemetry		Plettenberg Bay	various telemetry equipment installed. Not sure if working properly
Images				
				

Table 3: SS-1 Main Yard Condition Assessment

Asset ID	Description	Rating/Type	Location	Comment
32041	SS-Ferdinand (SS-1) Yardstone	Outdoor Substation	Plettenberg Bay	Outdoor equipment appears to not be in use. Vegetation within the yard
Images				

Asset ID	Description	Rating/Type	Location	Comment
16393	MS Dorothea (Old)	200 kVA	Plettenberg Bay	Severe oil leaks and severe corrosion. Many locks are not working or seized
Images				

Overall, the transformers within the proximity of the proposed development are in fair to good condition, and do not require urgent intervention. Continuous maintenance needs to be performed to ensure the longevity of the assets, and further inspections for any sudden changes in condition ratings due to vandalism, faults, environmental impacts etc.

3.2. Main Substation Capacity

The existing Plettenberg Bay town area is part of an 11 kV distribution network and is supplied from two 11 kV MV network feeders from Eskom with adequate capacity.

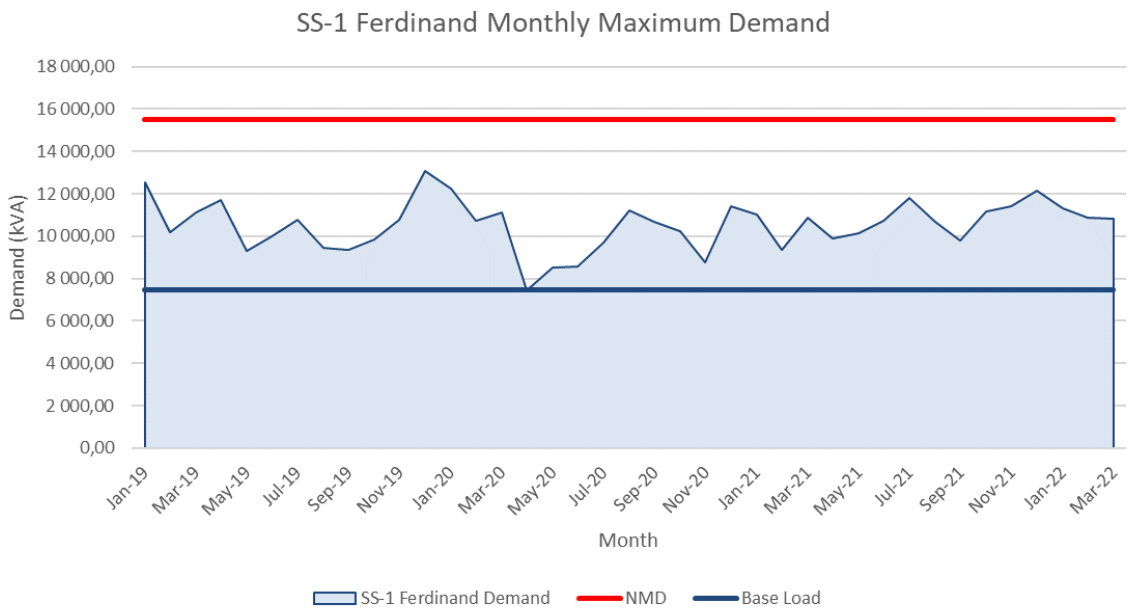


Figure 7: SS-1 Main monthly maximum demand trend

As mentioned previously, currently SS-1 Main has 2x10 MVA 66/11 kV transformers on Eskom portion of the substation. BLM receives its power through two double circuit 185mm^2 XLPE Cu conductors. As illustrated in 5, the loading of the substation is approximately only 48% of the NMD. The NMD of the substation is 15.5 MVA with a base load of 7.4MVA and a maximum demand of around 13MVA as at 2022 that occurred around December 2019 within its distribution zones.

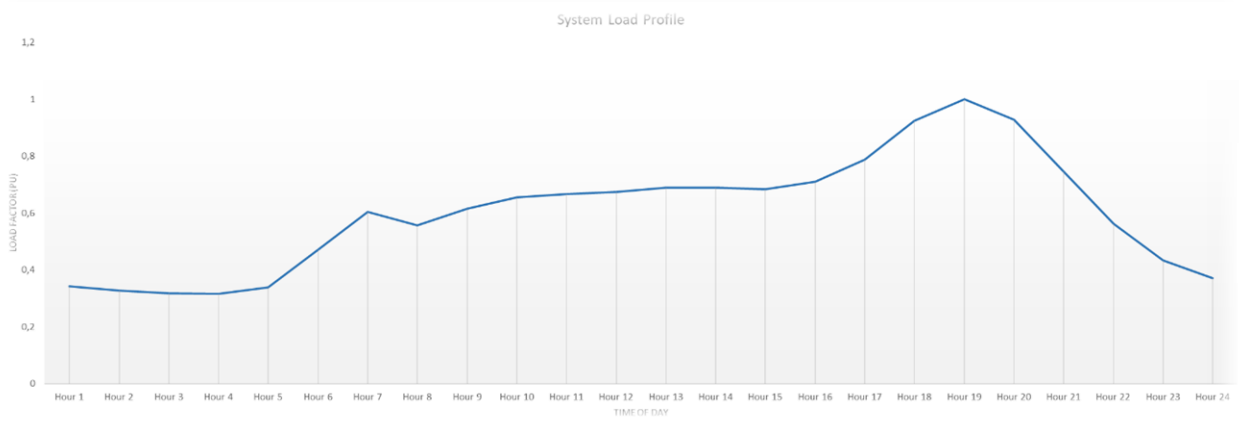


Figure 8: SS-1 Main typical load profile

The NMD is currently sufficient enough to cater for current and future additional load demands. The intake feeders from Eskom's portion of the substation are two double circuit 185mm^2 XLPE Cu conductors. Table *4* shows the installed capacity of the intake feeders.

Table 4: SS-1 Main Intake Feeders Carrying Capacity

Intake Feeder	Conductor Type	Material	Size (mm²)	Voltage (V)	Ampacity	MVA
Feeder 1 (Eskom)	XLPE	Copper	185	11 000	410	**7.81**
Feeder 2 (Eskom)	XLPE	Copper	185	11 000	410	**7.81**

Total Installed Capacity	**15.62**
Total Installed Capacity (Double Circuit)	**31.25**

The carrying capacity of the incoming feeders supplying SS-1 Main is 31.25 MVA with N-1 contingency provision of 15.62 MVA. The incoming feeders from Eskom's substation is a double circuit and dedicated to SS-1 Main. Of the ten outgoing feeders from SS-1 Main, six are 95mm^2 Aluminium PILC underground cables, two are 70mm^2 Copper XLPE underground cables whilst the remaining two are 70mm^2 Aluminium PILC underground cables.

3.3. MV Reticulation Carrying Capacity

Three feeders create ring-feeds encircling SS-Ferdinand and the development. One feeder consists of a 95mm2 Copper PILC underground supply originating from SS-Ferdinand, traversing Castelo Branco Avenue towards MS-The Hill, and further travelling via the N2 towards the development. Another feeder comprises a 70mm2 Copper PILC underground supply starting from SS-Ferdinand, extending towards RMU-Formosa via the N2 and then towards RMU-Sewerage Works, ultimately reaching the development. Additionally, a 95mm2 Copper PILC line extends through the MS-Ferdinand area, serving as a contingency supply route for the development, passing through Rosheen Crescent, Dorothea Avenue, and Beacon Way.

MS-Old Nick Village, located on the N2 near the Old Nick Shopping Mall, is a 500 kVA 11/0.4 kV mini-sub which reticulates power to RMU-National Road no. 2, through 70mm2 Copper PILC conductors, which in turn supplies power to PMT-Zondach through underground and overhead conductors. MS-Plett School is a 200kVA 11kV/400V miniature substation located on Beacon Way near Plettenberg Bay Primary School. Power is reticulated to RMU-Checkers Centre through 95mm^2 Copper PILC conductors. Table 5 shows the carrying capacity of the outgoing feeders from SS-Ferdinand.

Table 5: SS-Ferdinand Outgoing Feeders to Development Area Carrying Capacity

Outgoing Feeder	Conductor Type	Material	Area (mm²)	Voltage (V)	Ampacity	MVA
70mm2 Copper PILC	PILC	Copper	70	11000	207	**3.94**
95mm^2 Copper PILC	PILC	Copper	95	11000	245	**4.68**
Total Installed Feeder Capacity						**8.62**

3.4. Existing Network POC (Point of Connection) Capacities

The proposed development is situated on Beacon Way, the area is supplied by MS-Plett School, MS Old-Nick Village, MS-Strydom and MS-Plato through MV & LV reticulation.

The most preferred POC to supply electricity to the proposed development on Erf 6503 is from a new MV supply from MS-Plett near Beacon Way as highlighted with a black circle on the site plans as shown in Figure 9 and Figure 10.

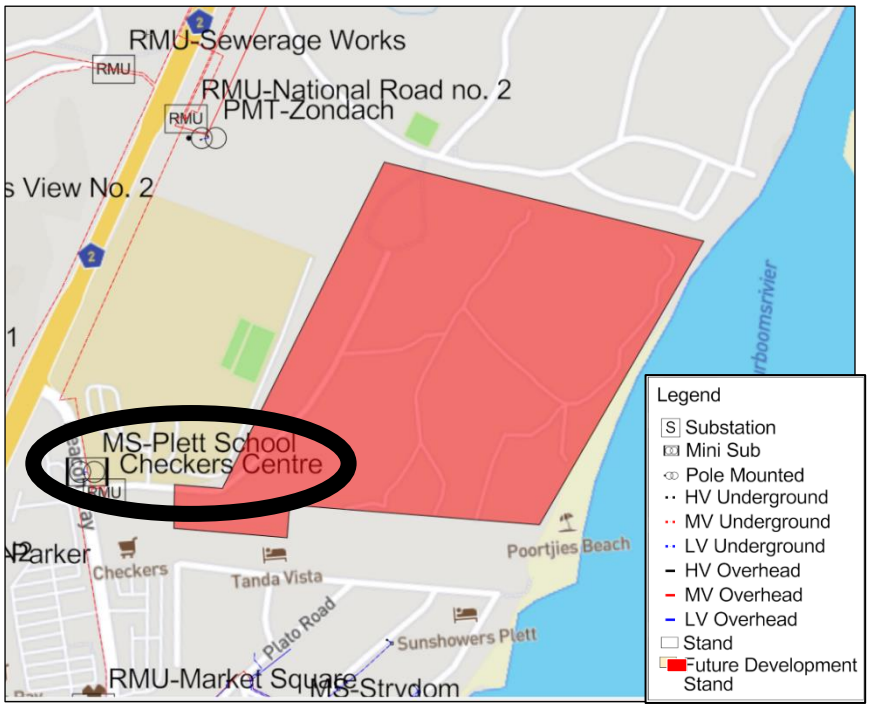


Figure 9: Proposed POC for Erf 6503

Figure 10: Proposed Development POC Location

For a Large Power User (LPU), a dedicated POC is most preferred and recommended for ease of NMD change and load flexibility. This allows the LPU to install the required equipment through a transformer or electrical room for transformation and control.

Bitou Local Municipality's current tariff guideline indicates that any electricity customer requiring a demand higher than 60 kVA or requiring a circuit breaker larger than 100 A should be classified a bulk user. In the case of the proposed development, with an estimated demand of 800 kVA, the development may require its own dedicated MV supply point, however this investigation will look at the possibility of connecting this required capacity on the MV network.

4. MV Supply Point Analysis

The proposed development on Erf 6503 requires a supply point from Bitou Local Municipality to cater for the following load points:

- Residential Zone I
- Residential Zone II
- Residential Zone IV
- Retail / Clubhouse

The above stated amenities are included in the 800 kVA provided by Sutherland Engineers. The simulation of the existing and anticipated load will be conducted at the proposed development estimated peak time of the day. The proposed development is a residential development with various four types of units. With this in mind, four load profiles are allocated based on its landuse type and location.

As part of the electrical masterplan conducted for Bitou Local Municipality, customized load profiles were created based on the customer consumption patterns, and these were compared to the Eskom standard Geospatial Load Forecast profiles. Figure 11 displays the load profiles assigned to the proposed development's zones overlayed on the standard residential flats profile.

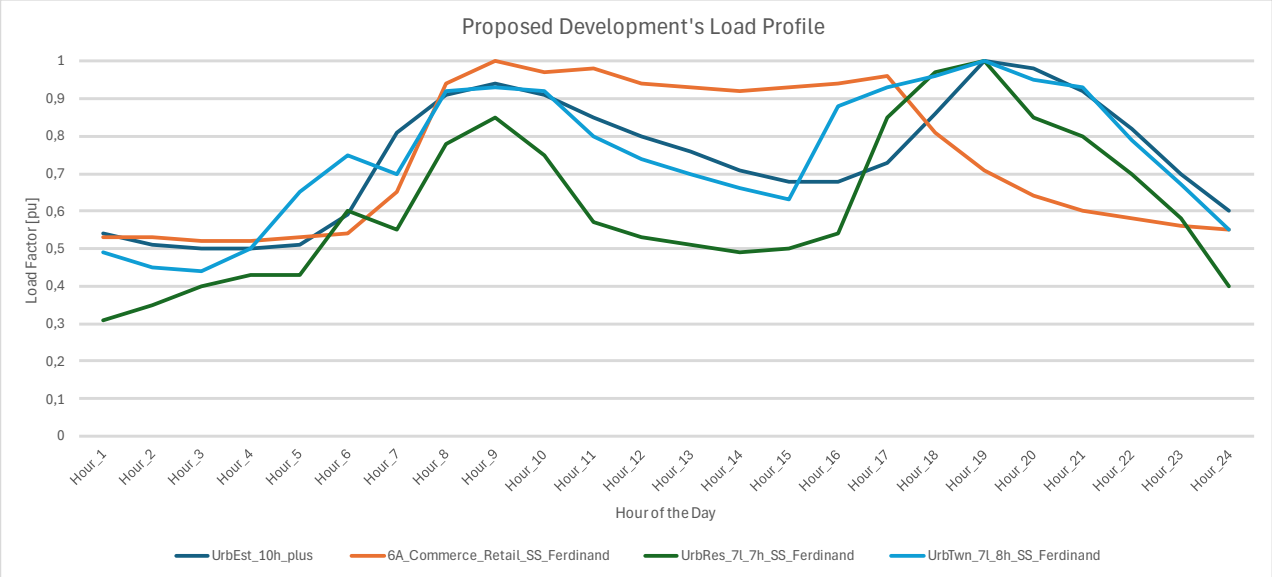


Figure 11: SS-1 Main (Ferdinand) residential flats load profile

The daily load profiles were computed in the SS-1 Ferdinand distribution zone. The peak hour is 19:00 in the evening as per the consolidated load profile.

Based on the existing feeders within SS-1 Main, the proposed development can be supplied electricity from three routes via SS-Ferdinand. To assess the performance of the existing network state within the study area (Plettenberg Bay), GLS analysed the network via simulations using Edisan power systems simulation software. Based on the feeder routes, the following Table 6 shows the loading

and voltage results for the different portions of the feeder:

Table 6: Existing MV Feeder simulation results

From	To	Conductor Type	Length (m)	Nominal Voltage (kV)	Current Rating (A)	Current Loading (A)	Conductor Loading (%)	Voltage (p,u)
PMT N2	**RMU-Sewerage Works**	70mm2 Cu PILC 3Core	759,94	11	207	33,51	16%	0,997
Plettenberg Bay, RMU-Formosa	**PMT N2**	70mm2 Cu PILC 3Core	643,12	11	207	33,60	16%	0,998
SS-1 Ferdinand	**MS-The Hill**	95mm2 Cu PILC 3Core	566,28	11	245	42,63	17%	0,998
RMU-National Road no, 2	**MS-Plett School**	95mm2 Cu PILC 3Core	510,36	11	245	10,39	4%	0,992
MS-The Hill	**MS-Baron's View No,1**	95mm2 Cu PILC 3Core	485,28	11	245	39,17	16%	0,997
MS-Old Nick Village	**RMU-National Road no, 2**	70mm2 Cu PILC 3Core	405,98	11	207	70,45	34%	0,994
MS-Baron's View No,2	**RMU-Sewerage Works**	95mm2 Cu PILC 3Core	393,99	11	245	36,80	15%	0,996
RMU-Sewerage Works	**MS-Old Nick Village**	70mm2 Cu PILC 3Core	366,66	11	207	70,45	34%	0,994
RMU-Market Square	**Checkers Centre**	95mm2 Cu PILC 3Core	332,39	11	245	3,38	1%	0,992
SS-1 Ferdinand	**Plettenberg Bay, RMU-Formosa**	70mm2 Cu PILC 3Core	309,59	11	245	35,53	15%	0,998
SS-Dorothea (SS-4)	**RMU-Market Square**	95mm2 Cu PILC 3Core	288,33	11	245	26,56	11%	0,992
MS-Baron's View No,1	**MS-Baron's View No,2**	95mm2 Cu PILC 3Core	270,88	11	245	37,17	15%	0,996
MS-Rosheen	**MS-Dorothea (200kVA)**	70mm2 Cu PILC 3Core	236,32	11	207	83,78	40%	0,995
MS-Dorothea (200kVA)	**MS-Dorothea**	95mm2 Al PILC 3Core	121,53	11	174	79,54	46%	0,993
MS-Dorothea	**SS-Dorothea (SS-4)**	95mm2 Cu PILC 3Core	119,57	11	245	78,73	32%	0,993
MS-Plett School	**Checkers Centre**	95mm2 Cu PILC 3Core	47,35	11	245	4,05	2%	0,992

Based on the results, the MV conductors (from SS-1 Ferdinand towards the proposed development) are loaded well below 80%. This means there is sufficient feeder capacity to supply the proposed development on Erf 6503. According to NRS 048-2, the acceptable voltage per unit (p.u) for an 11 kV rated system should be between 0.95 p.u. to 1.05 p.u. under normal operating conditions. The feeder voltage (for the segments) is within the stipulated limits. This also confirms that the feeder is neither constrained nor compromised to cater for proposed load. Based on the results under Table 6, the proposed development can be connected along this feeder. The next section details customer connection methodology and results.

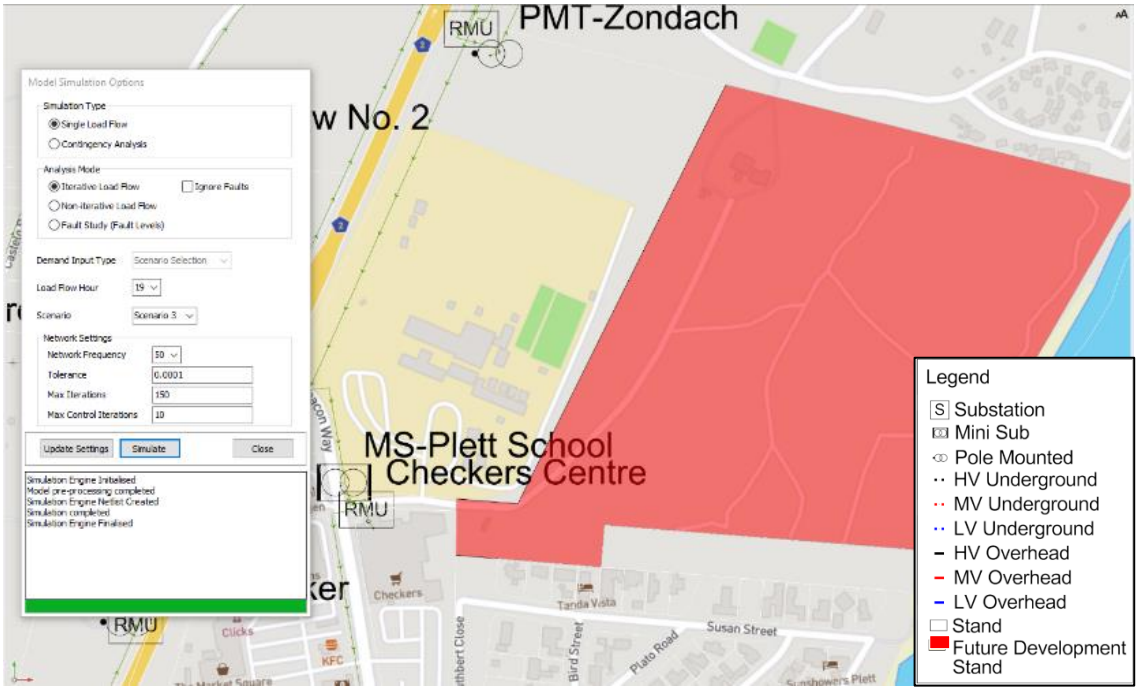


Figure 12: Existing Feeder Loading Loadflow Simulation

Simulations

The estimated load size at Erf 6503 is 800kVA being requested and thus falling within the bulk metering requirements. The proposed connection was formulated for simulation as described below:

- Dedicated MV supply from a new metering unit

The municipality has full access to the Point of Connection (POC).

4.1. Dedicated MV Supply from a new metering unit

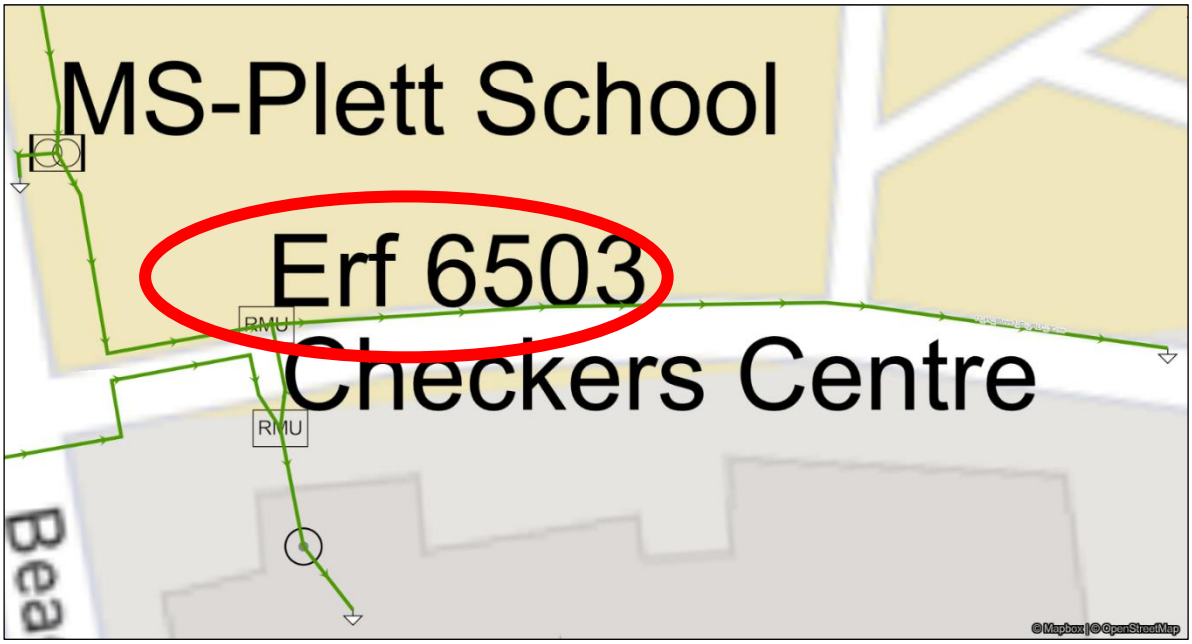


Figure 13: RMU – Erf 6503 Supply Point

The proposed development's load is supplied from a new metering unit, named Erf 6503, as shown in the red circle in Figure 13 above. The municipality will provide electricity to the customer via the 11kV bus. The additional demand provided by the proposed development was added to the existing demand to simulate the impact on the conductors supplying the area.

Table 7 shows the simulation results:

Table 7: MV Feeder Loading Results

From	To	Conductor Type	Length (m)	Nominal Voltage (kV)	Current Rating (A)	Current Loading (A)	Conductor Loading (%)	Voltage (p,u)
PMT N2	**RMU-Sewerage Works**	70mm2 Cu PILC 3Core	759,94	11	207	52,51	25%	0,996
SS-1 Ferdinand	**Cable Joint**		693,93	11	245	132,02	54%	0,998
Plettenberg Bay, RMU-Formosa	**PMT N2**	70mm2 Cu PILC 3Core	643,12	11	207	52,65	25%	0,997
SS-1 Ferdinand	**MS-The Hill**	95mm2 Cu PILC 3Core	566,28	11	245	64,88	26%	0,998
RMU-National Road no, 2	**MS-Plett School**	95mm2 Cu PILC 3Core	510,36	11	245	51,38	21%	0,990
MS-The Hill	**MS-Baron's View No,1**	95mm2 Cu PILC 3Core	485,28	11	245	61,26	25%	0,997
MS-Old Nick Village	**RMU-National Road no, 2**	70mm2 Cu PILC 3Core	405,98	11	207	111,28	54%	0,992
MS-Baron's View No,2	**RMU-Sewerage Works**	95mm2 Cu PILC 3Core	393,99	11	245	58,80	24%	0,995
RMU-Sewerage Works	**MS-Old Nick Village**	70mm2 Cu PILC 3Core	366,66	11	207	111,28	54%	0,992
RMU-Market Square	**Checkers Centre**	95mm2 Cu PILC 3Core	332,39	11	245	49,83	20%	0,989
SS-1 Ferdinand	**Plettenberg Bay, RMU-Formosa**	70mm2 Cu PILC 3Core	309,60	11	207	54,64	26%	0,998
SS-Dorothea (SS-4)	**RMU-Market Square**	95mm2 Cu PILC 3Core	288,33	11	245	72,32	30%	0,989
MS-Baron's View No,1	**MS-Baron's View No,2**	95mm2 Cu PILC 3Core	270,88	11	245	59,22	24%	0,996
Cable Joint	**MS-Rosheen**	70mm2 Cu PILC 3Core	261,25	11	207	132,10	64%	0,995
MS-Rosheen	**MS-Dorothea (200kVA)**	70mm2 Cu PILC 3Core	236,32	11	207	127,14	61%	0,993
MS-Dorothea (200kVA)	**MS-Dorothea**	95mm2 Al PILC 3Core	121,53	11	174	122,84	71%	0,992
MS-Dorothea	**SS-Dorothea (SS-4)**	95mm2 Cu PILC 3Core	119,57	11	245	122,02	50%	0,991
MS-Plett School	**Erf 6503**	95mm2 Cu PILC 3Core	47,35	11	245	47,30	19%	0,989
Erf 6503	**Checkers Centre**	95mm2 Cu PILC 3Core	10,95	11	245	49,17	20%	0,989

The MV reticulation can easily carry this additional load presented by the proposed development. All the conductors' voltages and thermal loading fall within the prescribed limits.

The contingency for this scenario would be the loss of the feeder from SS-Ferdinand towards MS - The Hill. In this case, an alternative supply comes from the 70mm2 Cu PILC conductor connected to Plettenberg Bay, RMU-Formosa.

Table 8: Feeder Loading Results under N-1 contingency

From	To	Conductor Type	Length (m)	Nominal Voltage (kV)	Current Rating (A)	Current Loading (A)	Conductor Loading (%)	Voltage (p,u)
PMT N2	**RMU-Sewerage Works**	70mm2 Cu PILC 3Core	759,94	11	207	50,92	25%	0,996
SS-1 Ferdinand	**Cable Joint**	95mm2 Cu PILC 3Core	693,93	11	245	110,87	45%	0,998
Plettenberg Bay, RMU-Formosa	**PMT N2**	70mm2 Cu PILC 3Core	643,12	11	207	51,07	25%	0,997
SS-1 Ferdinand	**Breaker**	95mm2 Cu PILC 3Core	559,30	11	245	88,65	36%	0,998
RMU-National Road no, 2	**MS-Plett School**	95mm2 Cu PILC 3Core	510,36	11	245	73,16	30%	0,990
MS-The Hill	**MS-Baron's View No,1**	95mm2 Cu PILC 3Core	485,28	11	245	3,79	2%	0,997
MS-Old Nick Village	**RMU-National Road no, 2**	70mm2 Cu PILC 3Core	405,98	11	207	44,76	22%	0,992
RMU-Sewerage Works	**MS-Baron's View No,2**	95mm2 Cu PILC 3Core	393,99	11	245	6,28	3%	0,995
RMU-Sewerage Works	**MS-Old Nick Village**	70mm2 Cu PILC 3Core	366,66	11	207	44,76	22%	0,992
RMU-Market Square	**Checkers Centre**	95mm2 Cu PILC 3Core	332,39	11	245	30,92	13%	0,989
SS-1 Ferdinand	**Plettenberg Bay, RMU-Formosa**	70mm2 Cu PILC 3Core	309,60	11	207	53,08	26%	0,998
SS-Dorothea (SS-4)	**RMU-Market Square**	95mm2 Cu PILC 3Core	288,33	11	245	51,73	21%	0,989
MS-Baron's View No,1	**MS-Baron's View No,2**	95mm2 Cu PILC 3Core	270,88	11	245	5,81	2%	0,996
Cable Joint	**MS-Rosheen**	70mm2 Cu PILC 3Core	261,25	11	207	110,93	54%	0,995
MS-Rosheen	**MS-Dorothea (200kVA)**	70mm2 Cu PILC 3Core	236,32	11	207	105,97	51%	0,993
MS-Dorothea (200kVA)	**MS-Dorothea**	95mm2 Al PILC 3Core	121,53	11	174	101,69	58%	0,992
MS-Dorothea	**SS-Dorothea (SS-4)**	95mm2 Cu PILC 3Core	119,57	11	245	100,87	41%	0,991
MS-Plett School	**Erf 6503**	95mm2 Cu PILC 3Core	36,4	11	245	68,73	28%	0,989
Erf 6503	**Checkers Centre**	95mm2 Cu PILC 3Core	10,95	11	245	30,29	12%	0,989
Breaker	**MS-The Hill**	95mm2 Cu PILC 3Core	4,23	11	245	0,00	0%	0,990

Under N-1 contingency, Erf 6503 still receives supply from the MS-Plett side, having now been supplied through the ring main unit at Formosa instead of through the mini-sub at The Hill. The impact of the contingency scenario is the higher current loading on the remaining operating feeders surrounding the development, but none of these feeders have their thermal loading exceeded. In terms of voltage regulation, there is no significant voltage drop than when operating in normal conditions and is therefore still within the prescribed limits.

The preferred connection point for the developers is at a new metering unit from the MV side, as the developer would be supplied at 11kV. It is also worth noting that the development's preferred POC will have sufficient contingency in case of a line loss.

5. Implementation of Master Plan

As per Bitou Network Master Plan, the following upgrades to the existing bulk supply system from the SS-1 Main upgrade have been considered and analysed:

Bulk supply upgrades

- SS-1 Main: Completion of the additional 66/11kV 20MVA power transformer to add firm capacity.

This was proposed to accommodate future development areas within the existing distribution zone where the proposed development is situated and offer firm capacity to ensure reliability.

- SS-1 Ferdinand 11kV intake

According to the Master Plan, the projected demand is anticipated to surpass the current NMD by the year 2032. The intake point for the network is supplied by an Eskom substation, which is located adjacent to SS-1 Ferdinand. This substation is equipped with two transformers, each with a capacity of 10 MVA.

To address the upcoming demand increase, an additional 20MVA 66/11kV transformer is scheduled for installation in SS-1 Ferdinand in 2025. In the following year, 2026, the substation's NMD will be increased to 20MVA. By 2027, it is proposed that the substation's NMD should be further increased to 25MVA. Finally, by 2032, an additional 10MVA transformer should be installed in SS-1 to ensure the substation does not exceed its installed capacity.

SS-1 Ferdinand substation will see the installation of new 11kV circuit breakers in 2025. For 2027, the proposed projects include upgrading the 800A rated busbars of nine 11kV circuit breakers to 1200A rated busbars in SS-1 Ferdinand.

MV reticulation upgrades

In 2024, there is a plan to replace the miniature substation (MS) Dorothea, which is currently facing severe corrosion and oil leaks, with a new 315 kVA MS.

In 2025, several key projects are proposed to improve reliability and capacity. The RMU at National Road No.2 will be replaced with a new 11kV 3-Way RMU, featuring a metering unit, to address severe corrosion and control panel issues.

These implementations were proposed to accommodate future development areas within the existing distribution zone where the proposed development is situated and offer firm capacity to ensure reliability. The Capital Cost Schedule extracted from the 2022 Electrical Masterplan is displayed in Appendix C.

6. Development Schedule

An estimate draft quotation for the augmentation fees payable by the developer will need to be provided. The fee for this proposed development will need to be based on an amended maximum demand of 800 kVA. GLS estimates the augmentation fee for additional kVA demand to be established as per the calculation below. It is important to note that the final quotation and amount for an augmentation fee will be provided by the municipality once the application has been made to the Project Management Unit (PMU) department. A formal costing will be provided by the municipality. The Previous Agreed Notified demand for the Erf will be confirmed by the municipality.

Parameters:

- New Notified Demand = 800 kVA

- ERU = 10.35 kVA
- N.F = 0.5
- D.F = 0.3
- Augmentation Fees (ERU) = R24 345.90 (Price from BLM Tariff Book as of December 2023)

$$Augmentation\ fee = \frac{\text{Required kVAxN. F x Augmentation Fee (ERU)}}{\text{ERU x D. F}} = \frac{(800)\text{x}0.5\text{x}24\ 345.90}{10.35\text{x}0.3}$$

$$Augmentation\ fee = \text{R3 136 347,826 VAT exclusive}$$

Equation 1: Augmentation fee calculation

This cost naturally does not include the infrastructure required to create the supply point for the proposed development. The quotation will be clear in noting that the applicant's electrician must supply all material and labour required for the complete installation of the service, including, where needed a mini-substation, metering unit, RMU cabling etc.

The proposed development, currently undergoing a rezoning application, is planned on Erf 6503 with a total site area of 19,1129 hectares. The zoning and landuse is classed as Residential. The development will consist of 42 residential units and a clubhouse. Total estimated demand for this entire development is sighted at 800kVA.

The proposed development may make allowances for the individual erven owners to install small-scale embedded generation (SSEG) technology as an additional alternative source. The developer and property owners should be aware of the current SSEG policy and should ensure that the SSEG installation is registered with the municipality. The system will abide by the necessary technical criteria before the installation commences. The potential SSEG installation may reduce the likelihood of any additional loading on the existing network infrastructure.

7. CONCLUSION

The erven identified for the development is situated on land within the Plettenberg Bay area. The network around the erven is currently mainly supplied by SS-1 Ferdinand, which is the substation supplying electricity to Plettenberg Bay town area. SS-1 Ferdinand currently has enough capacity to carry the additional 800 kVA maximum demand brought by the proposed development on Erf 6503. The MV feeders supplying the surrounding area have sufficient capacity to carry the additional demand at the proposed development.

The recommended solution is to supply electricity at the proposed development on Erf 6503 through an MV busbar connection to a new metering unit near Beacon Way with sufficient N-1 contingency.

Capital projects recommended in the Electrical Masterplan conducted in 2022 are recommended to ensure reliable provision of services to customers in Bitou Local Municipality residing within the study area.

In the event of installation of small-scale embedded generation (SSEG) at the development, the SSEG system should be registered with the municipality, and the metering unit should include a bi-directional meter.

The developer will bear the costs of connecting to the existing MV connections and necessary Augmentation Fees. The network supplying the proposed area has not been experiencing major trips, recurring failures, or power interruptions due to overloading.

The developer of Erf 6503 in Plettenberg Bay will be liable for the payment of a Development Contribution (as calculated by Bitou Local Municipality) for bulk electricity infrastructure as per Council

Policy. Also, find attached hereto Appendix A which includes general notes from Bitou Local Municipality regarding development approvals and conditions.

We trust you find this of value.

Yours sincerely

GLS CONSULTING (PTY) LTD

REG. NO.: 2007/003039/07

Per: T.K. MOKOENA

cc. Sutherland Engineers
2A Nautica Building,
The Water Club,
Beach Road,
Granger Bay,
8005

Attention: Mr Jonathan Edwards

APPENDIX A: General Notes from Bitou Local Municipality attached to GLS Bulk Electricity Services Capacity Report

1. The GLS report is a services capacity report and the costs estimated in this report are only approximate values applicable at the time of the study.
2. Should the development be approved by Council the approval will be linked to certain development conditions. These conditions will be the official conditions applicable to the project and will take precedence over this report. Once approval is granted, Council will enter into a formal services agreement with the developer.
3. Costs for any network upgrades, etc, presented in the GLS report could change from time to time due to escalation, new tariff structures, additional requirements etc.
4. The Developer may be liable to pay a Development Contribution as per Council policy. The value payable will be calculated using Bitou Local Municipality's Development Contribution Calculator.
5. The Development Contribution monies are calculated according to the approved Council Policy at the time of payment.
6. The Development Contribution monies are payable before the approval of the building plan certificate or final approval of the subdivision for the transfer of units will be issued, as applicable for the type of development.
7. Where servitudes are required, all the costs and arrangements therefore will be for the developer's account.
8. The developer will be solely responsible for the cost of the link services as identified in the GLS report. The developer will also be responsible for the costs of upgrading to the minimum requirements of the services as identified in the GLS report. These costs may however be offset against the Development Contribution monies payable.
9. The above conditions are subject to any approved Council policies, which may be amended from time to time.

APPENDIX B: Planning Criteria extract from Bitou Local Municipality Electrical Master Plan

The Bitou Local Municipality Electrical Master plan lists a set of planning criteria which are guided by the standard electricity network installations and the relevant guidelines. These guidelines include The Network Code within the South African Grid Code; The Electricity Regulations Act and the Distribution Code. The NRS 048-2 also provides utilities with compatibility levels for reporting power quality. The planning criteria are used to assess network capacity and determine the need for and timing of network expansion, reinforcement, or re-configuration. It also was noted that there are non-negotiable regulations that all electricity users and distributors shall comply with. The following items from the planning criteria was extracted for which this proposed development will abide by:

- Equipment Loading
- Voltage regulation and selection
- Network Protection
- Network Fault Level

Equipment Loading

No electrical equipment shall be loaded above its designed rating under normal network configurations. Exception can be made for temporary abnormal conditions.

Transformers

Under normal conditions, the thermal loading of the transformers should not exceed the nominal manufacturer's name plate rating. In the case where more than one customer is supplied from a transformer, a project should be initiated when the distribution transformer reaches 80% of its capacity. For cases where the distribution supplies a single customer, the planner should inform the customer when the transformer reaches 80% of its capacity.

For each class of transformer, general limitations on current and temperature are recommended as listed in IEC354 Loading Guide for Oil-Immersed Transformers. These values provide a broad "operating envelope" which may be greatly affected by the following:

- Load Profile (Duration and Peak)
- Ambient Conditions
- Assumption of transformer thermal characteristics
- Voltage limitations
- Capability of transformer accessories

It is thus recommended that the nameplate thermal rating is used for planning purposes. Once a specific transformer approaches its nameplate thermal loading limits, an informed decision, backed by physical measurements and sample tests, should be made with regard to the upgrade strategy.

Switchgear

Normal manufacturer's name plate rating.

Overhead Lines

Under normal operating condition, the thermal loading of the overhead line should not exceed the nominal manufacturer's name plate rating. The overhead line rating based ambient temperature under normal conditions is 75 °C and 90 °C under contingency conditions. The planner should initiate a project when the thermal loading on the line reaches 100% of its normal condition rating.

Under contingencies (emergency), the overhead line rating based ambient temperature is 90 °C. The

thermal loading of the overhead line should not exceed its emergency rating. For high temperature conductors, the temperature under contingency conditions is 180 °C.

Cables

Normal cyclic rating, with maximum operating temperatures of 90 °C for XLPE cables; 70 °C for 11kV paper insulated cables.

Under normal operating conditions, the thermal loading of the cable should not exceed the nominal manufacturer's name plate rating. The planner should initiate a project when the thermal loading on the line reaches 100% of its normal condition rating.

Under contingencies (emergency), the thermal loading of the overhead line should not exceed its emergency rating.

Voltage Regulation and Selection

The steady-state criteria apply to the normal continuous behavior of a network and cover post – disturbance behavior once the network has settled. When planning a network, it is necessary to access the reactive power requirements under light and heavy load to ensure that the reactive demand placed on supply infrastructure, be it to absorb or generate reactive power, and does not exceed the capability of the supply source.

As per the section 3.4, the NRS 048 – Quality of Supply provides us with the voltage regulation as below:

- For voltages <500 V the standard voltage is 400 V three phase or 230 V single phase.
- For voltages >500 V the standard voltage is the declared voltage.

For all LV supplies <500 V Bitou LM needs to provide a standard voltage of 400/230 V, with a maximum variation ±5%. Older 380/220 V contracts are no longer valid and do not need to be enforced.

For any system voltage ≥ 500 V, the supply voltage shall not deviate from the declared voltage by more than 5% for any period longer than 10 consecutive minutes, the network shall be designed to achieve a continuous network voltage at a user's connection not exceeding the design limit 105% of nominal and falling below 95% of nominal voltage during normal and maintenance conditions.

For any system voltage < 500 V, the supply voltage shall not deviate from declared voltage by more than 10% for any period longer than 10 consecutive minutes.

Table 9: Steady-State Voltage Regulation Limits

Voltage Level [V]	Compatibility Level [%]
Voltage < 500V	±10%
Voltage ≥ 500V	±5%

Network Protection

The network shall be adequately protected via standard protection philosophies to protect equipment as well as personal safety of staff.

Network Fault Level

For safety reasons, the fault rating of any equipment shall not be less than the fault level in that part

of the network at any time and for any normal network configuration. The maximum fault levels on Bitou Local Municipality networks depend on the network and substation configuration and the upstream fault level.

Table 10: Fault Levels Limits

Voltage Level [kV]	Fault Level Limits [kA]
66	25
22	25
11	25

Equipment owned by the Bitou Local Municipality are designed to withstand these fault levels for 1 second. Depending on the new configuration of the network the above fault levels might change. A fault level analysis check should be done to re-adjust the fault level. Projects should be initiated where the fault current level exceeds 90% of the fault current level rating of equipment.

APPENDIX C: Electrical Masterplan Capital Cost Schedule:

Table 11: Estimate Network Development Capital Cost from the 2022 Electrical Master Plan

Priority	Substation Area	Project Description	Type	Category	Project Details	Total Cost (xR1000)
2023	Plettenberg Bay	Replace Battery Units	Substation Batteries	Refurbishment	Refurbish the protection back up battery storage units in SS-1 Ferdinand	**547,18**
2024	Plettenberg Bay	Replace Transformer	Transformer	Reliability	Replace the auxiliary transformer in SS-2 Kloof with a new 500 kVA transformer	**681,04**
2024	Plettenberg Bay	Replace Miniature Substation	Mini Substation	Reliability	Replace MS Dorothea (Old) with a new 315 kVA MS (severe corrosion, severe oil leaks)	**771,83**
2025	Plettenberg Bay	Replace Transformer	Transformer	Reliability	Replace PMT Old Nick Residence with a new 16 kVA PMT (Corrosion, possible oil leaks, single phase transformer)	**24,86**
2025	Plettenberg Bay	SS-1 Ferdinand	Install Switchgear	Switchgear	New 11kV circuit breakers at SS-Ferdinand (SS-1).	**1 613,93**
2025	Plettenberg Bay	Replace Ring Main Unit	RMU	Reliability	Replace RMU National Road No.2 with a new 11kV 3-Way RMU with a metering unit (Severely corroded, signs of oil spillage, control panel cover/hinges broken. 5-Way on drawings)	**468,62**
2025	Plettenberg Bay	Replace Metering Unit	Metering Unit	Reliability	Replace RMU Checkers metering unit (RMU not in use, cables jointed directly together, meter offline)	**192,61**
2026	Plettenberg Bay	SS-1 Ferdinand	Install Switchgear	Switchgear	Replace existing 5 x 11kV oil type circuit breakers with new 5x 11kV SF6/vacuum type circuit breakers.	**4 034,84**
2027	Plettenberg Bay	SS-1 Ferdinand	Install Switchgear	Switchgear	Upgrading 800A rated busbars of 9 x 11kV circuit breakers to 1200A rated busbars (SS-1)	**7 262,70**
2026	Plettenberg Bay	SS-1 Ferdinand	Additional Transformer	Transformer	Install additional 20MVA 66/11kV transformer in 2025	**10 646,36**
2027	Plettenberg Bay	SS-1 Ferdinand	Increase NMD	Substation	Increase the substation NMD to 20MVA in 2026	**-**

(* Including P & G, Contingencies and Fees, but excluding VAT - Year 2022/23 Rand Value. This is a rough estimate, which does not include major unforeseen cost)

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to be the best together

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Supp.: Electrical: Planning (044-5013267)

16 May 2024

ERF 6503
Plettenberg Bay
6600

Erf: 6503

Estimated Cost for 800 kVA New Development Application

Required kVA	=	800.00 kVA
ERU		10.35kVA
N.F		0.5
D.F		0.3
Augmentation Fees (per ERU)		24 345.90

1. Augmentation fee

$$= \frac{800 \times 0.5 \times 24\,345.90}{10.35 \times 0.3}$$

= R 3 136 347.83 Excl. VAT
= R 3 606 800.00 Incl. VAT

2. Labour fee = R 990.22 Incl. VAT

3. Connection Fee = R 1 175.90 Excl. VAT
= R 1 352.29 Inc. VAT

Total = R 3 606 800.00 + R 990.22 + R 1 352.29= **R 3 609 142.51 Incl. VAT**

Please note:

Applicant's Electrician must supply all Material and Labour required for the complete installation of the electrical service, including a Mini-Substation, Metering Unit, RMU, Cabling etc

Kindly submit this estimated cost document to the Enquiries Office at Finance Department upon acceptance and when doing the required payment.

This estimated cost is valid up to 30 June 2024. Beyond that, a new application will have to be submitted. Please note that this cost does not include the deposit for the Municipal account.

Pay at Finance Department in Melville's Corner or Via EFT by searching for Bitou Municipality under registered accounts in your Banking App, use the Reference numbers below, and send back proof of payment.

Description	**Reference Number**	**Amount**
Augmentation Fee	20220714035446	R Incl. VAT
Connection Fee	20200629985000	R Incl. VAT
Labour Fee	20200629984997	R Incl. VAT
Bulk Meter and Keypad Fee	20200629984997	R Incl. VAT

Applicant's electrician is required to do the complete electrical service under the Municipal supervisor. A permit will be issued by the supervisor for this work. A copy of a valid COC must be provided to supervisor prior to switching on the power.

Yours Sincerely

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M.J. Rhode (Manager: Electrical and Energy Division)