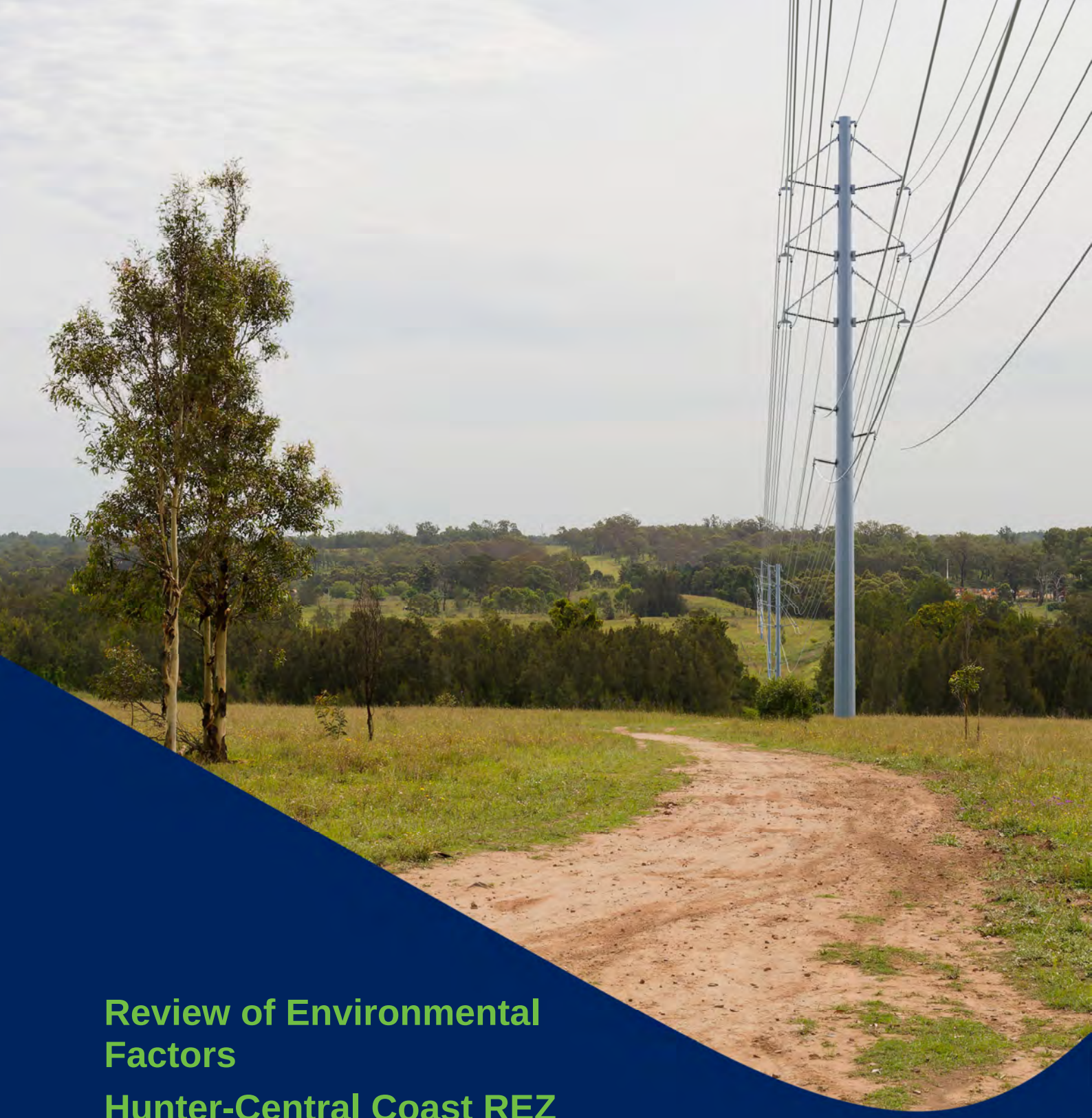

Review of Environmental Factors

Hunter-Central Coast REZ Network Infrastructure

Appendix M – Traffic Impact Assessment

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Ausgrid

Prepared for
Ausgrid
ABN: 78 508 211 731

Road Safety Audit - Existing Road

22-Apr-2025
Hunter-Central Coast Renewable Energy Zone Network Infrastructure
Commercial-in-Confidence

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Delivering a better world

Road Safety Audit - Existing Road

Client: Ausgrid

ABN: 78 508 211 731

Prepared by

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22-Apr-2025

Job No.: 60751984

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 and ISO45001.

Quality Information

Document	Road Safety Audit - Existing Road
Ref	60751984
Date	22-Apr-2025
Originator	Jacky Leung
Checker/s	Steve Kemp
Verifier/s	Brigette Humphrey-Robinson

Revision History

Rev	Revision Date	Details	Approved	
			Name/Position	Signature
A	14-Apr-2025	Initial issue	Brigette Humphrey-Robinson Principal Transport Engineer	

Table of Contents

Audit Summary

Audit Details	
RSA No.:	60751984 / 01
Audited project:	Proposed Hunter-Central Coast Renewable Energy Zone Network Infrastructure
Audit type:	Existing Road
Auditors:	Jacky Leung – Lead Auditor Auditor Level 3 Registered No: RSA-02-0319 Steven Kemp – Audit team member Auditor Level 2 Registered No: RSA-02-0559
Commencement meeting:	1 April 2025
Audit date:	3 April 2025
Completion meeting:	-
Sponsor Details	
Audit for:	Ausgrid
Contact name:	Richard Dunnicliff
Email:	RDunnicliff@ausgrid.com.au
Phone:	0437 036 469

1.0 Introduction

1.1 Project Background

AECOM Australia Pty Ltd (AECOM) has been engaged by Ausgrid to prepare a Road Safety Audit (RSA) of the existing intersection of the New England Highway (NEH) with Hebden Road. This intersection forms part of the access route to the proposed Hunter Central Coast Renewable Energy Zone (HCC REZ) Network Infrastructure works at Muswellbrook, NSW (the Project).

1.2 Purpose

The purpose of this audit is shown ticked in Table 1.

Table 1 Audit Purpose

Project Phase	Type of Road Safety Audit	Purpose of this Audit
Pre-construction	Strategic design	
	Concept design	
	Detailed design	
Construction	Roadworks	
	Pre-opening	
Post construction	Finalisation	
	Existing road	✓

1.3 Context

The HCC REZ was formally declared by the Minister for Energy and published in the NSW Gazette on 9 December 2022. The REZ infrastructure intends to deliver an additional one gigawatt (GW) of renewable energy transfer capacity by mid-2028 which will provide consumers with cleaner, more affordable and reliable electricity. The key works will span multiple Local Government Areas (LGAs) and will include:

- Rebuilding sub-transmission lines
- Building two new substations
- Upgrading two existing substations

This work would facilitate connecting and transferring power from batteries, pumped hydro, solar and wind farms to electricity consumers in the Muswellbrook and Newcastle areas.

The HCC REZ infrastructure would predominantly be constructed on land owned by Ausgrid or on public land. The sub-transmission lines would be predominantly built within corridors of land known as sub-transmission line easements. Ausgrid would use existing easements where possible; however, there would be a need to widen easements or acquire new easements in some sections.

Within the Muswellbrook Shire LGA, the proposed works for HCC REZ in the Hebden Road area would include:

- New sub transmission switching station known as Antienne STSS located at Lot 9 DP250890 Hebden Road, Muswellbrook
- Overhead connection works to existing network
- Rebuild of the feeder 95U to southeast of new Antienne STS
- Optic fibre cable installation along Hebden Road and then north under 95U feeder towards Muswellbrook.

The NEH is classified as a State highway and is an approved 25/26 m B-double freight route. The NEH runs in the north-south direction and intersects with Hebden Road at two locations. The scope of this RSA includes the northern intersection of the NEH and Hebden Road (the RSA Site).

The NEH provides an undivided carriageway, allowing for two lanes of travel in the northbound direction and a single lane in the southbound direction. There are deceleration lanes on the NEH to both the north and south of its northern intersection with Hebden Road to allow vehicles slow to turning speeds. The posted speed limit on the NEH at the RSA Site is 100 kilometres per hour (kph) for vehicles and the intersection operates with give-way priority control.

Hebden Road provides an undivided carriageway with a narrow single lane in each direction without linemarkings. Double barrier lines are provided near the RSA Site. The posted speed limit on Hebden Road is 80 kph for vehicles.

This RSA includes an assessment of the safety and functionality of the right-hand turn onto the NEH (including the cumulative impact of traffic movements combined with the proposed Hunter Transmission Project).

The RSA Site location is located in Muswellbrook, as shown in Figure 1 and Figure 2 shows the RSA Site extents.

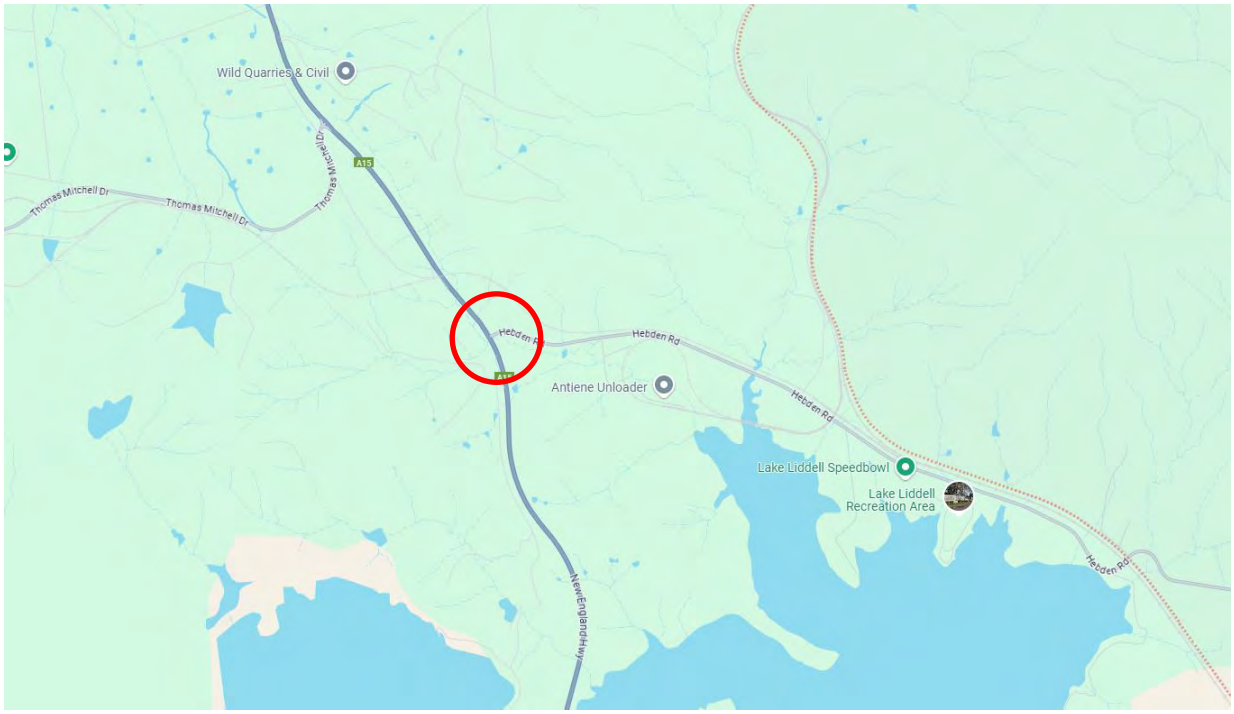


Figure 1 Site Location

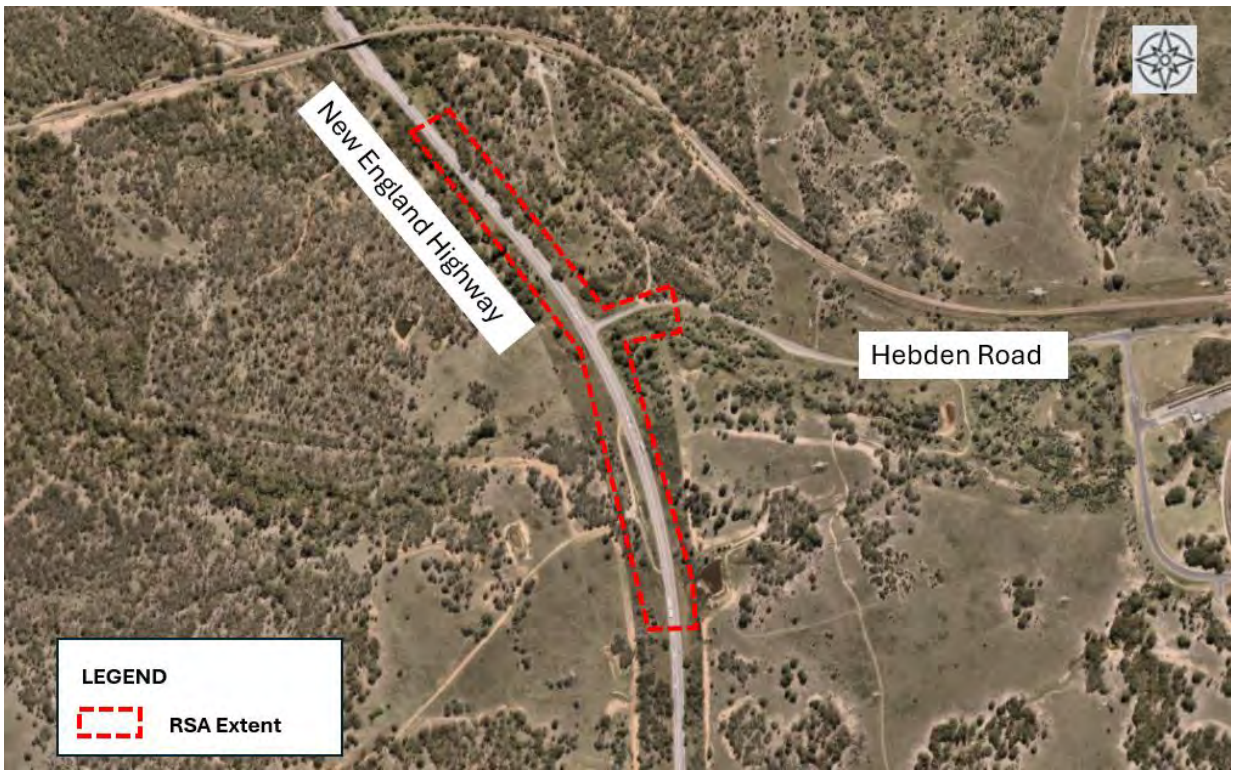


Figure 2 RSA Site Extent (NEH and Hebden Road Intersection)

2.0 RSA Process

The RSA was undertaken in accordance with The NSW Centre for Road Safety's Guidelines for Road Safety Audit Practices (July 2011) and with reference to Austroads Guide to Road Safety Part 6: Road Safety Audit (January 2022). The RSA methodology is based on the experience and skill of audit team members, rather than using checklists.

2.1 Scope of the RSA

This audit comprises a post-construction (Existing Road) RSA. The RSA was conducted to ascertain potential risks to road safety for all road users. The audit is limited to an appreciation of the site conditions from a day and night-time site inspection.

Issues considered during the RSA were:

- Existing conditions
- Road alignment and cross-section
- Physical objects
- Existing lighting conditions
- Traffic control devices
- Pedestrian and cycle facilities
- Signage and delineation

The objective of the RSA is to identify potential safety issues for all road users within the RSA study area, and to ensure that these are recognised and considered.

The following matters were reviewed:

- Have all of the movements of all the various road users been catered for in a safe way?
- Are the appropriate operational and control mechanisms in place to promote safety?
- Would the system operate to an acceptable level of safety in all situations, such as poor weather or during darkness?
- Are there opportunities to reduce the occurrence or severity of crashes?

Although the RSA has identified risks to road safety, the responsibility for assessing and implementing remedial measures remains with the designers, project managers and asset owners. It should be noted that it is not the role of the road safety auditor to provide solutions to the identified risks. However, identification of potential safety concerns may assist the project manager in reducing the incidence and severity of crashes.

2.2 Exclusions

The following items are excluded from the scope of this RSA:

- Areas outside of the RSA Site extents, as shown in Figure 2
- Wet weather conditions, noting that it was dry and sunny on the day of the site visit.

2.3 Audit Team and Sponsor Details

Audit team and sponsor details are shown in Table 2.

Table 2 RSA Team and Sponsor Details

Role	Name	
Sponsor	Richard Dunnicliff	
Sponsor email	RDunnicliff@ausgrid.com.au	
Lead auditor	Jacky Leung	Level 3 - RSA-02-0319
Lead auditor email	Jacky.leung2@aecom.com	
Audit team member	Steven Kemp	Level 2 - RSA-02-0559

2.4 Information and Material Supplied

The following non-audited materials were provided for consideration as part of this RSA:

- Request for Quote letter: Proposed Hunter-Central Coast Renewable Energy Zone Network Infrastructure – Traffic Impact Assessment, Dated 19 February 2025.

2.5 Reference Material

The RSA was undertaken with reference to:

- Transport for New South Wales, Guideline for Road Safety Audit Practices, (July 2011)
- Transport for New South Wales, Road Safety Audit Practices-L5 Road safety audit categories
- Transport for New South Wales, Guide for Risk Management, ILC-MI-TP0-201-G01, (June 2009)
- Austroads, Guide to Road Safety Part 6: Road Safety Audit (January 2022).

The potential risk(s) to road safety identified are based on a subjective assessment of the risk likelihood and crash consequence, as outlined in Section 3.0.

2.6 Meetings and Assessment Details

The key dates and RSA timeline are presented in Table 3.

Table 3 RSA Timeline

Activity	Date	Attendees
Opening meeting	1 April 2025	Jacky Leung, Steven Kemp, Sara Hu
Daylight inspection	3 April 2025	Jacky Leung, Steven Kemp
Night inspection	3 April 2025	Jacky Leung, Steven Kemp
Closing meeting	-	

A site inspection was undertaken on Wednesday, 3 April 2025 for the audit area as identified in Figure 2. It commenced at 5:00pm and concluded at 8:30pm during daylight, dusk and night-time conditions. The inspections were attended by Steven Kemp and Jacky Leung. A drive through of the site was undertaken. The weather on the day of the site inspection was fine and clear.

2.7 Completing the RSA

As set out in the *Guidelines for Road Safety Audit Practices (TfNSW, July 2011),* responsibility for the road design always rests with the designer/project manager, and not with the Road Safety Auditor. A project manager is under no obligation to accept all the RSA findings. Also, it is not the role of the Road Safety Auditor to agree to or approve of the project manager's response to the RSA. Rather, the RSA provides the opportunity to highlight potential problems and have them formally considered by the project manager, in conjunction with all other project considerations.

This formal RSA report should be responded to in writing. If any findings in this report are rejected by the Project Manager, then in each case, reasons for this rejection should be included in the written response. Acceptance of a finding may require no further comment, but an explanation of how or when the action will be taken may be useful and should be provided where possible.

Further details are available in the Guidelines for Road Safety Audit Practices[1].

[1] NSW Centre for Road Safety, Roads and Traffic Authority of New South Wales (2011), *Guidelines for Road Safety Audit Practices*, Sydney.

3.0 Risk Classification Methodology

The rating of the importance of risk in road safety has been undertaken based upon the crash probability and severity, in accordance with the risk matrix described in the following section. The selection of the crash likelihood and consequence are based on the auditor team's assessment and are necessarily subjective on this basis.

The risk ratings have been based on the risk matrix presented in Table 4.

Table 4 Risk Matrix

Severity / Probability	Minor or property damage	Moderate	Serious	Fatal
Weekly	Medium	High	Extreme	Extreme
Monthly	Medium	Medium	High	Extreme
6 Monthly	Low	Medium	High	Extreme
Yearly	Negligible	Low	Medium	High
Every 5 years or less	Negligible	Negligible	Medium	High

The terms in Table 4 are described below.

Probability:

- Weekly: Is expected to occur in most circumstances
- Monthly: Will probably occur
- 6 Monthly: Might occur at some time
- Yearly: Might occur but doubtful
- Every 5 years or less: May occur but only in exceptional circumstances.

Severity:

- Minor or property damage: A person who suffers no injury or only requires minor first aid treatment
- Moderate: A person who attends an emergency department on the same day or on the day after a crash but was not killed or subsequently admitted to hospital
- Serious: A person who is admitted to hospital on the same day or the day after a crash and did not die within 30 days of the crash
- Fatal: A person who dies within 30 days from injuries received in a road traffic crash.

Priority:

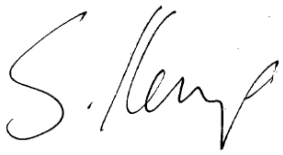
- Extreme: Should be corrected immediately
- High: Should be corrected in the very near future, even if costs are high. Temporary mitigation measures should be considered until final correction action taken
- Medium: Should be corrected in the very near future, even if costs are moderate. A delay until the routine maintenance should be justified. Temporary mitigation measures should be considered until final correction action taken
- Low: Should be corrected at a suitable time
- Negligible: Should be corrected at a suitable time, if cost low.

4.0 Audit Statement

We, the undersigned, have undertaken a post-construction (Existing Road) RSA of the proposed Hunter-Central Coast Renewable Energy Zone Network Infrastructure project. The RSA was conducted in accordance with the *Guidelines for Road Safety Audit Practice, (TfNSW, July 2011),* for the purpose of identifying any features that potentially impair road safety. While every care and diligence has been taken to identify potential safety concerns, as detailed in this report, we do not warrant that every safety issue has been identified. Further, if all the findings in this report were to be addressed, this would not guarantee that the site is “safe”; rather, the level of safety of the facility should be improved.

Jacky Leung
Auditor Level 3
Registered No: RSA-02-0319

Date: 14 April 2025



Steven Kemp
Auditor Level 2
Registered No: RSA-02-0559

Date: 14 April 2025

4.1 Confidentiality and Copyright

5.0 Audit Findings

General observations and assumptions that are to be noted as part of the RSA are presented in Table 5. These do not form part of the formal RSA findings but are considered worth noting by the RSA team.

Table 5 Observations and Assumptions

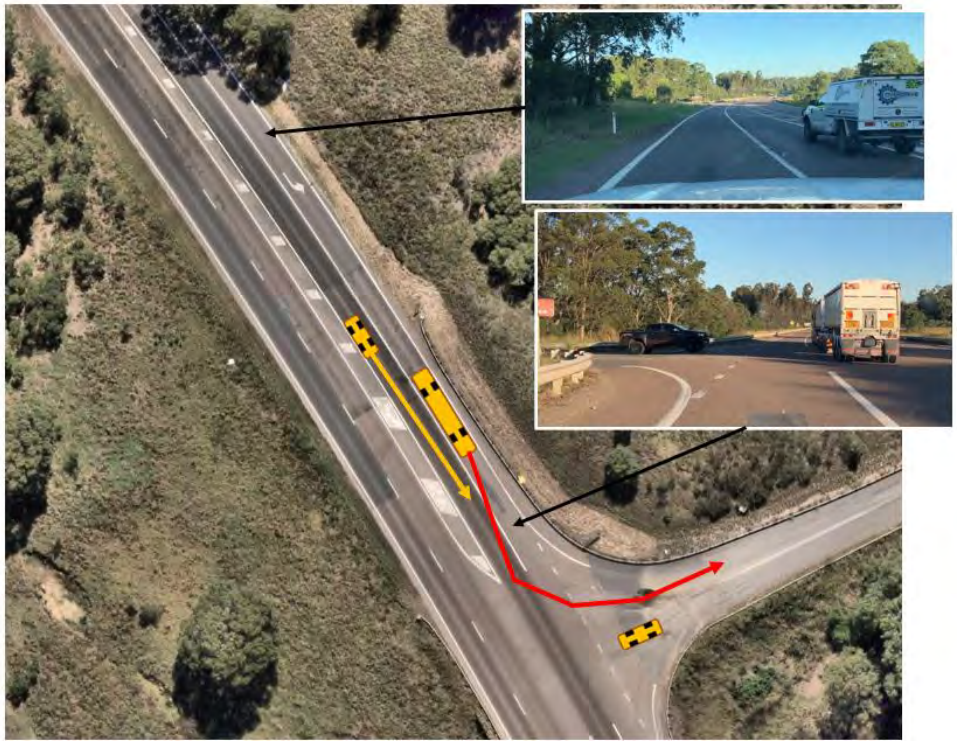
No.	Description of Observation or Assumption
1	The site inspection was undertaken on a sunny day.
2	At the intersection of NEH and Hebden Road, traffic was free flowing on the NEH, with minimal queuing at Hebden Road during the site inspection.

The RSA findings are documented in Table 6. The table provides details of the risks in road safety identified by the RSA team in relation to the supplied auditable material in conjunction with the site inspection, if applicable. The risks are not presented in order of relative importance to road safety.

The identified risks are assigned road safety categories to assist in the management of corrective actions by the Project Manager. Each risk is assessed with a rating as Extreme, High, Medium or Low, derived as a function of Probability and Severity, as outlined in Section 3.0.

Road safety risks that are outside the scope of the project are reported in Table 7. The client can forward these issues to others to resolve.

Table 6 Road Safety Audit Findings

Item No.	Photos	Description	Road Safety Audit Category	Probability	Severity	Risk Rating
1.		The southbound left turn lane from the NEH onto Hebden Road appears narrow and features a sharp turn. Heavy vehicle drivers approaching Hebden Road from the north may make late and/or abrupt manoeuvres to turn from the through traffic lane. This could lead to a risk of sideswipe or rear-end collisions on the NEH in a high-speed highway environment.	Auxiliary lanes	Yearly	Serious	Medium

Item No.	Photos	Description	Road Safety Audit Category	Probability	Severity	Risk Rating
2.		The right turn for oversized trucks from Hebden Road to the NEH appears to be tight. Vehicles turning right may occupy both northbound through traffic lanes. Due to the high traffic volumes on the NEH, truck drivers may be eager to turn out and accept smaller gaps in traffic. This could increase the risk of sideswipe or rear-end collisions in the high-speed highway environment.	Intersections	Yearly	Serious	Medium

Item No.	Photos	Description	Road Safety Audit Category	Probability	Severity	Risk Rating
3.		There is no street lighting at the NEH and Hebden Road intersection. During the site visit, inadequate lighting was observed within the audit study area. Insufficient lighting could increase the risk of side impact crashes if drivers fail to observe the vehicles turning out from Hebden Road and suddenly apply their brakes.	Lighting	Yearly	Serious	Medium

Table 7 Out of Scope Risk to Road Safety

Item No.	Photos	Description	Road Safety Audit Category	Probability	Severity	Risk Rating
1.		Some sections of Hebden Road are narrow and without linemarking. This may not be wide enough for two trucks to pass each other in a high-speed environment (80km/h). This issue may be further exacerbated by the crests and horizontal curves that reduce the visibility of oncoming traffic. This could lead to a risk of sideswipe or head-on collisions on Hebden Road.	Road alignment and cross section	Yearly	Serious	Medium

Prepared for
Ausgrid
ABN: 20 093 846 925

Traffic Impact Assessment

29-Apr-2025
Hunter-Central Coast Renewable Energy Zone Network Infrastructure Project
Commercial-in-Confidence

aecom.com

Delivering a better world

Traffic Impact Assessment

Client: Ausgrid

ABN: 20 093 846 925

Prepared by

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ABN 20 093 846 925

29-Apr-2025

Job No.: 60751984

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 and ISO45001.

Quality Information

Document	Traffic Impact Assessment
Ref	60751984
Date	29-Apr-2025
Originator	Sara Hu, Jordan Shiu
Checker/s	Brigette Humphrey-Robinson
Verifier/s	Anoop Sridhar

Revision History

Rev	Revision Date	Details	Approved	
			Name/Position	Signature
A	23-Apr-2025	For review	Brigette Humphrey-Robinson Team Leader - Transport Planning & Advisory	
B	29-Apr-2025	Final	Brigette Humphrey-Robinson Team Leader - Transport Planning & Advisory	

Table of Contents

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by Ausgrid to prepare a Traffic Impact Assessment (TIA) for the proposed Hunter Central Coast Renewable Energy Zone (HCC REZ) Network Infrastructure works at Muswellbrook, NSW (the Project).

1.1 Project overview

The Hunter-Central Coast Renewable Energy Zone (HCC REZ) was formally declared by the Minister for Energy and published in the NSW Gazette on 9 December 2022. As part of the NSW Government's clean energy transition, the REZ aims to deliver an additional one gigawatt (GW) of renewable energy transfer capacity by mid-2028. This would help provide consumers with cleaner, more affordable, and reliable electricity.

EnergCo is responsible for developing and overseeing the planning and approval process for the REZ Infrastructure. EnergyCo selected Ausgrid as the preferred network operator for the REZ. Ausgrid would design, build, finance, operate and maintain the REZ infrastructure. Ausgrid's proposed solution involves a major augmentation of Ausgrid's electricity network in the Hunter region to provide an additional one GW of renewable energy transfer capacity by mid-2028. This would include works which span multiple Local Government Areas (LGAs), and comprising:

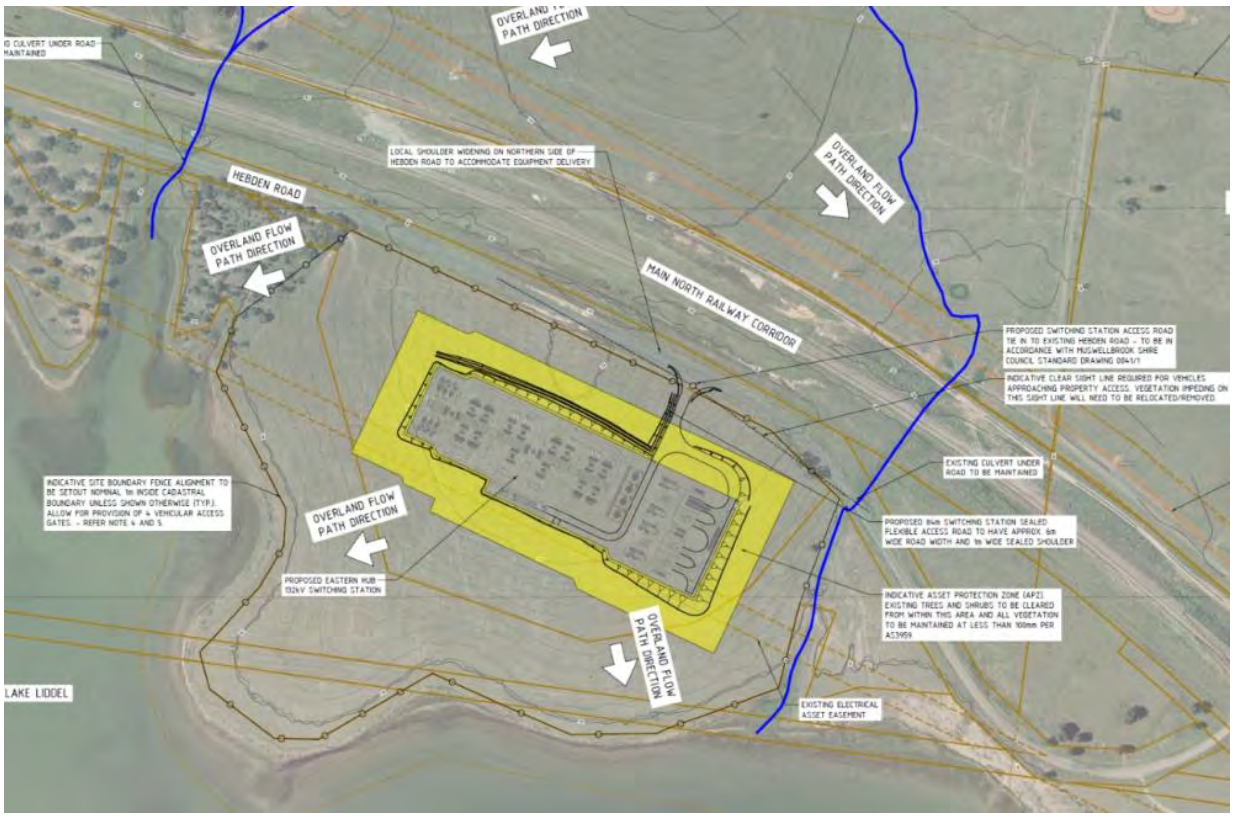
- Rebuilding sub-transmission lines
- Constructing two new substations
- Augmenting two existing substations.

This work would facilitate the connection and transfer of power generated from batteries, pumped hydro, solar, and wind farms to electricity consumers in the Muswellbrook and Newcastle areas.

The HCC REZ infrastructure would predominantly be constructed on land owned by Ausgrid or on public land. The sub transmission lines would be predominantly built within corridors of land known as sub transmission line easements. Ausgrid would use existing easements where possible; however, there would be the need to widen easements or acquire new easements in some sections.

The Project specifically includes network infrastructure works in the Hebden Road area within the Muswellbrook Shire LGA, including the following:

- New sub transmission switching station known as Antienne STSS located at Lot 9 DP250890 Hebden Road, Muswellbrook (as shown in Figure 1-1)
- Overhead connection works to existing network (as shown in Figure 1-2)
- Rebuild of the feeder 95U to southeast of new Antienne STSS (as shown in Figure 1-2)
- Optic fibre cable installation along Hebden Road and then north under 95U feeder towards Muswellbrook (as shown in Figure 1-3).



Source: Ausgrid

Figure 1-1 Proposed Antienne STSS

Source: Ausgrid

Figure 1-2 Proposed Antienne STSS connections and rebuild of feeder 95U

Source: Ausgrid

Figure 1-3 Fibre optic route

1.2 Purpose of this report

This TIA provides an assessment of the potential traffic impacts associated with the Project, including consideration of the following:

- Existing traffic and transport conditions in the Project area
- Traffic generating characteristics of the Project during construction and operation
- Likely routes to be used for oversize/overmass (OSOM) deliveries
- Traffic impacts during construction and operation of the Project and cumulative impacts with the proposed Hunter Transmission Project
- Suitability of the proposed site access arrangements
- Mitigation measures, if required, to minimise the traffic impacts of the Project.

1.3 References

In preparing this TIA, references have been made to the following documents and datasets:

- Transport for New South Wales (TfNSW) Open Data for NSW Crash data
- TfNSW National Heavy Vehicle Regulator (NHVR) National Network Map
- Interim Construction Noise Guideline (Department of Environment and Climate Change NSW, 2009)
- Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings
- TfNSW Guide To Transport Impact Assessment, 20123
- TfNSW Traffic Modelling Guidelines, 2013

- Other documents and datasets, as referenced in this report.

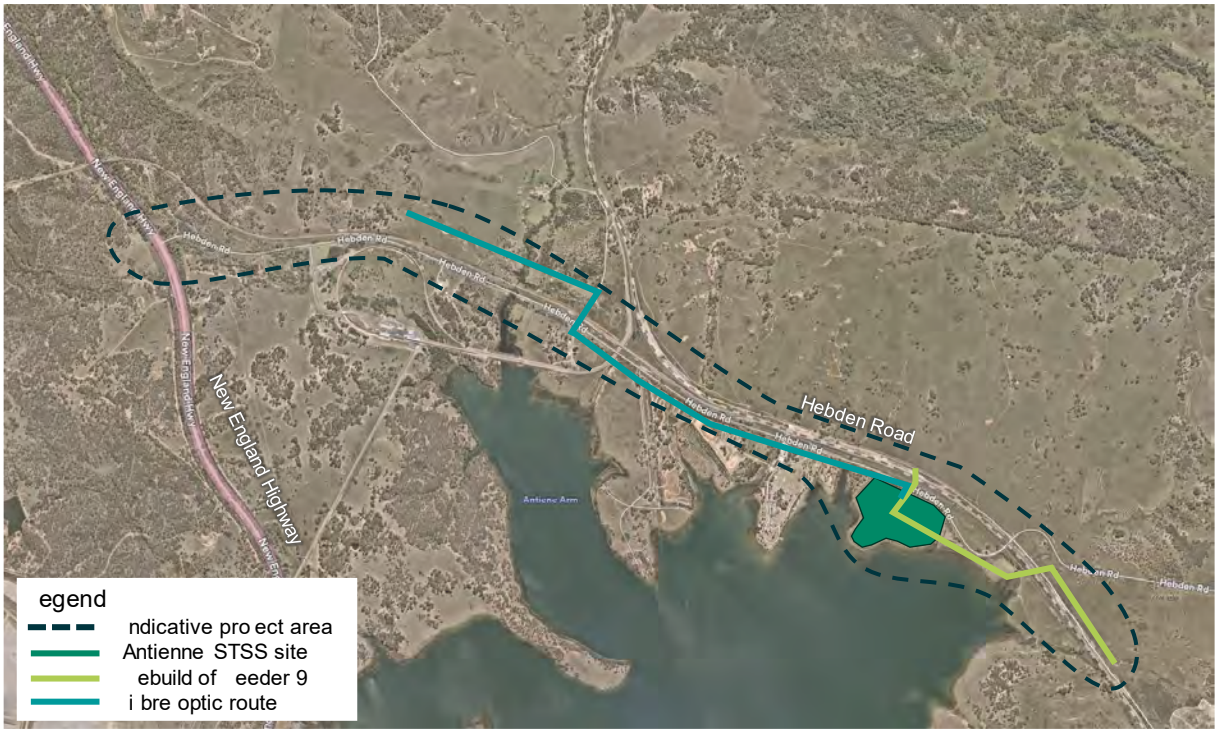
2.0 Existing environment

2.1 Site location

The Project area is located in Hebden, within the Muswellbrook Shire LGA in the Upper Hunter region. The project area is situated around 30 kilometres northwest of Singleton and 12.5 kilometres southeast of Muswellbrook. The location of the Project area is shown in Figure 2-1.

Lake Liddell and a coal unloader facility in the south, the Hunter Line towards the north-east, and recreational parks on the west side of the Antienne STSS site bound the Project area. Several coal mine sites and substation sites surround the outer extents of the Project area.

Under the *Muswellbrook Local Environmental Plan 2009* (LEP), the Antienne site is zoned as Public Recreation (RE1) and is surrounded by zoned Infrastructure (SP2) on the west and south sides, and zoned Primary Production (RU1) on the north and east side.



Basemap source: Nearmap, image taken 14 March 2025

Figure 2-1 Project area

2.2 Existing road network

Key roads near the Project area include the New England Highway and Hebden Road.

2.2.1 New England Highway

New England Highway is classified as a State highway that is 883 kilometres long and spans from Newcastle to Yarraman in Queensland. The New England Highway runs in a north-south direction west of the Project area. The New England Highway provides an undivided carriageway, allowing for two lanes of travel in the northbound direction and a single lane in the southbound direction in the vicinity of the Project area.

The posted speed limit on the New England Highway is 100 kilometres per hour for vehicles near the Project area.

2.2.2 Hebden Road

Hebden Road is a rural road that intersects with the New England Highway to the north and south of the Project area. It provides an undivided carriageway with one lane in each direction. The posted speed limit on Hebden Road is 80 kilometres per hour near the Project area.

The Project area is most commonly accessed via the unsignalised intersection of the New England Highway and Hebden Road to the north. Auxiliary turn lanes are provided at the New England Highway and Hebden Road for the left turn and right turn into Hebden Road.

Hebden Road is narrow in sections, and it may be difficult for two heavy vehicles to pass each other while travelling close to the posted speed limit of 80 kilometres, representing safety concerns.

2.3 Crash history

The most recent five years of available crash data within the project area were obtained from Transport's Centre for o ad Safety (2019 to 2023), as shown in Figure 2-2.

Five crashes occurred within the Project area. One occurred on Hebden Road, involving a vehicle driving off the path into an object and resulting in a serious injury. The other four crashes occurred on New England Highway near the intersection of New England Highway and Hebden Road, resulting in one minor injury and three non-casualty injuries.

Source: https://opendata.transport.nsw.gov.au/dataset/nsw-crash-data, accessed March 2025

Figure 2-2 Crash severity

2.4 Existing traffic volumes

2.4.1 Traffic survey data

Two types of traffic survey data were collected and analysed to better understand the existing traffic volumes within the Project area. They include:

- Classified intersection counts at the key intersection of the New England Highway and Hebden Road (to the west of the Project area) were conducted on Thursday, 3 April 2025, during the typical weekday peak periods.
- Seven-day automatic traffic counts on Hebden Road within the Project area between Wednesday, 2 April 2025, and Tuesday, 8 April 2025.

2.4.1.1 Classified intersection count data

The classified intersection counts indicated that the weekday peak hours at the intersection of the New England Highway and Hebden Road are:

- AM Peak hour: 6:15am to 7:15am
- PM Peak hour: 4:30pm to 5:30pm.

The turning movements at the intersection of the New England Highway and Hebden Road during the weekday AM and PM peak hours are shown in Figure 2-3.

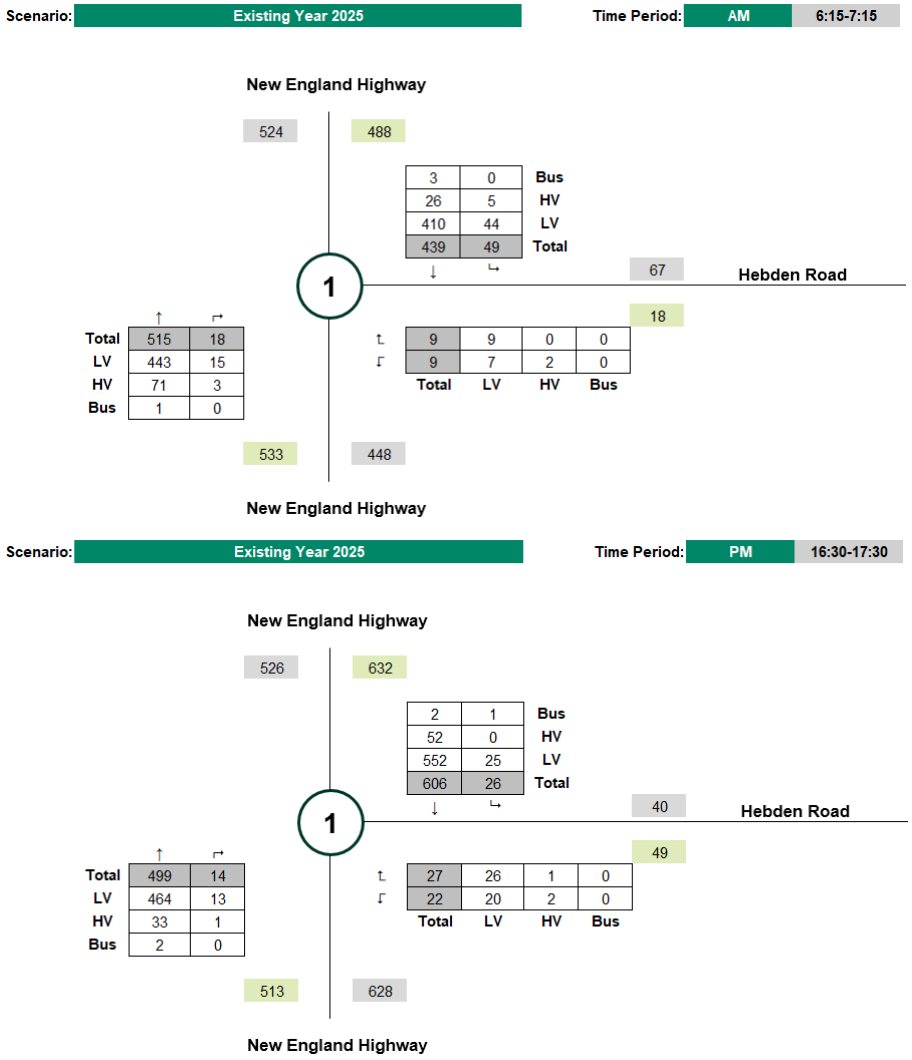


Figure 2-3 Existing 2025 intersection volumes

A site visit was also conducted during the PM peak period on Thursday, 3 April 2025. During the site visit, moderate traffic was observed in the northbound and southbound directions on the New England Highway with no vehicle queuing observed at the New England Highway and Hebden Road intersection.

2.4.1.2 Mid-block traffic count data

The seven day automatic traffic counter was located to the west of the proposed Antienne STSS site, as shown in Figure 2-4.

Source: Nearmap, image taken 14 March 2025

Figure 2-4 Tube count location

A summary of the two-way weekday traffic profile is displayed in Figure 2-5. The highest daily traffic volumes occurred on Thursday, with around 390 vehicles recorded throughout the day. The daily weekday traffic profile indicates the following:

- AM peak hour occurred at 5:00am with around 60 two-way vehicles movements and an 85:15 eastbound: westbound split.
- PM peak hour occurred at 5:00pm with around 40 two-way vehicle movements and a 32:68 eastbound: westbound split.

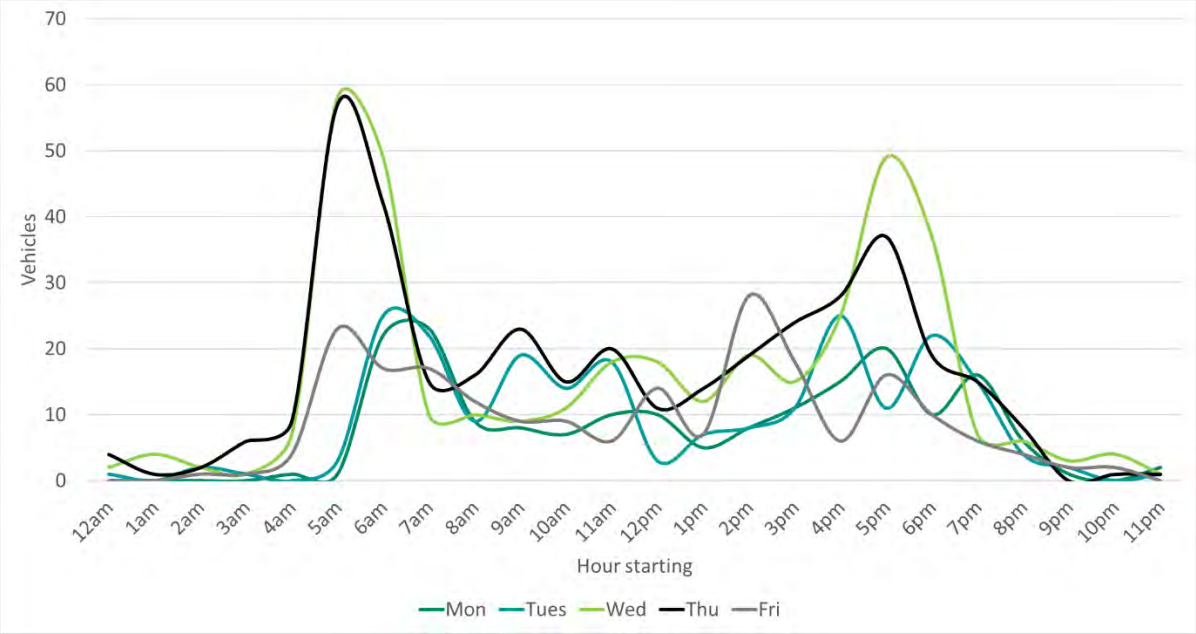


Figure 2-5 Daily weekday traffic profile

2.4.2 Average annual daily traffic volumes

Traffic volumes were sourced from the TfNSW historical traffic volume viewer for the permanent classifier (Station ID 6154) located on the New England Highway, 5.2 kilometres north of the Project area. The annual average daily traffic (AADT) volumes between 2015 and 2022, along with the corresponding compound annual traffic growth rate across this period are summarised in Table 2-1. Overall, traffic volumes on the New England Highway have been reducing since 2019.

Table 2-1 Historical AADT traffic volumes on and growth rates

Direction	Annual average daily traffic (AADT)								Average annual compound annual growth (2015-2022)
	2015	2016	2017	2018	2019	2020	2021	2022	
Northbound	4,620	4,576	4,632	4,654	4,762	4,337	4,439	4,207	-1.3%
Southbound	4,713	4,626	4,694	4,710	4,808	4,372	4,446	4,307	-1.3%
Total	**9,333**	**9,202**	**9,326**	**9,364**	**9,570**	**8,709**	**8,885**	**8,514**	**-1.3%**

Based on this analysis no traffic growth has been adopted in this assessment, and the existing surveyed 2025 traffic volumes are considered representative of traffic volumes throughout the construction period, which is anticipated to commence in January 2026.

2.5 Key intersection performance

The weekday AM and PM peak hour operation of the New England Highway and Hebden Road intersection was assessed using the SIDRA INTERSECTION 9.1 software, adopting the surveyed traffic volumes and site observations. SIDRA INTERSECTION is a micro-analytical modelling software package, capable of analysing isolated and coordinated intersections. The key outputs from SIDRA INTERSECTION are summarised in Table 2-2.

Table 2-2 SIDRA INTERSECTION modelling outputs

Output	Description
Degree of saturation (DoS)	Ratio of the arrival (demand) flow rate to the capacity of the approach or intersection during a given flow period. Where DoS is close to 1.00, the traffic demand is effectively equal to the capacity of the approach or intersection
95th percentile vehicle queue (metres)	A statistical value which represents the queuing experienced on an approach to an intersection
Average delay (seconds) and level of service (LoS)	Average delay is commonly used to assess the operational performance of intersections, with LoS used as an index.

A summary of the intersection LoS criteria is shown in Table 2-3. Common practice suggests that when intersection performance falls to LoS D, investigations should be initiated to determine if suitable remediation can be provided.

Table 2-3 LoS criteria for intersections

LoS	Average delay per vehicle (seconds per vehicle)	Traffic signals and roundabouts	Give way and stop sign
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

Source: Traffic Modelling Guidelines, Transport, 2013.

It is noted that the critical movement for LoS at a roundabout or priority-controlled intersection is the movement with the worst delay, whereas for a signalised intersection, the average delay over all movements is adopted.

Table 2-4 summarises the existing intersection operation of the New England Highway and Hebden Road intersection during weekday AM and PM peak hours.

Table 2-4 Existing intersection performance

Intersection	Peak hour	DoS	Average delays (seconds)	95th percentile queue (metres)	Level of service (LoS)
New England Highway and Hebden Road	AM	0.058	27	1.2	B
	PM	0.284	46	6.0	D

The New England Highway and Hebden Road intersection currently operates well at a LOS B during AM peak hour and satisfactorily at a LOS D during the PM peak hour. There is minimal vehicle queuing on all approaches to the intersection. However, the model indicates that vehicles turning right from Hebden Road to the New England Highway experience some delays, particularly during the PM peak hour. This is consistent with on-site observations, which indicated minimal vehicle queues occurred during the weekday peak hours.

2.6 Public transport

The Hunter line passes by northeast of the Project area and stops at Muswellbrook train station, approximately 14 kilometres north-west of the Project area.

2.7 Active transport

No pedestrian or cycling infrastructure is currently provided within the Project area. This reflects the predominantly surrounding area, which consists of primary production and industrial land uses.

3.0 Construction impact assessment

3.1 Construction program

The Project's construction would commence in early 2026 and take approximately 24 months to complete. However, this timing may change depending on market demand.

The Project's construction would involve three activities as summarised in Table 3-1, with further details discussed in Section 3.3.

Table 3-1 Construction timelines

Construction activity	Indicative timelines
Antienne STSS	January 2026 to mid-2027
Optic fibre cable installation	December 2025 to mid-2027
Rebuild of the feeder 95U to southeast of new Antienne STSS and Antienne STSS connections	January 2026 to mid-2026

3.2 Construction hours

Construction would be undertaken generally in accordance with the *Interim Construction Noise Guideline* (Department of Environment and Climate Change NSW, 2009), with extended hours of work on weekends and NSW public holidays. Construction hours would generally be limited to:

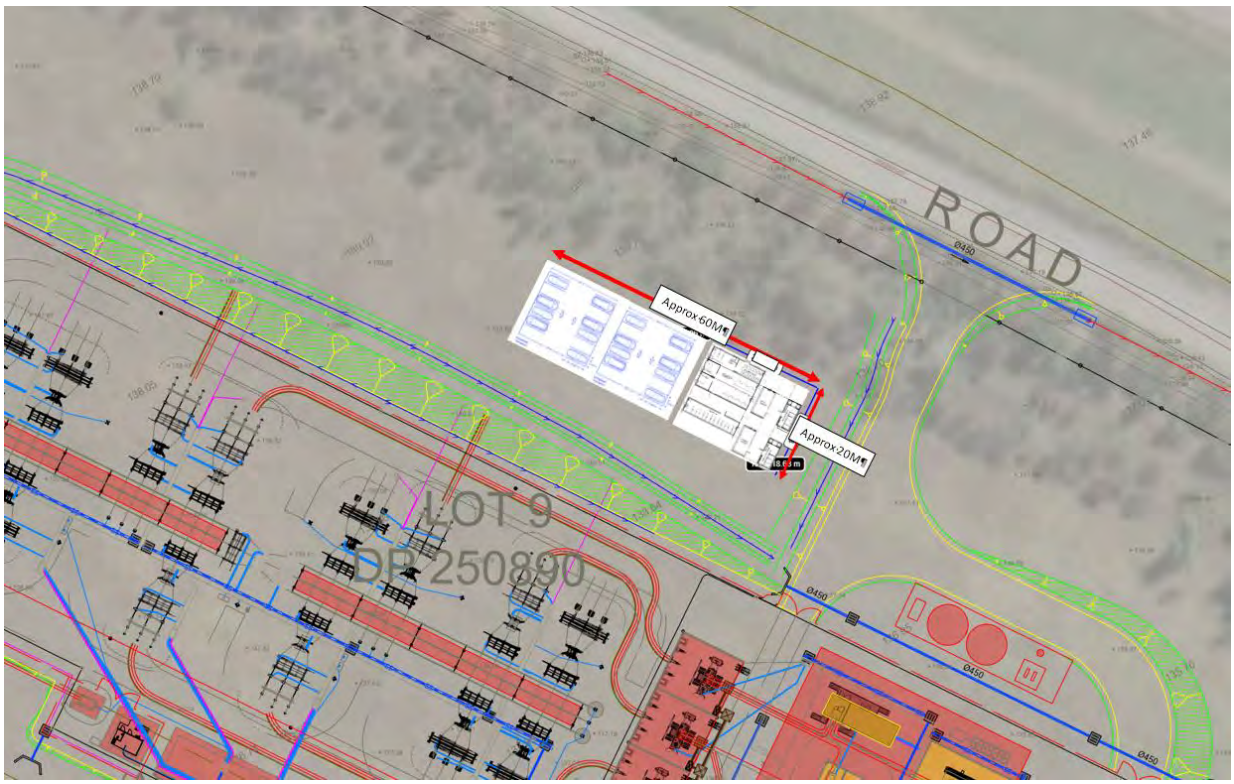
- Monday-Saturday: 7:00 am to 6:00 pm
- No work on Sundays or public holidays.

3.3 Construction arrangements

3.3.1 Antienne STSS

Construction at the Antienne site involves building a new substation, with access provided via a new intersection along Hebden Road, just east of the Lake Liddell Recreation Area. A car park, approximately 60 metres by 20 metres (see Figure 3-1), would be built on the west side of the Hebden Road access and would also serve as a lay-down and delivery area.

The busiest period for construction vehicle traffic is expected to occur on concrete pour days, which may take place on up to five days throughout the construction period and involve up to 30–40 light vehicles and 40 heavy vehicles per day (assumed to be one-way vehicle movements). OSOM vehicle use would include around 8 to 13 low loaders transporting the control room and heavy machinery such as excavators, oversized cranes, and a dozer, with no more than one of these vehicle movements likely to occur at the same time.



Source: Ausgrid

Figure 3-1 Proposed site access, car park and lay-down area

3.3.2 Fibre optic route

Fibre optic installation activities involve laying fibre optic cables along the south side of Hebden Road from the Antienne STSS site to Antienne Railway Station Road, as well as along the north side of Hebden Road and under the 95U Feeder towards Muswellbrook.

Multiple work sites would be established along Hebden Road to complete the installation. Construction workers would either set up on the roadside or park at the main site where safety concerns arise. The construction vehicle fleet for these works would include five light vehicles and two heavy vehicles per day, with low loaders for delivering machinery.

3.3.3 Proposed Antienne STSS connections and rebuild of feeder 95U

The proposed works for the rebuild of Feeder 95U and the Antienne STSS connection would take place north of the railway track, transitioning to the Antienne STSS connection.

Construction workers would access the area via Hebden Road and park near the structures being worked on. During peak construction activities, the vehicle fleet would include seven to 10 light vehicles and eight heavy vehicles, with approximately 15 to 20 workers on site on any day.

OSOM vehicle requirements would include a 100-tonne and 60-tonne crane, a 50-metre elevated work platform (EWP) vehicle, a drill rig, and a semi-trailer with a quad float.

3.4 Construction traffic volumes

The peak construction traffic volumes would occur when the construction of the Antienne STSS and the fibre optic route would overlap. At this time, no construction vehicles are expected to be generated by the works for the rebuild of feeder 95U and Antienne STSS connections.

Across the two sites, construction is expected to generate approximately 90 light vehicle movements (two-way) and 84 heavy vehicle movements (two-way), totalling 174 vehicle movements (two-way) per day. For the purpose of this conservative assessment, construction traffic for the fibre optic construction works are assumed to also access the Antienne STSS site.

The construction trip generation during the road network peak hours is summarised in Table 3-2 and is based on the following assumptions:

- All light vehicles are expected to arrive during the road network's AM peak hour
- As the road network's PM peak hour occurs within construction hours, it is assumed that workers would not depart until after 6:00pm. Therefore, no light vehicle movements are anticipated during the road network's PM peak hour
- Heavy vehicles are expected to arrive steadily throughout the 11-hour working day, averaging 10 heavy vehicle movements per hour (two-way).

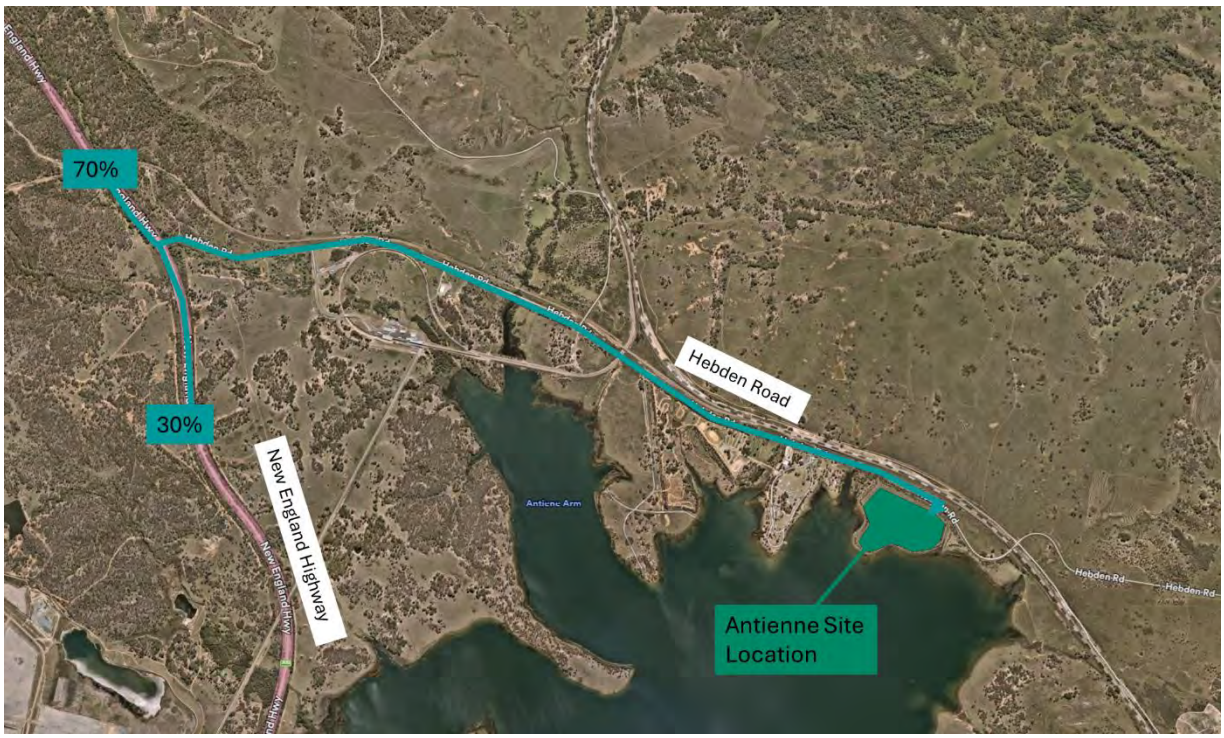
Table 3-2 Construction traffic volumes

Vehicle type	Peak hourly traffic volumes (vehicles)					
	AM peak hour (6:15am to 7:15am)		PM peak hour (4:30-5:30pm)		Construction worker departure (6:00-7:00pm)	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Light vehicles	45	0	0	0	0	45
Heavy vehicles	5	5	5	5	5	5
Total	**50**	**5**	**5**	**5**	**5**	**50**

It is noted that the traffic volumes at the intersection of the New England Highway and Hebden Road at 6:00pm are about 30% less than during the PM peak hour.

3.5 Traffic distribution

All construction traffic would travel to and from the New England Highway to access the construction sites via Hebden Road. Based on the 2025 intersection count data, the distribution of construction traffic was determined using the proportion of turning movement volumes at the intersection of the New England Highway and Hebden Road. The analysis indicates that 70% of construction traffic would approach from or depart to the north, and 30% to/from the south, as shown in Figure 3-2.



Source: Nearmap, image taken 14 March 2025

Figure 3-2 Construction traffic distribution

3.6 Intersection performance

The performance of the New England Highway and Hebden Road intersection has been assessed using the SIDRA INTERSECTION modelling software for the following scenarios:

- Road network AM and PM peak hour (refer to Table 3-3)
- Construction PM peak hour at 6:00pm to 7:00pm (refer to Table 3-4)

Table 3-3 Intersection performance with construction traffic during the weekday AM and PM peak hours

Intersection	Peak hour	Degree of Saturation (DoS)	Average delays (seconds)	95th percentile queue (metres)	Level of Service (LoS)
New England Highway and Hebden Road	AM	0.18	53	4	D
	PM	0.47	71	10	F
Proposed site access and Hebden Road	AM	0.07	7	2	A
	PM	0.03	9	1	A

Table 3-3 indicates that in the AM peak hour, the performance of the New England Highway and Hebden Road intersection would degrade slightly from LoS B to LOS D, with an increase in delay of 25 seconds and an additional two metres of queuing. In the PM peak hour, the performance is anticipated

to degrade from LoS D to LoS F, with an increase in delay of 24 seconds. The LoS F performance is associated with the eastbound right-turn movement from Hebden Road onto the New England Highway. This degradation occurs due to the high northbound and southbound traffic volumes on the New England Highway, which significantly reduce acceptable gaps for right-turning vehicles from Hebden Road. Notably, the LoS F is triggered by the presence of only five additional vehicles, as the delay experienced by each vehicle increases rapidly under these constrained conditions.

The proposed site access would operate with a LoS A during both the AM and PM peak hours.

Table 3-4 indicates that the New England Highway and Hebden Road intersection would operate well at LOS B with and without the construction vehicles at 6:00pm.

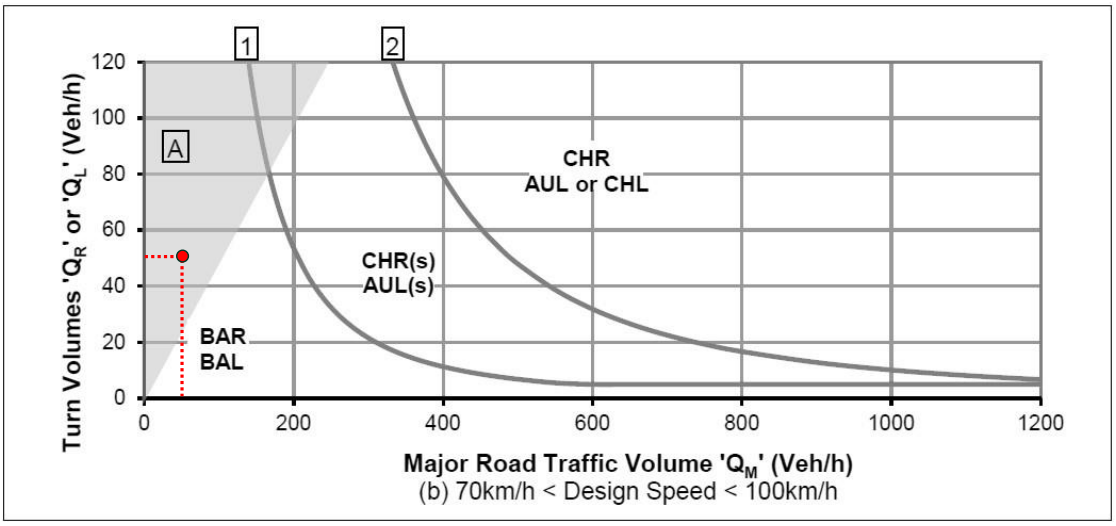
Table 3-4 Construction intersection performance at 6:00pm

Intersection	Scenario	Degree of Saturation (DoS)	Average delays (seconds)	95th percentile queue (metres)	Level of Service (LoS)
New England Highway and Hebden Road	Without construction	0.11	20	3	B
	With construction	0.30	25	8	B
Proposed site access and Hebden Road	With construction	0.02	9	1	A

3.7 Site access arrangements

Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management provides warrants for the preferred minimum turn treatments for major roads. Turn treatments for intersections are typically determined based on vehicle speeds and the relationship between through traffic volumes and turning volumes on the major road. Possible turn treatments include basic (BA), auxiliary lane (AU) and channelised (CH) turn treatments.

Figure 3-3 has been prepared to assess the anticipated turning traffic movements at the site access on Hebden Road during the construction stage of the Project against the Austroads turn treatment warrants. The assessment only considers the warrants for the eastbound right turn treatment into the Antienne STSS site as no construction vehicles are expected to turn left into the site. As a conservative approach, it is assumed all 55 construction vehicles would enter the Antienne STSS site for the warrant assessment.



Source: Figure 3.25 of Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management

Figure 3-3 Warrants for turn treatments on lower speed rural roads at unsignalised intersections

The warrants assessment suggests a BA right turn treatment is an appropriate turn treatment on Hebden Road into the construction site access. Therefore, channelised turn treatments are not required.

3.8 Mid-block road network performance

Based on Austroads guidance, it is estimated that the mid-block lane capacity of Hebden Road is approximately 800 vehicles per hour in each direction. Mid-block traffic volumes on Hebden Road are expected to reach up to 105 vehicles per hour (two-way) in the weekday peak hours during construction of the proposal. Therefore, Hebden Road is anticipated to operate with considerable spare capacity.

Stop-go traffic control on Hebden Road would be required to facilitate the construction of the access road to the Antienne STSS site, and for approximately 8 weeks during construction hours to accommodate the fibre optic installation. It is estimated that the temporary stop-go conditions, which are expected to include a short section of two-way one-lane arrangements, would typically result in only minor vehicle delays and queuing on Hebden Road. Nevertheless, temporary stop-go conditions should be minimised as much as possible to maintain the existing capacity of Hebden Road and minimise vehicle delays and queuing.

3.9 Emergency vehicles

Hebden Road and New England Highway are currently used by emergency services. Construction activities may require temporary stop-go traffic control. However, no full road closures are expected. As such, emergency vehicle access would be maintained through the Project area during construction. Emergency protocols on the site would include a requirement for traffic controllers to assist with emergency access through the Project area should any temporary traffic modifications be in place.

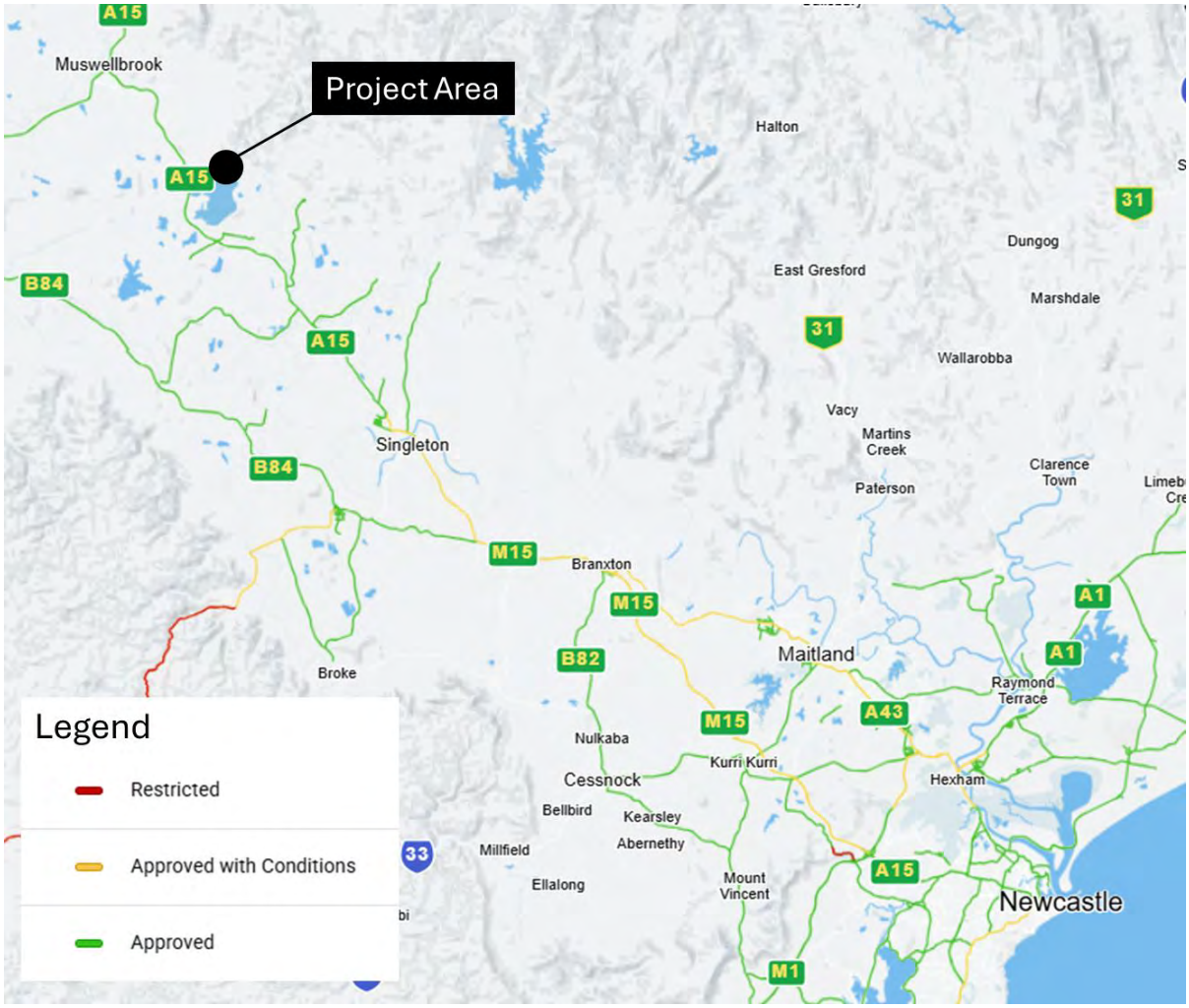
3.10 Access for OSOM vehicles

The current OSOM network surrounding the Project area has been reviewed to assess accessibility and available routes for transporting oversize and larger loads to the three construction sites. Figure 3-4 displays the surrounding NHVR approved and restricted roads. Hebden Road is not an approved NHVR route and will require NHVR permits. Several key corridors would be accessible under restricted conditions (shown in yellow in Figure 3-4) including:

- Maitland Road, New England Highway and John Renshaw Drive between Sparkle Street and Pacific Motorway

- *Prior to travel on the Pacific Highway at Hexham, the operator must contact the Hexham Straight Widening Project on 1800 515 141 a minimum of five (5) days prior to your proposed commencement date. Failure to provide notice may result in delays to travel.*
- *Prior to travel on the Pacific Highway, New England Highway and Pacific Motorway between Tomago, Tarro and Lenaghan, the operator must contact the Black Hill to Tomago Project on 1800 094 895 a minimum of five (5) days prior to your proposed commencement date. Failure to provide notice may result in delays to travel.*

- Hunter Express between John Renshaw Drive to New England Highway
  - *Vehicles or combinations exceeding 3.2 metres wide are not permitted to travel from Monday to Friday from 5:00am to 9:00am and from Monday to Friday from 4:00pm to 6:00pm (except on state-wide public holidays).*
- New England Highway between Hunter Express to Magpie Street
  - *Vehicles or combinations exceeding 3.2 metres wide are not permitted to travel from Monday to Friday from 5:00am to 9:00am and from Monday to Friday from 3:00pm to 6:00pm (except on state-wide public holidays).*



Source: https://maps.nhvr.gov.au/?networkLayerContext=NATIONAL_MAP&view=Category&exemptionSetId=-2&networkIds=%5B2157%5D , accessed April 2025

Figure 3-4 NHVR approved OSOM routes surrounding the Project area

3.11 Cumulative impact assessment

The Project area is located within close proximity to three nearby projects, including:

- Sandy Creek STSS
- The Liddell Future Land Use and Enabling Works Project
- The Hunter Transmission Project (HTP).

The cumulative impacts associated these projects are discussed the following sections.

3.11.1 Sandy Creek STSS

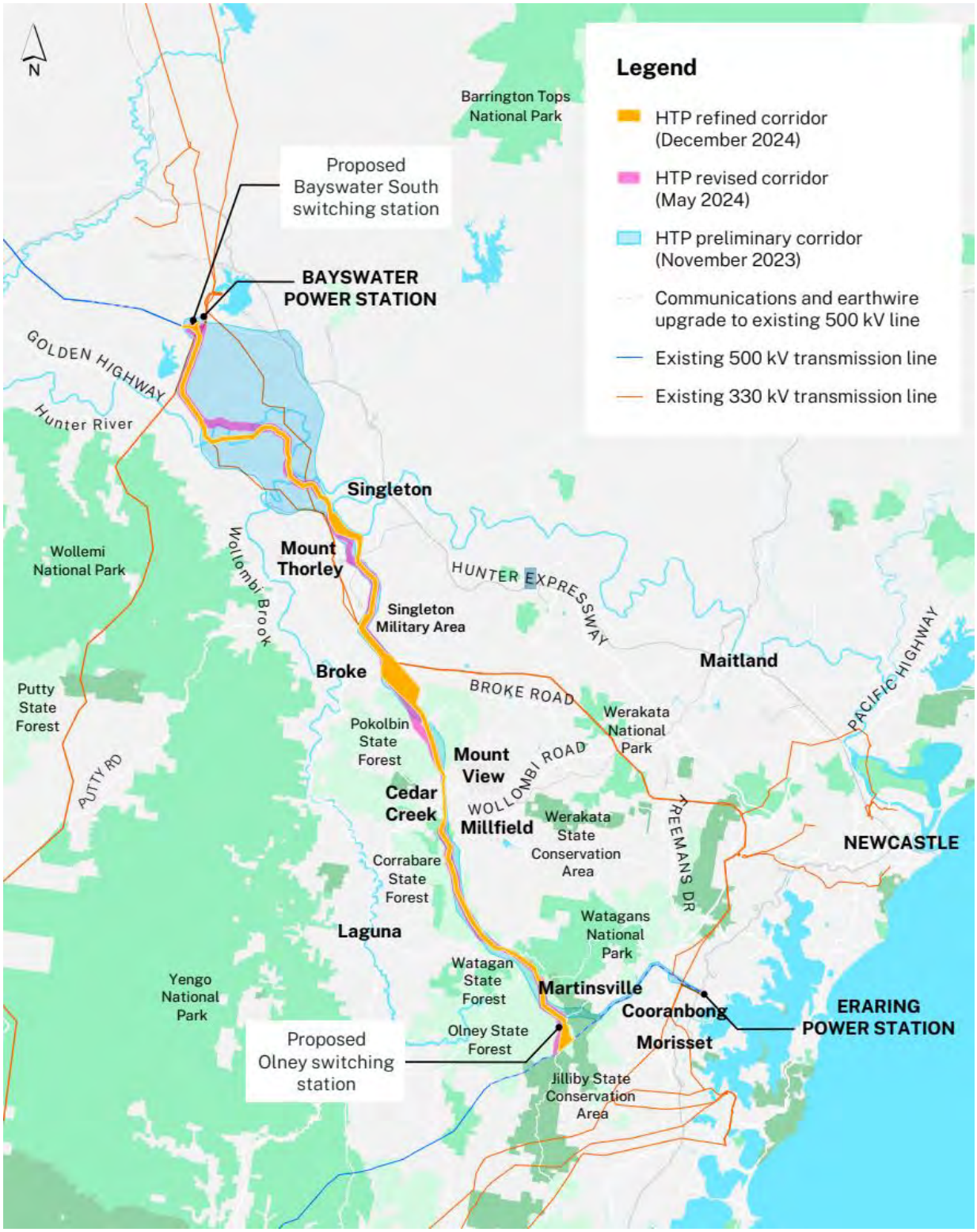
The Sandy Creek STSS, located to the north of Muswellbrook, would be constructed on behalf of Ausgrid concurrently with the Project. However, the peak construction activity (i.e. the concrete pour days) would be staggered between the two sites. This approach would minimise cumulative impacts, as one site would be relatively quiet while the other is undertaking peak activity.

3.11.2 The Liddell Future Land Use and Enabling Works Project

The Liddell Future Land Use and Enabling Works Project aims to transition towards a low-carbon future by closing its coal-fired power station. The State Government approved AG 's plan to convert the Liddell site into a renewable energy hub in early 2025. Remediation works have been progressing and would continue throughout the Pro ect's construction period. Therefore, the traffic generated from the remediation works have been accounted for in the 2025 traffic survey data and it is not expected that there are any cumulative impacts associated with the Project.

3.11.3 The Hunter Transmission Project

The HTP is a critical State significant infrastructure project which would deliver the construction of a new above-ground 500 kilovolt (kV) transmission line between Bayswater and Eraring in the Hunter region. The transmission line would be approximately 100 kilometres long and would follow the orange route defined in Figure 3-5. HTP is one of the State's most critical energy pro ects and would provide clean and reliable electricity for consumers for at least 50 years. HTP is currently in the Environmental Impact Statement (EIS) phase and will not be realised until mid-2025. As such, there is no information to assess the cumulative impacts at this stage. It is recommended that the HTP consider the cumulative impacts associated with these projects during the EIS preparation.



Source: https://www.energyco.nsw.gov.au/sites/default/files/2025-02/refining-the-htp-project-update-dec-2024.pdf, accessed March 2025

Figure 3-5 HTP refined corridor

3.12 Mitigation and management measures

Overall, the project's construction is expected to have a manageable impact on the surrounding road network. As such, no specific physical mitigation measures are required to facilitate the Project's construction.

A construction traffic management plan (CTMP) and associated traffic guidance schemes will be prepared for the Project as part of the construction environmental management plan. The CTMP will be prepared in consultation with the Muswellbrook Shire Council and emergency services.

In addition, the following management measures are recommended to minimise the Pro ect's traffic impacts during construction:

- **Minimise construction vehicle movements during the weekday PM peak hour:** The intersection of New England Highway and Hebden Road currently experiences some delay for right-turning vehicles from Hebden Road onto the New England Highway during the PM peak hour; therefore, it is recommended that construction vehicle movements be minimised as much as possible during this period
- **Reduce the speed limit on Hebden Road between the New England Highway and the site access:** Hebden Road is narrow in sections, and an increase in construction vehicle volumes raises the likelihood of two-way heavy vehicle movements needing to pass each other. Therefore, it is recommended that the speed limit be reduced during peak construction activities to minimise road safety risks associated with heavy vehicles passing at high speeds during the construction period.

4.0 Operational impact assessment

Once operational, it is anticipated that two staff members would visit the Antienne STSS site on a monthly basis. Therefore, the site would generate up to four vehicle movements per day (two-way), which would have a negligible impact on the surrounding road network.

The proposed Antienne STSS site includes parking provision for two cars and one heavy rigid truck. This parking provision would meet the needs of the Project, particularly considering the site is only expected to generate two workers on-site at one time.

5.0 Summary and conclusion

Key outcomes of the operational and construction impact assessment are as follows:

- The peak construction works associated with the Project are expected to generate up to 55 vehicle trips per hour (two-way) during the peak construction activities, which would take place on up to five days across the construction period
- SIDRA INTERSECTION modelling demonstrates that the additional construction traffic associated with the Project would have minor impacts on the surrounding road network during the AM peak hour, with a minor increase in queuing and delay. In the PM peak hour, the New England Highway and Hebden Road intersection would experience increased vehicle delays for the right turn from Hebden Road
- It is recommended that construction activities avoid the PM peak hour to minimise impacts on the New England Highway and Hebden Road intersection
- An Austroads warrant assessment of the new proposed construction site access indicates that a basic right turn treatment is appropriate, and therefore, no auxiliary lanes are required
- During operation, the Project would generate up to two vehicle trips per day, occurring infrequently and having negligible impacts on the surrounding roads, including Hebden Road and the New England Highway.

Appendix A

SIDRA INTERSECTION
outputs

MOVEMENT SUMMARY

Site: 101v [New England Highway/Hebden Road - AM (6:15-7:15am) (Site Folder: Existing Road AM Peak - 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: New England Highway															
2	T1	All MCs	542	14.0	542	14.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
3	R2	All MCs	19	16.7	19	16.7	0.028	11.6	LOS A	0.1	0.8	0.52	0.73	0.52	59.8
Approach			561	14.1	561	14.1	0.152	0.4	NA	0.1	0.8	0.02	0.02	0.02	97.7
East: Hebden Road															
4	L2	All MCs	9	22.2	9	22.2	0.008	7.4	LOS A	0.0	0.0	0.00	0.63	0.00	62.0
6	R2	All MCs	9	0.0	9	0.0	0.058	27.1	LOS B	0.2	1.2	0.84	0.94	0.84	50.0
Approach			19	11.1	19	11.1	0.058	17.2	LOS B	0.2	1.2	0.42	0.78	0.42	55.4
North: New England Highway															
7	L2	All MCs	52	10.2	52	10.2	0.030	8.1	LOS A	0.0	0.0	0.00	0.66	0.00	70.1
8	T1	All MCs	462	6.6	462	6.6	0.247	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach			514	7.0	514	7.0	0.247	0.8	NA	0.0	0.0	0.00	0.07	0.00	95.8
All Vehicles			1094	10.7	1094	10.7	0.247	0.9	NA	0.2	1.2	0.02	0.06	0.02	95.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101v [New England Highway/Hebden Road - PM (4:30-5:30pm) (Site Folder: Existing PM Peak 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: New England Highway															
2	T1	All MCs	525	7.0	525	7.0	0.141	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
3	R2	All MCs	15	7.1	15	7.1	0.026	12.6	LOS A	0.1	0.7	0.58	0.78	0.58	61.4
Approach			540	7.0	540	7.0	0.141	0.4	NA	0.1	0.7	0.02	0.02	0.02	98.2
East: Hebden Road															
4	L2	All MCs	23	9.1	23	9.1	0.018	7.1	LOS A	0.0	0.0	0.00	0.63	0.00	65.7
6	R2	All MCs	28	3.7	28	3.7	0.284	46.4	LOS D	0.8	6.0	0.91	0.99	1.03	39.0
Approach			52	6.1	52	6.1	0.284	28.7	LOS C	0.8	6.0	0.50	0.83	0.57	47.7
North: New England Highway															
7	L2	All MCs	27	3.8	27	3.8	0.015	7.9	LOS A	0.0	0.0	0.00	0.66	0.00	72.8
8	T1	All MCs	638	8.9	638	8.9	0.346	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
Approach			665	8.7	665	8.7	0.346	0.4	NA	0.0	0.0	0.00	0.03	0.00	98.3
All Vehicles			1257	7.9	1257	7.9	0.346	1.5	NA	0.8	6.0	0.03	0.06	0.03	94.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101v [New England Highway/Hebden Road - AM (6:15-7:15am) (Site Folder: Construction AM Peak - 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: New England Highway															
2	T1	All MCs	542	14.0	542	14.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
3	R2	All MCs	34	12.5	34	12.5	0.050	11.7	LOS A	0.2	1.4	0.54	0.76	0.54	60.8
Approach			576	13.9	576	13.9	0.152	0.7	NA	0.2	1.4	0.03	0.04	0.03	96.3
East: Hebden Road															
4	L2	All MCs	11	30.0	11	30.0	0.009	7.5	LOS A	0.0	0.0	0.00	0.63	0.00	60.0
6	R2	All MCs	14	30.8	14	30.8	0.176	53.2	LOS D	0.4	3.8	0.90	0.97	0.94	34.1
Approach			24	30.4	24	30.4	0.176	33.3	LOS C	0.4	3.8	0.51	0.82	0.53	42.0
North: New England Highway															
7	L2	All MCs	89	10.6	89	10.6	0.052	8.1	LOS A	0.0	0.0	0.00	0.66	0.00	69.9
8	T1	All MCs	462	6.6	462	6.6	0.247	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach			552	7.3	552	7.3	0.247	1.3	NA	0.0	0.0	0.00	0.11	0.00	93.4
All Vehicles			1152	11.1	1152	11.1	0.247	1.7	NA	0.4	3.8	0.03	0.09	0.03	92.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Hebden Road/Access Road - AM (6:15-7:15am) (Site Folder: Construction AM Peak - 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Access Road															
1	L2	All MCs	5	100.0	5	100.0	0.006	3.9	LOS A	0.0	0.3	0.10	0.47	0.10	31.5
3	R2	All MCs	1	0.0	1	0.0	0.006	4.3	LOS A	0.0	0.3	0.10	0.47	0.10	57.2
Approach			6	83.3	6	83.3	0.006	4.0	LOS A	0.0	0.3	0.10	0.47	0.10	34.0
East: Hebden Road															
4	L2	All MCs	1	0.0	1	0.0	0.011	6.9	LOS A	0.0	0.0	0.00	0.03	0.00	70.4
5	T1	All MCs	19	11.1	19	11.1	0.011	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	79.3
Approach			20	10.5	20	10.5	0.011	0.4	NA	0.0	0.0	0.00	0.03	0.00	79.0
West: Hebden Road															
11	T1	All MCs	71	11.9	71	11.9	0.071	0.0	LOS A	0.3	2.1	0.07	0.27	0.07	74.8
12	R2	All MCs	53	10.0	53	10.0	0.071	6.9	LOS A	0.3	2.1	0.07	0.27	0.07	63.0
Approach			123	11.1	123	11.1	0.071	2.9	NA	0.3	2.1	0.07	0.27	0.07	70.9
All Vehicles			149	14.1	149	14.1	0.071	2.6	NA	0.3	2.1	0.06	0.25	0.06	69.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101v [New England Highway/Hebden Road - PM (4:30-5:30pm) (Site Folder: Construction PM Peak - 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: New England Highway															
2	T1	All MCs	525	7.0	525	7.0	0.141	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
3	R2	All MCs	16	13.3	16	13.3	0.030	13.4	LOS A	0.1	0.8	0.60	0.79	0.60	59.0
Approach			541	7.2	541	7.2	0.141	0.4	NA	0.1	0.8	0.02	0.02	0.02	97.9
East: Hebden Road															
4	L2	All MCs	24	13.0	24	13.0	0.019	7.2	LOS A	0.0	0.0	0.00	0.63	0.00	64.5
6	R2	All MCs	33	16.1	33	16.1	0.468	70.8	LOS F	1.2	9.9	0.94	1.03	1.20	30.1
Approach			57	14.8	57	14.8	0.468	43.7	LOS D	1.2	9.9	0.54	0.86	0.69	39.0
North: New England Highway															
7	L2	All MCs	32	16.7	32	16.7	0.019	8.3	LOS A	0.0	0.0	0.00	0.66	0.00	68.1
8	T1	All MCs	638	8.9	638	8.9	0.346	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
Approach			669	9.3	669	9.3	0.346	0.4	NA	0.0	0.0	0.00	0.03	0.00	97.6
All Vehicles			1267	8.6	1267	8.6	0.468	2.4	NA	1.2	9.9	0.03	0.06	0.04	91.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Hebden Road/Access Road - PM (4:30-5:30pm) (Site Folder: Construction PM Peak - 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Access Road															
1	L2	All MCs	5	100.0	5	100.0	0.006	4.1	LOS A	0.0	0.3	0.16	0.46	0.16	31.3
3	R2	All MCs	1	0.0	1	0.0	0.006	4.2	LOS A	0.0	0.3	0.16	0.46	0.16	56.8
Approach			6	83.3	6	83.3	0.006	4.1	LOS A	0.0	0.3	0.16	0.46	0.16	33.9
East: Hebden Road															
4	L2	All MCs	1	0.0	1	0.0	0.028	6.9	LOS A	0.0	0.0	0.00	0.01	0.00	71.1
5	T1	All MCs	52	6.1	52	6.1	0.028	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	79.7
Approach			53	6.0	53	6.0	0.028	0.1	NA	0.0	0.0	0.00	0.01	0.00	79.6
West: Hebden Road															
11	T1	All MCs	42	5.0	42	5.0	0.029	0.1	LOS A	0.1	0.4	0.06	0.09	0.06	77.8
12	R2	All MCs	5	100.0	5	100.0	0.029	8.9	LOS A	0.1	0.4	0.06	0.09	0.06	64.4
Approach			47	15.6	47	15.6	0.029	1.0	NA	0.1	0.4	0.06	0.09	0.06	76.8
All Vehicles			106	14.9	106	14.9	0.029	0.8	NA	0.1	0.4	0.04	0.07	0.04	74.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101v [New England Highway/Hebden Road - PM (6:00-7:00pm) (Site Folder: Without construction 6 PM - 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: New England Highway															
2	T1	All MCs	366	8.3	366	8.3	0.099	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
3	R2	All MCs	6	0.0	6	0.0	0.007	10.1	LOS A	0.0	0.2	0.48	0.66	0.48	66.3
Approach			373	8.2	373	8.2	0.099	0.2	NA	0.0	0.2	0.01	0.01	0.01	99.1
East: Hebden Road															
4	L2	All MCs	17	12.5	17	12.5	0.013	7.2	LOS A	0.0	0.0	0.00	0.63	0.00	64.7
6	R2	All MCs	26	0.0	26	0.0	0.107	19.8	LOS B	0.3	2.4	0.76	0.91	0.76	55.5
Approach			43	4.9	43	4.9	0.107	14.9	LOS B	0.3	2.4	0.46	0.80	0.46	58.8
North: New England Highway															
7	L2	All MCs	13	16.7	13	16.7	0.008	8.3	LOS A	0.0	0.0	0.00	0.66	0.00	67.9
8	T1	All MCs	461	6.4	461	6.4	0.246	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach			474	6.7	474	6.7	0.246	0.2	NA	0.0	0.0	0.00	0.02	0.00	98.6
All Vehicles			889	7.2	889	7.2	0.246	0.9	NA	0.3	2.4	0.03	0.05	0.03	95.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101v [New England Highway/Hebden Road - PM (6:00-7:00pm) (Site Folder: With Construction 6 PM - 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: New England Highway															
2	T1	All MCs	366	8.3	366	8.3	0.099	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
3	R2	All MCs	7	14.3	7	14.3	0.010	11.0	LOS A	0.0	0.3	0.50	0.68	0.50	61.0
Approach			374	8.5	374	8.5	0.099	0.2	NA	0.0	0.3	0.01	0.01	0.01	98.7
East: Hebden Road															
4	L2	All MCs	32	10.0	32	10.0	0.025	7.1	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
6	R2	All MCs	64	6.6	64	6.6	0.299	25.1	LOS B	1.1	7.8	0.81	0.97	0.97	49.9
Approach			96	7.7	96	7.7	0.299	19.2	LOS B	1.1	7.8	0.55	0.85	0.65	54.2
North: New England Highway															
7	L2	All MCs	17	37.5	17	37.5	0.011	8.8	LOS A	0.0	0.0	0.00	0.66	0.00	61.9
8	T1	All MCs	461	6.4	461	6.4	0.246	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach			478	7.5	478	7.5	0.246	0.3	NA	0.0	0.0	0.00	0.02	0.00	97.8
All Vehicles			947	7.9	947	7.9	0.299	2.2	NA	1.1	7.8	0.06	0.10	0.07	90.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Hebden Road/Access Road - PM (6:00-7:00pm) (Site Folder: With Construction 6 PM - 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Access Road															
1	L2	All MCs	53	10.0	53	10.0	0.036	4.0	LOS A	0.1	1.1	0.12	0.49	0.12	53.0
3	R2	All MCs	1	0.0	1	0.0	0.036	4.1	LOS A	0.1	1.1	0.12	0.49	0.12	57.1
Approach			54	9.8	54	9.8	0.036	4.0	LOS A	0.1	1.1	0.12	0.49	0.12	53.1
East: Hebden Road															
4	L2	All MCs	1	0.0	1	0.0	0.023	6.9	LOS A	0.0	0.0	0.00	0.02	0.00	71.0
5	T1	All MCs	43	4.9	43	4.9	0.023	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	79.7
Approach			44	4.8	44	4.8	0.023	0.2	NA	0.0	0.0	0.00	0.02	0.00	79.6
West: Hebden Road															
11	T1	All MCs	19	11.1	19	11.1	0.017	0.1	LOS A	0.0	0.4	0.09	0.16	0.09	75.9
12	R2	All MCs	5	100.0	5	100.0	0.017	8.9	LOS A	0.0	0.4	0.09	0.16	0.09	61.8
Approach			24	30.4	24	30.4	0.017	2.0	NA	0.0	0.4	0.09	0.16	0.09	73.6
All Vehicles			122	12.1	122	12.1	0.036	2.2	NA	0.1	1.1	0.07	0.25	0.07	67.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.