New Feeder from Glenella to Planella

Business Case

2 February 2024

ERGON ENERGY NETWORK

Part of Energy Queensland

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DOCUMENT VERSION

Version Number	Change Detail	Date	Updated by
1.0	Review	08/12/2023	Principal Planning Engineer
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3.0	Approved	13/12/2023	General Manager Grid Planning

RELATED DOCUMENTS

Document Date	Document Name	Document Type
20/05/2022	Safety Net Application Guideline	EQL Standard

1 SUMMARY

Title	New Feeder from Glenella to Planella
DNSP	Ergon Energy - Network
Expenditure category	☐ Replacement ☒ Augmentation ☐ Connections ☐ Non-Network
Identified need	☒ Legislation ☒ Regulatory compliance ☒ Reliability ☐ CECV ☐ Safety ☐ Environment ☐ Financial ☐ Other Planella 33/11kV substation (PLANSS) supplies over 6,492 premises and a maximum combined load of around 20MVA. PLANSS is supplied by a single radial 33kV feeder rated at 23MVA. Load is forecast to exceed this rating by 2031 under a medium growth scenario. Following a credible contingency on the 33kV feeder supplying PLANSS there is no alternate 33kV supply. Following a credible contingency to one transformer at PLANSS the emergency rating of the remaining transformer is limited to 13.3MVA. For either contingency, the unsupplied load and restoration timeframes do not comply with minimum Safety Net criteria stipulated in the Distribution Authority for the DNSP from 2030 onwards under a medium growth scenario. Continued operation of the existing network supplying PLANSS results in increased organisational exposure to non-compliance with its Distribution Authority, and increased exposure of the Northern Mackay community to prolonged and widespread power outages.
Summary of preferred option	All feasible network options have been identified and assessed. NPV analysis with various sensitivities have been applied to identify the most cost-effective option. The least NPV option is to replace existing radial 33kV feeder F422 between North Mackay zone substation and Planella zone substation with dual circuit 66kV feeder from Glenella bulk supply substation and replace two transformers at PLANSS.
Expenditure	See table below
Benefits	The primary benefit is restoration of compliance with minimum network security criteria stipulated in the Distribution Authority for the DNSP.

Year	Previous period	2025-26	2026-27	2027-28	2028-29	2029-30	2025-30
$k, direct 2022/23	-	$2,321	$620	$11,826	$6,681	$4,365	$25,813

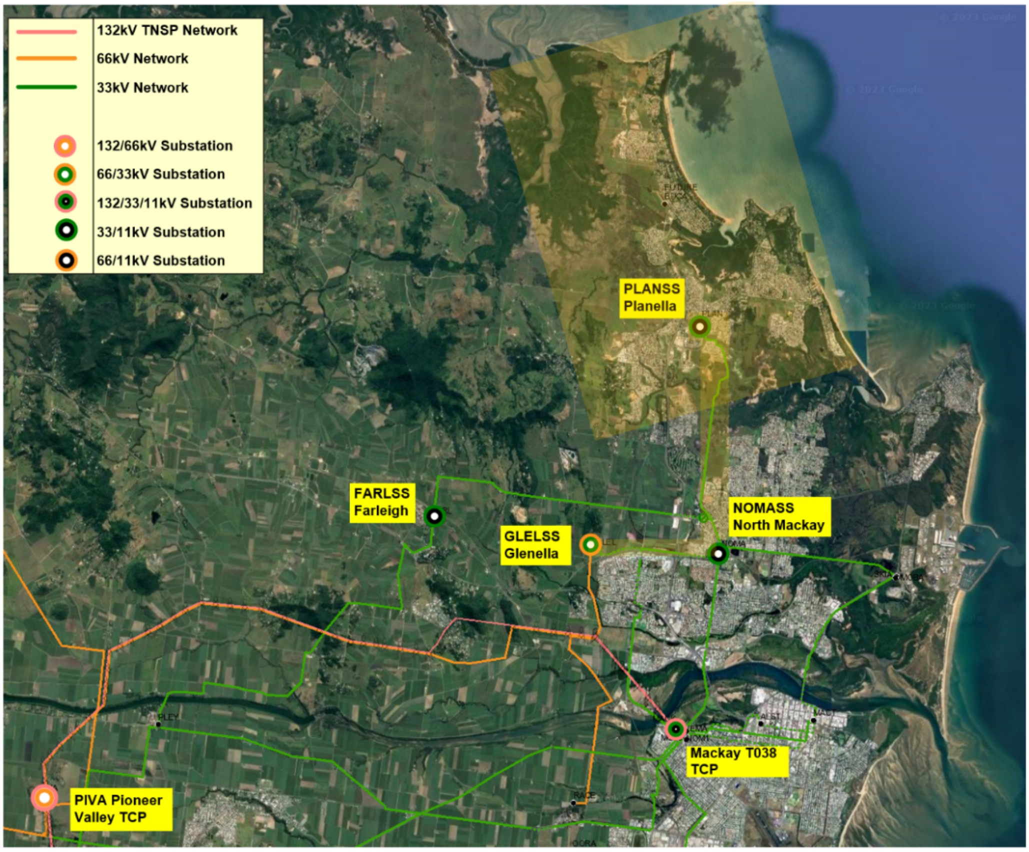
2 BACKGROUND

2.1 Community Supply and Network Arrangement

The Mackay Region, Queensland, Australia is home to over 125,000 people, supports 55,000 jobs and has an annual economic output of $22.3 billion[1]. Planella 33/11kV zone substation (PLANSS) supplies the Northern Beaches district which is the primary residential growth area for Mackay under the Mackay Council's planning schemes. The population of the district was 19,893 people in 2021, projected to grow to 28,237 people by 2036. The power supply to the area is via 11kV distribution from PLANSS servicing 6,492 premises with a maximum combined load of around 20MVA at present.

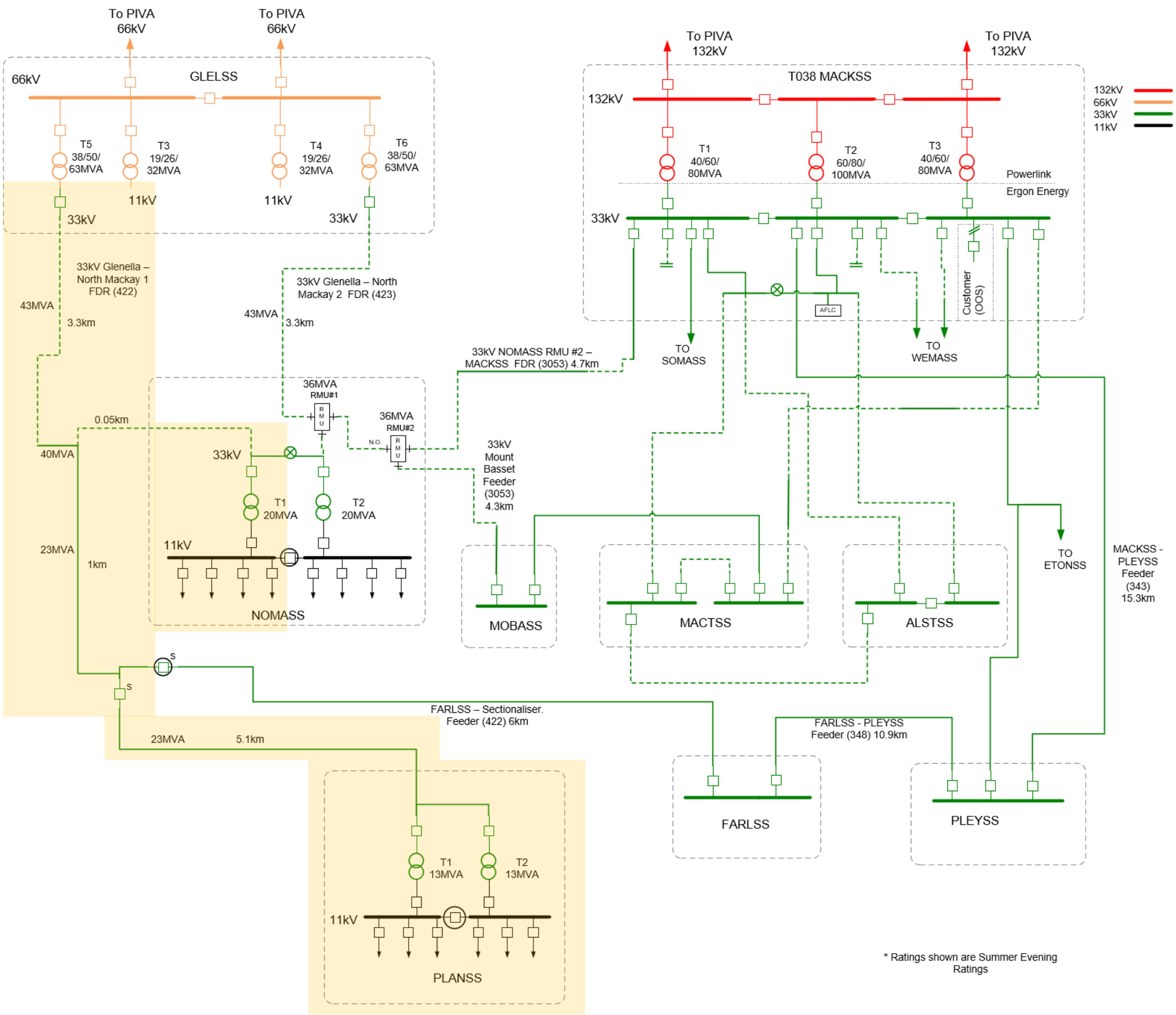
PLANSS is supplied by one radial 33kV feeder (F422) from Glenella bulk supply substation (GLELSS), with a tee off supplying half of North Mackay zone substation (NOMASS) with a manual 33kV tie arrangement. The NOMASS load can be transferred remotely at the 11kV bus. Geographic and schematic views of the network area are provided in Figure 1 and Figure 2 respectively.

Figure 1 – Existing network arrangement (geographic view)



[1]https://www.discovermackay.com.au/invest/our_economy

Figure 2 – Existing network arrangement (schematic view)



3 IDENTIFIED NEED

The identified need for investment is inadequate network capacity to PLANSS to support expected load growth in both "system normal" network state and under a single network contingency.

There are three network capacity limitations requiring investment to meet forecast load growth in the area.

1. System Normal supply capacity to Planella supply area is exceeded from 2031 onwards
2. Contingent Supply Capacity fails to meet Safety Net criteria for the following single credible contingencies:
    a. a pole or pole hardware failure on a subtransmission feeder supplying PLANSS zone substation.
    b. a single transformer failure at PLANSS zone substation.

    Other network contingencies exist that result in unsupplied customer load at Planella, but do not breach the Safety Net criteria until later than those listed above. The above contingencies are the "limiting" credible contingencies for compliance with the Safety Net criteria that dictate the timing of the initial investment.

The timing for practical completion of the proposed project to address the above limitations is 2030.

3.1 Compliance Requirements

3.1.1 Normal Supply Capacity

Under clause 6.5.7 (a) (1) of the National Electricity Rules (refer Appendix 1) the DNSP is required to develop proposals to invest in an efficient and prudent manner to meet or manage the expected demand for standard control services.

Failing to invest to supply reasonable forecast load does not comply with requirements of the NER, could result in forced load shedding in peak load periods, and/or commercial and industrial developments not being able to connect to the network in a reasonable timeframe.

3.1.2 Contingent Supply Capacity

Under clause 6.5.7 (a) (2) of the National Electricity Rules (refer Appendix 1) the DNSP is required to develop proposals to invest in an efficient and prudent manner to comply with all applicable regulatory obligations or requirements associated with the provision of standard control services.

Under its Distribution Authority, Ergon Energy must adhere to the Safety Net which identifies the principles that apply to the operation of network assets under network contingency conditions. System contingency related capability is assessed against available load transfers, emergency cyclic capacity (ECC) ratings, non-network response, mobile plant, mobile generators, and short-term ratings of plant and equipment, where available, using a 50% probability of exceedance (50PoE) forecast load.

Planella is classified as a Regional Centre, with the following Safety Net criteria load not supplied must be:

- Less than 20MVA (8000 customers) after 1 hour
- Less than 15MVA (6000 customers) after 6 hours
- Less than 5MVA (2000 customers) after 12 hours

- Fully restored within 24 hours.

(Note: Customer numbers shown are indicative only. Unsupplied load in MVA is the primary measure for Safety Net compliance)

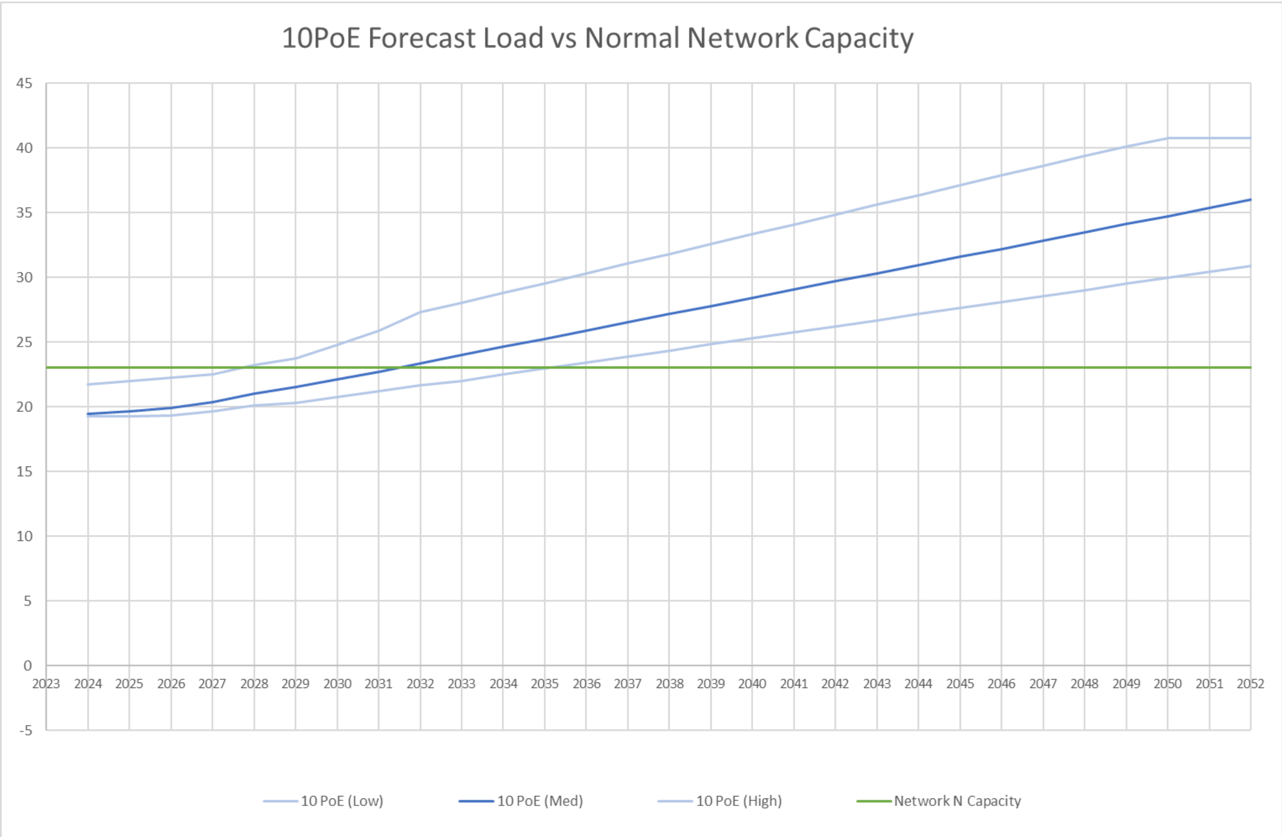
Under clause 6.5.7 (a) (2) of the National Electricity Rules (refer Appendix 1) the DNSP is required to develop proposals to invest in an efficient and prudent manner to comply with all applicable regulatory obligations or requirements associated with the provision of standard control services.

3.2 Normal Network Capacity

Load is forecast to exceed system normal capacity of the network requiring augmentation by 2031/32.

In the System Normal network state, supply capacity at Planella is constrained to 23MVA by the summer evening line rating of feeder F422. This constraint is exceeded by 10PoE forecast load from 2031/32 onwards under a medium forecast scenario as shown in Figure 3 below. Sensitivity to high and low forecast scenarios are also shown for reference.

Figure 3 – Forecast load at PLANSS vs subtransmission constraint (F422 summer evening rating)



3.3 Contingent Network Capacity

Compliance with Safety Net criteria is breached for a credible contingency on subtransmission feeder F422 from 2030 onward.

3.3.1 Failure on F422 Radial Section

A timber pole failure on the radial section of feeder F422 between NOMASS and PLANSS is expected to take longer than 6hrs but less that 12hrs to repair. The Safety Net criteria stipulates that not more than 15 MVA of customer load can be unsupplied for this timeframe.

Where feeder F422 is out of service, there is no alternative subtransmission supply to PLANSS. In an emergency response, up to 4MVA of load can be transferred to neighbouring substations via the 11kV feeder network within 2hrs, and up to 2MVA of generation can be deployed within 12hrs.

The resulting compliance limit for 50PoE forecast load at PLANSS is 21MVA. This constraint is exceeded by 50PoE forecast load from 2030 onwards under a medium forecast scenario as shown in Figure 4 below. Sensitivity to high and low forecast scenarios are also shown for reference.

Figure 4 – Forecast load at PLANSS vs subtransmission line constraint (F422 OOS)

3.3.2 Failure of Transformer at PLANSS

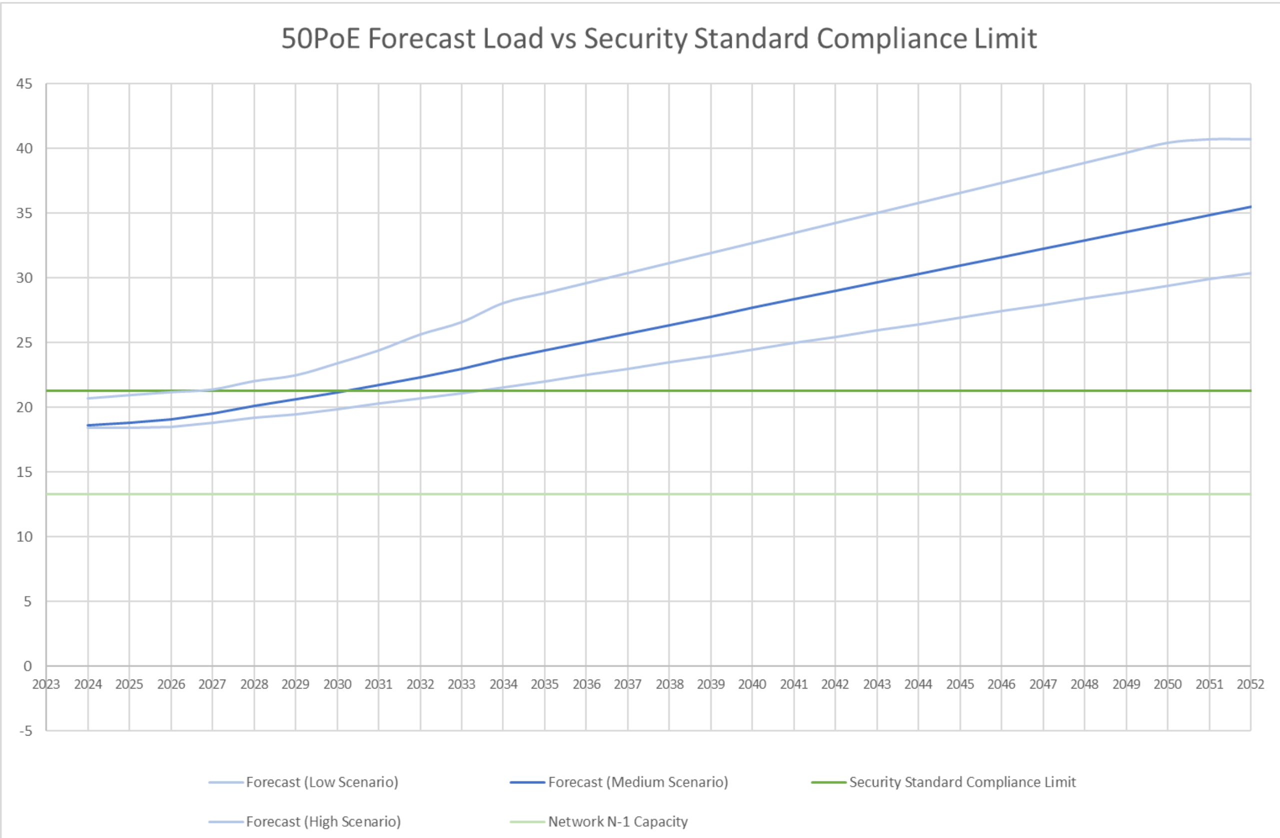
The Safety Net criteria is breached for a credible contingency to a transformer at PLANSS from 2030 onwards.

A transformer failure at PLANSS is expected to take longer than 24hrs to repair. The Safety Net criteria stipulates that no customer load can be unsupplied for this timeframe.

Where one transformer is out of service, the remaining transformer can supply up to 13.3MVA in an emergency. In an emergency response, up to 4MVA of load can be transferred to neighbouring substations via the 11kV feeder network within 2hrs, and up to 4MVA of generation can be deployed within 24hrs.

The resulting compliance limit for 50PoE forecast load at PLANSS is 21.3MVA. This constraint is exceeded by 50PoE forecast load from 2030 onwards under a medium forecast scenario as shown in Figure 5 below. Sensitivity to high and low forecast scenarios are also shown for reference.

Figure 5 – Forecast load at PLANSS vs transformer constraints (T1 or T2 OOS)



3.3.3 Failure of Transformer T5 (or CBs) at GLELSS or F422 Cable between GLELSS and PLANSS

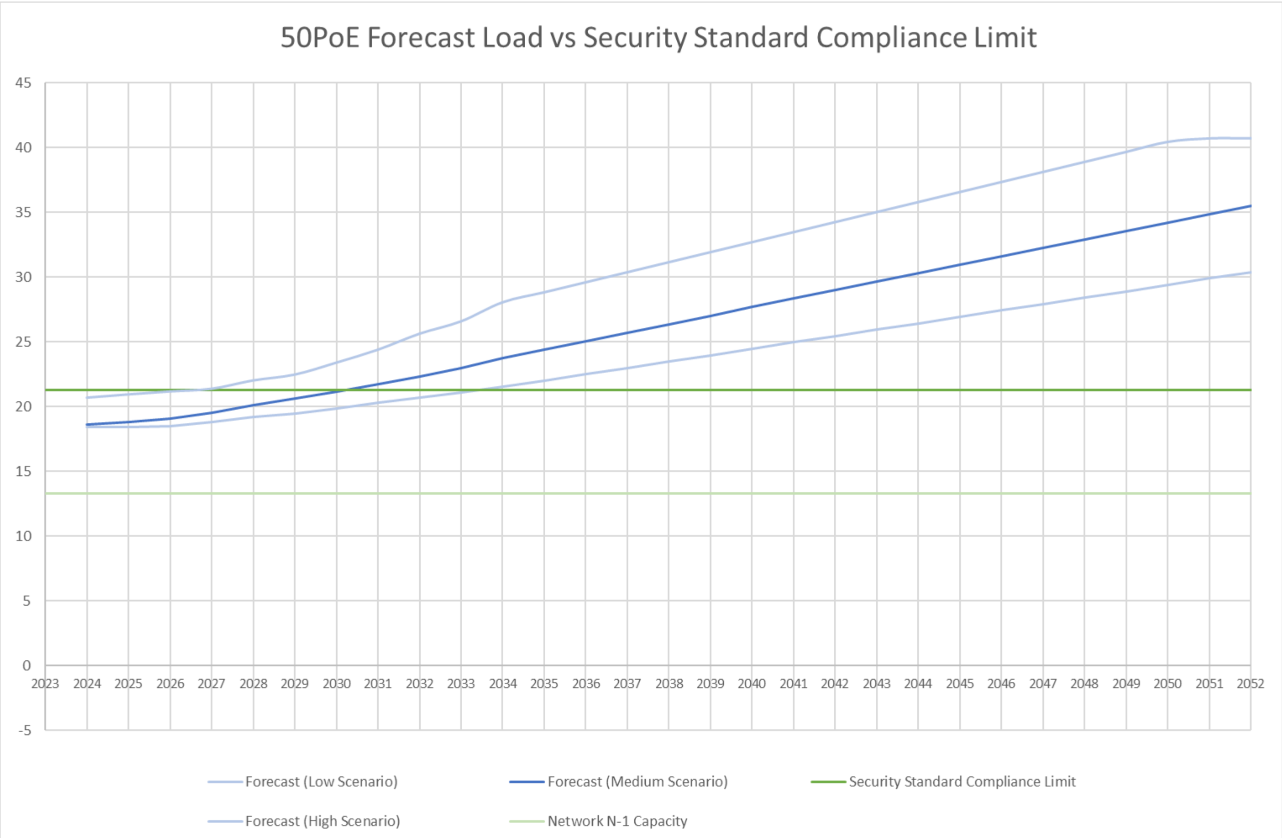
The Safety Net criteria is breached for a credible contingency to a transformer T5 or associated 33kV or 66kV circuit breaker failure at GLELSS, or cable failure on F422 between GLELSS and PLANSS, from approximately 2030 onwards.

Any of these failures are expected to take longer than 24hrs to repair. The Safety Net criteria stipulates that no customer load can be unsupplied for this timeframe.

Where any of these items are out of service, the manual isolator at NOMASS can be used to supply F422 to Planella with approximately 13MVA load from F423, limited by the 36MVA rating of RMU1 at NOMASS and the growing load at NOMASS. In an emergency response, up to 4MVA of load can be transferred from NOMASS and PLANSS to GLELSS 11kV supply within 2hrs, and up to 4MVA of generation can be deployed within 24hrs.

The resulting compliance limit for 50PoE forecast load at PLANSS is 21MVA. This constraint is exceeded by 50PoE forecast load from 2030 onwards under a medium forecast scenario as shown in Figure 7 below. Sensitivity to high and low forecast scenarios are also shown for reference.

Figure 6 – Forecast load at PLANSS vs Transfer Capacity at NOMASS (GLELSS T5, CB or Cable OOS)



4 OPTIONS IDENTIFICATION

Ergon Energy Network has sought to identify all technically feasible options to meet forecast load growth in system normal and remain compliant with the Safety Net under credible network contingencies.

Options considered are:

- Option 1 – Staged 33kV Augmentation: Build one 33kV feeder to PLANSS (from MACKSS) and replace transformers at PLANSS in 2030. This option would involve future stages to meet expected longer-term growth in the Planella supply area.
- Option 2 – Dual 66kV Augmentation: Build two 66kV feeders from GLELSS and replace transformers at PLANSS in 2030.

Further options were identified and rejected as detailed in Section 4.3. Non-network options will be identified and evaluated through the RIT-D process.

4.1 Option 1 – Staged 33kV

This option involves initial augmentation to the 33kV network in 2030, followed by future stages to meet longer term growth. The initial stage establishes a second 33kV feeder to PLANSS and replaces transformers at PLANSS in 2030. Future stages would uprate feeder F422, and then add a third 33kV feeder with associated switchgear to meet safety net requirements under the ultimate load. The ultimate arrangement of the staged works is shown in Figure 7 below. The capacity triggers for staged investment are dictated by Limitation #2 as shown in Figure 8.

- Stage 1 (2030) includes:
    - Establish a new feeder from MACKSS rated at 28MVA reusing sections of a previously defunct line and extending it further to PLANSS.
    - Install a 33kV switchboard at PLANSS.
    - Replace two 33/11kV 13.3MVA transformers at PLANSS with two 33/11kV 32MVA transformers.
- Stage 2 (2045) includes:
    - Uprate 2.5km of existing feeder F422 from 23MVA to 28MVA rating.
- Stage 3 (2052) includes:
    - Establish a new 33kV Line (5km overhead, 3.5km underground) line from GLELSS.
    - Install a 33kV switchboard at GLELSS.

Other consequential works caused by this option includes:

- After future Repex project at NOMASS (expected to occur in 2040), an additional 33kV circuit breaker bay in a new 33kV switchboard will be installed to supply PLANSS,

Figure 7 – Option 1 network diagram (ultimate)

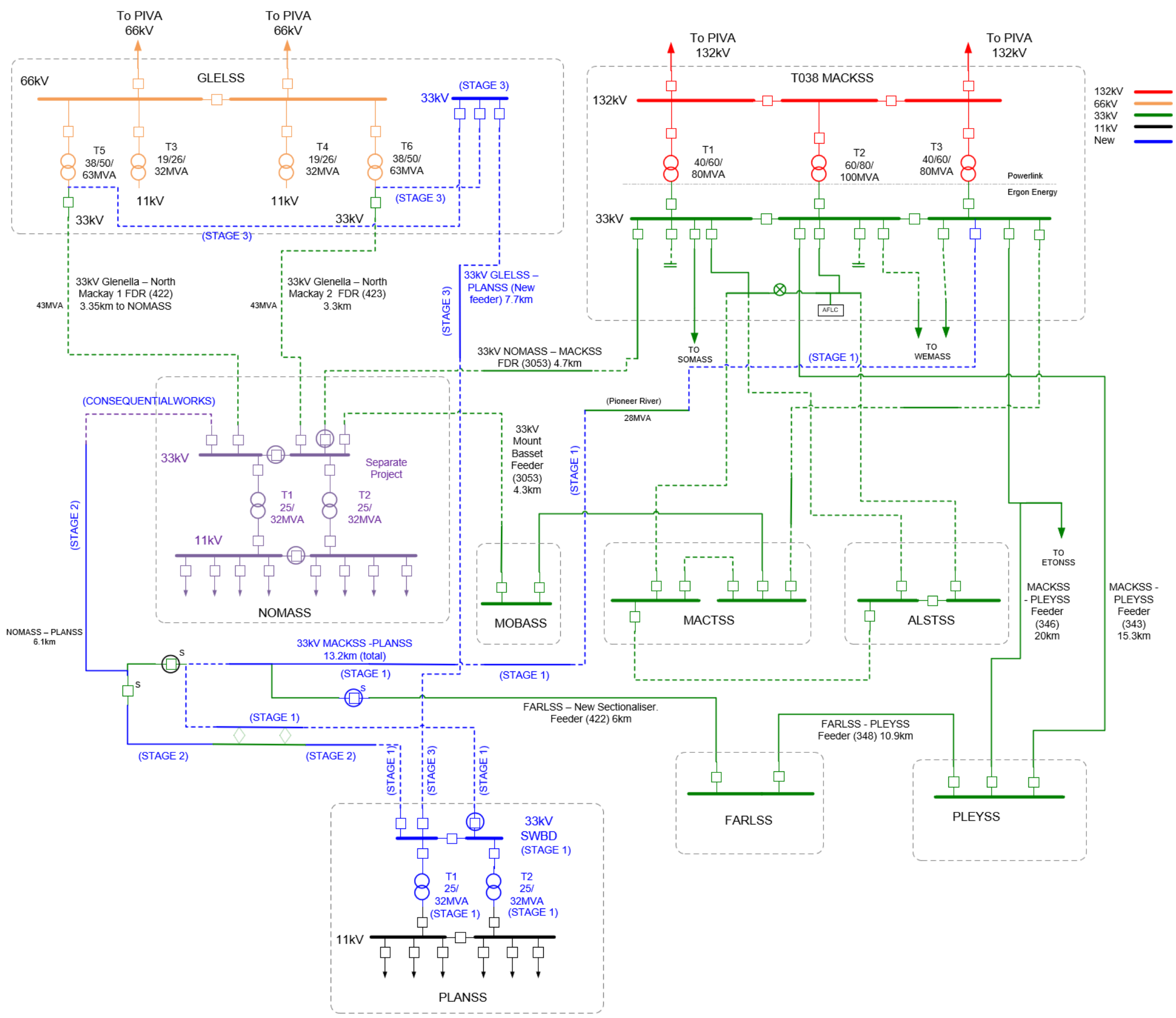
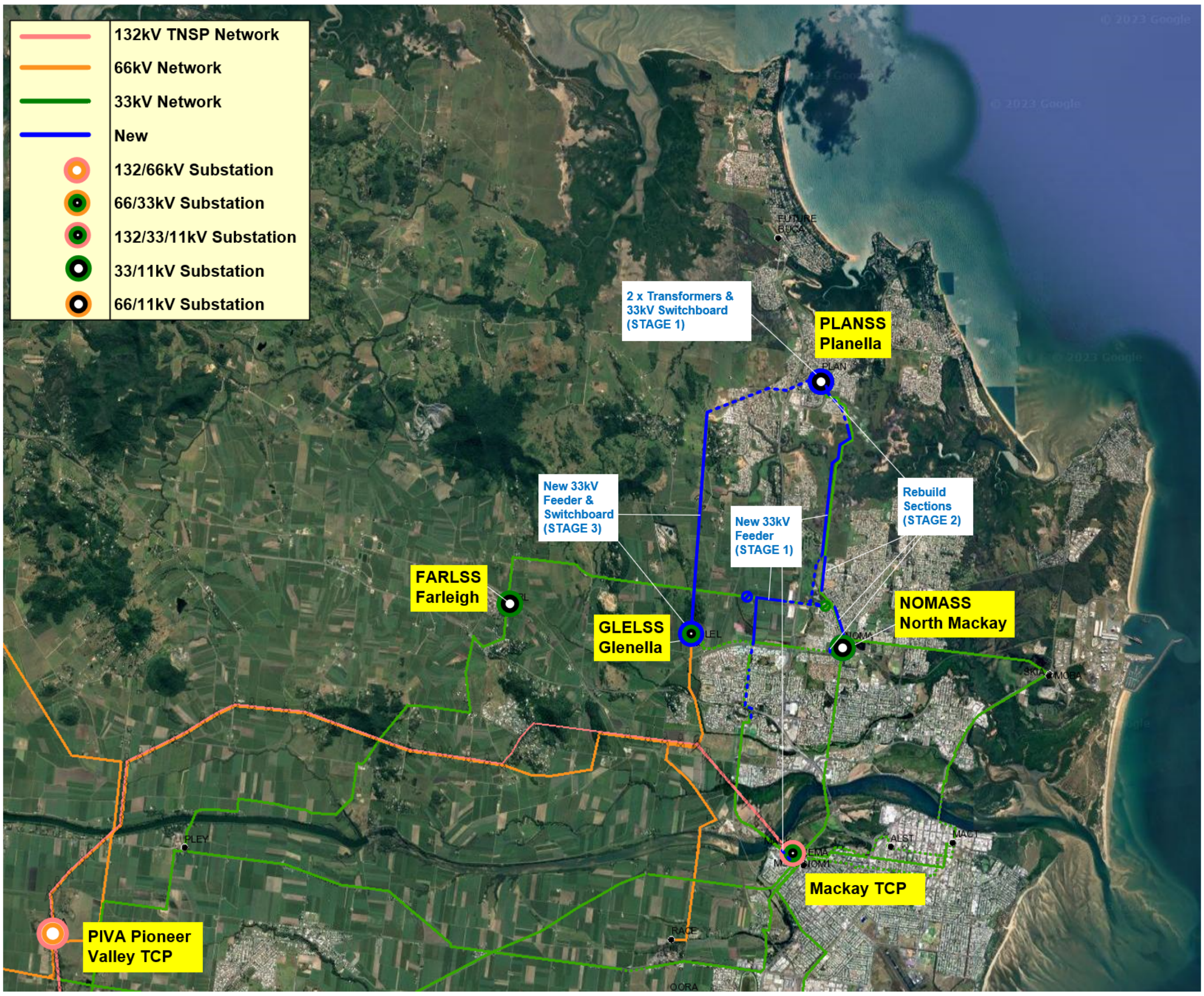


Figure 8 – Option 1 network arrangement (ultimate geographic view)



4.1.1 Supply Capacity in System Normal

Under Option 1, the initial investment in 2030 introduces a second 33kV feeder to meet contingency requirements, consequentially increasing the system normal (N) supply capacity from 23MVA to 51MVA. This resolves supply constraints to Planella in System Normal for the foreseeable future assuming an ultimate area load of 41MVA.

4.1.2 Contingent Supply Capacity

For Option 1, N-1 network capacity and compliance after each stage is summarised in Table 1 below, with timing of future stages shown in Figure 8 below. Sensitivity to high and low forecast scenarios are also shown for reference.

- The initial investment in 2030 (Stage 1) increases the N-1 transformer capacity (emergency rating) to 41MVA, and the compliance limit after transfers and generation to 49MVA. This is beyond the expected ultimate load of 41MVA. This resolves the "transformer N-1" constraint at PLANSS for the foreseeable future.

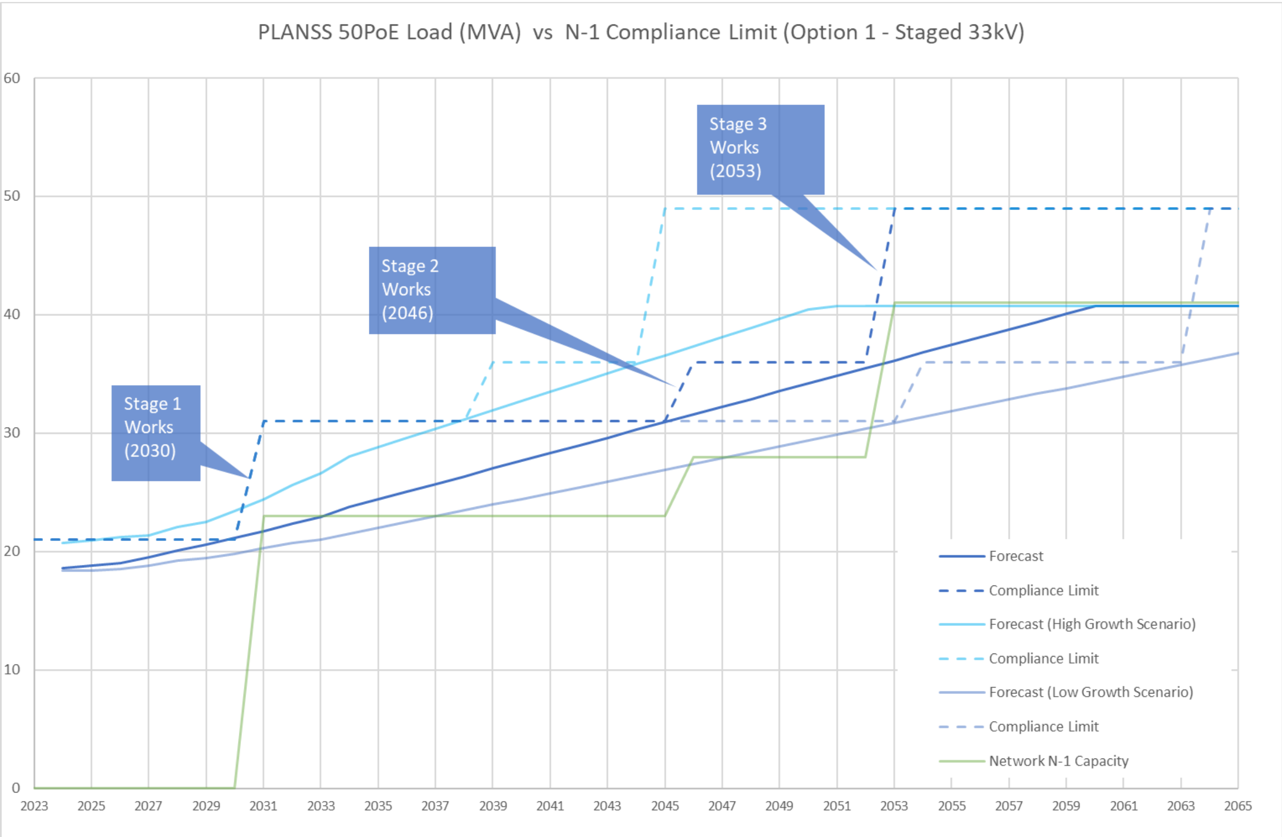
- Stage 1 adds a second 33kV feeder rated at 28MVA, increasing the N-1 capacity of the 33kV network to the rating of F422 which is 23MVA.
    - The new feeder will have cable sections for which a credible contingency would take longer than 24hrs to repair. The Safety Net criteria requires 0 MVA of customer load to be unsupplied beyond 24hrs.
    - In an emergency response, up to 4MVA of load can be transferred to neighbouring substations via the 11kV feeder network within 2hrs, and up to 4MVA of generation can be deployed within 24hrs.
    - The resulting compliance limit for 50PoE forecast load at PLANSS is 31MVA. This constraint is exceeded by 50PoE forecast load from 2046 onwards under a medium forecast scenario as shown in Figure 8 below, triggering Stage 2 investment.
- Stage 2 uprates the original 33kV feeder F422 to 28MVA, increasing the N-1 capacity to 28MVA and the security standard compliance limit to 36MVA. This constraint is exceeded by 50PoE forecast load from 2053 onwards under a medium forecast scenario as shown in Figure 8 below, triggering Stage 3 investment.
- Stage 3 adds a third 33kV feeder increasing N-1 supply to 56MVA, at which point the limiting contingency becomes a transformer outage at PLANSS resulting in an N-1 capacity of 41MVA and a Safety Net compliance limit of 49MVA.

Table 1 – Contingency Capacity Limits after Option 1 (Staged)

	Existing	Existing	Existing	Stage 1	Stage 2	Stage 3
Stage Description	Existing Network	Existing Network	Existing Network	Add 2^{nd} 33kV feeder rated at 28MVA. Replace transformers at PLANSS with 32MVA units	Uprate existing 33kV feeder F422 to 28MVA	Add 3^{rd} 33kV feeder
Limiting Credible Contingency	Pole or pole top hardware failure on existing 33kV feeder F422	Transformer failure at PLANSS	T5, CB or 422 Cable failure GLELSS-NOMASS	Cable failure on new 2^{nd} 33kV feeder	Cable failure on new 33kV feeder	Transformer failure at PLANSS
Credible Restoration Time	<12hrs	>24hrs	>24hrs	>24hrs	>24hrs	>24hrs
Immediate N-1 Capacity (MVA)	**0**	**13.3**	**13**	**23**	**28**	**41**
	(No alternate 33kV supply)	Emergency rating of remaining transformer at PLANSS	Rating of RMU1 at NOMASS	Rating of remaining feeder F422	Rating of remaining feeder F422	Emergency rating of remaining transformer at PLANSS

	Existing	Existing	Existing	Stage 1	Stage 2	Stage 3
Security Standard Allowable Unsupplied Load (MVA)	+15	+0	+0	+0	+0	+0
11kV Transfer Capacity (MVA)	+4	+4	+4	+4	+4	+4
Deployable Emergency Generation (MVA) within Credible Restoration Time	+2	+4	+4	+4	+4	+4
Security Standard Compliance Limit (MVA)	**21**	**21.3**	**21**	**31**	**36**	**49**

Figure 9 – Forecast Compliance Constraints with Staged Works – Option 1



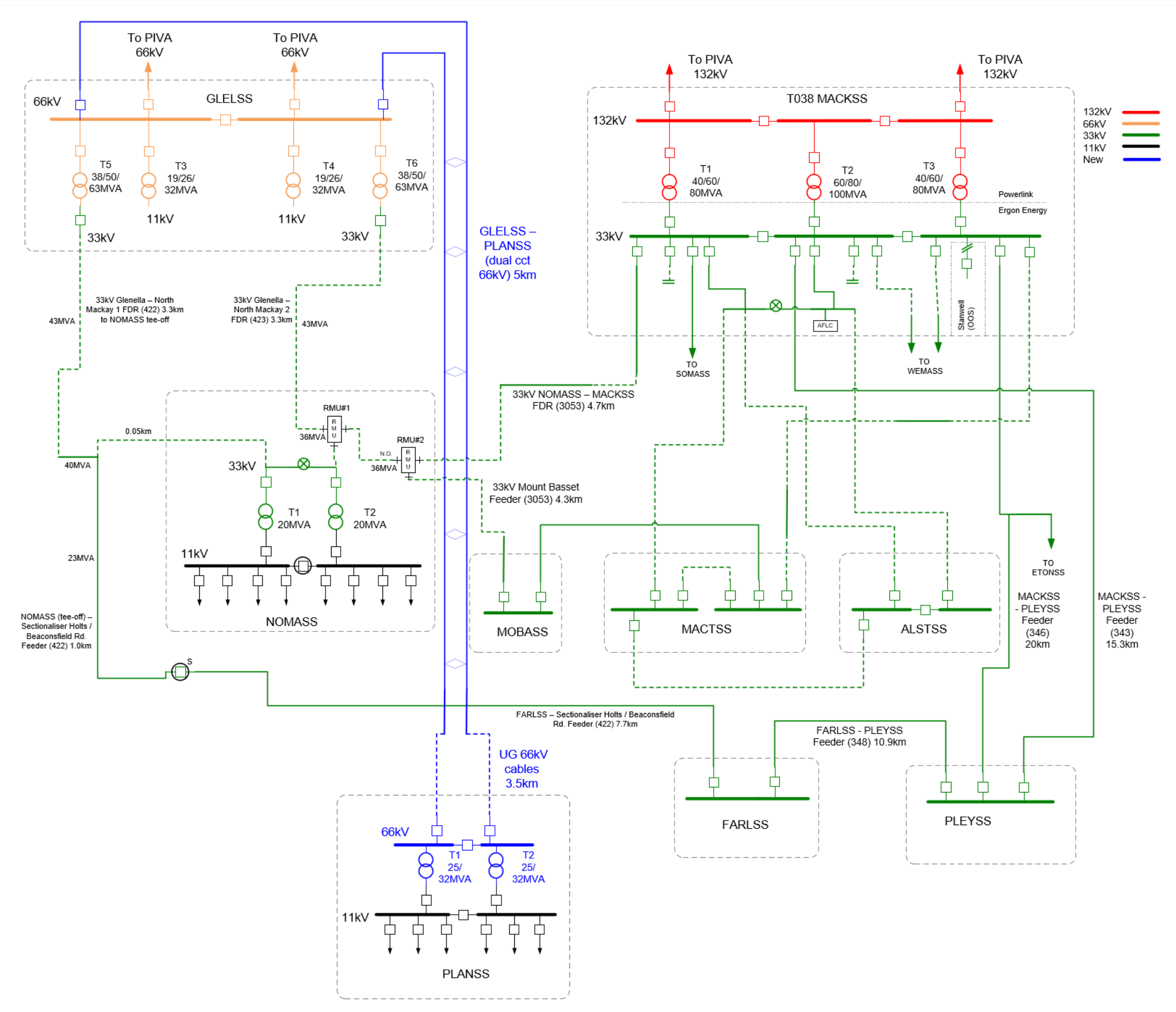
4.2 Option 2 – Establish Dual 66kV feeders with rebuilding PLANSS as 66/11kV

This option involves the following works:

- Build two new 66kV feeders from GLELSS to PLANSS consisting of 5.5km of double circuit 66kV concrete pole construction (DCCP) with standard “Grape” conductor and 3.5km of 66kV underground cable.
- Add a 66kV bus at PLANSS with 3x66kV outdoor circuit breakers
- Replace transformers at PLANSS with standard 32MVA 66/11kV units.
- Add two 66kV bays at GLELSS.

The total of the works is shown in Figure 9 below.

Figure 10 – Option 2 network diagram



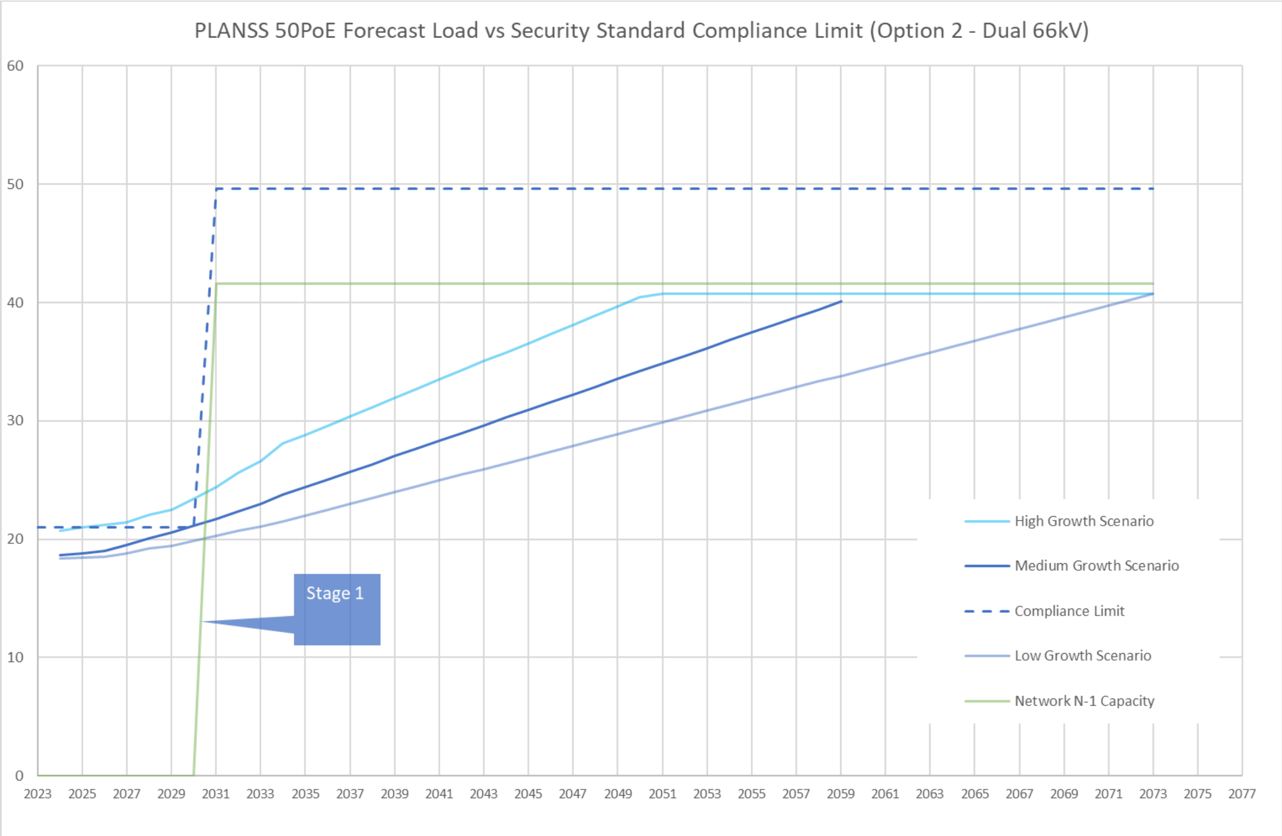
4.2.1 Supply Capacity in System Normal

The initial investment in 2030 replaces the single 33kV radial feeder with dual 66kV feeders to meet contingency requirements, consequentially increasing the system normal (N) supply capacity to the parallel rating of the two new transformers i.e. 64MVA. This resolves supply constraints to Planella in System Normal for the foreseeable future assuming an ultimate area load of 41MVA.

4.2.2 Contingent Supply Capacity

The initial investment in 2030 increases the N-1 subtransmission network rating from 0MVA to the 65MVA of each 66kV feeder, at which point the limiting contingency becomes a transformer outage at PLANSS. The N-1 transformer capacity (emergency rating) is increased from 13.3MVA to 41MVA, and the compliance limit after transfers and generation to 49MVA. This is beyond the expected ultimate load of 41MVA and resolves the N-1 constraints at PLANSS for the foreseeable future as shown in Figure 10 below.

Figure 11 – Forecast Compliance Constraints with Staged Works – Option 2



4.3 Options Considered and Rejected

The following options were considered but rejected for the reasons listed:

1. Establish a new 33kV feeder from NOMASS.

   Feeder route availability from NOMASS to Planella is highly constrained.

2. Establish dual 33kV feeders from GLELSS as Stage 1.

   There is no 33kV bus at GLELSS. A 33kV switchboard would need to be established at in stage 1 at significant cost and complexity compared to the options considered.

5 COUNTERFACTUAL ANALYSIS

Risk quantification was used to compare options by comparing the risk under each option to the counterfactual.

The need for this project is compliance with a legislative requirement to meet the minimum network security criteria stipulated in the Distribution Authority for the Ergon Energy DNSP, therefore a negative NPV is acceptable.

5.1 Risk Quantification Value Streams

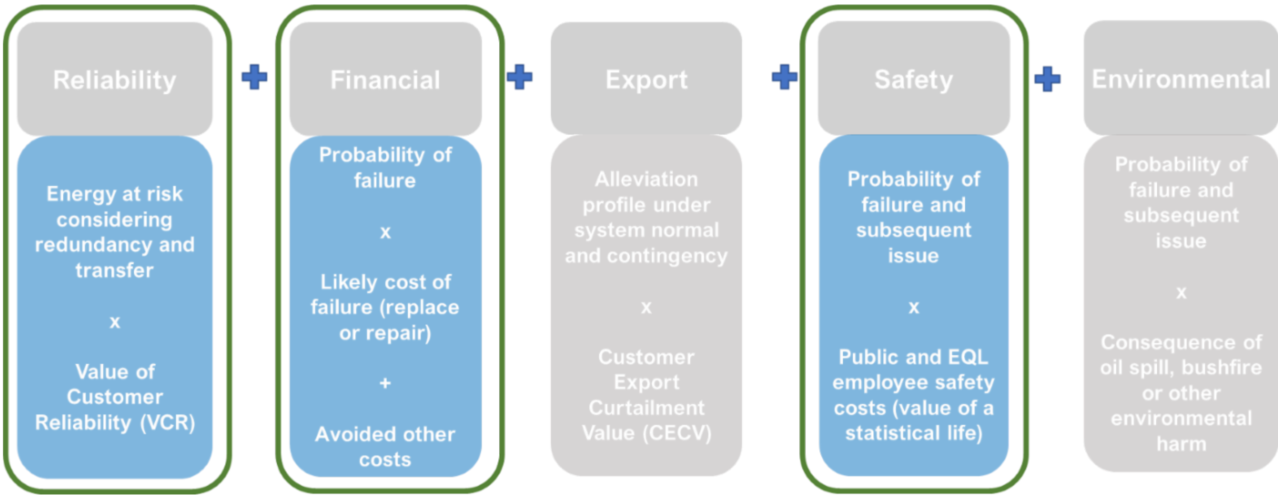
The risk quantification of the counterfactual has considered three primary value streams, *reliability*, *financial* and *safety,* as shown in Figure 5 and described in further detail below.

- **Reliability**: Reliability risk in terms of potential unserved energy was quantified in the following outage scenarios:
  - Failure of T5 at GLELSS or the associated circuit breakers supplying PLANSS[2]
  - Failure of the radial section of 33kV overhead feeder supplying PLANSS
  - 33kV circuit breakers at PLANSS manufactured 2005
  - 33/11kV transformers at PLANSS manufactured 1979
- **Safety:** There is safety risk associated with continuing to operate the following existing equipment that will be replaced or eliminated under each option:
  - 33kV circuit breakers at PLANSS manufactured 2005
  - 33/11kV transformers at PLANSS manufactured 1979
- **Financial:** There is financial risk associated with continuing to operate the following existing equipment that will be replaced or eliminated under each option:
  - 33kV circuit breakers at PLANSS manufactured 2005
  - 33/11kV transformers at PLANSS manufactured 1979

Replacing single assets on failure as individual failed in-service projects has been assumed to incur a 30% increase in cost in comparison to a planned project.

[2] This is an emerging safety net constraint with timing later than the constraints considered.

Figure 12 – Value Streams for Investment



The counterfactual risks are the expected unserved energy, emergency replacement cost, and safety risks, during an equipment failure and associated unplanned supply outage. Figure 6 shows the quantified risk per annum increasing from 2030 to 2083.

In calculating the value streams the following assumptions are used:

- **Forced Outage Rate** – The CB outage rate is predicted using a Weibull distribution with a Shape Parameter (β) of 4 and a Characteristic Life (η) of 80 for 33kV CBs. A flat outage rate of 0.027 has been applied for the first 4 years to capture the increased risk of failure in the first years of a circuit breakers life.
- **Restoration** – it has been estimated that the average rectification time would be 48 hours for CB failures.
- **Transfers** – during a contingency affecting PLANSS:
    - Approximately 4 MVA of 11kV load can be transferred to adjacent substations in peak summer periods within 2hrs.
- **VCR Rate** – a VCR rate of $34.27 / kWh has been used, with the mix of customers weighted towards domestic, commercial and industrial customers. The weighting applied to each customer type is shown in Table 1.
- **Emergency replacement Cost:** On failure of assets the plant will be replaced like-for-like with an additional 30% cost in comparison to the planned project.
- **Safety** – Considers forced outage rate of the asset with a conversion factor of 0.1% that a fatality to employee and/or injury to employee will occur.
- **Risk timeframe** – risks were calculated over a 60-year period, starting from 2030 to align with the investment year of Option 1 (see below).

Figure 13 – Counterfactual Risk

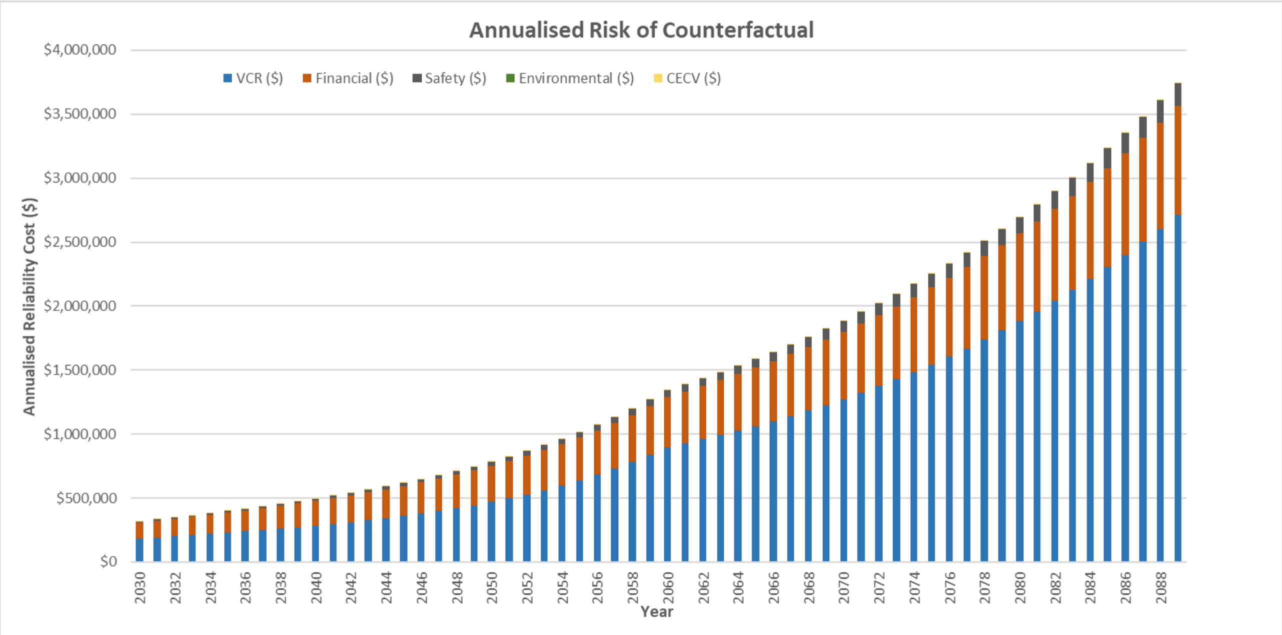


Table 2 – VCR weighting applied to each customer type

Customer Segment	Postcode	Annual Consumption (kWH)	VCR
Domestic	4740	46,072,222	$28.44
Commercial		13,455,741	$49.54
Industrial		1,721,719	$70.97
Agricultural		7,488	$42.14
Large Cust. Services (>10MVA)			$11.73
Large Cust. Industrial (>10MVA)			$131.28
Large Cust. Metals (>10MVA)			$22.10
Large Cust. Mines (>10MVA)			$39.12
Total		61,257,170	$34.27

5.1.1 Operational Costs

The following Opex costs were applied:

- Opex cost of $4k per km was applied to subtransmission overhead lines,
- Opex cost of $3k per km was applied to subtransmission underground cables, and
- 1.5% of capital cost for substation equipment.

6 OPTIONS ANALYSIS

The options identified in Section 4 have been compared on a “best NPV” basis. The need for this project is compliance with a legislative requirement to meet the minimum network security criteria stipulated in the Distribution Authority for the Ergon Energy DNSP, therefore a negative NPV is acceptable. NPV analysis is applied to determine the best value option to ensure ongoing compliance.

6.1 Financial Analysis

6.1.1 Methodology

Options were analysed on a scenario NPV basis with initial investments for each option in 2030 and future investments occurring based on base, low and high load growth scenarios (refer Figure 8 and Table 3). Weightings of 60%, 20% and 20% were applied respectively to the load growth scenarios to obtain a “Net NPV”. The results with the Capex, Opex and Benefits components are shown in Table 5. Sensitivity analysis was also applied to the discount rate used in the financial model. Table 6 shows the sensitivity to discount rate and growth scenarios.

6.1.2 Capital Costs - Option 1

Capital Costs of Option 1 and timing of investment applied for the NPV analysis are as follows in Table 3

Table 3 – Option 1 Works

	Works Description	Estimated Cost ($2023, Direct)	Investment Timing		
Stage 1	33kV line MACKSS to PLANSS, 33kV switchboard at PLANSS, replace 2 x TRs at PLANSS	19,426,000	2030		
Future Works			**Base**	**Low Growth**	**High Growth**
Stage 2 in 2045	Uprate feeder F422	1,750,000	2046	2054	2039
(other)	Consequential works to Repex project at NOMASS	1,000,000	2040	2040	2040

	Works Description	Estimated Cost ($2023, Direct)	Investment Timing		
Stage 3 in 2052	33kV line GLELSS to PLANSS, 33kV switchboard at GLELSS,	11,300,000	2053	2064	2045

6.1.3 Capital Costs - Option 2

Capital costs of Option 2 and timing of investment applied for the NPV analysis are as follows in Table 4 below.

Table 4 – Option 2 Works

	Works Description	Estimated Cost (2023)	Investment Timing
Stage 1	Dual 66kV line GLELSS to PLANSS, 2 x 66kV CB bays at GLELSS, replace 2 x TRs at PLANSS.	25,800,000	2030

6.1.4 NPV Analysis

The NPV analysis results are summarised in Table 5 below with sensitivities summarised in Table 6.

Table 5 – Base Case NPV Analysis ($k) (3.5% Discount Rate)

Option	Rank	Net NPV [3]	Capex NPV	Opex NPV	Benefits NPV
Option 1 – Staged 33kV Augmentation	2	-7,649	-19,510	-3,510	15,371
Option 2 – Dual 66kV Augmentation	**1**	**-6,471**	-19,896	-2,003	15,429

[3] Note: a negative NPV is acceptable to meet a legislative requirement.

Table 6 – NPV Sensitivity Analysis ($k)

Option		Discount rate		Growth scenario	
		2.5%	**4.5%**	**Low**	**High**
Option 1 – Staged 33kV Augmentation		-4,039	-9,476	**-7,212**	-8,225
Option 2 – Dual 66kV Augmentation		**-1,569**	**-9,276**	-8,077	**-5,027**

6.1.5 NPV Analysis Outcome

The weighted average "Net NPV" was in favour of Option 2 – Dual 66kV Augmentation. All scenarios and sensitivities resulted in the best NPV except in the Low Growth scenario only.

7 RECOMMENDATION

It is recommended to build 8.5km dual circuit 66kV line from Glenella bulk supply substation to Planella zone substation and replace transformers at Planella zone substation. Table 7 summarises the options under consideration. The timing of the proposed project is for practical completion in 2030.

Table 7 Options Analysis Scorecard

Criteria	Option 1 – Staged 3 x 33kV lines to PLANSS, replace TRs at PLANSS	Option 2– New 2 x 66kV Lines Glenella to Planella, replace TRs at PLANSS
Net Present Value	-$7.649m	-$6.471m
Investment cost (TCO)	$19.426m (direct) ($14.05m deferred)	$25.8m (direct)
Investment Risk	Medium	Medium
Benefits	Compliance	Compliance
Delivery time	2030	2030
Detailed analysis – Benefits	Achieves compliance with Safety Net minimum security with the forecast load growth at Planella	Achieves compliance with Safety Net minimum security with the existing and forecast load growth at Planella
Detailed analysis – Risks	Load at Planella increases in line with the medium or high forecast scenario, or a larger customer block load is added bringing forward deferred cost resulting in a less favourable NPV outcome.	Load at Planella increases in line with a low forecast scenario, resulting in a less favourable NPV outcome.
Detailed analysis - Advantages	This option results in an electricity supply to Planella that meets forecast load and complies with the security standard with the least initial cost	This option results in an electricity supply to Planella that meets forecast load and complies with the security standard with the best NPV considering longer term forecast scenarios.

7.1 Cost summary 2025-30

The estimated cost to establish the new 8.5km 66kV dual supply and replace aged/overloaded transformers at PLANSS has been estimated as $25.8m. The forecast expenditure by year is shown in Table 8.

Table 8 – Cost summary 2025-30 ($k, Direct Cost, 2022/23)

Option	2025-26	2026-27	2027-28	2028-29	2029-30	Total Direct 2025-30
Establish Dual 66kV to PLANSS	$2,321	$620	$11,826	$6,681	$4,365	$25,813

Appendix 1: Alignment with the National Electricity Rules

Table 9 Recommended Option's Alignment with the National Electricity Rules

NER capital expenditure objectives	Rationale
A building block proposal must include the total forecast capital expenditure which the DNSP considers is required in order to achieve each of the following (the capital expenditure objectives):	
6.5.7 (a) (1) meet or manage the expected demand for standard control services over that period	Section 4
6.5.7 (a) (2) comply with all applicable regulatory obligations or requirements associated with the provision of standard control services;	Section 3, Section 4
6.5.7 (a) (3) to the extent that there is no applicable regulatory obligation or requirement in relation to: (i) the quality, reliability or security of supply of standard control services; or (ii) the reliability or security of the distribution system through the supply of standard control services, to the relevant extent: (iii) maintain the quality, reliability and security of supply of standard control services; and (iv) maintain the reliability and security of the distribution system through the supply of standard control services	Section 3, Section 4
6.5.7 (a) (4) maintain the safety of the distribution system through the supply of standard control services.	Section 5.1
NER capital expenditure criteria	**Rationale**
The AER must be satisfied that the forecast capital expenditure reflects each of the following:	
6.5.7 (c) (1) (i) the efficient costs of achieving the capital expenditure objectives	Section 6.1
6.5.7 (c) (1) (ii) the costs that a prudent operator would require to achieve the capital expenditure objectives	Section 6.1
6.5.7 (c) (1) (iii) a realistic expectation of the demand forecast and cost inputs required to achieve the capital expenditure objectives	Section 3, Section 2, Section 5.1.1, Section 6.1.2

Appendix 2: Undeveloped Residential Land in the Planella Supply Area

Figure 14 – Residential Land Zoning in the Mackay Northern Beaches Area