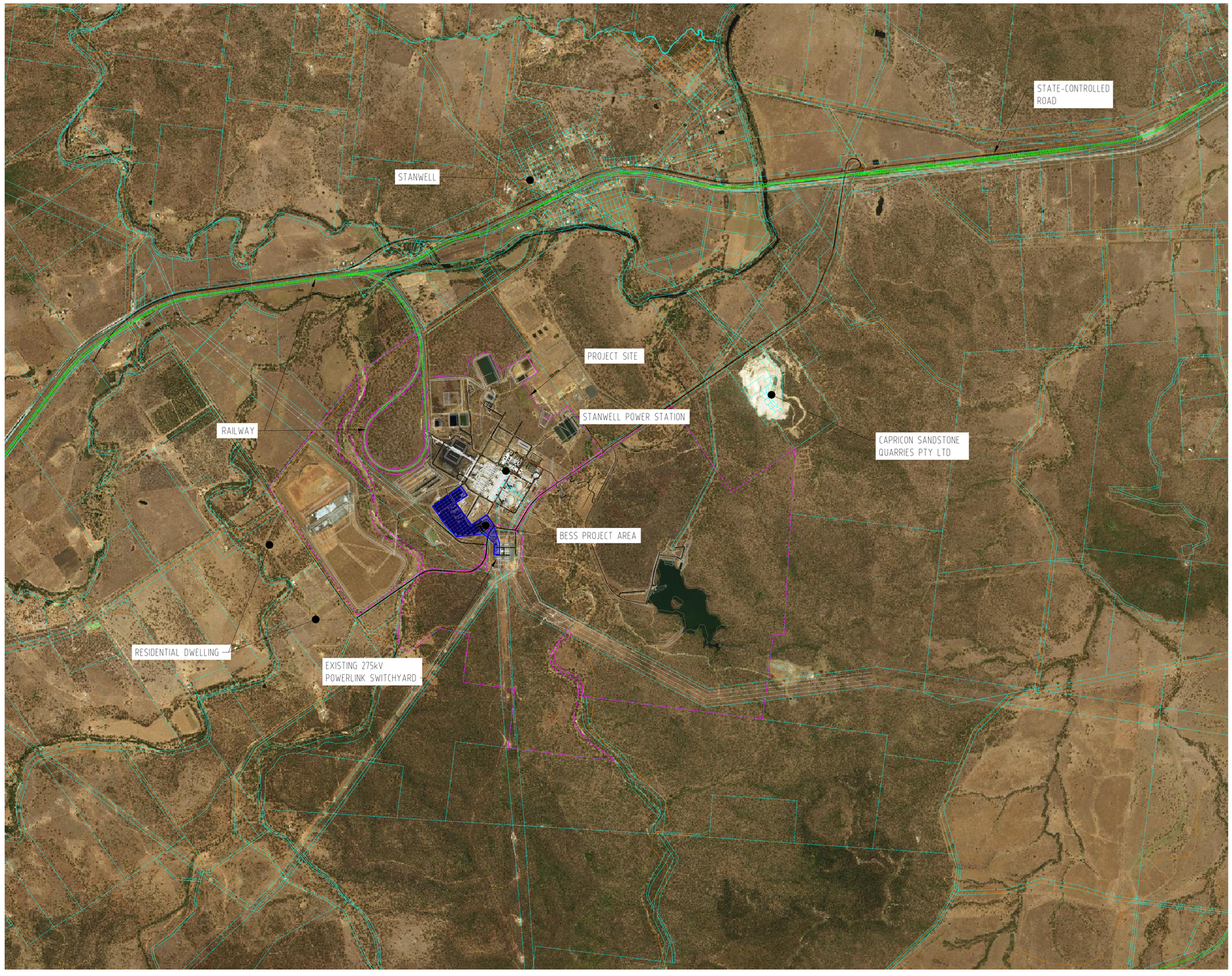

LEGEND:

- BESS SITE BOUNDARY
- EASEMENT
- ROAD AND TRACK BASELINE
- RAILWAY
- PROJECT SITE CADASTRE

ROCKHAMPTON REGIONAL COUNCIL

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These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/82-2022

Dated: 17 November 2022

REVISION	DESCRIPTION	DRAWN BY	CHECKED	APPROVED	APPEA No.
A	ISSUED FOR CLIENT REVIEW	LM	HJD		

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SWITCHROOM FOLDER
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SUPERSEDED DRGS:
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REFERENCE DRGS:
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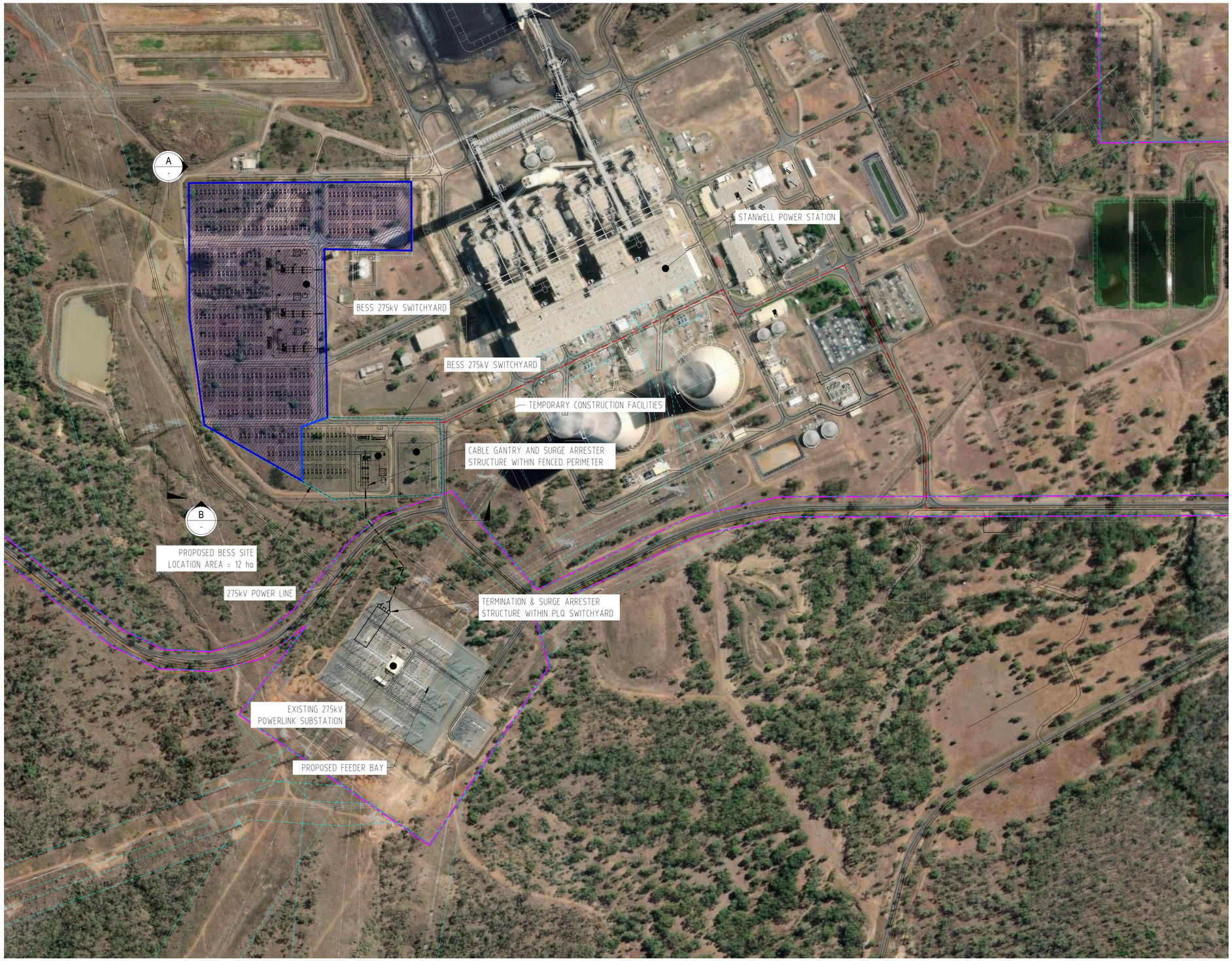
STANWELL Power Station | stanwell

CENTRAL RENEWABLE ENERGY ZONE
BATTERY STORAGE SYSTEM
OVERALL PROJECT SITE
LOCATION PLAN

AURECON DRAWING No.
CRBP-DRG-JJ-0004
STANWELL DRAWING No.
CRBP-0000-AGP-100-DRG-G-0004

Drawn	M.G.	Revision
Date	20.05.2022	B
Scale	1:3000	



LEGEND:

- STAGE 1
- STAGE 2
- EASEMENT
- ROAD AND TRACK BASELINE
- RAILWAY
- SITE CADASTRE
- BESS SITE BOUNDARY
- PROPOSED INTERNAL ACCESS

NOTES:

1. BESS FACILITY LAYOUT TO BE LOCATED WITHIN THE AREA SHOWN.
2. STAGE 1 CONFIGURATION IS 150 MW / 300 MWh.
3. STAGE 2 CONFIGURATION IS SHOWN AS 1300 MW / 2,600 MWh.
4. LAYOUT SHOWN IS INDICATIVE ONLY FOR THE COMBINED 1,450 MW / 2,900 MWh.

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	APEQ No.	

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SUPERSEDED DRGS.
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STANWELL Power Station | stanwell

CENTRAL RENEWABLE ENERGY ZONE
BATTERY STORAGE SYSTEM
SITE
LOCATION PLAN

AURECON DRAWING No.
CRBP-DRG-JJ-0003
STANWELL DRAWING No.
CRBP-0000-AGP-100-DRG-G-0003

Drawn M.G	Revision
Date 20.05.2022	B
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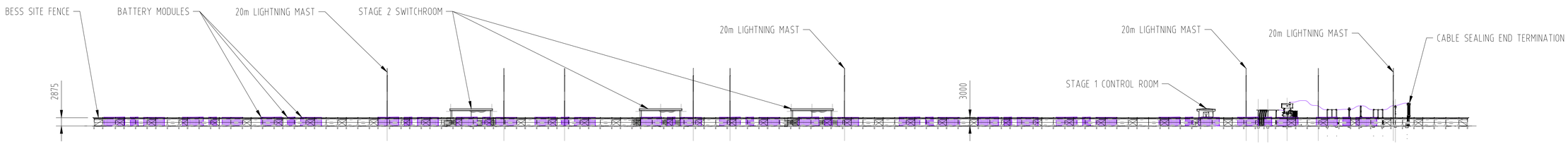
NOTES:

1. REFER TO NOTES IN LAYOUT DRAWING.



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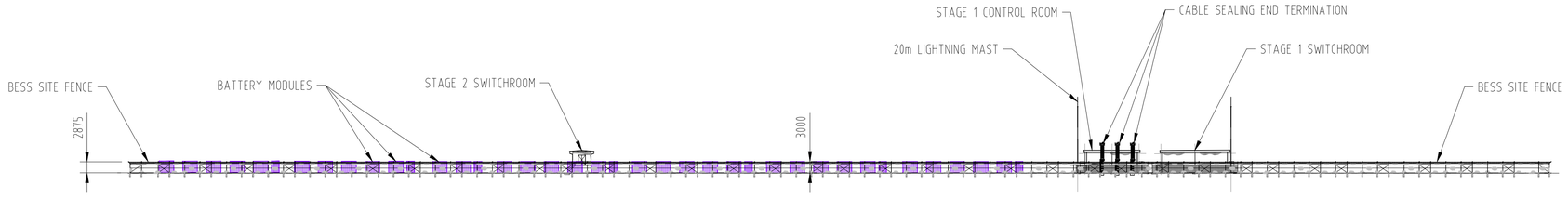

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SWITCHROOM FOLDER
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SUPERSEDED DRGS:
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REFERENCE DRGS:
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STANWELL Power Station | stanwell

CENTRAL RENEWABLE ENERGY ZONE
BATTERY STORAGE SYSTEM
SITE
ELEVATIONS

AURECON DRAWING No.
CRBP-DRG-JJ-0005
STANWELL DRAWING No.
CRBP-0000-AGP-100-DRG-G-0005

Drawn	V.S	Revision
Date	06.04.2022	A
Scale	1:750	

Stanwell BESS

Concept Stormwater Management Plan

Stanwell Corporation Limited

Reference: P12486

Revision: 1

2022-10-07

ROCKHAMPTON REGIONAL COUNCIL

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Document control record

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Approval			
Author signature		Approver signature	
Name	Adrian Low	Name	Hugh Campbell
Title	Lead Consultant	Title	Senior Consultant

Contents

Figures

Tables

1 Introduction

1.1 Scope and Purpose

This Conceptual Stormwater Management Plan (CSMP) has been developed by Aurecon on behalf of Stanwell Corporation Limited (Stanwell) to support a development application for the construction of a Battery Energy Storage System (BESS) located at 397 & 519 Power Station Road, Stanwell (hereinafter referred to as the Project). The Project proposes the installation of a BESS capable of storing and exporting electrical energy to the National Electrical Market (NEM).

This CSMP outlines conceptual stormwater measures in managing runoff (both quantity and quality) discharge from the site (for Stage 1 and the Final Developed scenarios) and excludes detailed drainage layout internally within the site and construction phase Erosion and Sediment Control Plan (ESC).

1.2 Site Description

1.2.1 Location and Land Use

The Project is located at 397 & 519 Power Station Road, Stanwell, formally described as Lot 44 on SP140243 and Lot 1 on RP886588 (hereinafter referred to as the Project Site). The Project Site is located within the Central Queensland Region approximately 28km southwest of Rockhampton. The Project locality plan is shown in Figure 1.

The land surrounding the Project Site is characterised by rural land utilised for grazing purposes. The nearest township is Stanwell, located approximately 1.7km to the north. Capricorn Sandstone Quarries Pty Ltd is located approximately 600m east of the Project Site.

The Project Site has a total area of 1,118.3 ha. However, the proposed development footprint (hereinafter referred to as the Project Area) will encompass an area of approximately 11.5 ha located directly southeast of the Stanwell Power Station (Lot 44 on SP140243) and north of the Powerlink Switchyard (Lot 1 on RP886588). The proposed development area (Project Area) is shown in Figure 2.

The existing Stanwell Power Station is a highly developed area with large scale coal power generation infrastructure, water storage facilities, coal stockpiles and transmission line infrastructure.

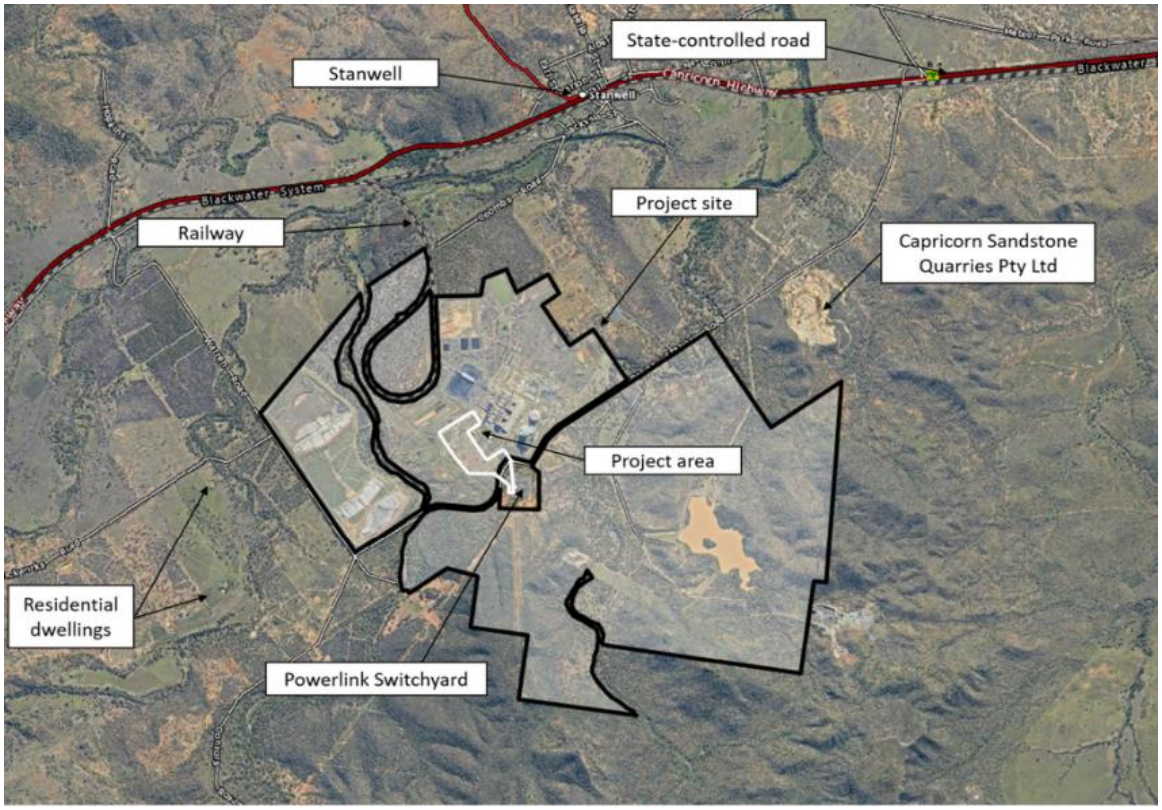

Figure 1 Project Locality Plan

Figure 2 Proposed Development Area (Project Area)

1.2.2 Topography and Drainage

The Project Area is located near a crest and the existing terrain generally falls south and runoff is directed to the Southern Stormwater Dam via open channel (see Figure 3). The dam spillway is located on the south eastern corner of the dam, which subsequently discharges into Stony Creek.

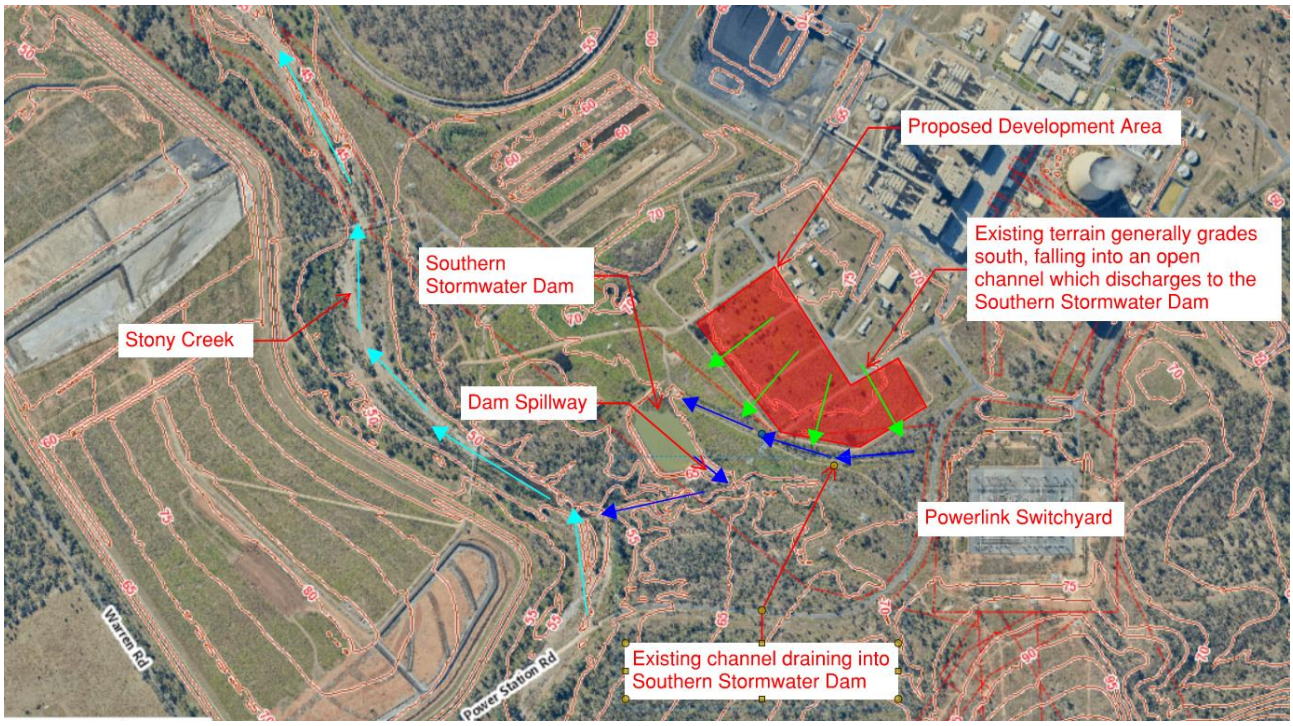

Figure 3 Existing topography and drainage plan

1.2.3 Flood Overlay

Based on the online FloodCheck tool provided by Business Queensland, the Project Area is not located within the 1% AEP flood overlay (see Figure 4). Therefore, it does not warrant any two-dimensional hydraulic modelling and does not present any tailwater constraint for the pre and post development flow assessment.

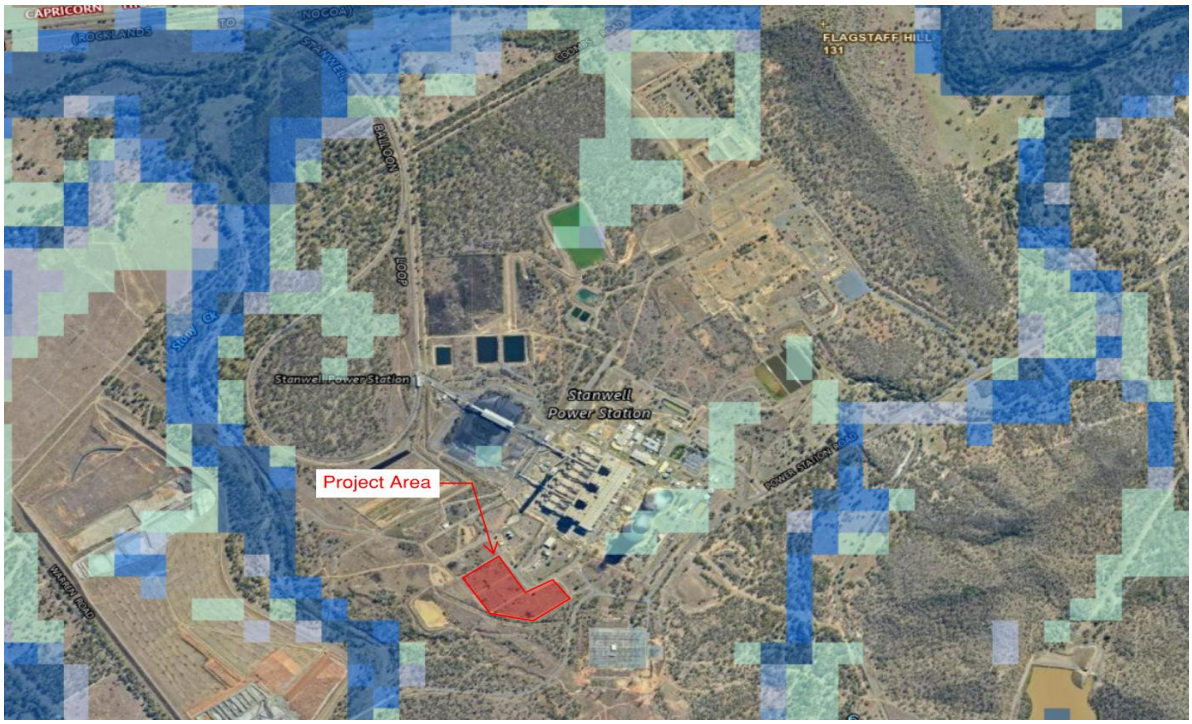

Figure 4 Flood Mapping for 1%AEP event *(Source: https://www.business.qld.gov.au/running-business/support-assistance/mapping-data-imagery/maps/flood-mapping)*

1.3 Proposed Development

The Project involves installing a BESS capable of storing and exporting electrical energy to the NEM. The BESS will be connected to the adjoining Powerlink Switchyard, located on Lot 1 on RP886588 via a 275kV transmission line. It is important to note that the proposed development does not include the feeder bay within the Powerlink Switchyard as these works will be undertaken by Powerlink.

The Project will occur in two stages (see Figure 5). Stage 1 will involve the installation of batteries with an output of 150MW/300MWh and Stage 2 will have an output of up to 1,300MW/2,600MWh. The land use proposed is considered consistent with the existing use of the land for power generation.

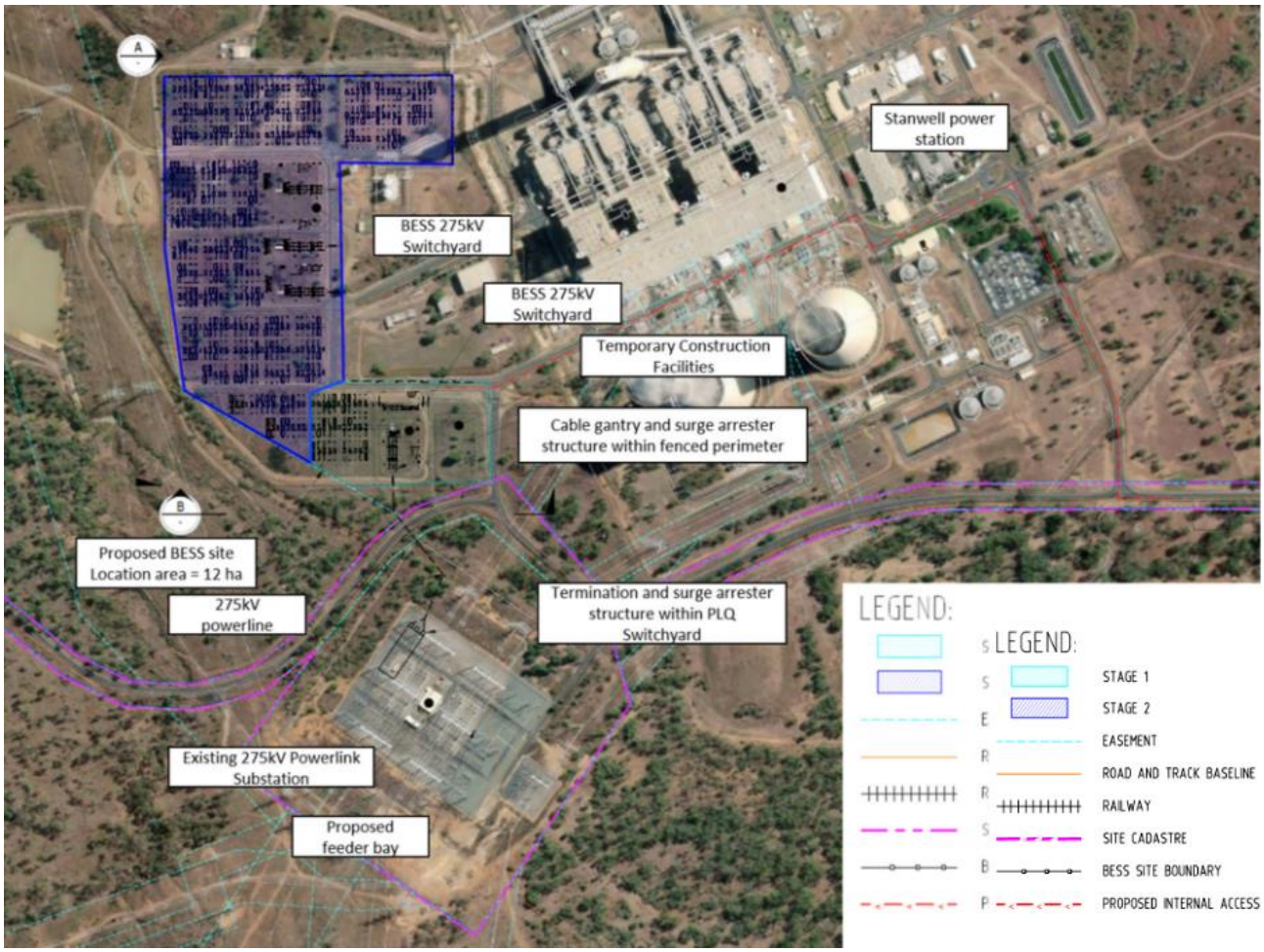

Figure 5 Proposed Site Layout

2 Stormwater Management

2.1 Stormwater Management Compliance Standards

As per correspondence with Rockhampton Regional Council dated 28 July 2022, the key matters to be addressed from a stormwater management perspective were as follows:

- Provide a stormwater drainage strategy for the proposed development, prepared by a suitably qualified registered engineer that clearly demonstrates how the post-development runoff for the site will be limited to the pre-development scenario and conveyed to a lawful point of discharge in accordance with the requirements of the Queensland Urban Drainage Manual.
- Provide detailed stormwater quality modelling (MUSIC) that demonstrates that the proposed development is able to comply with water quality design objectives outlined in the State Planning Policy (SPP).
- The risk to water quality would be oil contamination from leaks at the transformer and runoff from the proposed impervious area. As per the standard practice, the transformer area should be bunded and drained to a Stormwater Quality Improvement Device (SQID) to intercept any contaminated water. Further details will be required in this regard to demonstrate how the development complies with SPP requirements.

2.2 Stormwater Quantity Management

The Project Area is located within a larger catchment area that reports to the Southern Stormwater Dam (see Figure 6). The pre and post development flows from the Southern Stormwater Dam spillway was assessed using the DRAINS software.

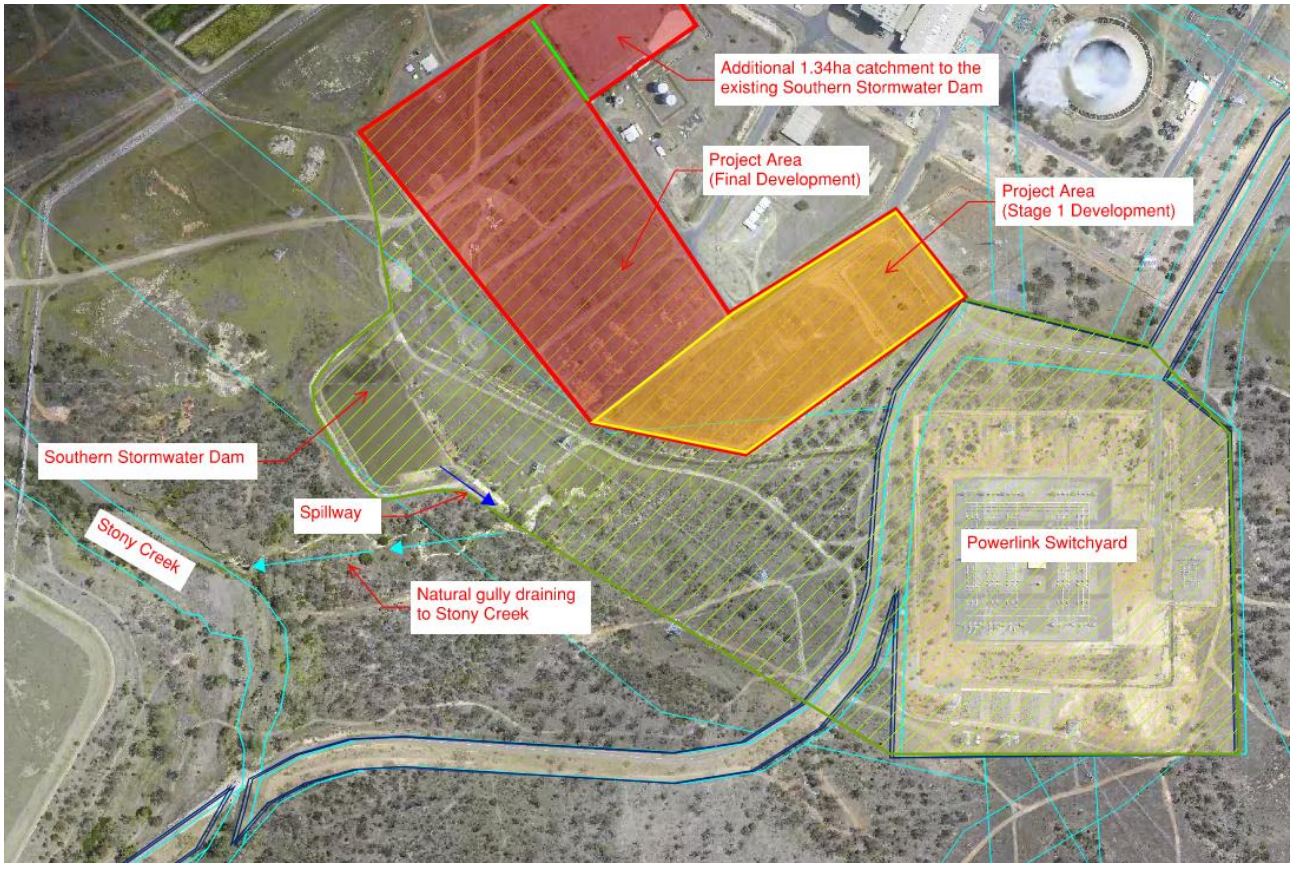

Figure 6 Catchment Contributing to Southern Stormwater Dam

As shown in Figure 6, it is worth noting that the Project Area would increase the existing catchment (total area is 37.8ha) to Southern Stormwater Dam by 1.34ha. Table 1 compares the pre and post development catchments.

Table 1 Pre and Post Development Catchment Comparison

	Pre-Development	Post-Development (Stage 1)	Post-Development (Final)
Total Catchment (ha)	37.8	37.8	39.14
% Imperviousness	8	16.4	37.3

2.2.1 Hydrology

The Project Site coordinates (23.513S, 150.316E) were used to obtain the Australian Rainfall and Runoff (ARR 2016) temporal patterns and IFD data from BoM. The temporal patterns and IFD depths (see Table 2) were then utilised in developing the ILSAX hydrological model in DRAINS.

Table 2 IFD Rainfall Depth *(Source: BoM)*

Duration (mins)	Annual Exceedance Probability (AEP)						
	63.2%	**50%**	**20%**	**10%**	**5%**	**2%**	**1%**
5	9.34	10.3	13.6	15.8	17.9	20.8	23.1
10	15.6	17.2	22.5	26.1	29.7	34.6	38.4
15	20.0	22.1	28.8	33.5	38.2	44.5	49.4
20	23.3	25.7	33.6	39.1	44.6	52.0	57.7
25	25.9	28.6	37.4	43.5	49.7	58.0	64.4
30	28.0	31.0	40.6	47.2	53.9	62.9	70.0
45	32.7	36.2	47.6	55.5	63.5	74.2	82.7
60	35.9	39.8	52.5	61.4	70.3	82.5	92.0
90	40.3	44.8	59.6	69.9	80.3	94.6	106
120	43.4	48.4	64.7	76.3	87.9	104	117
180	47.8	53.6	72.5	86.0	99.7	119	134

Table 3 shows the ILSAX hydrological model parameters adopted in the DRAINS model.

Table 3 ILSAX Hydrological Model Parameters

Paved (impervious) area depression storage (mm)	**1**
Supplementary area depression storage (mm)	1
Grassed (pervious) area depression storage (mm)	5
Soil Type	3 (slow infiltration rates)

2.2.2 Pre and Post Development Flow Comparison

In order to attenuate increased post development flows (due to increased imperviousness), the existing Southern Stormwater Dam will need to increase its footprint from 9,960m^2 to 12,500m^2 (see Table 4), with 2.2 m depth from the spillway.

Table 4 Southern Stormwater Dam Pre and Post Development Footprint

	Pre Development	Post Development (Stage 1)	Post Development (Final)
Surface Area (m^2) at Spillway Level	9,960	540	12,500
Base Area (m^2)	7,400	450	9,500

The existing Southern Stormwater Dam is found to be able to contain storm events smaller that 10% AEP (i.e. no overtopping of spillway). Table 5 shows the pre and post development flows from the Southern Stormwater Dam spillway.

Table 5 Pre and Post Development Flows from Southern Stormwater Dam Spillway

Development	Annual Exceedance Probability (AEP)				
	20%	**10%**	**5%**	**2%**	**1%**
Pre	0	0.34	2.37	4.72	6.60
Post	0	0.12	2.00	3.95	6.03

2.3 Stormwater Quality Management

In accordance with the Urban Stormwater – Queensland Best Practice Environmental Management Guidelines (2009), the pollutant load reductions targets for Central Coast (South), where the Project Site is located, are shown in Table 6.

Table 6 Pollutant Load Reduction Targets for Central Coast (South)

Pollutant Type	Percentage Load Reduction (%)
Total Suspended Solids (TSS)	85
Total Phosphorus (TP)	70
Total Nitrogen (TN)	45
Gross Pollutants (GP)	90

The water quality modelling has been undertaken using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software.

As the detailed internal layout within the Project Area is yet to be finalised, it is assumed that all runoff from the Project Site will be treated with a single bioretention basin (see Figure 7) adjacent to the Southern Stormwater Dam to be conservative. Bioretention systems operate by filtering pollutants from runoff through a soil media prior to discharge. There is an opportunity to provide water quality treatment swales within the Project Area.

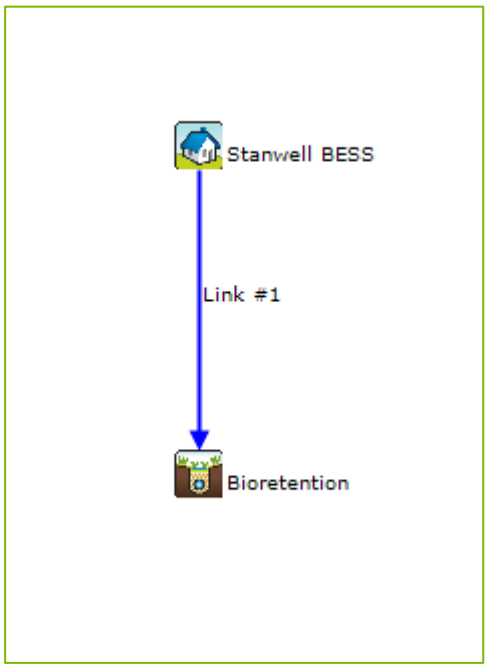

Figure 7 MUSIC Model Schematic

2.3.1 Meteorological Data

Table 7 summarises the rainfall data adopted in the MUSIC model.

Table 7 Rainfall Data Adopted in MUSIC Model

Gauge Station	Rockhampton AERO
Period	1/1/1999 to 31/12/2009
Time Step	6 minutes

Potential Evapotranspiration (PET) data was obtained from the Bureau of Meteorology (BoM) website and is summarised in Table 8.

Table 8 Potential Evapotranspiration Data *(Source: BoM)*

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PET (mm)	195	150	165	120	90	75	75	90	120	165	180	195

2.3.2 Source Node Parameters

The Project Site has been modelled as Industrial land use and the lumped catchment approach is adopted. The rainfall runoff and pollutant load parameters are in accordance with Water by Design MUSIC Modelling Guidelines (2018) and are summarised in Table 9 and

Table 10.

Table 9 Rainfall Runoff Parameters

Parameter	Value
Rainfall Threshold	1 mm/day
Soil Storage Capacity	18 mm
Initial Storage	10%
Field Capacity	80 mm
Infiltration Capacity Coefficient – a	243
Infiltration Capacity Coefficient – b	0.6
Initial Depth	50 mm
Daily Recharge Rate	0%
Daily Baseflow Rate	31%
Daily Deep Seepage Rate	0%

Table 10 Pollutant Load Parameters

Flow Type	TSS Log^{10} Values		TP Log^{10} Values		TN Log^{10} Values	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Baseflow	0.78	0.45	-1.11	0.48	0.14	0.20
Stormflow	1.92	0.44	-0.59	0.36	0.25	0.32

2.3.3 Treatment Node Parameters

Table 11 summarises the bioretention basin parameters adopted in the MUSIC model.

Table 11 Bioretention Basin Parameters

Parameters	Values
Extended Detention Depth	0.3 m
Surface Area	700 m^2 (Stage 1 Development) 2200 m^2 (Final Development)
Filter Area	500 m^2 (Stage 1 Development) 1955 m^2 (Final Development)
Saturated Hydraulic Conductivity	200 mm/h
Filter Depth	0.5 m
TN Content of Filter Media	400 mg/kg
Orthophosphate Content of Filter Media	30 mg/kg
Is Base Lined?	Yes
Unlined Filter Media Perimeter	0.01
Exfiltration Rate	0 mm/h
Vegetation Properties	Vegetated with Effective Nutrient Removal Plants
Overflow Weir Width	2 m
Underdrain Present?	Yes
Submerged Zone with Carbon Present?	No
Submerged Zone Depth	N/A

2.3.4 MUSIC Modelling Results

Results of the MUSIC modelling for treatment train effectiveness is summarised in Table 12 and Table 13.

Table 12 MUSIC Modelling Results (Stage 1 Development)

Pollutant	Source (kg/yr)	Residual Load (kg/yr)	% Reduction Achieved	% Reduction Targets
Total Suspended Solids	2197	224	89.78	85
Total Phosphorus	5.98	1.20	80.00	70
Total Nitrogen	37.67	20.62	45.25	45
Gross Pollutants	431	0	100	90

Table 13 MUSIC Modelling Results (Final Development)

Pollutant	Source (kg/yr)	Residual Load (kg/yr)	% Reduction Achieved	% Reduction Targets
Total Suspended Solids	8529	934	89.05	85
Total Phosphorus	21.93	4.19	80.90	70
Total Nitrogen	140.63	77.24	45.07	45
Gross Pollutants	1599	0	100	90

3 Findings and Recommendations

This CSMP has assessed the hydrology and hydraulics of the Project Site for pre and post development scenarios and investigated stormwater quality treatment devices to meet the pollutant removal targets.

The following stormwater management measures are recommended:

- For the Final Development, it is proposed to extend the footprint of the existing Southern Stormwater Dam to include additional volume for flow attenuation and a segment for bioretention system to facilitate water quality treatment (see Figure 8).

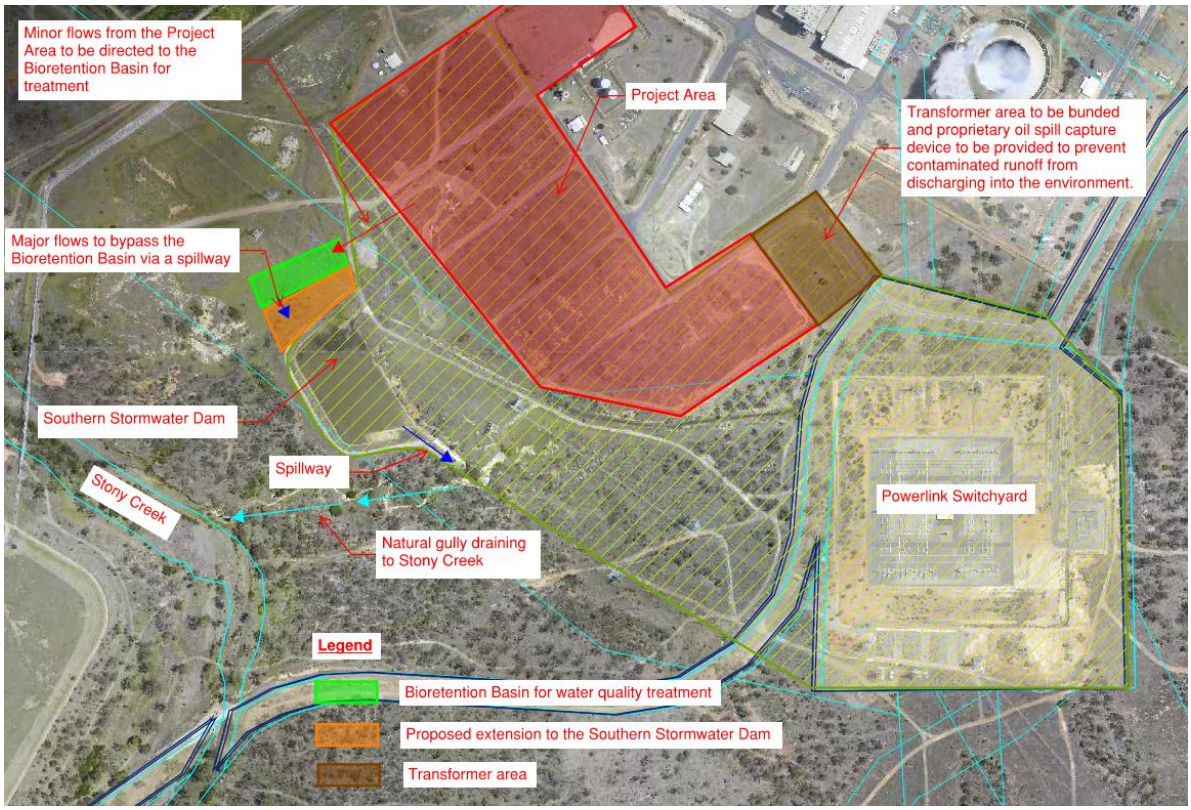

Figure 8 Recommended Stormwater Management Measures (Final Development)

- For the Stage 1 Development, it is proposed to include the bioretention basin on the most southwestern corner (of the Stage 1 Development area) while extending the footprint of the existing Southern Stormwater Dam to incorporate additional volume for flow attenuation (Figure 9).

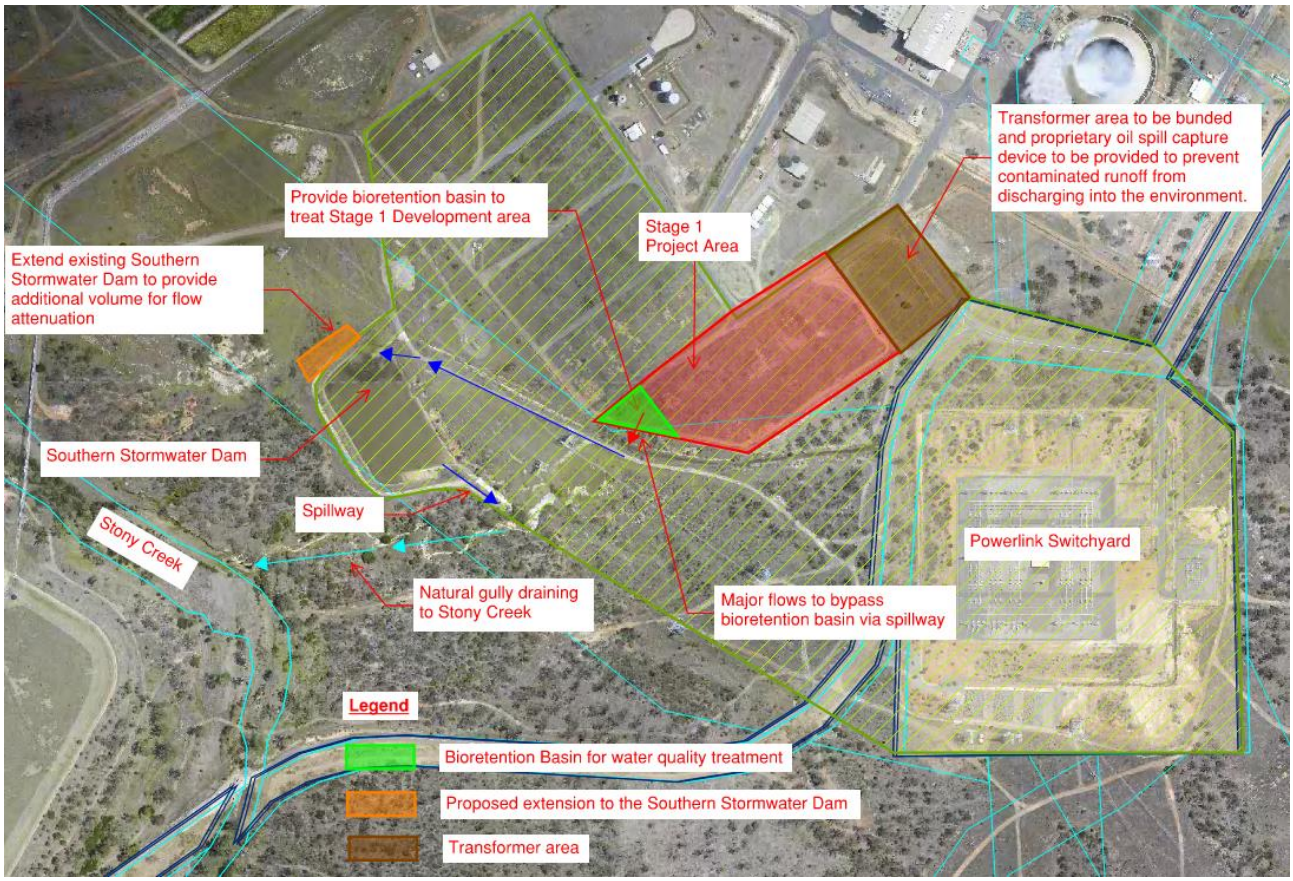

Figure 9 Recommended Stormwater Management Measures (Stage 1 Development)

- All transformers to be installed by the project (including main power transformer and BESS step up transformers) will be installed with facilities to contain the total volume of insulating liquid within the transformers. In the case of the main power transformers, where these bunds will be outdoors, subject to prevailing weather conditions and likely to accumulate rain water, an oil water treatment or containment system will be installed to ensure that no discharge of contaminated water to the surrounding environment occurs.

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Stanwell BESS FEED

Traffic Impact Assessment

Stanwell Corporation

Reference: 512486

Revision: A

2022-10-12

ROCKHAMPTON REGIONAL COUNCIL

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Client contact		Troy Cook	**Client reference**		N/A	
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Author signatures			Approver signature	
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Title	Traffic Engineer	Traffic Engineer	Title	Traffic Engineer

Contents

Appendices

Figures

Tables

1 Introduction

1.1 Background

A Development Permit is currently being sought for a Battery Energy Storage System (BESS) facility development located at 397 and 519 Power Station Road, Stanwell (the Project / the BESS). Once completed, the BESS will be capable of storing and exporting electrical energy to the National Electricity Market (NEM).

The Project, proposed for completion in two stages, includes the following elements:

- Stage 1: installation of batteries with an output of 150 MW/300 MWh
- Stage 2: installation of additional batteries with an output of 1,300 MW/ 2,600 MWh.

Rockhampton Regional Council (RRC) has issued a request for further information (RFI, Reference D/82-2022) in which they request "… a short Traffic Impact Assessment (TIA) report addressing the impacts of construction traffic generated by the development and how these impacts will be catered by the existing infrastructure, and/or what measures are proposed to ameliorate any impacts."

Aurecon Australasia Pty Ltd (Aurecon) has been engaged by Stanwell Corporation to prepare a TIA for submission as a part of the Development Permit application for the Project, relating to the construction traffic generated by the development.

1.2 Scope and study area

The scope of this TIA is limited to construction traffic generated by the proposed development and the potential impacts to existing infrastructure and road safety along Power Station Road and associated intersections within the extents of this TIA shown in Figure 1 on the following page.

The Stanwell Power Station internal road network connectivity with Power Station Road is illustrated in Figure 2 on the following page, highlighting the existing intersection assessed as a part of this TIA. If required, mitigation measures to ease the construction impact will be discussed and recommended in this report.

This TIA focuses on the six (6) week delivery program scheduled for Stage 1 which includes the peak construction activity. Stage 2 does not have specific timing confirmed but is planned to occur over the next five or so years and is not included within this TIA.

A TIA was previously prepared by Advisian for a separate hydrogen facility project located within the Stanwell power station, which included assessment of the road impacts under the construction and operational phases. This report references information from this TIA where relevant.

This TIA has been developed in accordance with the key principles from the *Guide to Traffic Impact Assessment, Transport and Main Roads* (*GTIA*) (dated December 2018) and in response to the Rockhampton Regional Council information request (*Reference D/82-2022*).

It is noted that the GTIA specifically addresses development-related traffic impacts on the broader state-controlled road (SCR) network, and only provides "some guidance on the method to assess localised impacts" (i.e. on local Council roads). The GTIA has however been used as the basis of assessing state-controlled-roads (SCR) *and* the initial basis for assessing RRC controlled roads for the purposes of this assessment.

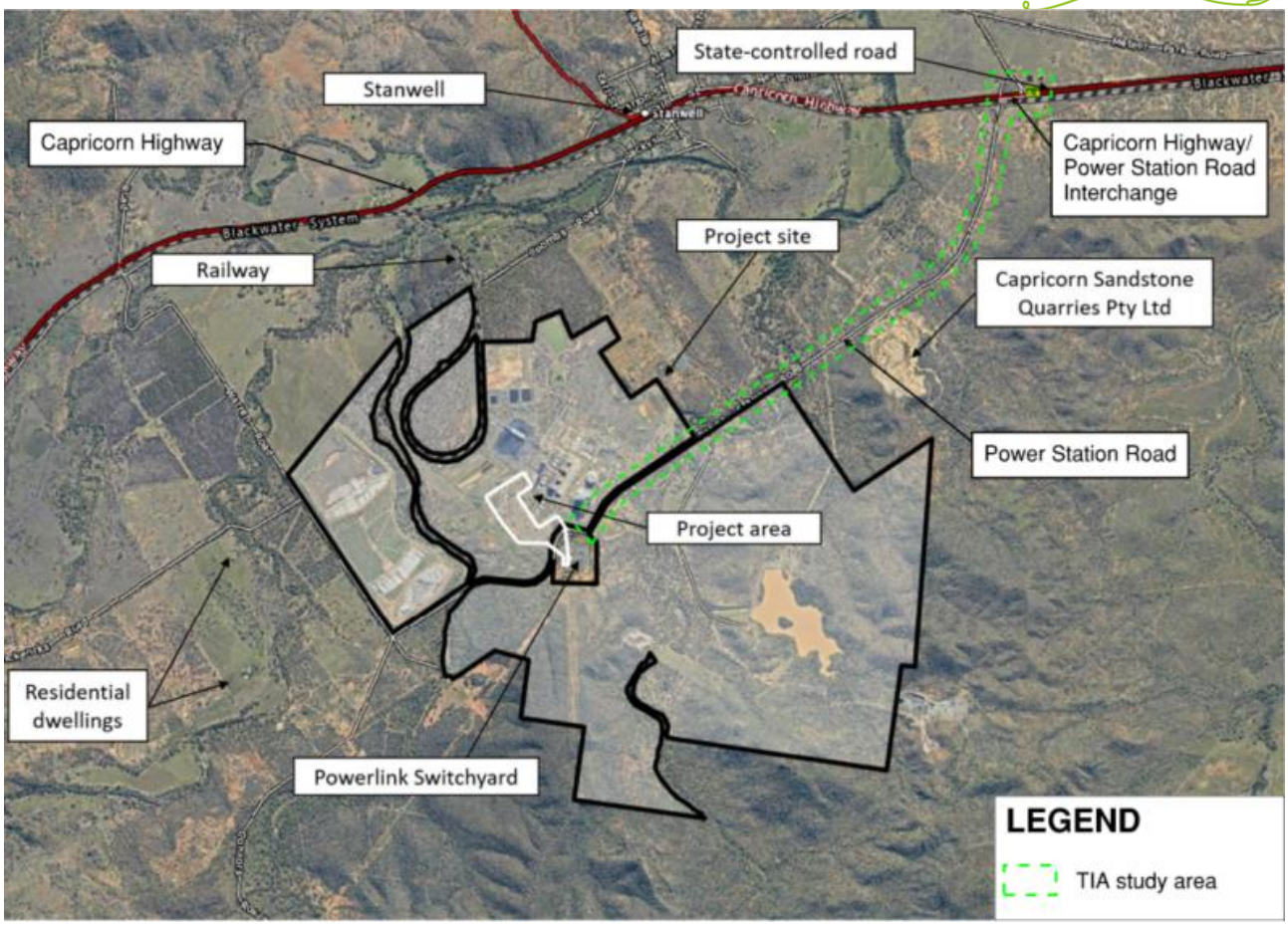


Figure 1 Study Area

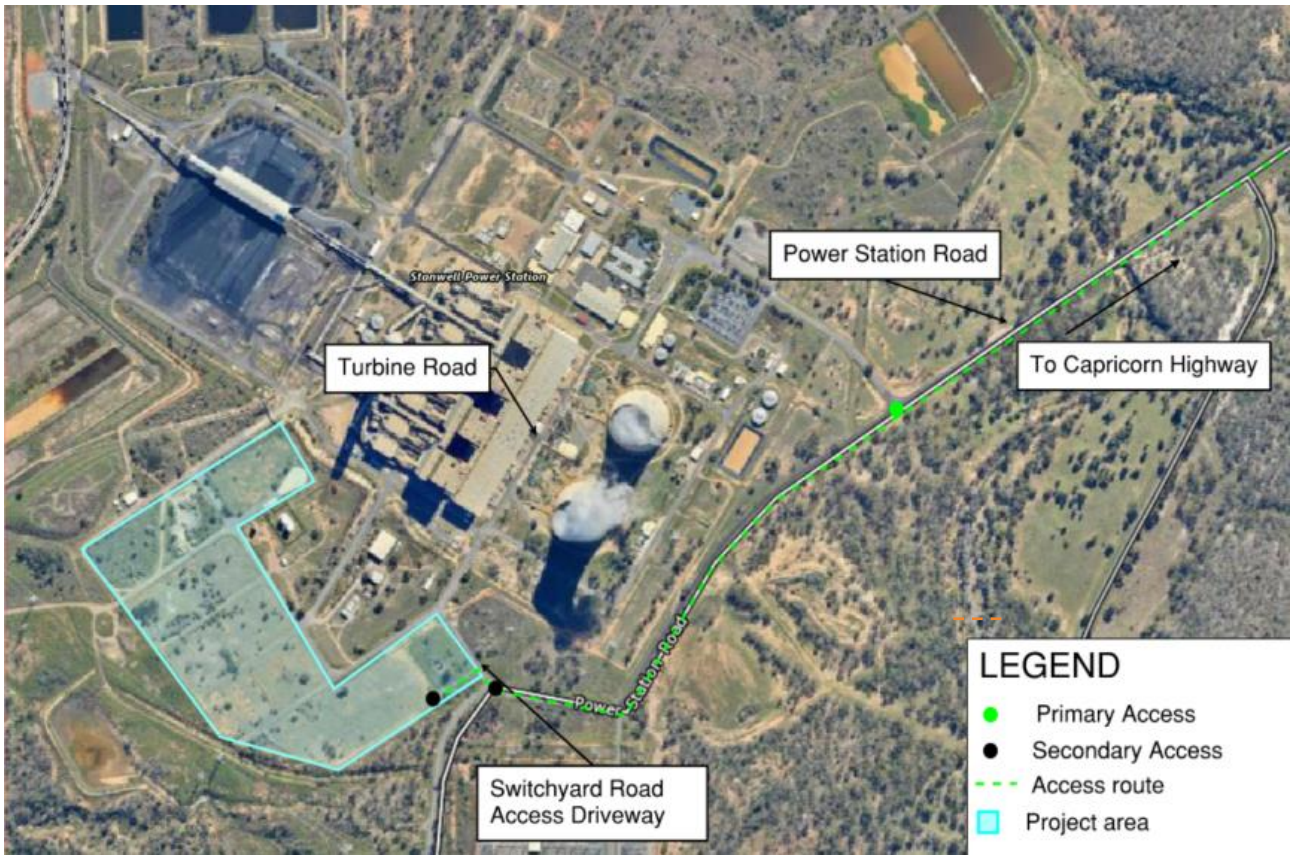


Figure 2 Stanwell Power Station Access Points (Source: QGlobe)

1.3 References

This TIA has been undertaken by referencing the following data sources and documentation:

- *AADT Segment Report, 2020* – Area 404 – Fitzroy District, Road Section 16A – CAPRICORN HIGHWAY (ROCKHAMPTON – DUARINGA), Road Segment from 13.367km to 17.856km, Segment Site - 61457 (TMR)
- Central Renewable Energy Zone - Battery Energy Storage System (CREZ BESS) Planning Report (Aurecon, Rev A, 28 April 2022)
- *411001-00029-GE-RPT-0001* Stanwell Hydrogen Pilot Plant Facility Traffic Impact Assessment (Advisian, 9 September 2020)
- Power Station Road Culvert Inspection Technical Memo #2 (Cardno, Rev 1, 23 September 2019)
- Stanwell BESS FEED Logistics Assessment (Aurecon, Rev A, 18 November 2021)
- Queensland Option Data Portal (2022)
- Austroads Guide to Road Design (AGRD) Part 3, 4, and 4A
- Austroads Guide to Traffic Management (AGTM) Part 6
- Other documents and/or guidelines as referenced in this report.

1.4 Disclaimer

The analysis in this report has been prepared with due care but is subject to several assumptions which are outlined in the relevant sections, based upon information available at the time of writing.

The review and assessment are based on information provided to Aurecon by other parties.

Aurecon has not independently verified this information and does not accept responsibility or liability for any inaccuracies or shortcomings in this information.

The review and assessment are provided strictly on the basis that the information that has been provided is accurate, complete, and adequate.

Should these information sources be modified by these third parties, Aurecon assumes no responsibility for any resulting inaccuracies in its information.

The contents of this report must not be relied upon for design, construction, costing or programming purposes.

It is noted that the workforce estimates for all phases of the project should be verified at the start of the construction phase.

1.5 List of abbreviations & acronyms

Table 1 Abbreviations & acronyms

Abbreviation / Acronym	Reference
AADT	Annual average daily traffic
AGRD	Austroads Guide to Road Design
ASD	Approach sight distance
BESS	Battery energy storage system
CREZ	Central renewable energy zone
DOS	Degree of Saturation
EB	Eastbound
ESA	Equivalent standard axle
FEED	Front End Engineering Design

Abbreviation / Acronym	Reference
GTIA	Guide to traffic impact assessments
HV	Heavy vehicle
LOS	Level of Service
LV	Light vehicle
MGSD	Minimum gap sight distance
NEM	National energy market
OD	Over dimensional
OSOM	Over size over mass
RFI	Request for information
RRC	Rockhampton Regional Council
QPS	Queensland Police Service
SAR	Standard axle repetition
SCR	State controlled road
SISD	Safe intersection sight distance
TARS	Traffic analysis & reporting system
TIA	Traffic impact assessment
TCP	Traffic control plan
TMP	Traffic management plan
TMR QLD / TMR	Department of Transport & Main Roads Queensland
WB	West bound

2 Existing Conditions

2.1 Land use and zoning

The Project is located at 397 and 519 Power Station Road, Stanwell, formally described as Lot 44 on SP140243 and Lot 1 on RP886588. It is located on vacant land within the Stanwell Power Station, a highly developed environment incorporating large-scale coal power generation infrastructure, water storage facilities, coal stockpiles and transmission line infrastructure.

It is understood that the Project area was previously used as a construction laydown area for other projects within the site.

The Project area is located entirely within a Special Industry Zone and Special Purpose Zone within the RRC Planning Scheme, as shown in Figure 3 Project area zoning (excerpt: CREZ BESS Planning Report, 2022)

. The BESS will be located entirely within the Special Industry Zone, with only the transmission line, connecting the BESS to the Powerlink Switchyard, proposed within the Special Purpose Zone.

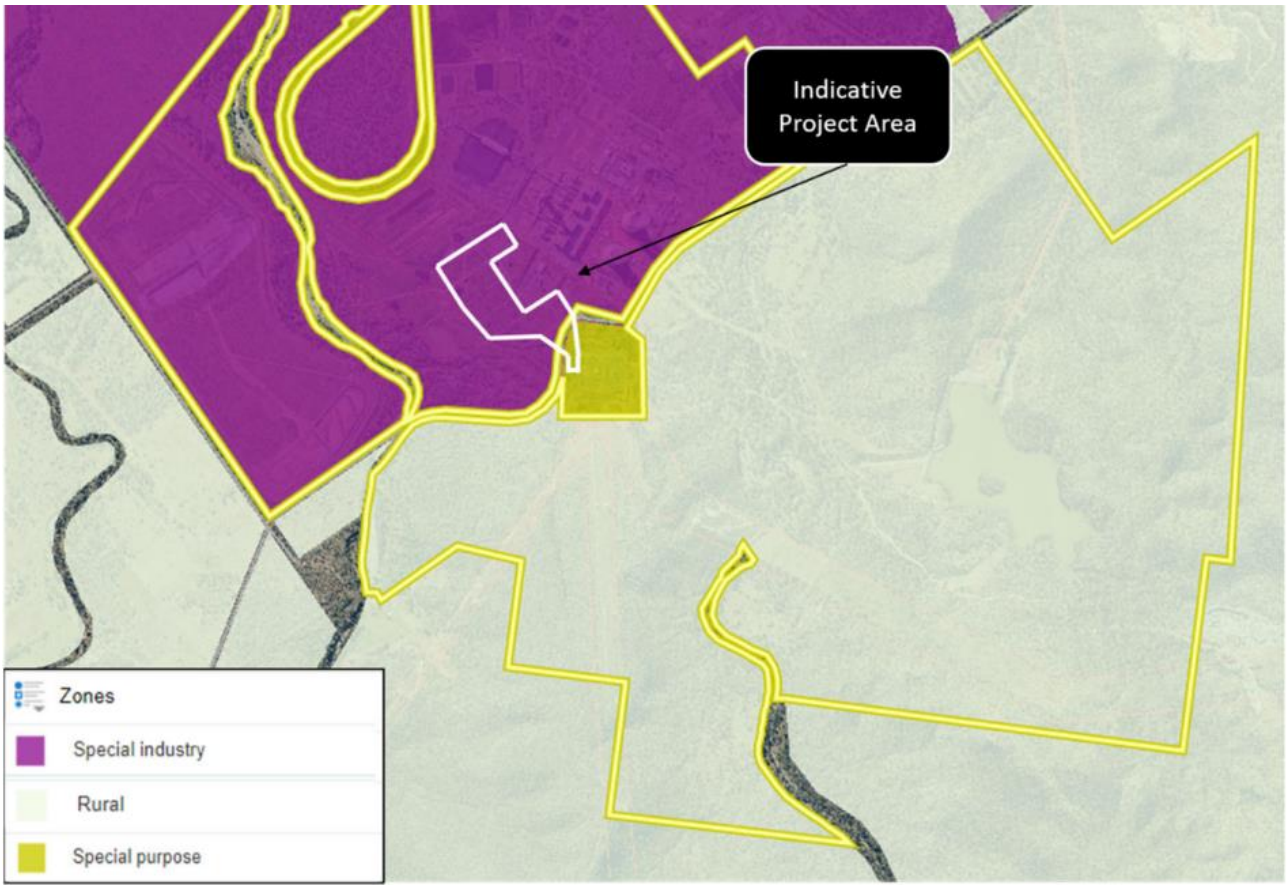


Figure 3 Project area zoning (excerpt: CREZ BESS Planning Report, 2022)

2.2 Adjacent land uses / approvals

The land surrounding the Project area is generally characterised by rural land used for grazing purposes. The closest township to the Project is Stanwell, located approximately 1.7 km to the north.

A limited number of other developments are also accessed from Power Station Road, primarily including:

- Capricorn Sandstone Quarries Pty Ltd / Scotsman's Folly Quarry, with access located approximately 2.6 km north-east of the Project

- Stanwell Quarry – Central Queensland Quarries Pty, with access located approximately 1.4 km north-east of the Project
- Aurizon Stanwell Depot, with access located approximately 4.6 km north-east of the Project (adjacent Capricorn Highway).

The R. Moore Mechanical & Engineering site, located 1.7 km west of the Project area, may also be accessed via Power Station Road, but the site appears to be more conveniently accessed via Capricorn Highway from Warren Road (i.e., not Power Station Road).

A review of aerial imagery also indicates dwellings are located further to the west and north-east of the Project, with the closest dwelling to where the works are proposed being located approximately 2 km to the west.

The installation and operation of a pilot hydrogen production facility on the north-eastern side of the Stanwell Power Station (lot 44 on SP140243) was also previously assessed in 2020 (Advisian assessment 9 September 2020) and has not yet been constructed.

2.3 Existing road network

2.3.1 Surrounding roads

The Project site is located approximately 2.6 km south of Stanwell township. Table 2 summarise the characteristics of the roads within the vicinity of the project area based on a desktop assessment.

Table 2 Existing Road Network details

Road	Description	Road Authority	Carriageway Width [1]	Posted Speed Limit
Power Station Rd	Undivided, sealed, rural, two-way / two lane	Rockhampton Regional Council (RCC)	7 m + shoulders	100 km/h (80 km/hr [2])
Capricorn Hwy	Undivided, sealed, rural, two-way / two lane	Department of Transport and Main Roads	9 m + shoulders	100 km/h
Switchyard Rd	Undivided, sealed, rural, two-way / two lane	Stanwell Corporation	4-7m (overgrown, poor condition)	-

[1] Approximate and varies, [2] In the vicinity of Power Station primary access point (only)

2.3.2 Key intersections

Two intersections within the study area have been considered for the purpose of this assessment:

- Capricorn Highway / Power Station Road – diagrammatically represented in Figure 4, and
- Power Station Road / Switchyard Road (Stanwell power station secondary access) – diagrammatically represented in Figure 5.

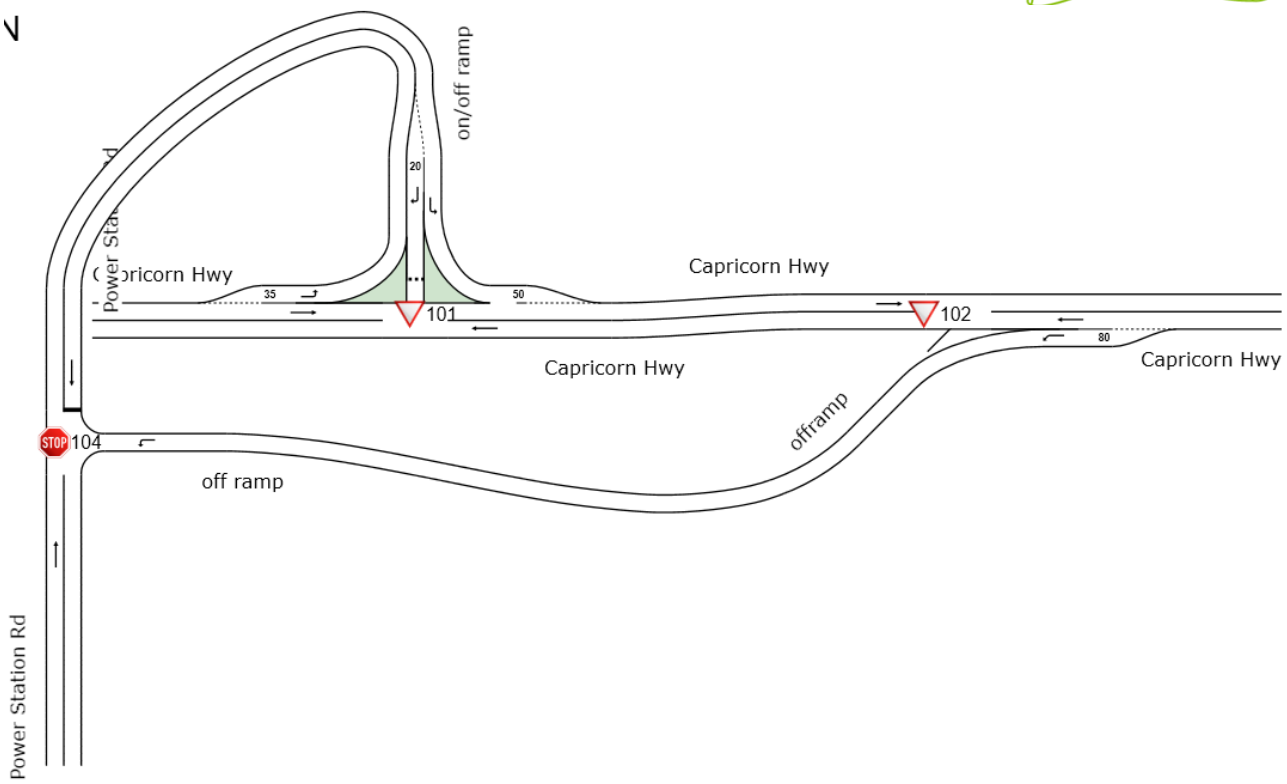


Figure 4 Capricorn Highway / Power Station Road Interchange

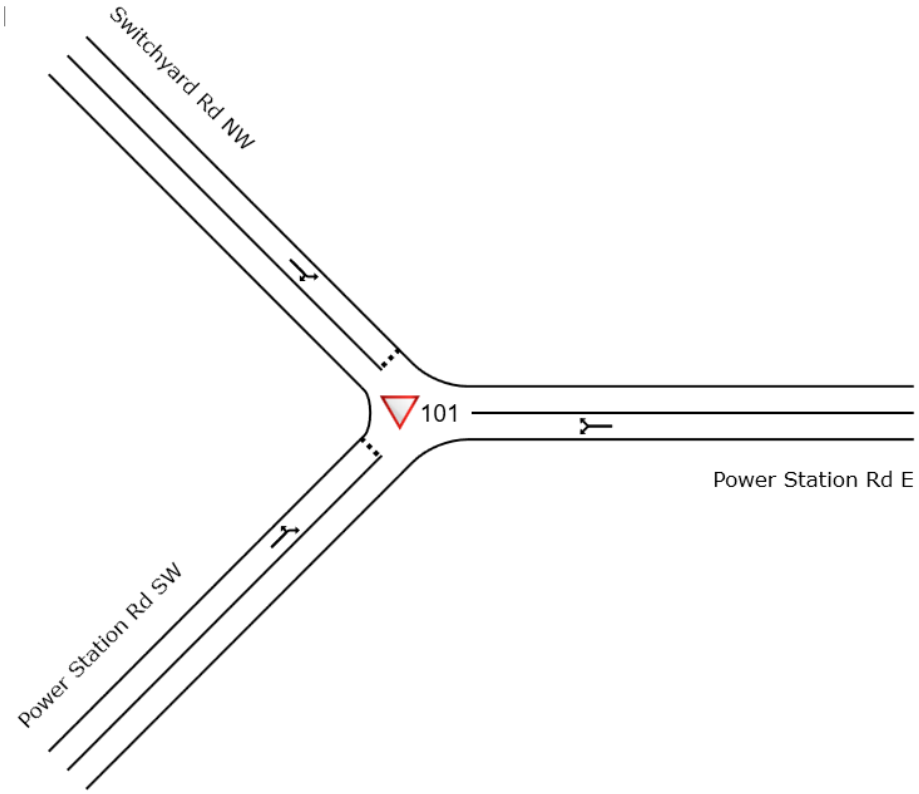


Figure 5 Power Station Road / Switchyard Road intersection

The Capricorn Highway / Power Station Road interchange is currently used for access to the Aurizon Stanwell Depot, Capricorn Sandstone Quarries / Scotsman's Folly Quarry, Stanwell Power Station, and Stanwell Quarries.

The Power Station Road / Stanwell Access Road is currently used for secondary 'back of house' access to the Stanwell Power Station, with the primary access for normal operations located approximately 800 m to the north-east on Power Station Road (refer to Figure 2).

2.3.3 Background traffic volumes

Capricorn Highway

The Annual Average Daily Traffic (AADT) Segment Report for Capricorn Highway from 2020 is available from Queensland Government's Traffic Analysis and Reporting System (TARS). The count was located approximately 185 m west of Meteor Park Road between E Williams Road and Power Station Road (approximately 3.3km east of the Capricorn Highway / Power Station Road interchange).

Capricorn Highway carries 3,994 vehicles per day (AADT) with approximately 22% HV.

Power Station Road

Reference is made to the previous assessment for the pilot hydrogen project assessment, which included a traffic count undertaken in November 2016 by Rockhampton Regional Council on Power Station Road at the primary access point for Stanwell Power Station (approximately 1.5 km from Capricorn Highway).

The data indicated a total of 315 vpd at the location with 20% HV, reflecting this road's primary role in providing access to the limited number of developments along it.

A peak hour traffic count was also undertaken by Stanwell Corporation at the same location on Tuesday 7th July 2020. The count was completed for the AM and PM peak periods between 6:00-8:00am and 4:00-6:00pm respectively, with 6:00-7:00am and 4:30-5:30pm peak hours.

The Stanwell Corporation 2020 traffic count indicated significantly higher daily traffic volumes compared to RRC's 2016 counts (in the order of 10x) and this occurred due to the former occurring during increased activity at the plant due to an outage / shutdown.

The daily RRC 2016 data has therefore been adopted for the assessment(s) included later in this report.

Switchyard Road / Power Station

No traffic count data was available on Switchyard Road for the purposes of this assessment. We understand that Switchyard Road has very low and infrequent traffic movements, which is supported by the Power Station Road / Power Station primary access intersection traffic count provided by Stanwell Corporation (which indicates little traffic volume along Power Station Road to the south-west (toward Switchyard Road).

Background Traffic Volume Summary

Existing AM and PM peak hour and daily traffic volumes at the roads and intersections discussed above are summarised in Figure 6, Figure 7, and Figure 8 respectively. Several assumptions have been made to estimate movements and periods not available from the data considered in this report, including:

- Capricorn Highway 8% peak-to-daily split and Power Station Road 10% peak-to-daily split,
- Capricorn Highway daily directional split assumed the same in AM and PM peak hours,
- Power Station Road traffic volume distributions: 20% to/from west / 80% to/from east on Capricorn Highway
- Power Station Road daily 50% eastbound / 50% westbound split, and
- Power Station Road / Primary Access intersection turning distributions taken from 2020 Stanwell Corporation counts.

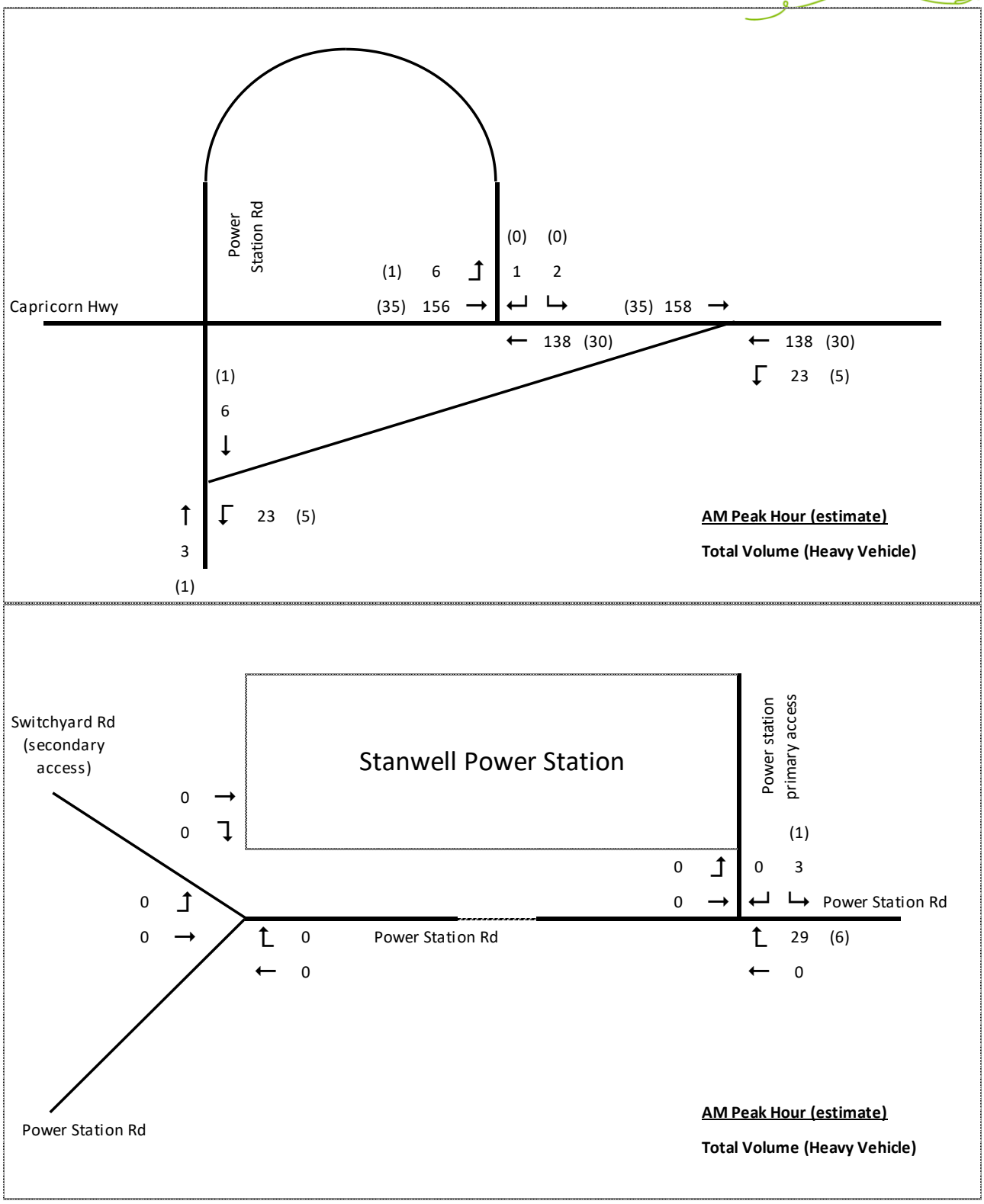


Figure 6 Existing Traffic Volumes – AM Peak Hour

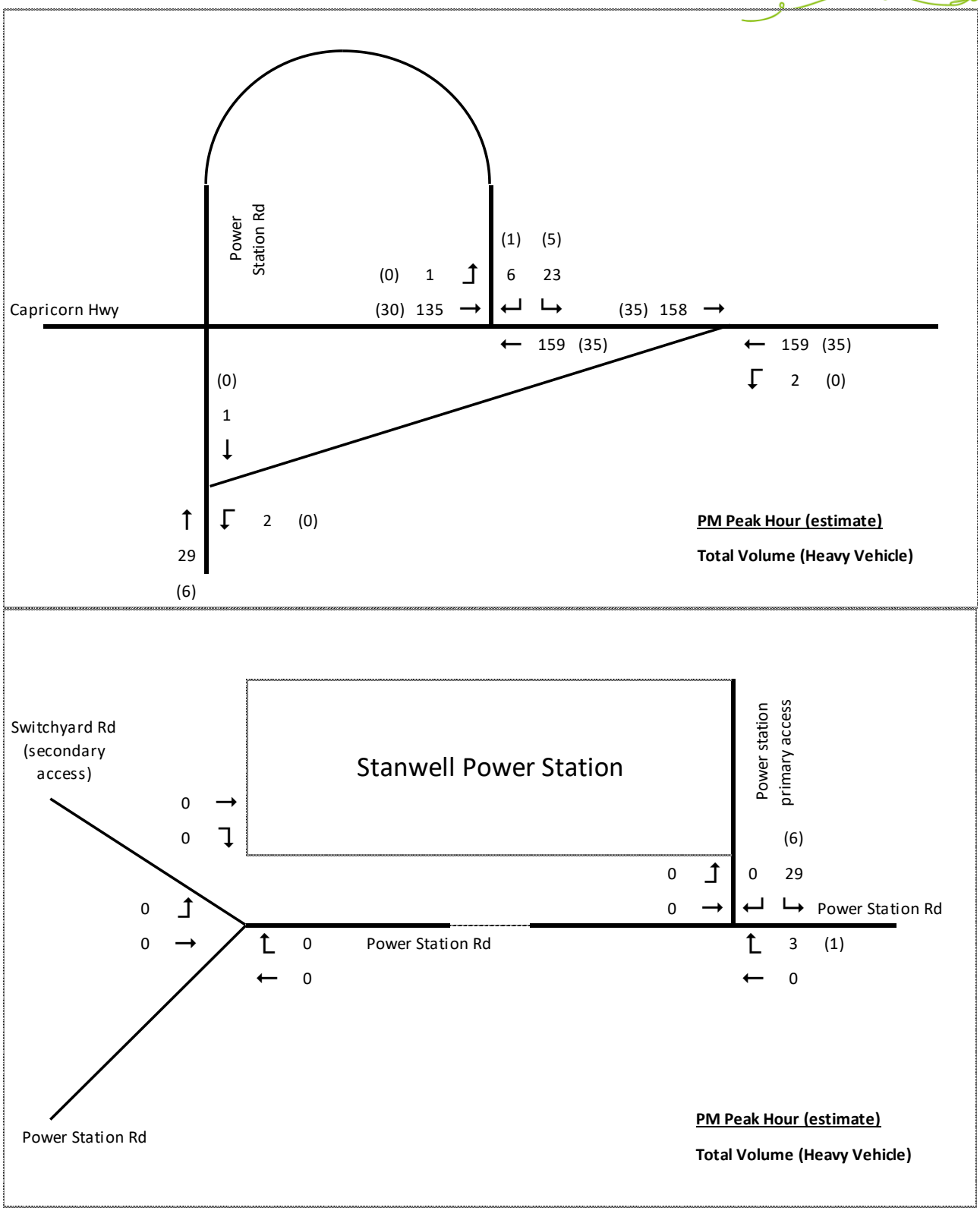


Figure 7 Existing Traffic Volumes – PM Peak Hour

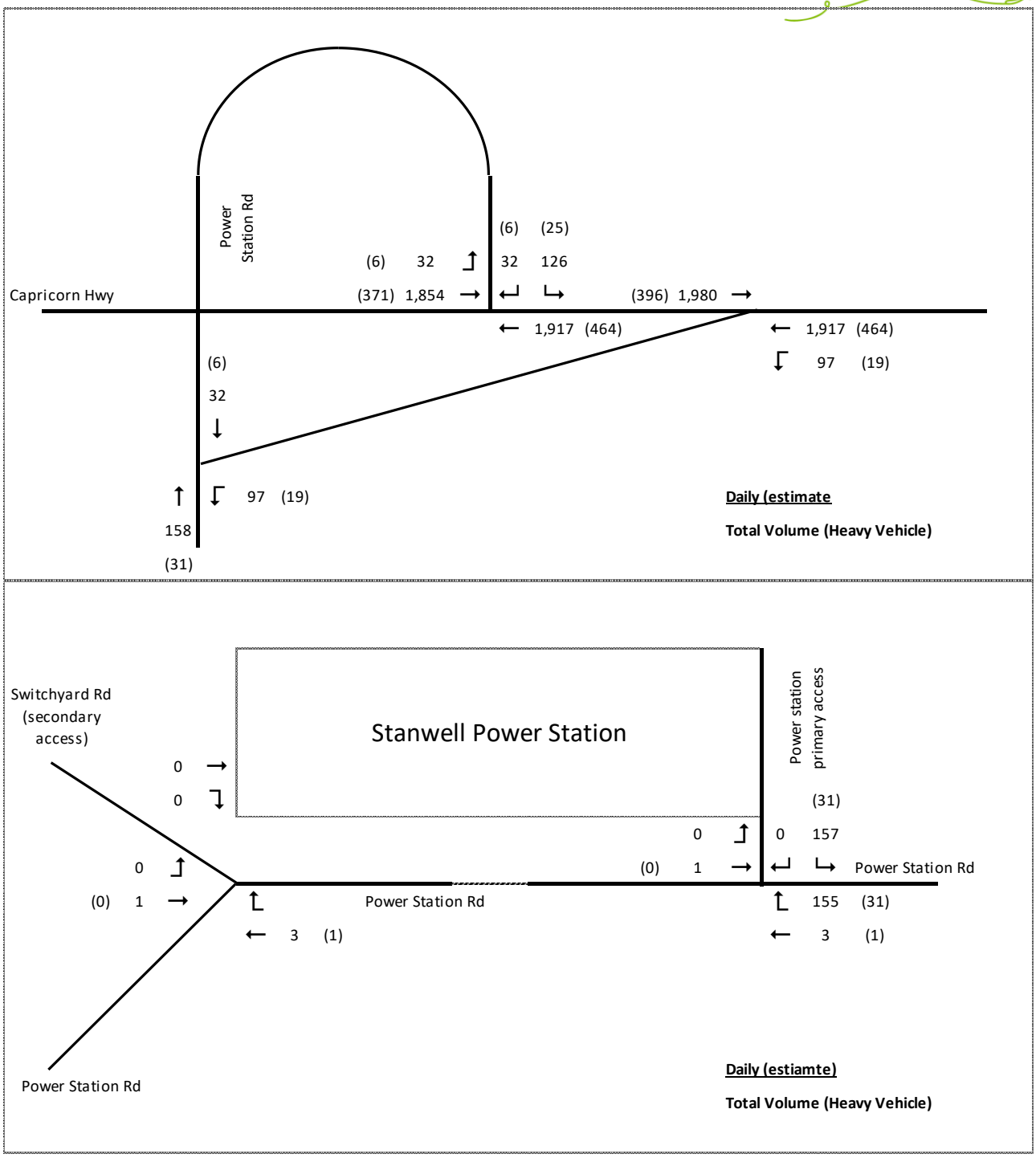


Figure 8 Existing Traffic Volumes - Daily

2.3.4 Peak period determination

Traffic data at the Power Station Road / Power Station primary access intersection, collected by Stanwell Corporation, has been assessed to determine the peak AM and PM peak hours. Based on this data[1], the peak hours were identified as:

- AM: 6:00-7:00am, and
- PM: 4:30-5:30pm

[1] This data was collected during non-typical operation of the power station (unscheduled outage) and may not reflect typical peak hours on Power Station Road.

Peak traffic generation of construction activities will depend on the construction schedule and timing of deliveries and worker start and finish times. For the purposes of this assessment, these are assumed to occur at the same AM and PM peak hours nominated above.

2.3.5 Traffic growth rate

Capricorn Highway

Traffic census data from Queensland Government's TARS, indicates traffic volumes on Capricorn Highway have remained constant between 2016-2021 and have generally decreased between 2010-2021 as illustrated in Figure 9.

For the purposes of this assessment, traffic growth on Capricorn Highway is therefore assumed to be negligible (i.e., zero).

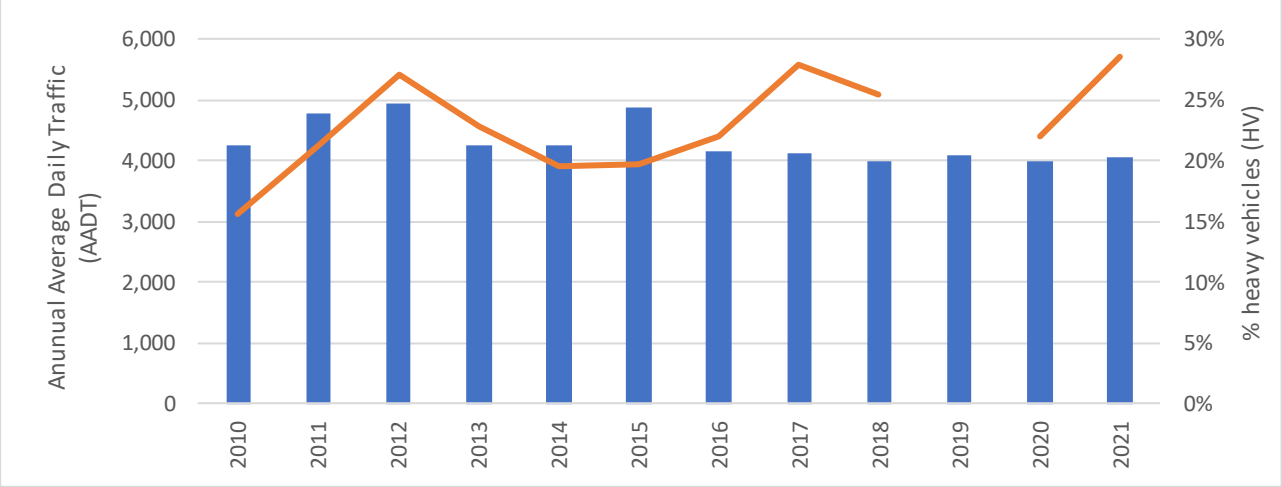


Figure 9 Capricorn Highway (east of Power Station Road)

Power Station Road

No historic traffic growth data is available on Power Station Road. Given the existing uses accessed from Power Station Road very little, to no growth, could be expected along this road in the short to medium term (noting the Stanwell Power Station Hydrogen project is understood to not yet be a committed project).

2.3.6 Opening year

An opening year has not been confirmed by the project team; it is assumed that opening could occur as early as 2023 (subject to timing of relevant permits and approvals).

2.3.7 Road safety issues

Crash data collected by TMR between 2016-2020 indicates that there was one reported crash in July 2019 within the study area on Power Station Road, shown in Figure 10.

The crash occurred in the early morning and involved a single vehicle travelling south-west on Power Station Road leaving the carriageway on an unlit right bend, located on a slight crest, and hitting a fixed object. The crash resulted in one hospitalisation.

It is noted that warning signage is placed in advance of the bend in both directions (with speed reduction warning of 40 km/h) and chevron signage is provided to delineate the direction of travel on the curve in both directions – however it unknown if this was in place at the time of the reported crash.

While note located at the single reported crash site, Power Station Road / Switchyard Road intersection is a Y-junction where both the south-west Power Station Road leg and the north-west Switchyard Road leg gives way. Give-way line-marking appears to be worn and faded.

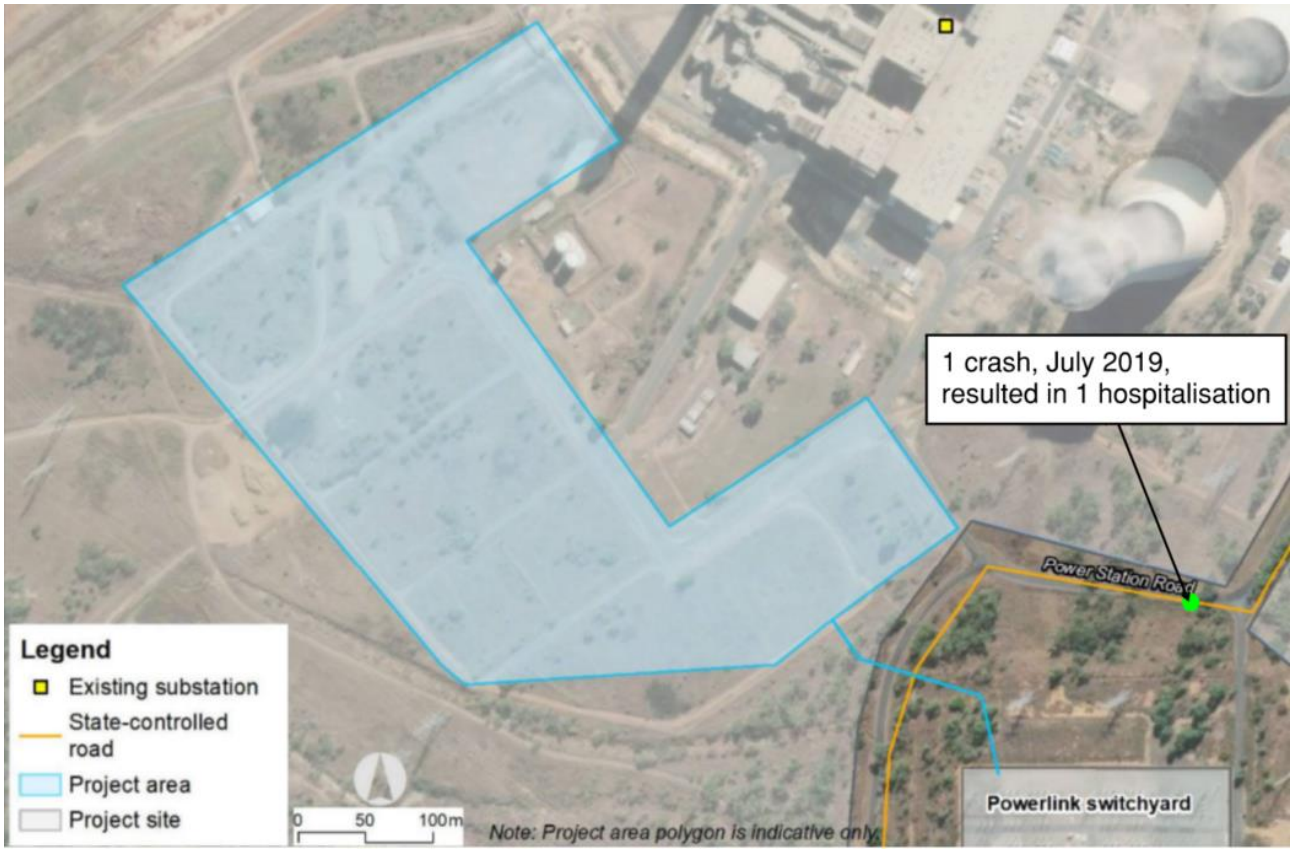


Figure 10 Crash history in study area (excerpt: CREZ BESS Planning Report, 2022)

2.3.8 Sight distance assessment

Safe Intersection Sight Distance (SISD), Approach Sight Distance (ASD), and Minimum Gap Sight Distance (MGSD) have been assessed based on Austroads Guide to Road Design (Part 3 and Part 4A) for trucks as summarised Table 3. The below desktop assessment indicates that sight distances at each intersection appear to be appropriate.

Table 3 Existing sight distance assessment

Road	Assessed Speed (km/h)	Type	Required Sight Distance (m)	Condition
Power Station Road / Capricorn Highway	100	SISD [1]	233	Met
		ASD [2]	248	Met
		MGSD, ta= 4	111	Met
Power Station Road / Stanwell Access Road (Primary access)	80	SISD [1]	161	Met
		ASD [2]	170	Met
		MGSD, ta= 4	89	Met
Power Station Road / Switchyard Road (Secondary Access)	Assuming 60 (based on geometric constraints)	SISD [1]	101	Met
		ASD [2]	106	Met
		MGSD, ta= 4	67	Met

[1] Reaction time = 2.5s, Coefficient of deceleration = 0.24, [2] Reaction time = 2.5s, Coefficient of deceleration = 0.22, grade = 0%

2.4 Alternative transport modes

2.4.1 Public transport

No public transport routes operate on Power Station Road. We understand Stanwell Corporation runs several private bus services between the power station and Gracemere / Rockhampton for employees only. It is assumed that operations staff for this Project could also use the service.

2.4.2 Active transport

There is no existing walking or cycling facilities or connections to the site on Power Station Road. Accordingly, it is highly unlikely that employees or visitors will walk or cycle to the power station.

Capricorn Highway is a nominated 'Priority Route C'[2] under TMR QLD's addendum to the Central Queensland Priority Route Maps'

2.5 Parking

There is no existing parking specifically available within the Project site area. On-site parking is available within the broader Stanwell Power Station site (accessed from the primary Power Station access).

2.6 Pavement

Cardno was engaged by RCC in 2019 to investigate and determine if the existing pavement was adequate for transport of a large generator. Based on Cardno's assessment, it is understood that Capricorn Highway and Power Station Road have granular pavement with thin bituminous surfacing.

The existing pavement along Power Station Road was found to be in fair condition, except for some isolated areas (locations were not specified). The pavement was considered adequate to withstand the load from the transportation of the generator.

[2] 'The priority reflects that the road authority may intend to undertake further planning, design and/ or construction on the route such as an upgrade of the existing infrastructure or filling missing links', with 'C' denoting 'for delivery in the next 15 to 20 years')

2.7 Transport infrastructure

Cardno previously determined the suitability of existing culverts and pavement to transport a large generator along Power Station Road to the Stanwell Power Station in 2019. This assessment concluded that:

- “The culverts are generally in fair condition and appear to only require minor repairs”,
- “The pavement was found to be generally in fair condition, and suitable for transportation of the generator”,
- “The culverts will be heavily loaded and, in some cases, may exceed the ultimate capacity”, and therefore:
  - recommended several minor repairs be completed prior to generator transport (it is not known if these have been completed to date), and
  - propping of certain culverts and link slabs prior to generator transport (with details of propping to be confirmed).

The pavement degradation since 2019 is unknown and it is recommended an updated assessment be completed prior to commencement of construction as part of the TMP.

2.8 Base scenario traffic volumes

Based on the discussions in Section 2.3.5 and 2.3.6, existing traffic volumes on Capricorn Highway and Power Station Road (summarised in 2.3.3 and specifically Figure 6, Figure 7 and Figure 8) have been assumed as the base scenario traffic volumes for this assessment.

3 Development proposal

3.1 Stanwell BESS facility site plan

A Development Permit is currently being sought for a BESS and associated ancillary infrastructure at 397 and 519 Power Station Road, Stanwell. The Project site and area are depicted in Figure 11 and Figure 12. Stage One of the Project, which will generate the most construction related traffic movements, includes the construction of:

- Enclosed modular batteries and inverters with an output of 150 MW/300 MWh.
- A 275 kV substation located to the east of the battery system enclosures
- Underground or overhead 275 kV cable leading to the Powerlink Switchyard
- 275 kV, 200 MVA transformer with approximate dimensions of 10.3 m x 3.9 m x 4.4 m
- 275 kV gantry terminal point
- Gable sealing and surge arrester structure
- Access driveway and a 6m road providing access to all equipment
- Control room to house site controllers
- Perimeter fencing.

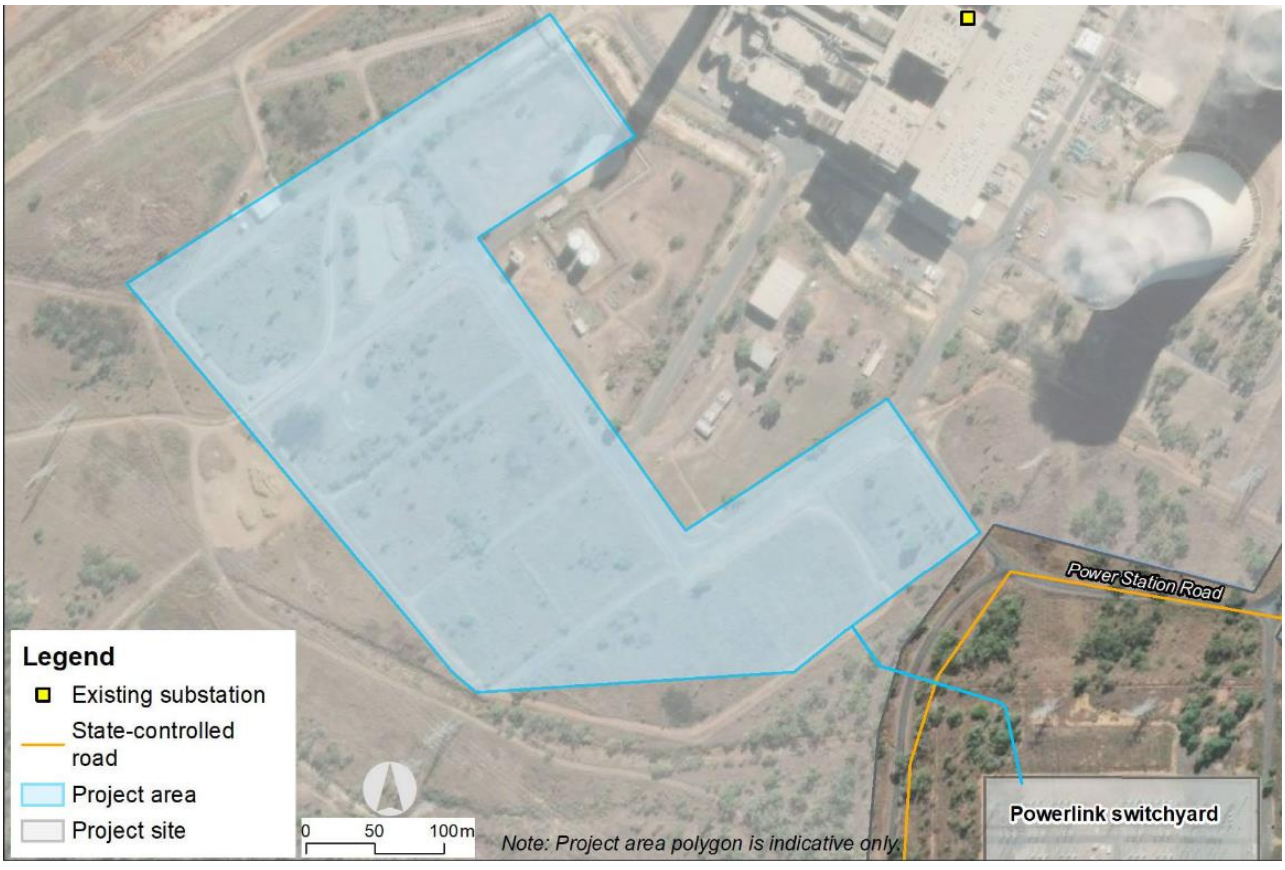


Figure 11 Stanwell BESS Project area (excerpt CREZ BESS Planning Report, 2022)

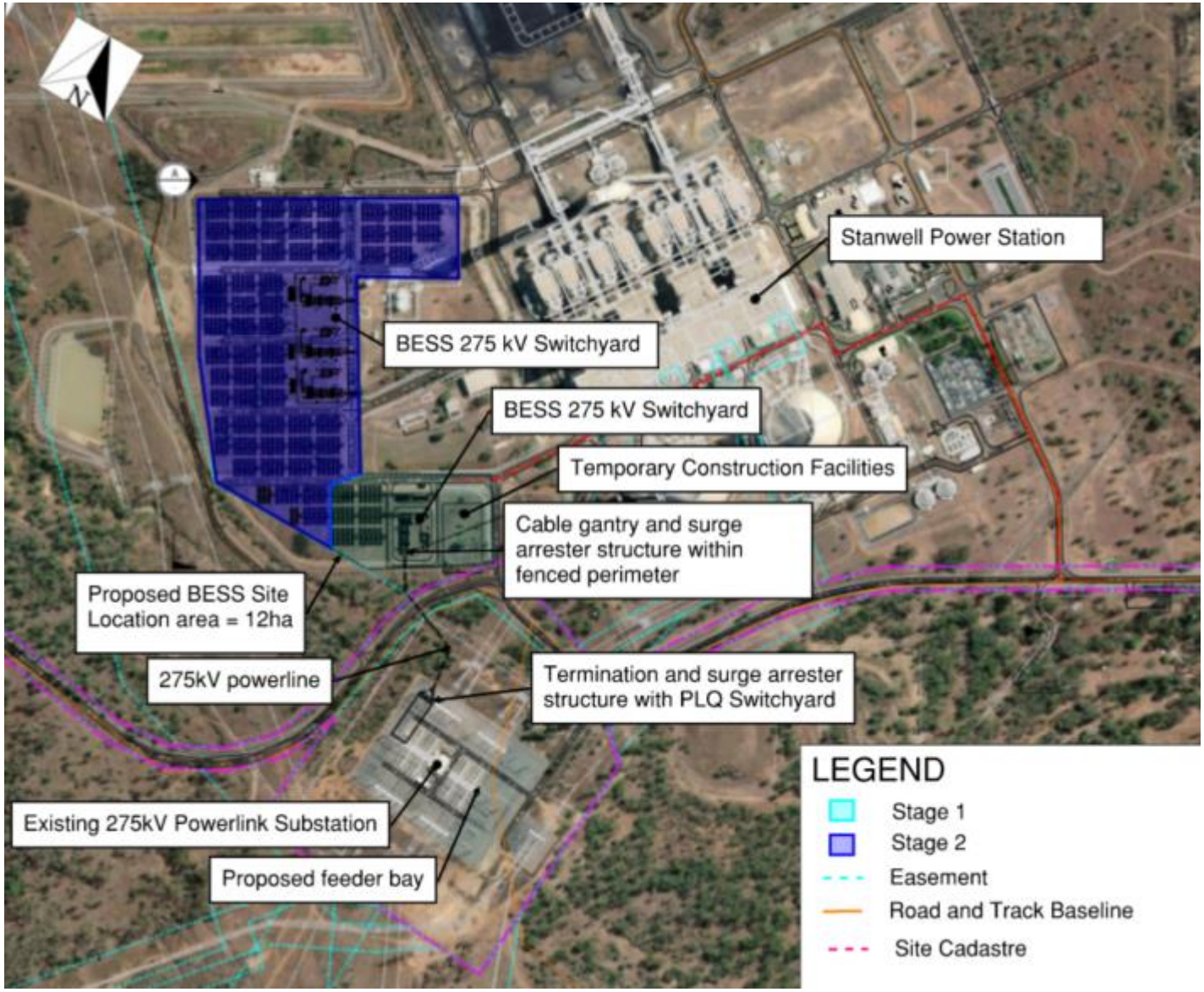


Figure 12 Stanwell BESS site layout (excerpt CREZ BESS Planning Report, 2022)

3.2 Construction and operational details

It is understood that the construction methodology will generally be as follows:

- Establishment of site offices and security fencing,
- Preparation of project area,
- Road upgrades,
- Excavation, filling, and compaction,
- Construction of foundation to support BESS and substation,
- Transportation and installation of BESS units and new transformer located within substation,
- Installation of the 275 kV transmission line,

Assessment of the operational phase is excluded from this assessment.

3.3 Proposed access and parking

The proposed construction vehicle access route to site is illustrated in both Figure 13 . The route comprises the following movements: Capricorn Highway → Power Station Road → Switchyard Road Access Driveway.

All vehicles will be able to access the site from the east or west from Capricorn Highway, *except* the largest vehicle expected to access the site (substation transformer delivery) which is recommended to access Power Station Road via the eastbound Capricorn Highway on ramp loop (for egress, the prime mover and trailer combination will be dismantled).

Most construction vehicles will use Power Station Road / Switchyard Road access intersection, as shown in Figure 14. As part of the development Switchyard Road is proposed to be upgraded and widened to accommodate construction traffic movements.

Car parking for the Project will be located within the Stage One construction laydown area (refer to Figure 14).

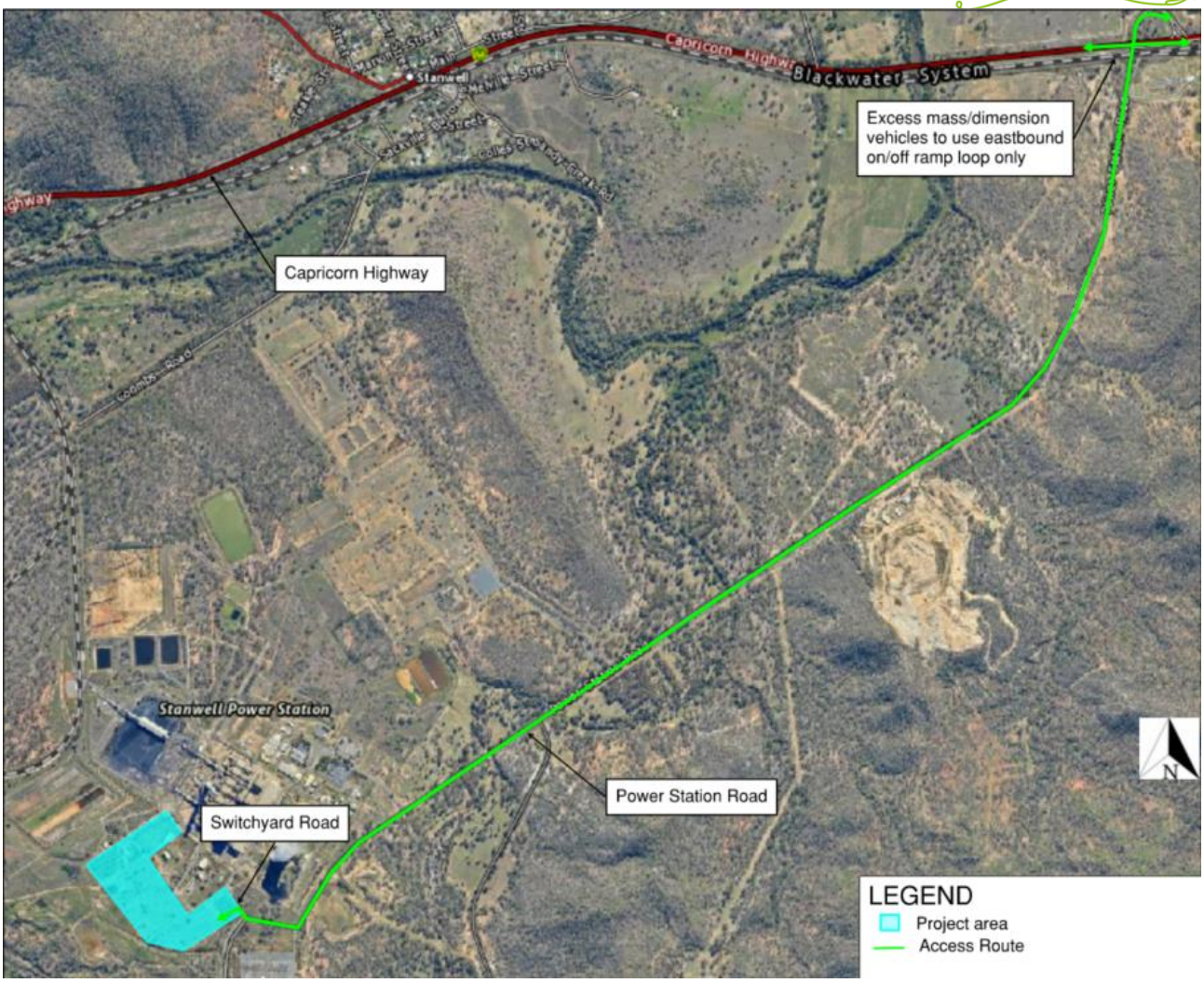


Figure 13 Proposed construction vehicle access route (excerpt: Queensland Globe)

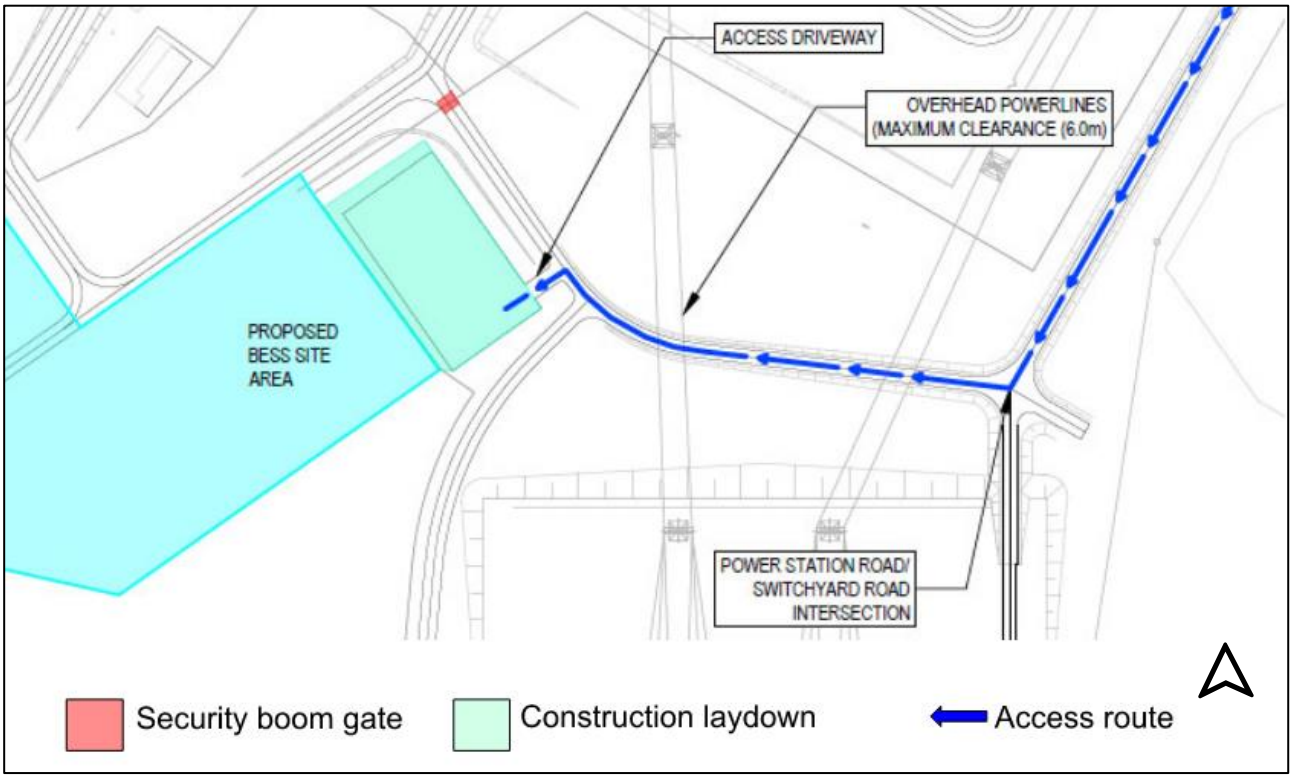


Figure 14 Project area construction vehicle access (excerpt: CREZ BESS Planning Report, 2022)

4 Construction traffic

4.1 Traffic generation

Based on information provided by the project team, the traffic generation activities include:

- Extraction and delivery of fill material
- Delivery of construction material including but not limited to gravel, pavement materials, pre-mixed concrete, precast concrete, reinforcement, structural steel, and fittings.
- Delivery of construction machinery (excavators on low loader platform trailers, etc.),
- Delivery of transformers, substations, and battery systems
- Delivery of electrical equipment
- Movement of construction workforce
- Servicing trips

While the overall construction period for Stage 1 will extend over 12 months, the peak construction period will be during the delivery of the battery systems which is proposed to be carried out over a 6-week delivery program for Stage 1. The proposed working hours will be from 6.00 am to 6.00 pm, six (6) days a week.

The following vehicles are typically expected to access the site during construction:

- 12 m single unit trucks
- 19m semi-trailers to import batteries, and/or with low loader platform trailers for equipment
- 26m B-doubles to bring in worker huts
- Truck and dog combinations for extraction and/or delivery of fill material, construction material, etc.
- A special low loader to transport the one-off substation transformer delivery.

The special low loader vehicle has been assessed by Aurecon previously as part of Stanwell BESS FEED logistics plan prepared by Aurecon and this specific assessment included 2 prime movers, followed by a 16-axle low-bed modular trailer to host the transformer, and another prime mover to steer from the rear as illustrated in Figure 15 below.

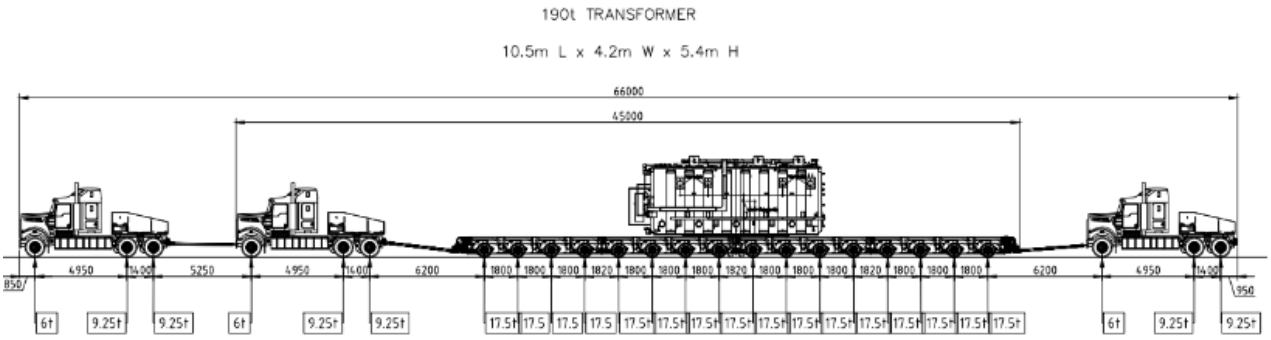


Figure 15 Transformer transport vehicle specifications

4.2 Trip distribution

Construction traffic trip distribution is assumed to:

- 100% of trips use Capricorn Highway to access Power Station Road.
- Workforce trips (light vehicles):
  - 100% of trips are completed in peak hour corresponding with the start and finish of construction shifts.
  - 100% of trips are inbound during AM peak period and outbound during PM peak period.
- 80% East / 20% West split of origin/destination for trips on Capricorn Highway.

4.3 Construction traffic volumes

The below Stage 1 construction information has been provided by the project team:

- 12 month construction program
- Six-week peak construction program,
- Import 80 batteries (each 25t) using 19m semi-trailer trucks: 160 trips over six weeks,
- Import one (1) transport via special low loader: 2 trips (one loaded, one unloaded),
- Various 19m semi-trailer truck and/or B-double truck deliveries for worker huts, etc.: 6 per day (up to 10 assumed),
- 50 workers per day: 50 'in' and 'out' movements per day, and
- While not nominated by the project team, construction could be expected to start in 2023 (subject to required permits and approvals).

On the above basis, Table 4 has been prepared to summarise the anticipated total, daily and peak hour Stage 1 construction traffic volumes.

Table 4: Stage 1 - Construction traffic volumes

Movement	Total movements	Daily (vpd)	Peak Hour (vph)
Light vehicles (LV)	3,600 movements	100	50
Heavy vehicles (HV)	378 movements	20	10
Total	3,978 movements	120	60

Vpd – vehicles per day, vph – vehicles per hour

Figure 16, Figure 17 and Figure 18 has been prepared to summarise the AM peak and PM peak hour, and daily Stage 1 construction traffic volumes.

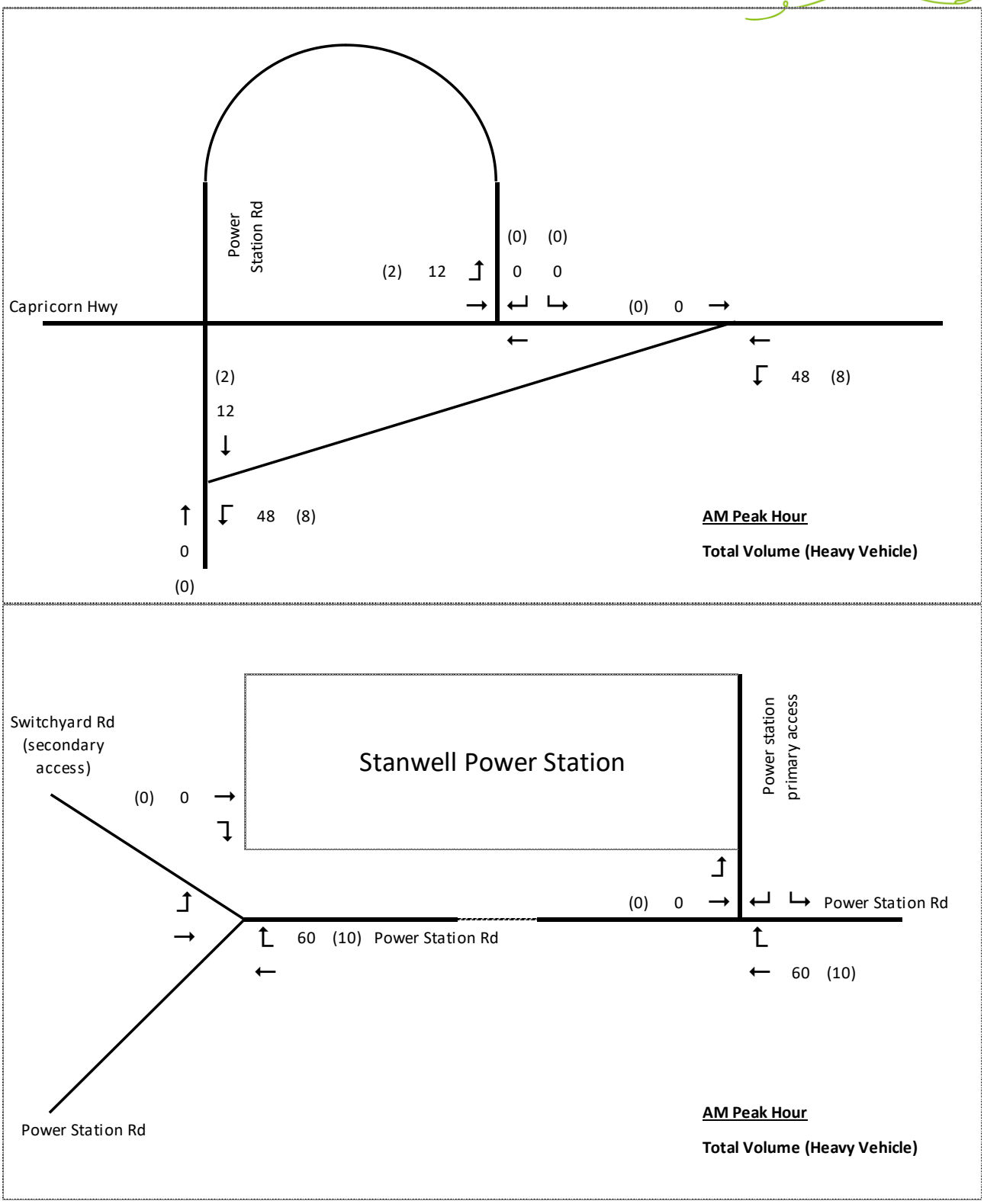


Figure 16 Stage 1 construction traffic movements – AM Peak Hour

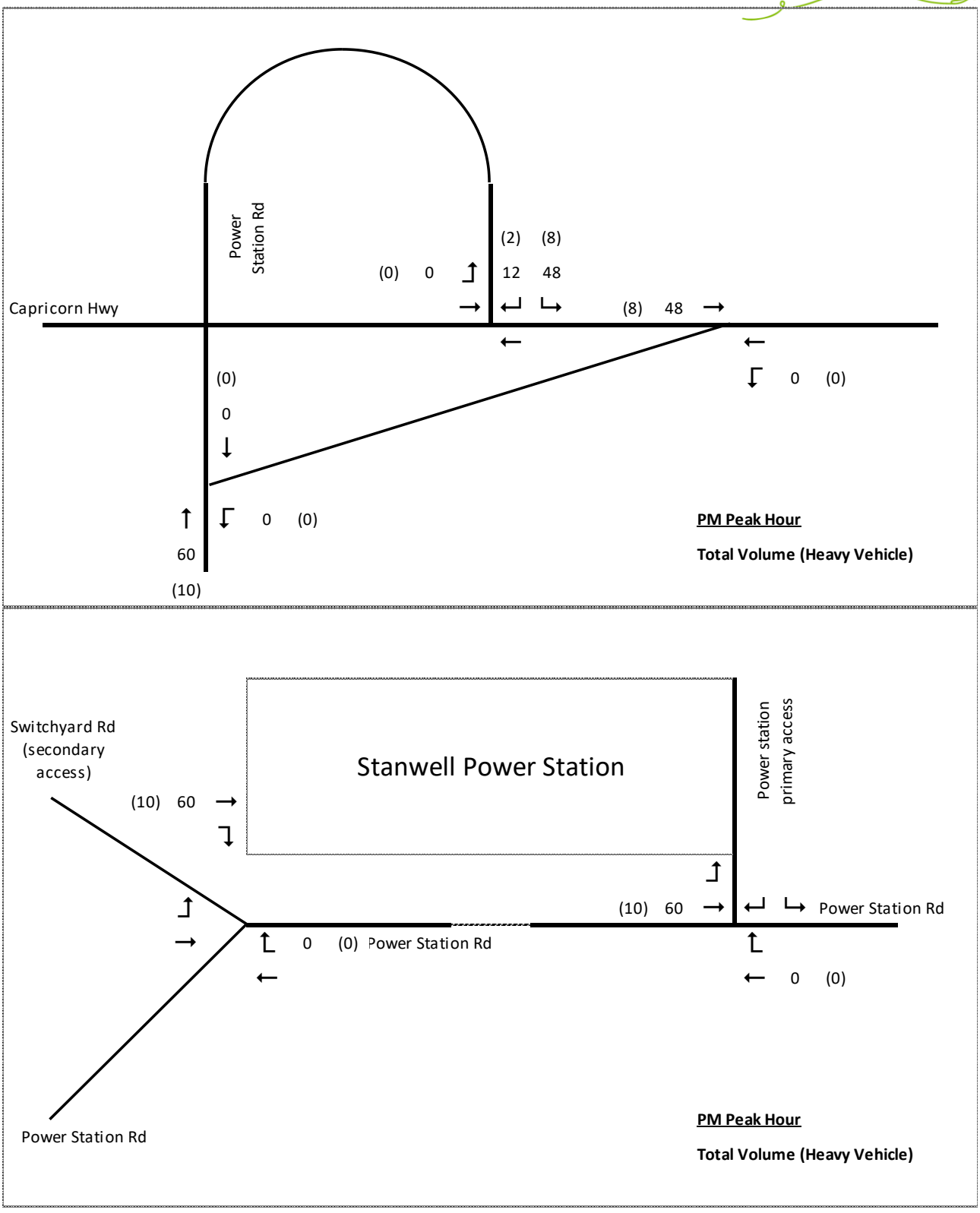


Figure 17 Stage 1 construction traffic volumes - PM Peak Hour

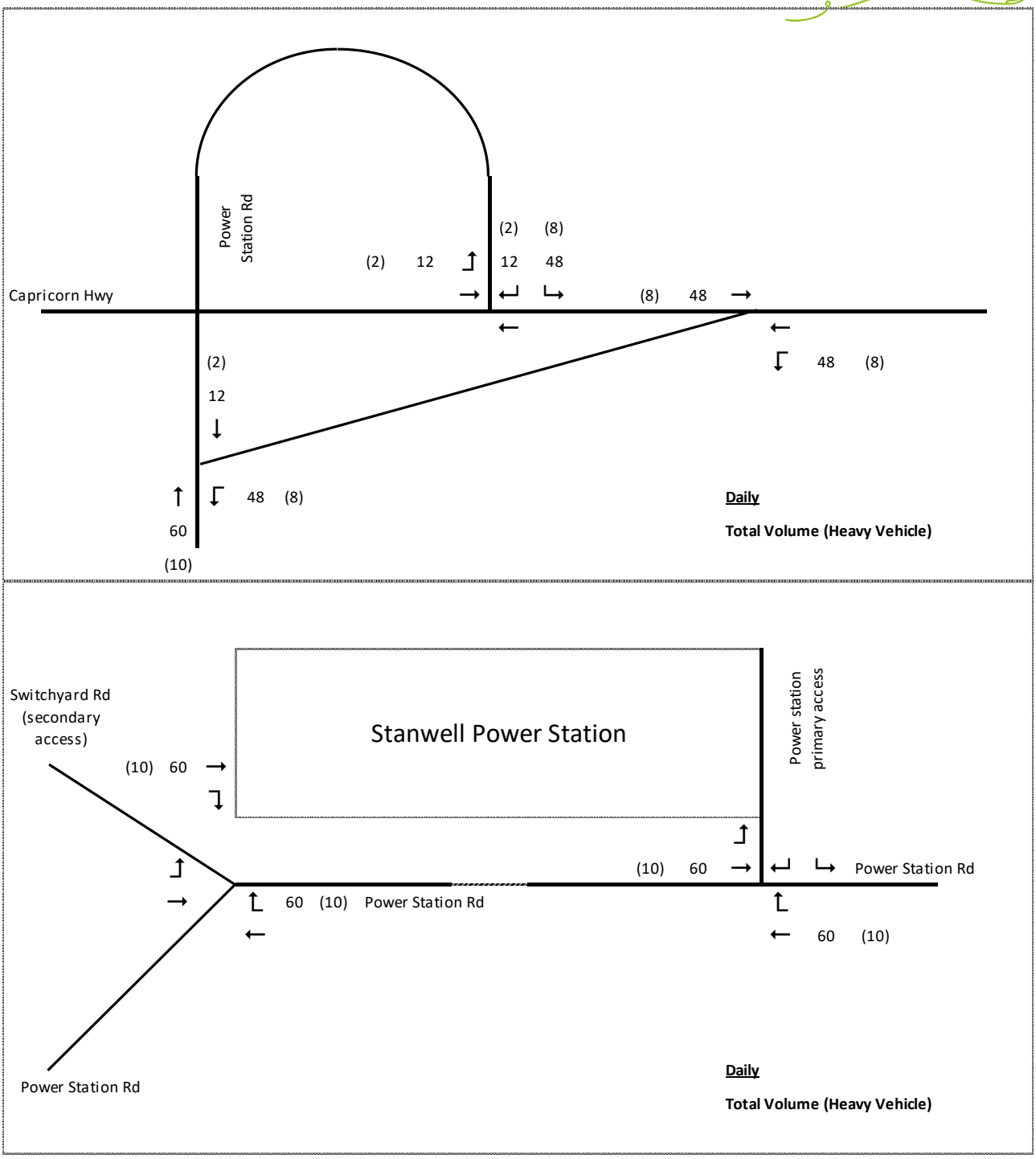


Figure 18 Stage 1 construction traffic volumes - Daily

5 Impact Assessment and Mitigation

The following report sections provide the following impact assessment and mitigation measures (as required):

- Section 5.1 - Road safety
- Section 5.2 - Access and frontage assessment
- Section 5.3 - Intersection delay
- Section 5.4 - Road link capacity
- Section 5.4 - Pavement
- Section 5.6 - Transport infrastructure
- Section 5.7 - Other Considerations

5.1 Road safety

The TMR GTIA states any intersection turn movement or road link volume that increases more than 5% from the base case volume (in this case existing traffic volumes) requires a road safety impact assessment to determine whether risk has increased to the next level because of the construction traffic (in this instance).

Based on volumes summarised in Section 5.3 and 5.4 this includes the whole nominated study area comprising; Capricorn Highway / Power Station Road interchange, Power Station Road, and the Stanwell Power Station access intersections.

Accordingly, the following sets out a safety impact assessment of the nominated study area.

5.1.1 Crash History

Available crash history data indicates that there has been only one crash on Power Station Road within the study area in the five-year period 2016-2020, as detailed in Section 2.3.4. There was no discernible design, geometric or other contributing factor to this single reported crash.

The expected increase in traffic from the proposed construction activities is therefore not expected to contribute to an increase crash risk at this location.

5.1.2 Sight distance desktop assessment

Existing site access intersections, and other intersections within the Project study area are proposed to be used for construction access (i.e., no new intersections or access intersections are proposed).

Notwithstanding, a high-level desktop sight distance assessment has been undertaken of the two Power Station access points (primary access and secondary access used for construction) in accordance with *Austroads Guide to Road Design Part 3* and *Part 4A*:

- The primary Stanwell Power Station access is a T-junction intersection, with the main access to the Power Station terminating at Power Station Road. All approaches are straight and situated within a relatively flat topography, providing road users a clear view in all directions. Sight distances from all approaches appear to be unobstructed by roadside furniture or vegetation.
- The secondary Stanwell Power Station access, to be used by construction vehicles during Stage 1 construction, is a Y-junction intersection, with vehicles approaching the intersection via the southern leg of Power Station Road required to give way to all traffic (i.e., vehicles approaching the intersection via Switchyard Road and the eastern leg of Power Station Road are not required to yield).

  The intersection appears to be relatively level, noting the southern leg of Power Station Road appears grade down slightly to the intersection. Views appear to be unobstructed for vehicles approaching the

intersection via the eastern leg of Power Station Road. The Switchyard Road approach is straight and level, though there is a possibility that southward views (looking right) are obstructed by vegetation growth.

The southern leg of Power Station Road approaches the intersection along a right bend, with warning signage. The bend is delineated by roadside reflectors. It is noted that there is an absence of line marking to delineate the requirement for vehicles to give way (cat eyes only).

The above is to be considered a preliminary assessment only and is not based on a site inspection. It is recommended that this assessment be revisited closer to construction and undertaken in-person to confirm there are no obstructions to sight distances (e.g., vegetation, etc. not identified from a desktop assessment).

5.1.3 Turn lane warrants

Based on the TMR GTIA, a turn lane warrant assessment is typically applied to new T-intersections and private access roads where the major road comprises one lane in each direction to determine what type of access / driveway would be required.

Notwithstanding, a turn lane warrant assessment has been undertaken of the egress movements from Capricorn Highway to Power Station Road during the AM peak hour (left turn from east and west approaches) in accordance with the Austroads Guide to Traffic Management Part 6[3] noting these movements increase significantly from existing base case conditions.

The turn lane warrant assessment is summarised in Figure 19 based on turning movement summaries included in Figure 6 and Figure 16.

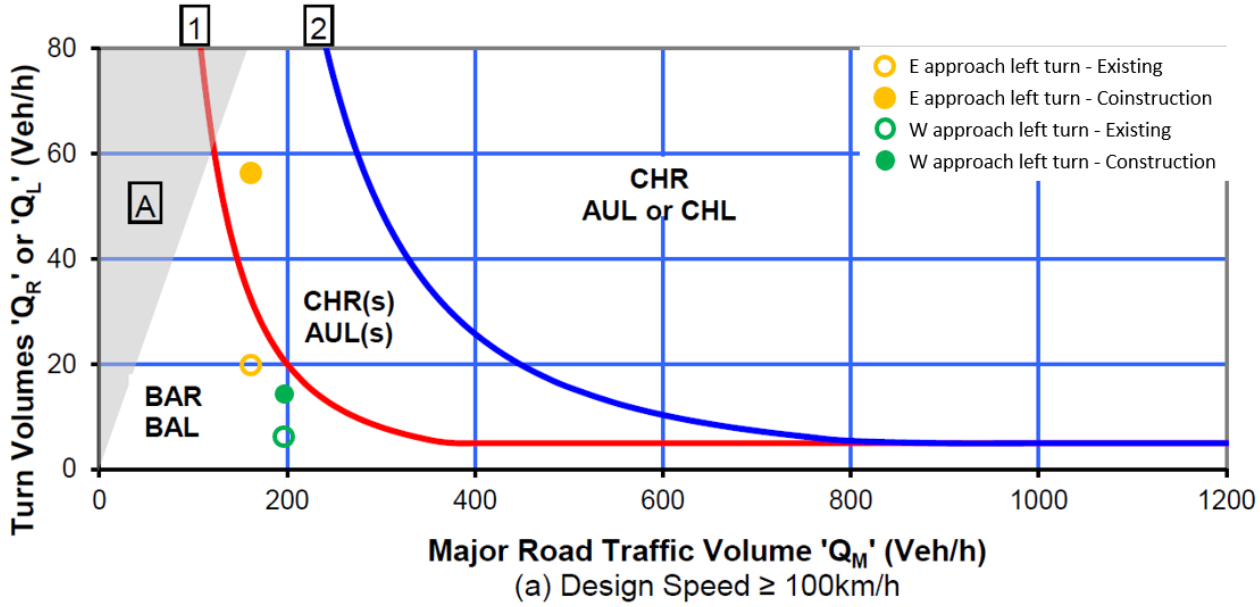


Figure 19 Turn Lane Warrant Assessment – Critical AM Peak Hour

The assessment indicates that under both existing and construction periods at a minimum, basic left turn lane treatments are warranted on Capricorn Highway (on both approaches) – *except* the left turn from the east approach which meets a short channelised left turn treatment.

Both existing east and west approach left turn lane treatments include channelised left turn lanes which exceed or meet these turn lane warrants.

No mitigation is therefore considered warranted for the proposed Stage 1 construction generated traffic movements.

[3] Estimated turning movements do not change under the PM peak hour and therefore has not been assessed.

5.1.4 Risk Assessment

The TMR GTIA requires a risk assessment of all developments to determine the likelihood and consequence of safety risks increasing because of development (construction traffic in this instance) as a first step in identifying if any works are required to mitigate risk. In regard to RRC controlled roads, the GTIA recommends that local government intersections be included in the assessment area if triggered by relevant impact assessment criteria.

A risk assessment has accordingly been undertaken to identify and assess existing safety risks, and to assess impacts of the construction period of the Project to understand if there is an increase in road safety risk or if any existing risk is acceptable.

The following items have been identified as relevant risks that would change the existing risk profile as part of the construction phase of the development (based on the TMR GTIA); 'increases in traffic volumes, including more traffic introduced on narrow rural roads' (noting these volumes are very low) and 'introduction of over-dimension or heavy vehicles'. Specifically, these relate to:

- More turn movements into Power Station Road from Capricorn Highway,
- Increased right turn movements to Switchyard Road from Power Station Road, and
- Increased traffic movement at the Capricorn Highway / Power Station Road interchange and along Power Station Road.

It is noted that as part of the construction process a Traffic Management Plan (TMP) will be put in place by the construction contractor. While these have not been developed, nor are they the focus of this assessment, it is expected that speed reductions, advance warning signage (of various types) and site traffic control will occur at variation locations along Power Station Road during construction.

		Potential consequence				
		Property only (1)	Minor injury (2)	Medical treatment (3)	Hospitalisation (4)	Fatality (5)
Potential likelihood	Almost certain (5)	M	M	H	H	H
	Likely (4)	M	M	M	H	H
	Moderate (3)	L	M	M	M	H
	Unlikely (2)	L	L	M	M	M
	Rare (1)	L	L	L	M	M

L: Low risk
M: Medium risk
H: High risk

Figure 20 Safety risk score matrix (TMR GTIA)

The following therefore sets out a safety risk score assessment based on the TMR GTIA (refer Figure 20 above) and assuming appropriate traffic control treatments are in place during construction, as summarised in Table 5.

Table 5 Risk Assessment Summary (assuming construction traffic management controls)

Risk Item		Existing			During Construction		
		Likelihood	Consequence	Result	Likelihood	Consequence	Result
Increase in traffic volume, including more traffic introduced on narrow rural roads (increase crash risk, etc.)	Capricorn Hwy / Power Station Rd	3	4	M	3	4	M
	Power Station Rd [1]	2	4	M	2	4	M
	Power Station Rd / Primary Access	2	4	M	2	4	M
	Power Station Rd / Construction Access	1	4	M	2	4	M
Introduction or increases in over-dimension or heavy vehicles (increase crash risk, etc.)	Capricorn Hwy / Power Station Rd	3	4	M	3	4	M
	Power Station Rd [1]	2	4	M	2	4	M
	Power Station Road / Primary Access	2	4	M	2	4	M
	Power Station Road / Construction Access	1	4	M	2	4	M

[1] Power Station Road and third-party access intersections between Capricorn Highway and the Power Stations secondary access point.

Assuming appropriate traffic management treatments within the study area, the risk assessment process indicates that while all risk scores remain below 'H', with no changes in risk assessment scores between existing and construction scenarios.

No road safety mitigations are required and therefore no further road safety assessment or road safety audit is necessary.

5.2 Access and frontage

The TMR GTIA requires an access and frontage impact assessment on the SCR network for the extent of the frontage of the site, or works, on both the site frontage side and potentially on the opposite side of the road. Based on the TMR GTIA access and frontage impacts and mitigation typically include (but are not limited to) access intersection works, kerb and channel, footpaths / cycle ways, stormwater infrastructure, bus stop relocation / provision, etc.

The site frontage and works do not front or propose access from the SCR network. Notwithstanding the below considers the access and frontage of the site and proposed works on the RRC network.

Directly along the site's frontage two site access intersections exist for the Stanwell power station (primary access and Switchyard Road secondary access). Between the Stanwell Power Station and Capricorn Highway several site access points exist, including:

- Stanwell Quarry – Central Queensland Quarries Pty (T-intersection), located approximately 1.4 km north-east of the Project
- Abandoned Stanwell Power station access (T-intersection), located approximately 1.7km north-east of the project.

- Capricorn Sandstone Quarries Pty Ltd / Scotsman's Folly Quarry (T-intersection), located approximately 2.6 km north-east of the Project, and
- Aurizon Stanwell Depot (T-intersection) located approximately 4.6 km north-east of the Project (adjacent Capricorn Highway).

Proposed Stage 1 construction traffic (6-week construction period) will impact these intersections due to increase light vehicle and heavy vehicle movements noting these are only through vehicle movements on Power Station Road. Notwithstanding, these traffic volumes are estimated to be quite low and are considered low risk and low impact to these access points and no mitigation measures are considered necessary.

No changes are proposed or considered necessary regarding existing access points from Power Station Road, or the configuration of it along frontage of the site and proposed works.

5.3 Intersection delay

The TMR GTIA requires and intersection delay assessment for all intersections where increased traffic exceeds 5% of the base traffic for any movement in the nominated peak periods at the year of opening (2023 construction period in this instance).

5.3.1 Turn movement volume increase

Table 6 has been prepared to summarise the turn movement increases under the construction period at the Capricorn Highway / Power Station Road interchange during the AM and PM peak hours.

Table 6 Capricorn Hwy / Power Station Rd - Movement volume for design peak for year of opening (AM / PM)

Approach	Movement	Base scenario			Construction scenario			% Increase from base	Exceed 5%
		LV	HV	Total	LV	HV	Total		
Capricorn Hwy (East)	Left	23 / 2	5 / -	**28 / 2**	71 / 2	13 / -	**84 / 2**	**200%**/-	**Y** / -
	Through	138 / 159	30 / 35	**168 / 194**	138 / 159	30 / 35	**168 / 194**	-/ -	- / -
Capricorn Hwy (West)	Left	6 / 1	1 / -	**7 / 1**	18 / 1	3 / -	**21 / 1**	**200%** / -	**Y** / -
	Through	156 / 135	35 / 30	**191 / 165**	156 / 135	35 / 30	**191 / 165**	- / -	- / -
Power Station Rd (North)	Left	2 / 23	- / 5	**2 / 28**	2 / 71	- / 13	**2 / 84**	/ **200%**	- / **Y**
	Right	1 / 6	- / 1	**1 / 7**	1 / 18	- / 3	**1 / 21**	- / **200%**	- / **Y**
Total		**326 / 326**	**71 / 71**	**397 / 397**	**386 / 386**	**81 / 81**	**467 / 467**	**18% / 18%**	**Y / Y**

5.3.2 Delay assessment

The project intersections with SCR network links have been assessed for both base case and construction period (assumed 2023) in accordance with the procedure outlined in the TMR GTIA document, as summarised in the following:

- Each intersection that has any >5% turn movement volume increases has been analysed for the base case, and construction peak to determine the movement delays.
- Total vehicle -minutes across each intersection and scenario have been calculated, to determine the development impact in accordance with the aggregate intersection delay impact vehicle minutes formula. Where development traffic adds less than 5% of delay to the base case traffic aggregate, no mitigation to treat the intersection delay is required.

- With development intersection vehicle minutes is calculated by multiplying the 'with development' scenario average delay by movement, by the base case volume for each movement. This purposely does not count the impact as delays to development traffic, only to pre-existing traffic that is affected by the additional delays.
- Base case intersection vehicle minutes is calculated by multiplying the base case average delay by movement by the bas case volume for each movement.
- Identify any intersection upgrades if required to mitigate intersection delay.

A SIDRA intersection 9.0 performance assessment has been carried out for each of these intersections under the base case and construction year (assumed 2023) peak hour conditions to confirm that they will operate within acceptable capacity limits with the additional traffic forecast to be generated by the proposed development, in accordance with standard practice.

SIDRA parameters

Key SIDRA parameters adopted for measuring intersection performance, include the following:

- **Degree of Saturation (DoS)** - Degree of saturation (DoS) is defined as the ratio of demand to capacity of a given intersection. A DoS of 1.0 indicates the intersection is at full capacity, and above 1.0 is oversaturated, resulting in long queues and delays. In practice, a DoS of 1.0 would result in unstable flows, therefore there is a practical DoS which represents the target maximum saturation. The maximum target DoS for signalised intersections is 0.90, and for an unsignalised intersection is 0.80.
- **Average Delay** - The delay time, in seconds, which can be expected over all vehicles making a particular movement in the peak hour. More than 70 seconds of delay on a movement equates to a Level of Service of F and usually indicates severely congested conditions, while delays of 0 – 28 seconds represent good operation and delays of 43 – 56 seconds suggest operation near capacity, depending upon the nature of the movement and the intersection control.
- **Level of Service (LOS)** - An index of the operational performance, based upon delays, measured on an A to F scale, with LOS A representing the best operating conditions and LOS F the worst.
- **95th Percentile Queue** - The maximum queue length, in metres, that can be expected in 95% of observed queue lengths in the peak hour. In other words, only 5% of queues during the peak hour will exceed this queue. The acceptability of this length varies according to site conditions but as a minimum it is important to at least achieve sight distance to the back of queue to avoid a safety risk. SIDRA intersection turn movements have been increased to be at least 1 light vehicle per hour, to meet program requirement

5.3.3 Vehicle delay calculation

Table 7 provides a summary of the aggregate intersection delay calculations for the peak construction period (assumed 2023), and whether the intersection exceeds 5% of additional delay.

Table 7 Summary of construction year aggregate intersection delay calculations (AM / PM)

Intersection	Base (vehicle minutes)	Construction scenario (vehicle minutes)	Increase from base (%)
Capricorn Hwy / Power Station Rd (east-bound on/off ramp)	1:13 / 3:18	1:13 / 3:18	- / 0.3%
Capricorn Hwy / east-bound off ramp	3:17 / 0:15	3:14 / 0:15	-1.2% / -
Power Station Rd / east-bound off ramp	3:23 / 2:26	3:25 / 2:23	0.9% / -2%

Intersection	Base (vehicle minutes)	Construction scenario (vehicle minutes)	Increase from base (%)
Total	**7:53 / 6:06**	**7:53 / 6:03**	**-0.3% / -1.7%**

The above indicates the aggregate delay across the Capricorn Highway / Power Station Road interchange is less than 5% therefore no mitigation works are required.

5.4 Road link capacity

The TMR GTIA guidelines require a link capacity assessment be undertaken on all SCR roads where the development traffic exceeds 5% of the opening year AADT base volume. For this project, the existing traffic volume is compared against the construction period volume. Table 8 indicates that no links exceed 5% of the base traffic in either direction.

Table 8 Road link capacity assessment – base volume change

Road link	Existing			Construction Traffic			24h volume change exceed 5% of base traffic?
	LV	HV	Total	LV	HV	Total	
Capricorn Hwy east bound	1,580	400	1,980	1,620	408	2,028	+2.4% No
Capricorn Hwy west bound	1,533	481	2,014	1,573	489	2,062	

No road link capacity assessment is considered necessary under the GTIA and therefore no mitigation measures are required.

5.5 Pavement

5.5.1 Capricorn Highway

As noted in Section 2, Capricorn Highway daily traffic volumes are not expected to increase by 5% or more in either direction because of proposed construction activity. A pavement impact assessment is therefore not required on Capricorn Highway.

5.5.2 Power Station Road

It is noted that the GTIA does not apply to Power Station Road. Notwithstanding, for the purposes of this assessment and in response to RRC's RFI, construction activities are expected to result in increased activities of heavy vehicles along Power Station Road and an impact assessment of the road pavement has been undertaken in accordance with the GTIA.

Based on the referenced pavement and culvert review, the pavement along Power Station Road is granular pavement with thin bituminous surfacing and is in fair condition.

As per section 13.1 of GTIA, for sealed roads, Standard Axle Repetition (SAR) has replaced Equivalent Standard Axle (ESA). The daily traffic volume for Power Station Road is 315 vpd, with 20% HV. As per GTIA, a background SAR per HV of 3.2 is adopted.

Please refer to Table 9 for the estimated background SAR4s.

Table 9 Estimated background SAR4s

Road Name	Direction	Vpd	% HV	AADT HV	SAR / HV	SAR / DAY	SAR / ANNUM
Power Station Rd	WB	126	20%	32	3.2	102.4	37,376
Power Station Rd	EB	126	20%	32	3.2	102.4	37,376

During the duration of construction (6-weeks), a total of 378 heavy vehicle movements will be generated on Power Station Road. The daily development of SAR4's for each vehicle class is calculated below.

The class for each vehicle is determined in accordance with Austroads and GTIA.

- 12.5m single unit truck – Class 4
- 19.0 semi-trailer – Class 9
- 26m B-double – Class 10
- Prime Mover 19m – Class 6

The one larger special low loader vehicle required for sub-station transformer delivery (one loaded trip to site and unloaded (with trailer and prime movers separate) trip from site has been assumed to be eligible for the purposes of this assessment as on a per axle basis this is not expected to significantly vary to a Class 10 vehicle.

Table 10 Construction traffic SAR4 – Power Station Road

Direction	Vehicle Class	HV Volume	SAR / HV	SAR Total	SAR Increase (%)	>5%
Westbound (loaded)	Class 10	378	6.3	2,381.4	6.4%	Yes
Eastbound (unloaded)	Class 10	378	0.53	200.34	0.6%	No

It can be observed that in the westbound direction the construction traffic increases the SAR by 6.4% during the period of construction and it may impact the life of the westbound lane pavement. There is negligible impact on eastbound pavement.

The recommendation is to conduct another pavement and culvert assessment prior to the commencement of construction activities.

5.6 Transport infrastructure

5.6.1 Access

As detailed in Aurecon's *Central Renewable Energy Zone - Battery Energy Storage System (CREZ BESS) Planning Report*, swept path modelling has been undertaken to determine the potential traffic impacts of transporting a 190t transformer of approximately 10.3 m x 3.9 m x 4.4 m in size to the Project Area.

A custom design vehicle was created on AutoCAD for swept path analysis (refer to Figure 15 in Section 4.1). It is noted that the vehicle specifications used for this analysis were based on a previous similar project with similar access conditions and transformer size.

The haulage route for all vehicles involves the Capricorn Highway, Power Station Road, and Switchyard Road.

The modelling for the largest 190t transformer haulage vehicle indicates that temporary removal and/or reinstatement of a grassed traffic island will be required at the Capricorn Highway eastbound on/off ramp loop as the vehicle will traverse across it to access Power Station Road (refer to Appendix A).

All other vehicles will be able to access Power Station Road from Capricorn Highway in the normal manner.

5.6.2 Culverts

As noted in Section 2.7, Cardno previously determined the suitability of existing culverts and pavement to transport a large generator along Power Station Road to the Stanwell Power Station in 2019.

This assessment concluded that the culverts were generally in fair condition and only required minor repairs. Several culverts were however identified to require minor repairs and recommended propping of certain culverts and link slabs prior to transport of the large transformer.

The recommendation of this report is to conduct another pavement and culvert assessment prior to the commencement of construction activities.

5.7 Other considerations

Specific traffic management measures to be implemented during construction of the project will be identified and implemented by the construction contractor to the satisfaction of the relevant road authority.

Notwithstanding, it is expected that several construction traffic management measures will be employed to manage the increase in the number of vehicles (including heavy vehicles) accessing the Project site from the Capricorn Highway / Power Station Road interchange, along Power Station Road, and via the Power Station Road secondary access point (to be used for construction).

It is also noted that permitted will be required for OD and/or OSOM roads as discussed below.

5.7.1 Construction traffic management measures

Construction traffic management measures will be adopted for this project, including TMP and TCP. The Manual of Uniform Traffic Control Devices shall be used as a basis for developing TMP relating to all construction activities on and near all roads being used, including access roads. General traffic management strategies and measures recommended to be adopted during the construction period include, but are not limited to:

- Power Station Road speed reduction on the approaches to the Power Station access points
- Power Station Road speed reduction on approach to/from the Capricorn Highway.
- Switchyard Road speed reduction,
- Warning signs on Power Station Road as required.

Notwithstanding the above, treatments may be required for specific instances, such as the one-off delivery of the 190t transformer (as well as escort and pilot vehicles, etc).

5.7.2 Over Dimensional (OD) / Over Size Over Mass (OSOM) Vehicles

The construction contractor may be required to procure permits/approvals for the transportation of transformers, batteries, and site machinery for certain excess mass/excess dimension vehicles. The construction contractor will therefore need to consider the following for the transportation of any excess mass/excess dimension vehicles:

- Rockhampton Regional Council approvals
- TMR permit conditions
- approvals from Queensland Police Services (QPS)
- any other requirements under the *Transport Operation (Road Use Management) Act 1995 (Qld).*

The construction contractor should provide movement schedules to QPS, three months in advance of the movement schedule commencing, or later by the arrangement with Regional Traffic Coordinator.

A TMP should be prepared prior to commencement of any deliveries for high risk OSOM movements. The TMP's would include the following:

- Alternate diversion route for non-construction vehicle
- Potential lay-by areas for OSOM vehicles to allow vehicles to overtake at various locations along the corridor
- details of road work / pavement modifications
- vegetation management
- temporary parking restriction requirements
- earthwork and structural modifications
- intersection upgrades

The requirements for escorting of over dimensional loads are also summarised in Figure 21.

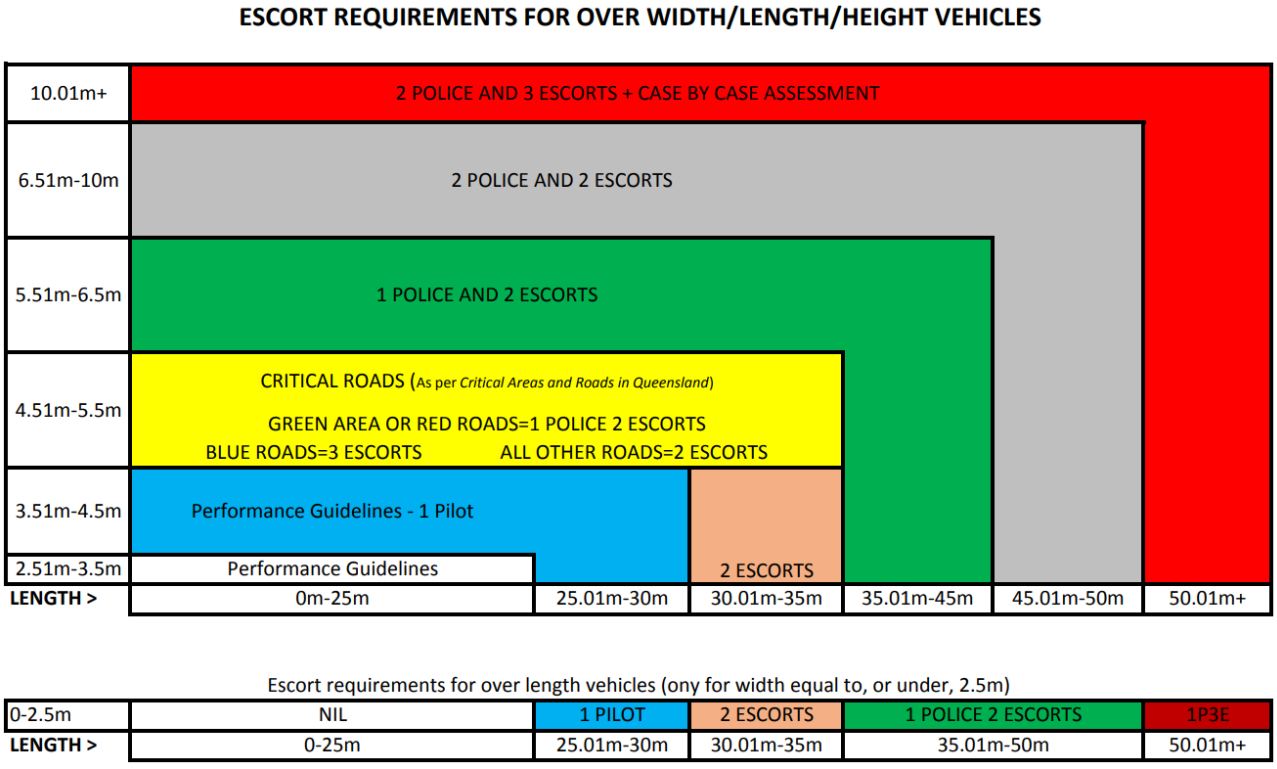


Figure 21 Guide for Over dimensional vehicles (Queensland Police Service)

6 Conclusion

Based on the above discussions and analysis, the following is summarised:

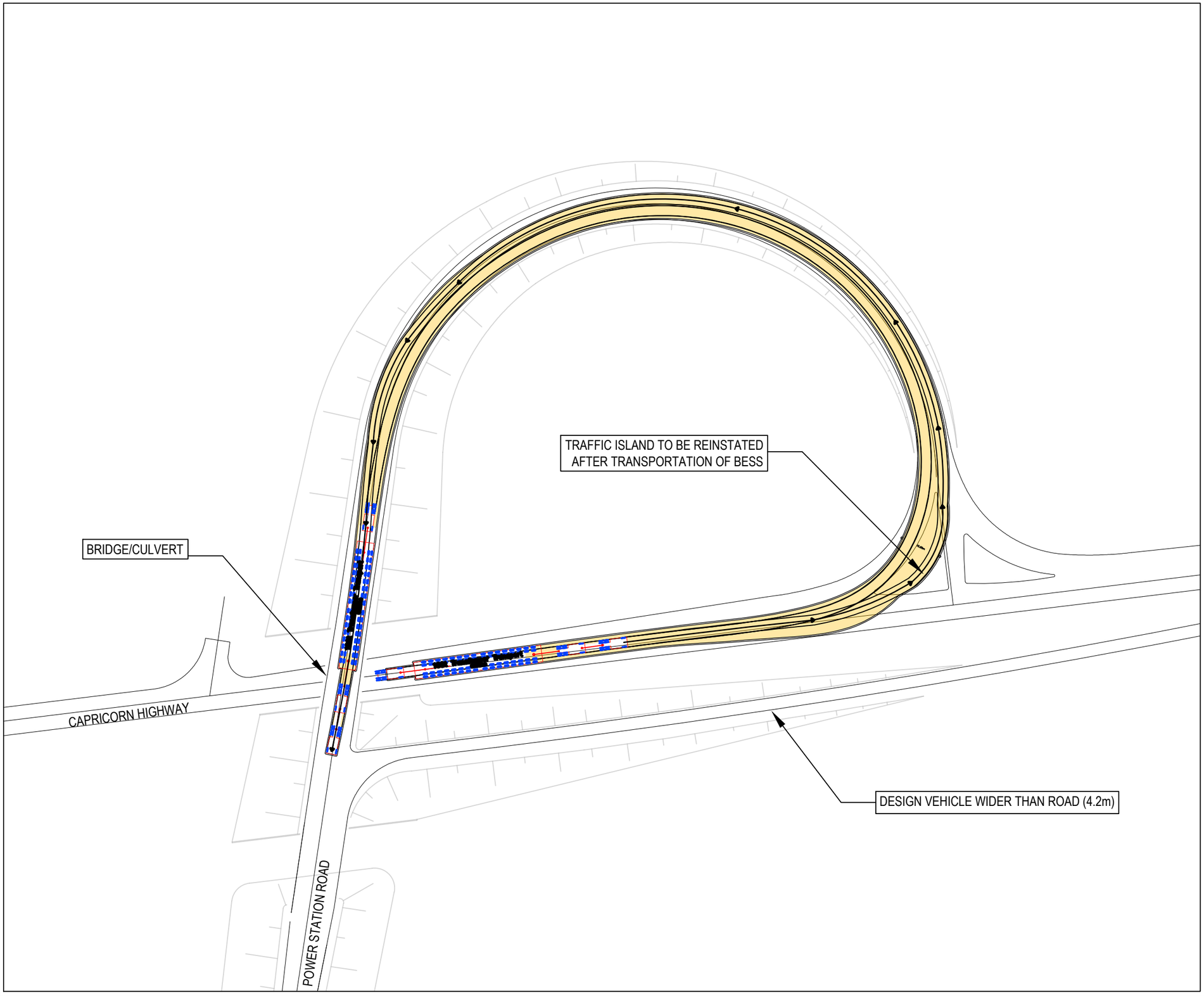
- The proposed BESS facility is proposed to be constructed in two stages, with stage 1 expected to generate peak construction traffic volume movements over a six-week period:
  - Stage 1: 150MW/300MWh installation, and
  - Stage 2: additional 1,300MW/2,600MWh (over several years).
- Access is proposed via Power the Station Road / Switchyard Road intersection (i.e., the power station's secondary access) which is accessible from Power Station Road and Capricorn Highway to the north-east.
- Peak construction activity is expected to generate a total of 3,978 vehicle movements comprising:
  - Light vehicles (LV): 3,600 movements by construction workforce
  - Heavy vehicles (HV): 378 movements for construction material delivery (including transformers and batteries), equipment transportation, etc.
- Peak construction activity is expected to generate 120 vehicle movements per day comprising 100 LV and 20 HV, and 50 LV and 10 HV movements in any peak hour.
- An impact assessment has been undertaken in accordance with QLD TMR GTIA which includes:
  - An **access and frontage impact assessment** in Section 5.2 indicates that the site frontage and construction works do not front or propose access from the SCR network. Notwithstanding, no changes are proposed or considered necessary regarding exiting access points from Power Station Road (RRC road).
  - An **intersection delay impact assessment** in Section 5.3 indicates that the aggregate delay across the Capricorn Highway / Power Station Road interchange is less than 5% therefore no mitigation works are required.
  - A **road link impact assessment** in Section 5.4 found that construction volume increases were within the 5% specified in GTIA therefore no further analysis was required.
  - A **pavement impact assessment** in Section 5.5 identified that the proposed construction works may have an impact on the south-westbound pavement on Power Station Road and it is recommended that another pavement and culvert assessment prior to the commencement of construction activities is conducted
  - A **transport infrastructure assessment** in Section 5.6 - the modelling for the largest 190t transformer haulage vehicle indicates that temporary removal and/or reinstatement of a grassed traffic island will be required at the Capricorn Highway eastbound on/off ramp loop as the vehicle will traverse across it to access Power Station Road. The recommendation of this report is also to conduct another pavement and culvert assessment prior to the commencement of construction activities.
  - **Other considerations assessed** in Section 5.7 - minor temporary traffic management measures and vehicle permitting will be require for the construction phase of the project.
  - **Crash History**- the likely increase in construction traffic is not expected to increase crash risk at the location, and therefore no mitigation measures are required.
  - **Sight Distance** – a preliminary desktop assessment shows unobstructed sight distances at intersections of Capricorn Highway/Power Station Road, Power Station Road/ Primary Access Road, and Power Station Road / Secondary Access Road. However, it is recommended that, an in-person assessment is to be conducted closer to construction to confirm these preliminary findings.
  - **Turn movements** – a turn lane warrant assessment was undertaken for egress movements from Capricorn Highway to Power Station Road during AM Peak hour. The assessment indicated that basic

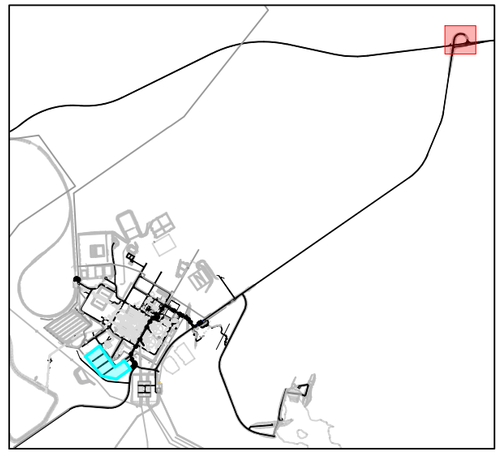
left turn lane treatments are warranted on both approaches of Capricorn Highway before and during construction. Therefore, no mitigation measures are warranted for Stage 1.

- **Risk Assessment** – the existing safety risks and construction period impacts were assessed. It was observed that there are increased movements at Capricorn Highway/ Power Station Road interchange, along Power Station Road and Switchyard Road. However, it is noted that TMP(s) will be in place prior to commencement of construction, including speed reductions, advance warning signs and site traffic control. Therefore, no mitigation measures are required for road safety. Further to this, no additional road safety audits and or road safety assessments are warranted.
- **Intersection delay –** assessment indicates the aggregate delay at Capricorn Highway/Power Station Road interchange is minimal (<5%), and therefore no mitigation works are required.
- **Road link capacity –** as the daily construction traffic volume is not more than 5% from base case, a road link capacity assessment is not required under GTIA. Therefore, no mitigation measures are required.
- **Transport infrastructure –** the swept path analysis of the custom vehicle shows that temporary removal of grassed traffic island will be required at Capricorn Highway eastbound on/off ramp loop. It is recommended that this is completed prior to transportation of the transformer.
- **Culverts –** the culvert assessment shows that some culverts require minor repairs. It is recommended that another assessment is to be completed prior to the commencement of construction activities.

- Construction traffic management measures are required to be adopted during the 6-weeks period or as determined as per TMP.
- Transportation of the transformer will require approvals from RRC, TMR, and QPS.

Appendix A
Swept Path Assessment





NOTES:

1. TRANSPORT VEHICLE CONSISTS OF 3 x PRIME MOVERS & 16 LINE MODULAR TRAILER (GROSS 353.5t)

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SUPERSEDED DRGS:

REFERENCE DRGS:

STANWELL Power Station | stanwell

CENTRAL RENEWABLE ENERGY ZONE
BESS PROJECT
TRANSPORT LOGISTICS
ENTRY

AURECON DRAWING No.
CRBP-DRG-CC-0001

STANWELL DRAWING No.
CRBP-0000-AGP-100-DRG-C-0003

Drawn	P.S.
Date	21.12.2021
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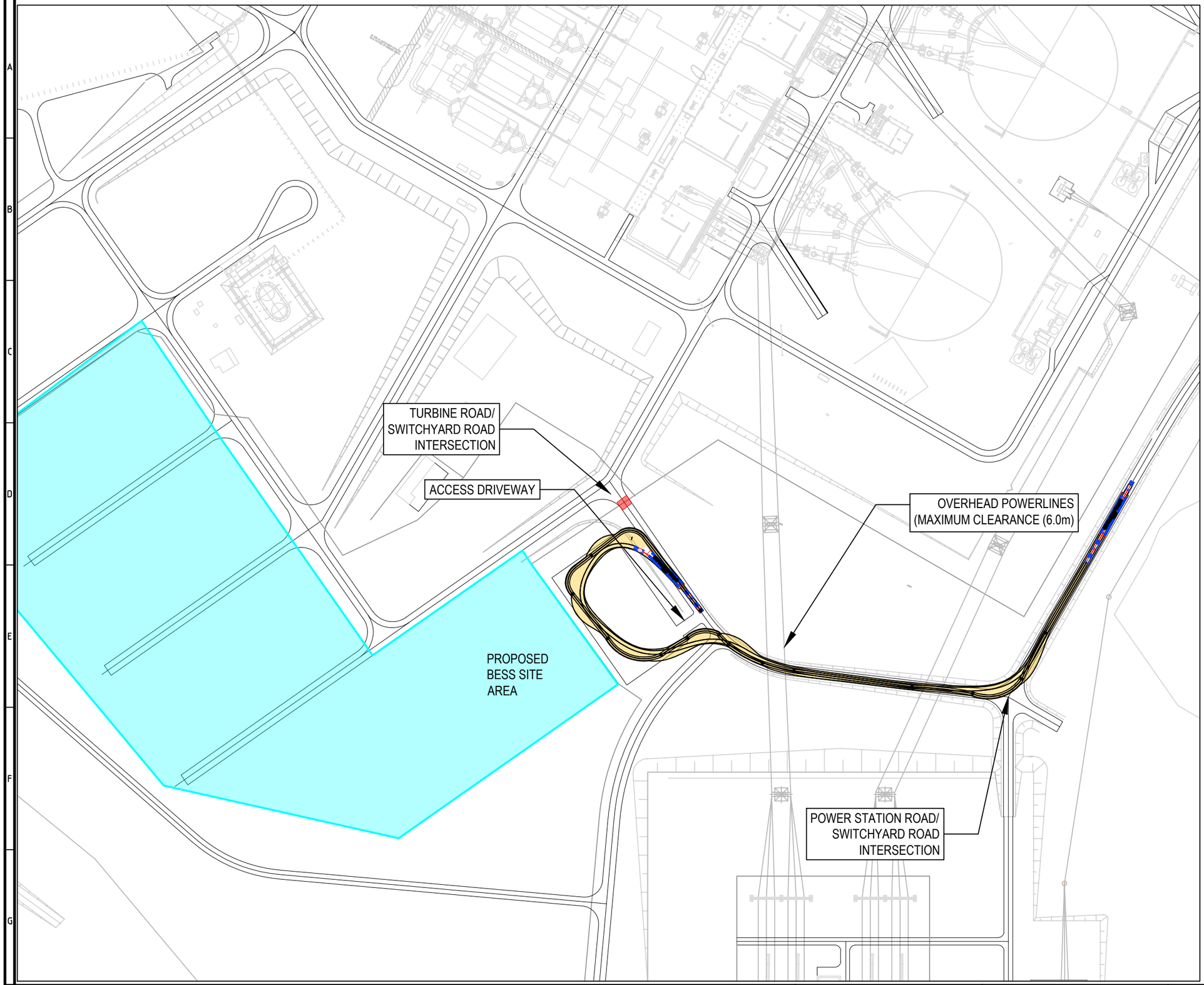
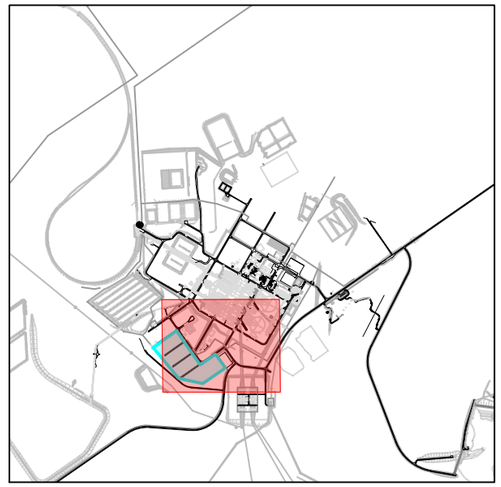
Revision	C





LEGEND

PROPOSED SITE BESS AREA

SECURITY GATE

NOTES:

1. TRANSPORT VEHICLE CONSISTS OF 3 x PRIME MOVERS & 16 LINE MODULAR TRAILER (GROSS 353.5t)
2. OPTION DEMONSTRATES TIGHTEST TURN FOR CRITICAL VEHICLE. CONTRACTOR MAY UTILISE LARGER TURNING CIRCLE.

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SUPERSEDED DRGS:

REFERENCE DRGS:

STANWELL Power Station | stanwell

CENTRAL RENEWABLE ENERGY ZONE
BESS PROJECT
TRANSPORT LOGISTICS
OPTION 3A

AURECON DRAWING No.
CRBP-DRG-CC-0002
STANWELL DRAWING No.
CRBP-0000-AGP-100-DRG-C-0004

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2022-11-02

Rockhampton Regional Council (RRC)
C/- Hugh Campbell
Senior Consultant
Aurecon
sent via email: hugh.campbell2@aurecongroup.com.au

Dear Hugh

Stanwell BESS FEED Facility Development Application (D/82-2022) – Traffic Impact Assessment Report

Introduction

I refer to recent correspondence from Rockhampton Regional Council (RRC, dated 26 October 2022) regarding the development application for the Stanwell BESS facility proposed within the Stanwell power station site.

Specifically, the RRC provided draft conditions for the development but have limited approval to Stage 1 of the project as the traffic impact assessment submitted did not consider Stage 2 (e.g., the remainder of the project). Aurecon has subsequently discussed the Stanwell BESS facility traffic impact assessment with RRC's 'Engineering Development Unit' who assessed this report submitted with the application.

The following letter provides further discussion regarding construction of Stage 2 of the Stanwell BESS facility.

This letter addendum should be read in conjunction with the 'Stanwell BESS FEED Traffic Impact Assessment' (dated 12 October 2022 revision A).

Discussion

The overall development comprises a BESS facility with a total capacity of 1,450 MW / 2,900 MWh (including necessary transformer, cabling, and switching gear, etc.), including:

- Stage 1: of 150 MW / 300 MWh and
- Stage 2: 1,300 MW / 2,600 MWh.

Stage 1 includes delivery of a 190t transformer via special low lower transport (multiple axle custom low loader trailer and three (3) prime mover trucks, with a total length of 66m). It expected that this 190t transformer will be sufficient for capacity requirements beyond the Stage 1.

Construction of Stage 1 will extend over 12 months, with a peak 6-week construction period which includes the delivery of the battery systems. Stage 1 could be complete by early to mid-2024 (subject to required permits and approvals).

Stage 1 traffic volumes generated have been calculated to be 100 light vehicles and 20 heavy vehicles per day for the construction period.

Stage 2

Completion of Stage 2 is expected to occur over several years and will primarily be driven by market demands. It is not clear when the remainder of the development will be completed and there is insufficient information to understand the Stage 2 traffic impacts and what mitigations are required.

To the best of our understanding, it is likely that Stage 2 will be constructed in similar fashion to Stage 1. Therefore, we estimate that traffic volumes generated would be similar to Stage 1 with 100 light vehicles and 20 heavy vehicles per day for the construction period.

Conclusion

I recommend a Stage 2 Traffic Impact Assessment be undertaken in line with TMR and RCC requirements when construction program and staging inputs are available in detail to confirm that traffic volumes generated will not exceed the daily traffic generation rates calculated for Stage 1.

Should you have any questions or comments, please do not hesitate to contact me on +61 7 3173 9467 or at **erin.thomas@aurecongroup.com**.

Yours sincerely

Erin Thomas
Lead Engineer (RPEQ 18608) – Integrated Transport & Mobility (QLD)

Copies: Ben Simpson – Associate – Aurecon Integrated Transport & Mobility (SAVI)