Powerlink Queensland

June 2021

Preparatory Activities - Gladstone Grid Reinforcement

EDRMS A4729079

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1 Executive summary

The 2020 Integrated System Plan (ISP) [1] defined the projects and timing of 18 network investments in the optimal development path (ODP). Future ISP projects are a subset of these projects that are not yet 'actionable' under the new ISP Rules, but are expected to become actionable in the future. Those projects categorised as 'future ISP projects' require the responsible TNSP to carry out preparatory activities including providing a report of these activities to the AEMO by 30 June 2021.

Appendix A3.5.4 of the 2020 ISP [2] describes the future ISP the Gladstone grid reinforcement project as a third Calliope River 275/132kV transformer, rebuilding and reconfiguring the 275kV transmission network between Bouldercombe and Calliope River and a new 275kV Calvale to Larcom Creek double circuit. The new Calvale to Larcom Creek 275kV double circuit has been revised to Calvale to Calliope River 275kV double circuit to more effectively address the trigger surrounding reduced generation at Gladstone PS.

This report summarises the preparatory activities undertaken by Powerlink for these projects for the purposes of the 2022 ISP.

2 Preliminary Engineering Design

2.1 Single Line Diagrams

The following diagrams present an overview of the proposed works as part of the future ISP project associated with the Gladstone Grid Reinforcement.

To facilitate effective project and outage management, this proposed ISP project has been separated into three individual projects for Powerlink purposes as follows:

- CP.01707 Larcom Creek to Bouldercombe 275kV DCST Transmission Line Rebuild (and Calliope River 3rd 275/132kV Transformer)
- CP.01706 Calliope River to Larcom Creek 275kV DCST Transmission Line Rebuild
- CP.0xxxx Calvale to Calliope River 275kV DCST Transmission Line.

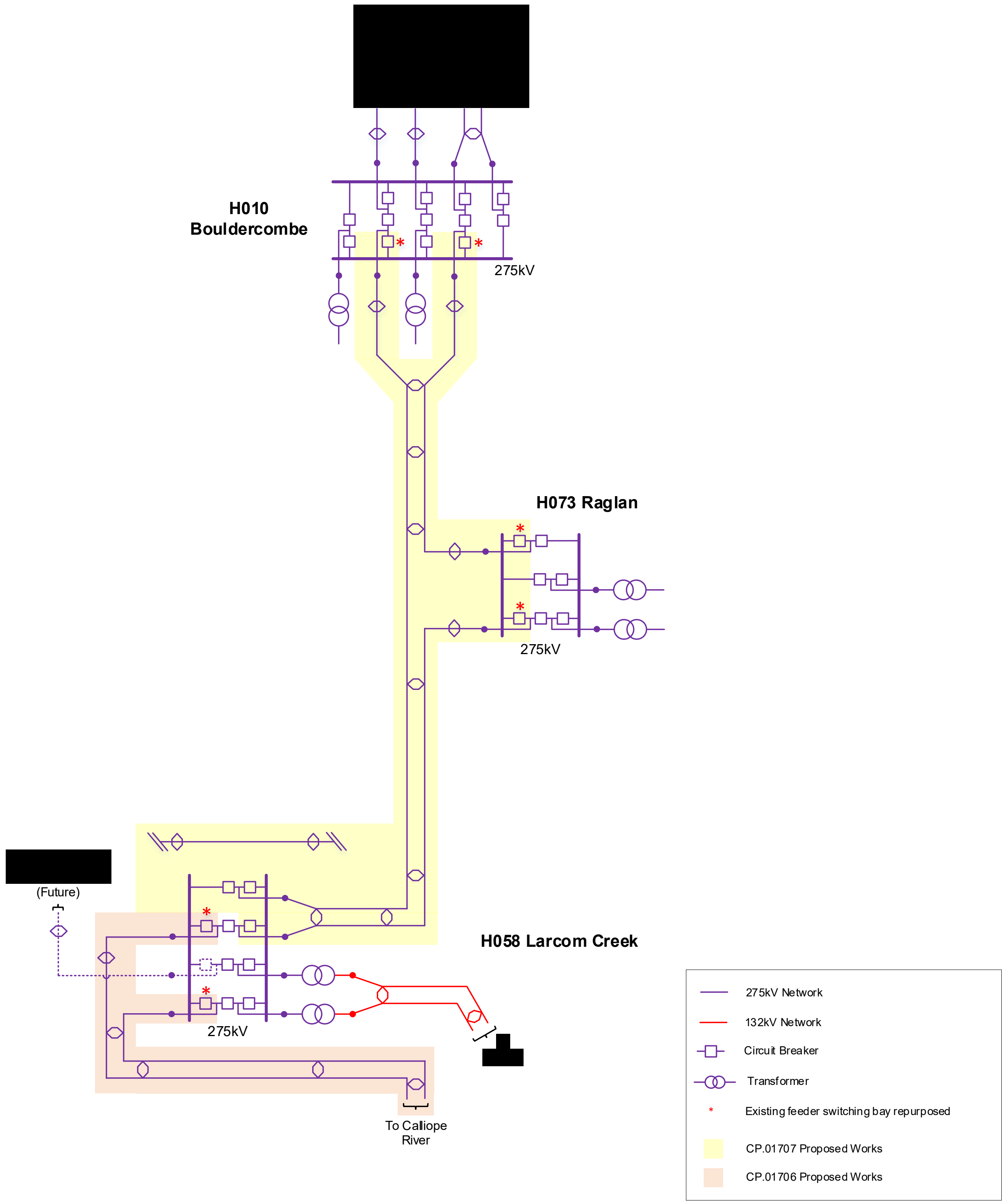


Figure 1 – Overview of proposed works (CP.01707)

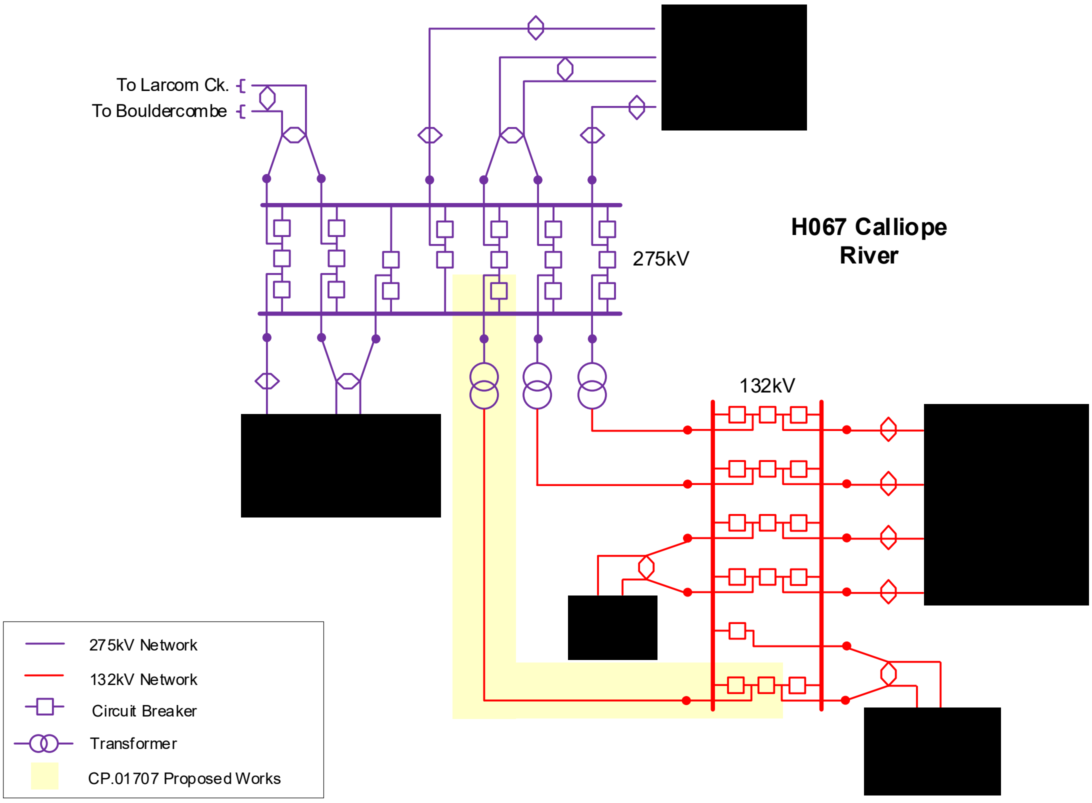


Figure 2 – Overview of proposed works (CP.01707)

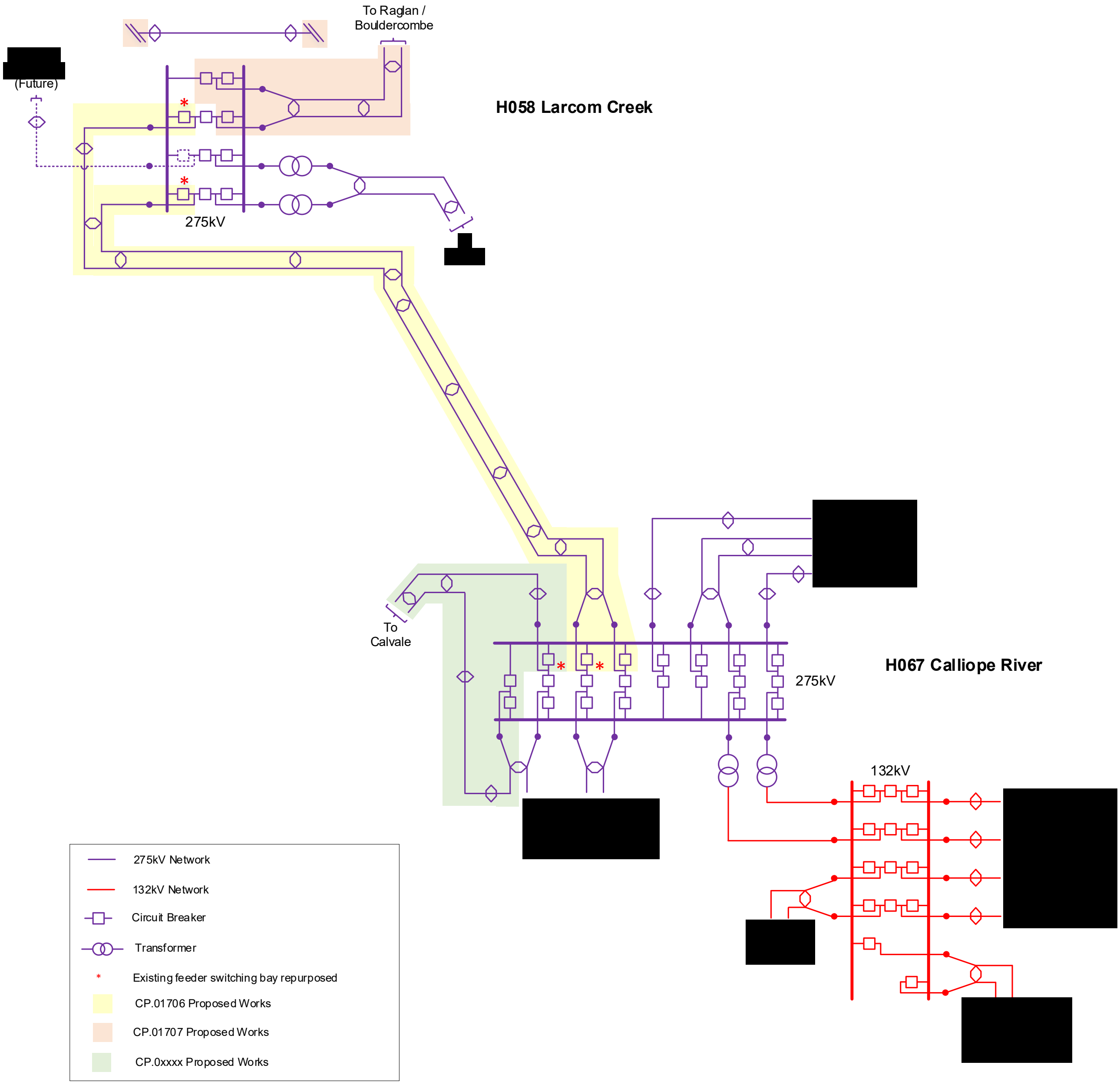


Figure 3 – Overview of proposed works (CP.01706)

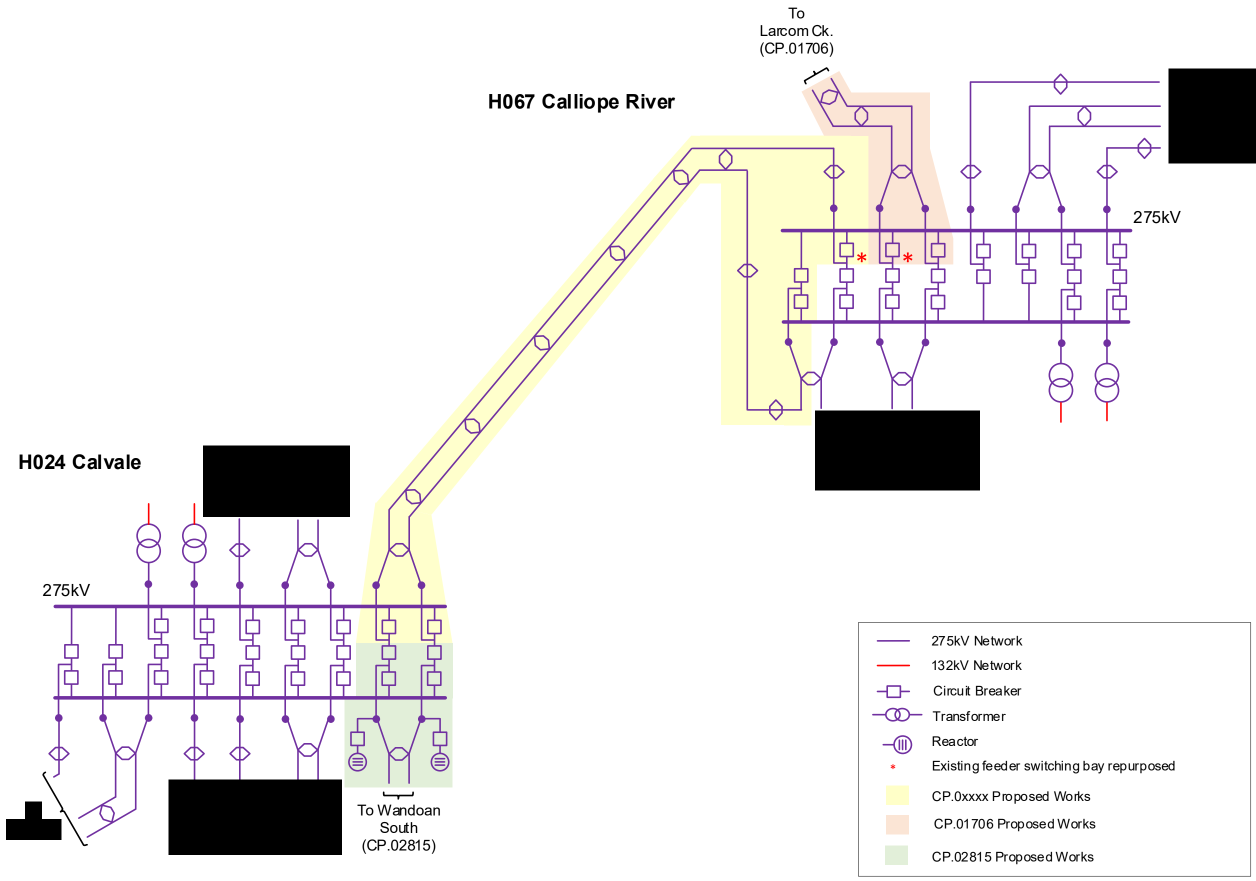


Figure 4 – Overview of proposed works (CP.0xxxx)

In addition to the overview presented in Figure 1, detailed single line diagrams have been prepared for each substation to inform estimating. These have been included in the report provided to AEMO, but are not included in the publicly available version of this report.

Figure 5 – Single line diagram of Larcom Creek Substation (CP.01707)

Figure 6 – Single line diagram of Calliope River 275kV Substation (CP.01707)

Figure 7 – Single line diagram of Calliope River 132kV Substation (CP.01707)

Figure 8 – Single line diagram of Calliope River 275kV Substation (CP.01706)

Figure 9 – Single line diagram of Calliope River 275kV Substation (CP.0xxxx)

Figure 10 – Single line diagram of Calvale Substation (CP.0xxxx)

2.2 Site Layout

Indicative site layout (general arrangement) diagrams have been produced for Bouldercombe, Raglan, Larcom Creek, Calliope River and Calvale substations to inform estimating. However, these have not been presented due to the complexity in the diagrams and the indicative nature of the layout.

2.3 Asset List

The total procurement costs for each broad asset grouping is provided in the cost estimate provided in Table 26. Powerlink does not present itemised costs for specific plant items to external parties, as this is commercially sensitive information subject to confidentiality.

2.4 Network Parameters and Transfer Limits

2.4.1 Network Parameters

Illustrated as Figure 11, the Gladstone grid reinforcement replaces the existing 275kV feeders between Bouldercombe and Calliope River with two new higher capacity feeders. In addition, two new 87km long feeders are established between Calvale and Calliope River and a 3rd 275/132kV transformer is added to Calliope River Substation.

Preparatory activities for CQ-SQ transmission link project involves the addition of a new double circuit Calvale to Wandoan South 275kV feeder. The impact of this project is also investigated and presented in this report.

Table 1 and Table 2 present the electrical network parameters required to model the project, when performing loadflow, fault level and dynamic analysis.

Table 1 – Gladstone grid reinforcement transmission line electrical parameters (using 100MVA/275kV base quantities)

Circuit	R	X	B	R0	X0	B0
Calvale – Calliope River 275kV Feeder 1	0.284%	3.028%	21.192%	2.426%	8.883%	12.253%
Calvale – Calliope River 275kV Feeder 2	0.284%	3.028%	21.192%	2.426%	8.883%	12.253%
Rebuilt Bouldercombe – Raglan 275kV Feeder	0.165%	1.753%	12.688%	1.404%	5.143%	7.094%
Rebuilt Raglan – Larcom Creek 275kV Feeder	0.097%	1.036%	7.497%	0.830%	3.039%	4.192%
Bouldercombe – Larcom Creek 275kV Feeder	0.262%	2.789%	20.185%	2.234%	8.181%	11.286%
Rebuilt Larcom Creek – Calliope River 275kV Feeder 1	0.047%	0.498%	3.604%	0.399%	1.461%	2.015%
Rebuilt Larcom Creek – Calliope River 275kV Feeder 2	0.047%	0.498%	3.604%	0.399%	1.461%	2.015%

Table 2 – Gladstone grid reinforcement transformer electrical parameters (using 100MVA/275kV base quantities

<table>
<tr><th>Circuit</th><th>R12</th><th>X12</th><th>R23</th><th>X23</th><th>R13</th><th>X13</th></tr>
<tr><td rowspan="3">450MVA 275/132/19.1kV Calliope River transformer (PSS®E connection code 113 auto wye-wye-delta)</td><td>0.062%</td><td>4.886%</td><td>0.280%</td><td>14.579%</td><td>0.278%</td><td>21.093%</td></tr>
<tr><th>R01</th><th>X01</th><th>R02</th><th>X02</th><th>R03</th><th>X03</th></tr>
<tr><td>0.012%</td><td>5.578%</td><td>0.051%</td><td>-0.750%</td><td>0.267%</td><td>15.321%</td></tr>
</table>

Transmission line parameters are consistent with twin sulphur 275kV double circuit lines. Thermal ratings would be consistent with lines of similar construction in the zone such as a summer normal rating of 1,096MVA and summer emergency rating of 1,230MVA. Thermal ratings of the 3 winding transformer assumed a normal cyclic rating of 486MVA and emergency cyclic rating of 487.5MVA.

2.4.2 Transfer Limits

Power system analysis has been undertaken to increase the accuracy of applicable limits prior to and after the Gladstone grid reinforcement and CQ-SQ transmission link projects as part of the preparatory activities. Gladstone grid section transfer limits, are generally sensitive to the generation at Stanwell, Callide and Gladstone power stations and to the flows out of Central Queensland (CQ) to the north and south.

A wide range of network conditions in the CQ region were simulated. From these simulated cases, contingencies were applied to key 275kV feeders in the Gladstone area. The resulting feeder flows, intra-regional flows and generation patterns were recorded.

A regression was then performed on the simulated data to predict the MVA flow on each Gladstone grid section feeder following the critical contingency. The regression's intercept was adjusted to ensure the predicted flow is greater than the actual flow in 95% of cases.

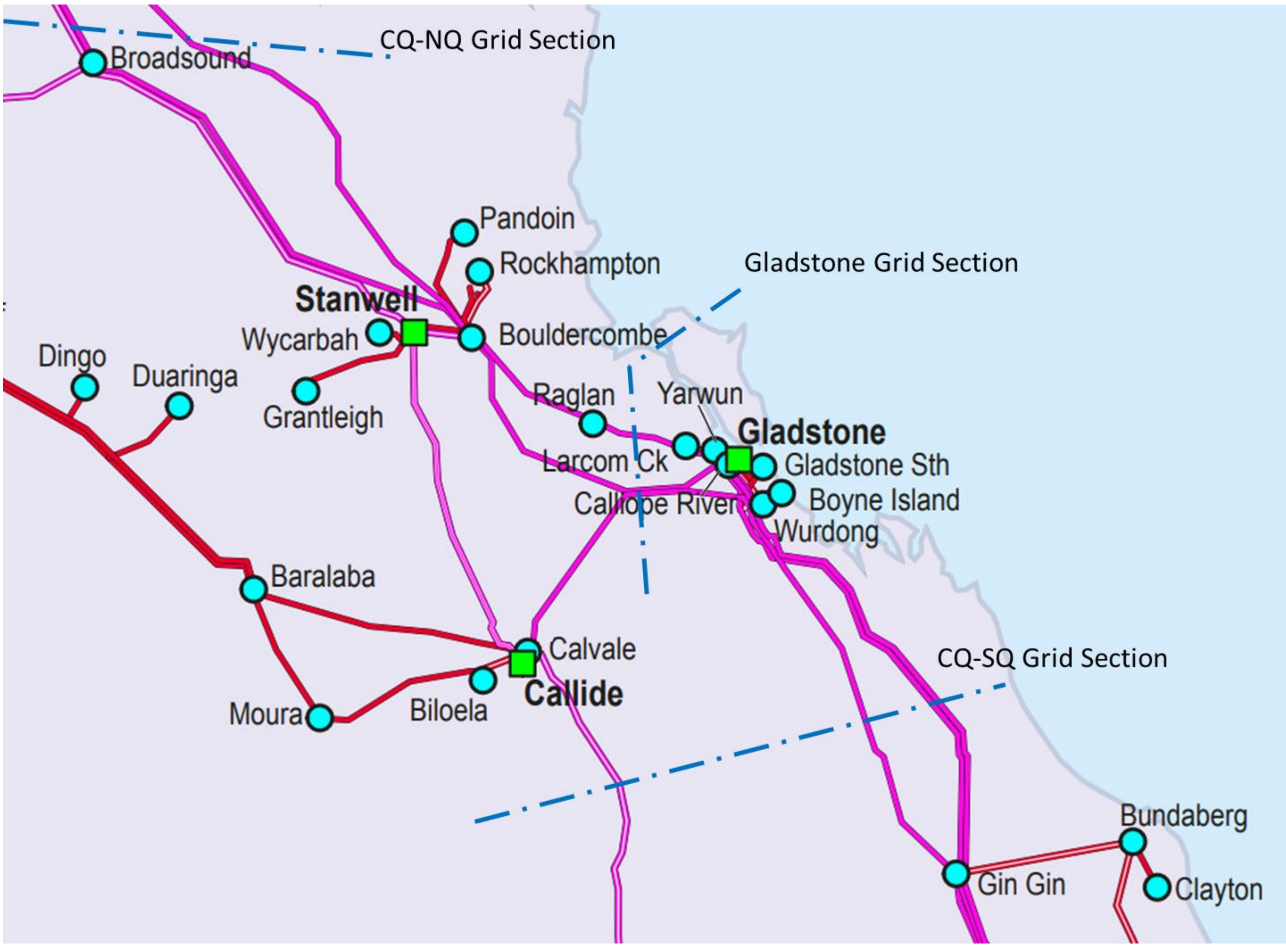
This process was repeated for four different network topologies:

1. the existing network
2. the Gladstone grid reinforcement project;
3. the CQ-SQ transmission link project; and
4. the Gladstone grid reinforcement project and CQ-SQ transmission link project.

The following definitions and assumptions are the basis of the analysis:

- *CQ-NQ northerly MW Flow* is an active power term (MW) with polarity following NEM convention (positive south to north). This term can be derived as the difference between the NQ demand (including losses) and NQ generation.
- *Stanwell net MW Generation* is the net MW generation at Stanwell 275kV bus (i.e. doesn't include loads at Bouldercombe, but does include the effect of Stanwell's auxiliary loads).
- *Yarwun net MW Generation* is the net MW generation at Yarwun 132kV bus.
- *Callide net MW Generation* is the net MW generation from Callide B and C.
- *Gladstone net MW Generation* is the net MW generation at Calliope River 275kV and 132kV buses.
- *Boyne Island MW Load* is the net MW load at Boyne Island 132kV bus.
- *Rodds Bay net MW Generation* is the net MW generation at new Bororen 275kV bus.
- The predicted worst case feeder flows are in MVA.

- All predicted flows are assumed to be towards Gladstone (west to east).



Source: https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/maps/2016-nem-regional-boundaries-map-web.pdf?la=en

Figure 11 – Central Queensland generation and flow definitions used in transfer limit assessment

Whilst the AEMO requested limits be specified in a simplified manner (single number/s) that can be used in the DLT, Powerlink is not in a position to resolve the simplifying assumptions leading to a trigger / timing commensurate with higher levels of accuracy.

The post contingency flows for each potentially critical CQ feeders has been modelled based on the variables that should be available in the DLT.

2.4.2.1 Existing Transfer Limits for DLT studies

Table 3, Table 4, Table 5, Table 6 and Table 7 list regression results applicable to the current network.

Table 3 – Calvale to Wurdong (871) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	168.9
CQ-NQ northerly MW Flow	-0.099
Stanwell net MW Generation	0.100
Yarwun net MW Generation	-0.080
Callide net MW Generation	0.185
Gladstone net MW Generation	-0.149
Boyne Island MW Load	0.319
Rodds Bay net MW Generation	-0.339

Table 4 – Bouldercombe to Calliope River (812) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	97.4
CQ-NQ northerly MW Flow	-0.234
Stanwell net MW Generation	0.226
Yarwun net MW Generation	-0.103
Callide net MW Generation	0.160
Gladstone net MW Generation	-0.203
Boyne Island MW Load	0.191
Rodds Bay net MW Generation	-0.167

Table 5 – Bouldercombe to Raglan (811) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	118.2
CQ-NQ northerly MW Flow	-0.249
Stanwell net MW Generation	0.241
Yarwun net MW Generation	-0.322
Callide net MW Generation	0.187
Gladstone net MW Generation	-0.232
Boyne Island MW Load	0.223
Rodds Bay net MW Generation	-0.202

Table 6 – Raglan to Larcom Creek (8875) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	109.2
CQ-NQ northerly MW Flow	-0.244
Stanwell net MW Generation	0.236
Yarwun net MW Generation	-0.308
Callide net MW Generation	0.184
Gladstone net MW Generation	-0.228
Boyne Island MW Load	0.220
Rodds Bay net MW Generation	-0.199

Table 7 – Larcom Creek to Calliope River (8859) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	3.5
CQ-NQ northerly MW Flow	-0.247
Stanwell net MW Generation	0.240
Yarwun net MW Generation	0.679
Callide net MW Generation	0.187
Gladstone net MW Generation	-0.231
Boyne Island MW Load	0.225
Rodds Bay net MW Generation	-0.200

2.4.2.2 Augmentation Transfer Limits

2.4.2.2.1 Gladstone Grid Section Reinforcement Transfer Limits

The following regression results apply to the Gladstone grid reinforcement upgrades that were identified to address the potential closure of Gladstone Power Station. Upgrades of importance to model for limit calculations include:

- Rebuilding of Feeders 811, 8875, 8859 and 812 to twin sulphur conductor.
- Cutting in Feeder 812 to Larcom Creek substation (creating 812-1 Bouldercombe to Larcom Creek and 812-2 Larcom Creek to Calliope River).
- Adding two new feeders between Calvale to Calliope River.

Under this topology, the new Calvale to Calliope River feeders are included into the Gladstone grid section with Feeders 871, 812 and 8875.

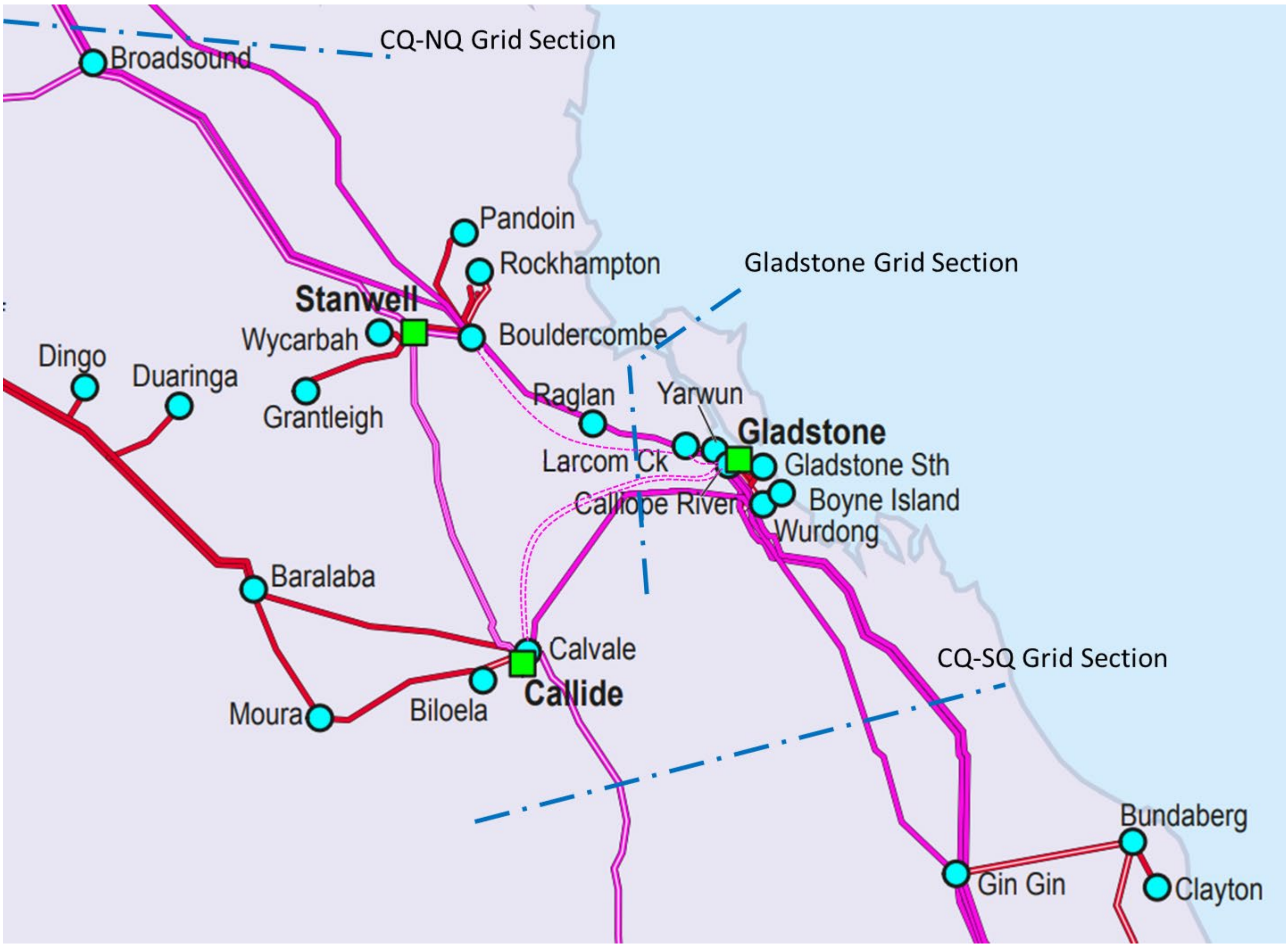


Figure 12 – Simplified representation of Gladstone Grid Reinforcement project

Table 8 – Calvale to Wurdong (871) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	15.2
CQ-NQ northerly MW Flow	-0.062
Stanwell net MW Generation	0.062
Yarwun net MW Generation	0.017
Callide net MW Generation	0.100
Gladstone net MW Generation	0.012
Boyne Island MW Load	0.296
Rodds Bay net MW Generation	-0.351

Table 9 – Bouldercombe to Larcom Creek (812-1) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	14.6
CQ-NQ northerly MW Flow	-0.322
Stanwell net MW Generation	0.308
Yarwun net MW Generation	-0.157
Callide net MW Generation	0.084
Gladstone net MW Generation	-0.110
Boyne Island MW Load	0.100
Rodds Bay net MW Generation	-0.084

Table 10 – Bouldercombe to Raglan (811) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	19.3
CQ-NQ northerly MW Flow	-0.320
Stanwell net MW Generation	0.306
Yarwun net MW Generation	-0.157
Callide net MW Generation	0.084
Gladstone net MW Generation	-0.110
Boyne Island MW Load	0.099
Rodds Bay net MW Generation	-0.084

Table 11 – Raglan to Larcom Creek (8875) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	8.4
CQ-NQ northerly MW Flow	-0.318
Stanwell net MW Generation	0.304
Yarwun net MW Generation	-0.160
Callide net MW Generation	0.082
Gladstone net MW Generation	-0.108
Boyne Island MW Load	0.098
Rodds Bay net MW Generation	-0.083

Table 12 – Larcom Creek to Calliope River (8859) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	-93.1
CQ-NQ northerly MW Flow	-0.448
Stanwell net MW Generation	0.430
Yarwun net MW Generation	0.760
Callide net MW Generation	0.144
Gladstone net MW Generation	-0.187
Boyne Island MW Load	0.167
Rodds Bay net MW Generation	-0.145

Table 13 – New Calvale to Calliope River post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	131.2
CQ-NQ northerly MW Flow	0.005
Stanwell net MW Generation	0.002
Yarwun net MW Generation	-0.188
Callide net MW Generation	0.163
Gladstone net MW Generation	-0.217
Boyne Island MW Load	0.194
Rodds Bay net MW Generation	-0.166

2.4.2.2.2 CQ-SQ Transmission Link Transfer Limits

The following regression results apply to the existing network as in section 2.4.2.1 but with the inclusion of the CQ-SQ transmission link project.

Figure 13 – Simplified representation of existing network with CQ-SQ Transmission Link projects

Table 14 – Calvale to Wurdong (871) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	201.8
CQ-NQ northerly MW Flow	-0.023
Stanwell net MW Generation	0.026
Yarwun net MW Generation	-0.159
Callide net MW Generation	0.108
Gladstone net MW Generation	-0.199
Boyne Island MW Load	0.393
Rodds Bay net MW Generation	-0.428

Table 15 – Bouldercombe to Calliope River (812) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	141.2
CQ-NQ northerly MW Flow	-0.175
Stanwell net MW Generation	0.168
Yarwun net MW Generation	-0.160
Callide net MW Generation	0.093
Gladstone net MW Generation	-0.254
Boyne Island MW Load	0.245
Rodds Bay net MW Generation	-0.231

Table 16 – Bouldercombe to Raglan (811) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	173.1
CQ-NQ northerly MW Flow	-0.179
Stanwell net MW Generation	0.172
Yarwun net MW Generation	-0.391
Callide net MW Generation	0.107
Gladstone net MW Generation	-0.290
Boyne Island MW Load	0.283
Rodds Bay net MW Generation	-0.264

Table 17 – Raglan to Larcom Creek (8875) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	158.0
CQ-NQ northerly MW Flow	-0.176
Stanwell net MW Generation	0.169
Yarwun net MW Generation	-0.376
Callide net MW Generation	0.105
Gladstone net MW Generation	-0.285
Boyne Island MW Load	0.279
Rodds Bay net MW Generation	-0.260

Table 18 – Larcom Creek to Calliope River (8859) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	53.1
CQ-NQ northerly MW Flow	-0.178
Stanwell net MW Generation	0.172
Yarwun net MW Generation	0.614
Callide net MW Generation	0.107
Gladstone net MW Generation	-0.289
Boyne Island MW Load	0.285
Rodds Bay net MW Generation	-0.263

2.4.2.2.3 Gladstone Grid Reinforcement with CQ-SQ Transmission Link projects Transfer Limits

The following regression results apply to the same network as section 2.4.2.2.1 but with the inclusion of the Gladstone grid reinforcement and CQ-SQ transmission link projects.

Figure 14 – Simplified representation of Gladstone Grid Reinforcement with CQ-SQ Transmission Link projects

Table 19 – Calvale to Wurdong (871) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	32.9
CQ-NQ northerly MW Flow	-0.023
Stanwell net MW Generation	0.025
Yarwun net MW Generation	-0.017
Callide net MW Generation	0.061
Gladstone net MW Generation	-0.025
Boyne Island MW Load	0.340
Rodds Bay net MW Generation	-0.383

Table 20 – Bouldercombe to Larcom Creek (812-1) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	46.6
CQ-NQ northerly MW Flow	-0.293
Stanwell net MW Generation	0.279
Yarwun net MW Generation	-0.178
Callide net MW Generation	0.050
Gladstone net MW Generation	-0.140
Boyne Island MW Load	0.121
Rodds Bay net MW Generation	-0.109

Table 21 – Bouldercombe to Raglan (811) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	49.7
CQ-NQ northerly MW Flow	-0.291
Stanwell net MW Generation	0.277
Yarwun net MW Generation	-0.175
Callide net MW Generation	0.050
Gladstone net MW Generation	-0.140
Boyne Island MW Load	0.121
Rodds Bay net MW Generation	-0.109

Table 22 – Raglan to Larcom Creek (8875) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	41.2
CQ-NQ northerly MW Flow	-0.291
Stanwell net MW Generation	0.276
Yarwun net MW Generation	-0.181
Callide net MW Generation	0.050
Gladstone net MW Generation	-0.139
Boyne Island MW Load	0.119
Rodds Bay net MW Generation	-0.108

Table 23 – Larcom Creek to Calliope River (8859) post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	-48.9
CQ-NQ northerly MW Flow	-0.393
Stanwell net MW Generation	0.375
Yarwun net MW Generation	0.711
Callide net MW Generation	0.086
Gladstone net MW Generation	-0.234
Boyne Island MW Load	0.215
Rodds Bay net MW Generation	-0.191

Table 24 – New Calvale to Calliope River post contingent MVA flow prediction

Measured Variable	Coefficient
Intercept (95% Confidence Level)	175.8
CQ-NQ northerly MW Flow	0.067
Stanwell net MW Generation	-0.059
Yarwun net MW Generation	-0.244
Callide net MW Generation	0.100
Gladstone net MW Generation	-0.275
Boyne Island MW Load	0.251
Rodds Bay net MW Generation	-0.220

2.5 Corridor / Route Selection

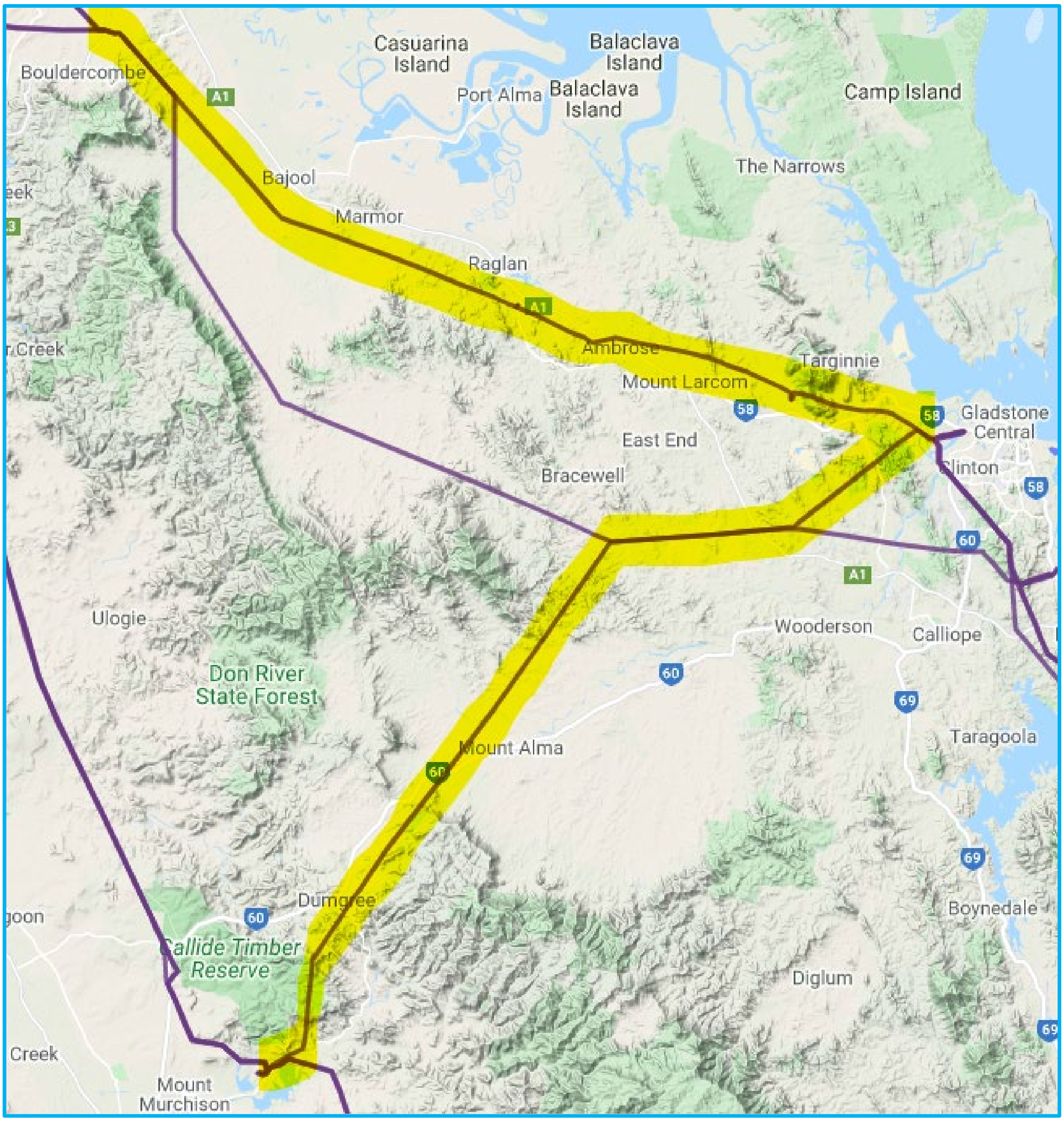


Figure 15 – Indicative alignment

A high-level desktop assessment has been conducted, exploring potential transmission line route options between Bouldercombe and Calvale substations, via Larcom Creek and Calliope River substations. It is concluded that nominally following the existing 275kV transmission lines, which connect the same substations, is the preferred option, as it is the most direct and is likely to be the lowest cost alternative, both for acquisition and construction phases. A notional corridor 20km wide surrounding the existing easement is assumed, and widening the existing easement, or creating a separate "parallel" easement are to be considered within this corridor. A decision regarding separation between existing and proposed lines will be made at a later stage, taking into account all the relevant factors.

No provision is made for land acquisition at any of Bouldercombe, Larcom Creek, Calvale and Calliope River substations. The existing sites have vacant area available for the required expansion.

2.6 Project schedule and staging

A high level staging plan for an assumed commissioning date of October 2030 is presented in Table 25.

Table 25 – High level schedule and staging

Activity	Target Completion
Project Approval – Property Acquisition	Jun-25
Project Approval – Delivery	Jun-28
Substation Site Access	Jun-28
Transmission Line Site Access	Jun-28
Substation Construction Complete (CP.01707 Larcom Creek to Bouldercombe)	Jan-30
Transmission Line Construction Complete (CP.01707 Larcom Creek to Bouldercombe)	Jan-30
Substation Construction Complete (CP.01706 Calliope River to Larcom Creek)	Mar-30
Transmission Line Construction Complete (CP.01706 Calliope River to Larcom Creek)	Mar-30
Substation Construction Complete (CP.0xxxx Calvale to Calliope River)	May-30
Commissioning Complete (CP.01707 Larcom Creek to Bouldercombe)	May-30
Commissioning Complete (CP.01706 Calliope River to Larcom Creek)	Jun-30
Transmission Line Construction Complete (CP.0xxxx Calvale to Calliope River)	Aug-30
Commissioning Complete (CP.0xxxx Calvale to Calliope River)	Oct-30

3 Cost estimates

The cost estimate is presented in Table 26. This has been assessed as a class 5 estimate.

Table 26 – Estimate breakdown

Gladstone Grid Reinforcement Class 5	Base Cost $k, real 2020
Overheads	**31,386**
Project Management, Coordination and Other Support	15,636
Property Acquisition, Environmental & Cultural Heritage	15,750
Environmental Offsets	-
Transmission Lines	**234,814**
Design	10,711
Procurement	31,391
Construction	191,134
Commissioning	-
Post Commissioning	1,578
Substations	**30,704**
Design	2,947
Procurement	12,816
Construction	12,790
Commissioning	1,745
Post Commissioning	406
Telecoms	**673**
Network Operations	**549**
Estimate Allowances	**15,409**
Estimate Total (include Project Allowance)	**313,534**
Total Contingency	**94,059**
Mitigated Risk (Known Risk)	19,939
Contingency (Unknown Risk)	74,120
Estimate Total (include Project Allowance, Risk & Contingency)	**407,594**

A summary of the risks considered and included in the estimate are presented in Figure 16. Note that the risk costs are presented in real, 2021 dollars, and have been deescalated to real, 2020 dollars for inclusion in the project cost estimate.

Risk type	Risk Cost Estimate (Pessimistic - no factoring applied)	Risk Cost Estimate (after Likelihood factoring applied)	Impact To Project (UNTREATED)	Risk Treatment Cost (Additional cost to administer Risk)	Mitigated Risk (Known Risk)	Project Cost -direct transfer to estimate (Estimate Allowance)	Impact To Project (AFTER RISK TREATMENT)
Commercial & Legal	[redacted]	[redacted]	Moderate	[redacted]	[redacted]	[redacted]	Moderate
Finance & Economic	[redacted]	[redacted]	Minor	[redacted]	[redacted]	[redacted]	Minor
People / Human Resources	[redacted]	[redacted]	Minor	[redacted]	[redacted]	[redacted]	Minor
Natural Events	[redacted]	[redacted]	Minor	[redacted]	[redacted]	[redacted]	Minor
Environmental	[redacted]	[redacted]	Minor	[redacted]	[redacted]	[redacted]	Minor
Health & Safety	[redacted]	[redacted]	Minor	[redacted]	[redacted]	[redacted]	No impact
Project Management	[redacted]	[redacted]	No impact	[redacted]	[redacted]	[redacted]	No impact
Interfacing Management	[redacted]	[redacted]	No impact	[redacted]	[redacted]	[redacted]	No impact
Community Issues	[redacted]	[redacted]	Moderate	[redacted]	[redacted]	[redacted]	Moderate
Design	[redacted]	[redacted]	Minor	[redacted]	[redacted]	[redacted]	No impact
Delivery	[redacted]	[redacted]	Moderate	[redacted]	[redacted]	[redacted]	Moderate
Completion	[redacted]	[redacted]	No impact	[redacted]	[redacted]	[redacted]	No impact
TOTAL	$ 56,795,904	$ 39,858,070		$ 13,295,813	$ 20,756,813	$ 16,040,750	

Figure 16 – Risk summary

4 Approvals and stakeholders

4.1 Stakeholder engagement plan

Powerlink is committed to genuine and timely stakeholder engagement that leads to improved decision-making and better outcomes for our stakeholders. A detailed stakeholder engagement plan will be developed prior to engagement activities commencing, which will apply the principles established in our Stakeholder Engagement Framework [3]. Key stakeholders include customers, consumer advocacy groups, landholders, Traditional Owners, our Customer Panel, State and Local Government representatives.

Early engagement is anticipated with the key stakeholders, with a Project Participation and Access Allowance being made available to eligible landholders, in accordance with normal Powerlink practice. Engagement is expected to predominantly take the form of presentations and briefings, community briefings and one on one meetings. Powerlink will work with stakeholders to identify engagement preferences.

4.2 Stakeholder assessment

It is anticipated that landholder issues can be identified at an early stage and accommodated during the route finalisation process.

Consultation with the Traditional Owners is a significant component of the route selection process. Powerlink will engage and establish relationships with the relevant Traditional Owners and develop a Cultural Heritage Management Plan / Agreement in conjunction with the identified groups. This will also include a comprehensive on-site Cultural Heritage Survey conducted with the Traditional Owners. Measures will be implemented for the avoidance of impacts or management of Aboriginal Cultural Heritage.

Investigations into historical heritage will be conducted, and measures established to avoid impact on historic or other heritage.

4.3 Relevant planning overlays

Detailed geospatial data and planning overlays are not available at this stage of development. This information will be made available as the route alignment becomes more firm following appropriate engagement with landholders, Traditional Owners and relevant State and Local Government representatives.

4.4 Estimate of planning approval complexity

Planning approval for the transmission line will be facilitated under the Ministerial Infrastructure Designation process, per the Queensland Government's *Planning Act 2016*. No planning approval is required for the proposed substation works. Overall the project has been assessed as having medium planning approval complexity, due to the number of stakeholders to be engaged, but risk of delays can be mitigated through early and effective engagement on the route selection.

5 References

1. 2020 Integrated System Plan, July 2020, https://aemo.com.au/-/media/files/major-publications/isp/2020/final-2020-integrated-system-plan.pdf?la=en, accessed 16 June 2021, Australian Energy Market Operator.

2. 2020 ISP Appendix 3. Network Investments, July 2020, https://aemo.com.au/-/media/files/major-publications/isp/2020/appendix--3.pdf?la=en, accessed 16 June 2021, Australian Energy Market Operator.

3. Stakeholder Engagement Framework, https://www.powerlink.com.au/engagement-framework, accessed 28 June 2021, Powerlink Queensland.