Goulburn River
Solar Farm

Amended Traffic and Transport Impact Assessment

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Document Information

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Contents

Definitions and abbreviations

Definitions and abbreviations to be applied to the Traffic and Transport Impact Assessment (TTIA) are listed in the table below.

Abbreviation	Definition
95% back of queue	The length of vehicle queue at an intersection that is not exceeded in 95% of all cycles
Amended Project	The Amended Project includes the elements of the Project as described in the EIS as well as changes which have been made largely in response to submissions on the EIS. These include: Project site access/egress amendments, upgrades to additional sections of Wollara Road and Ringwood Road, increased BESS capacity and an option of a decentralised BESS, minor Project layout modifications, construction of an additional transmission tower and additional assessment and revised approach for workforce accommodation.
ARTC	Australian Rail Track Corporation
Auxiliary lane	A portion of the roadway adjoining the through traffic lanes, used for speed change or for other purposes supplementary to through traffic movement
B-double	A combination consisting of a prime mover towing two semitrailers, with the first semitrailer being attached directly to the prime mover by a fifth wheel coupling and the second semitrailer being mounted on the rear of the first semitrailer by a fifth wheel coupling on the first semitrailer.
BESS	Battery Energy Storage System
CRN	Country Regional Network
CTMP	Construction Traffic Management Plan
CWO REZ	Central West Orana Renewable Energy Zone. A group of new wind and solar power generation in the Central West Orana region so that it can be efficiently stored and transmitted across NSW
DOS	Degree of Saturation
DPE	Department of Planning and Environment
EIS	Environmental Impact Statement
EIS Project	The proposed Goulburn River Solar Farm. The Project includes the construction, operation and decommissioning of a solar farm with capacity of up to 550 MW, BESS and associated infrastructure. Including the various road repairs and upgrades to Ringwood Road.
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	Environmental Protection Authority
GAV	General Access Vehicles
Haulage routes	Roads designed for heavy or bulk transport of materials by heavy vehicles.
HML	NSW Combined Higher Mass Limits
km/h	Kilometres per hour
kV	Kilovolt
LOS	Level of Service
MWdc	Megawatt defined conditions
MWh	Megawatt hour
MWp	Megawatt peak
NSW	New South Wales
OSOM vehicle	Oversize Overmass. A vehicle or vehicle combination that exceeds any general access mass or dimension limits
Peak period	The period that has the highest demand volume of traffic and/or number of passengers during the day (peak hour, peak half hour, etc.)

Project construction vehicles	Standard construction vehicles generated by the Project including light vehicles, shuttle buses and heavy vehicles up to 19m semi-trailers.
RAV	Restricted Access Vehicles
ROL	Road Occupancy Licence
RUM	Road User Movement
SISD	Safe Intersection Sight Distance
SSD	State Significant Development
Swept path	The area bounded by lines traced by the extremities of the bodywork of a vehicle while turning.
Tie-in infrastructure	Operations and maintenance buildings, civil works and electrical components
TTIA	Traffic and Transport Impact Assessment
VMP	Vehicle Movement Plan

1. Introduction

1.1. Background

Lightsource Development Services Australia Pty Ltd (Lightsource bp) proposes to develop a solar farm in the Upper Hunter region of New South Wales (NSW), approximately 28 kilometres (km) southwest of Merriwa. The proposed Goulburn River Solar Farm (the Project) would be located on an agricultural parcel of land zoned RU1 – Primary Production (the Project Area), surrounded by the Goulburn River National Park.

The Project would involve the construction, operation and decommissioning of approximately 550-megawatt peak (MWp) of solar photovoltaic (PV) generation as well as a Battery Energy Storage System (BESS) with a combined 1,030 MWp / 2,060 megawatt hour (MWh) capacity. The Project would also include a substation and connection to an existing 500 kilovolt (kV) transmission line. The Project would include various associated infrastructure, including road repairs and upgrades to Ringwood Road and Wollara Road, temporary construction facilities, operation and maintenance buildings, internal access roads, civil works and electrical infrastructure to connect the Project to the existing transmission line which passes through the Project Area.

The Project Area covers an area of approximately 1,996.5 hectares with a development footprint of approximately 792.19 hectares. The Project Area encompasses two freehold properties and sections of Crown Roads.

The Project is considered a State Significant Development (SSD) under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and State Environmental Planning Policy (Planning Systems) 2021.

The objectives of the Project are to:

- Deliver affordable and sustainable renewable energy to business and communities within NSW
- Provide renewable energy that would contribute to the reduction of greenhouse gases across NSW, avoiding up to 705,000 tonnes per annum of carbon dioxide
- Support the local regional economy by preferencing local workers and businesses in the development, construction and operation of the Project
- Facilitate community engagement and participation in the design, development and operation of the Project
- Minimise environmental and heritage impacts to the Project Area through adaptive design.

Subject to planning approval, construction is proposed to commence in 2024.

1.2. Updates for Amendment Report

This TTIA report was prepared to support the Project Environmental Impact Statement (EIS). It has now been updated in response to the community and stakeholder submissions received on the EIS and to reflect the outcomes of ongoing engagement with the Department of Planning and Environment (DPE), Transport for NSW, Upper Hunter Shire Council and Mid-Western Regional Council throughout and/or post the Project exhibition period.

As a result, the following amendments to this TTIA report has been completed:

- Section 1.2 (this section) has been added to provide a summary of the updates to the document
- Section 2.3 has been added to include details on the proposed transport route
- Section 2.3.1 has been added to include discussion on the initial transport route options assessed
- Section 2.3.3 has been updated to include revised safe intersection sight distance checks at the Golden Highway / Ringwood Road intersection and addition of checks at the Wollar Road / Ringwood Road intersection and Golden Highway / Barnett Street intersection
- Section 2.3.5 has been added to include an analysis of speed surveys collected on the Golden Highway
- Section 2.4 has been added to include discussion on nearby turning areas
- Section 2.6 has been updated to include additional detail on school bus routes and bus stops
- Section 2.7 has been updated to reflect changes to Transport for NSW's definitions of the existing cycle network
- Section 2.8 has been updated to reflect more recent crash data available from the Centre for Road Safety
- Section 3.1 has been updated to include a figure showing the footprint of the Project
- Section 3.2.3 has been updated to reflect the proposed changes to Project construction vehicle routes and trip distribution, including management and mitigation measures required to enforce the proposed routes
- Section 3.2.4 has been updated to include additional detail on Oversize Overmass (OSOM) return routes, pull-over bay / rest area locations and reference to a Traffic Management Plan for a similar project
- Section 3.2.5 has been updated to include additional road upgrades proposed on Ringwood Road and Wollara Road to benefit the community, upgrades proposed at the Golden Highway / Ringwood Road intersection to accommodate construction vehicles, and additional signage and line-marking recommended at the Golden Highway / Barnett Street intersection
- Section 3.2.6 has been moved and updated to include revised or new swept paths tested at the Golden Highway / Ringwood Road intersection, Golden Highway / Barnett Street intersection, and the Barnett Street turnaround facility

- Section 3.3.2 has been updated to clarify the number of construction vehicle movements anticipated per day
- Section 3.3.3 has been updated to clarify the number of operational vehicle movements anticipated per day
- Section 3.4 has been added to include details on the use of the Barnett turnaround facility
- Section 3.6 has been updated to include details of the formalisation of a bus stop near the Golden Highway / Ringwood Road intersection
- Section 4.1.1 has been updated to reflect the inclusion of peak hour traffic volumes generated by other nearby projects in the intersection modelling assessment and turn warrants assessment for the cumulative base and cumulative construction scenario
- Section 4.1.3 has been updated to reflect the impacts on the bus and rail networks due to the change in proposed construction vehicle routes
- Section 4.1.5 has been updated to reflect any new publicly available information on the cumulative projects since the Project exhibition period
- Section 5 has been updated to include any new or revised mitigation and management measures proposed as a result of the changes to the project as described above
- Section 6 has been updated to include any new or revised outcomes of the assessment as a result of the changes to the project as described above
- Appendix A has been added to provide a summary of the submissions received related to traffic and transport and how this report addresses the submissions
- Appendix B has to include the construction assessment of Wollar Road / Ringwood Road, which is not proposed to be used construction vehicles
- Appendix C has been added to show the strategic design of the proposed upgrades at the Golden Highway / Ringwood Road intersection, including swept paths and sight distance checks
- Appendix D has been added to show the safe intersection sight distance checks carried out at the Wollar Road / Ringwood Road intersection
- Appendix E has been moved and updated to reflect more recent crash data available
- Appendix F has been moved and updated to show the specifications of the OSOM vehicles proposed for the Project
- Appendix G has been added to include the Traffic Management Plan for OSOM vehicles for the Avonlea Solar Farm
- Appendix H has been moved and updated to include the additional road upgrades proposed on Ringwood Road and Wollara Road
- Appendix J has been added to show the swept paths carried out at the Golden Highway / Barnett Street intersection and Barnett Street turnaround facility.

This updated report will be appended to the Amendment Report and submitted to DPE for review and planning approval.

Appendix A provides a summary of the submissions received related to the TTIA in the EIS and subsequent consultation with DPE and Transport for NSW, and how they have been addressed in this updated report.

1.3. Scope and objectives of this report

This report assesses the existing transport network conditions as well as the anticipated traffic and transport network impacts during construction and operation. Where feasible, mitigation and management measures to reduce the anticipated impacts of the Project have been identified. This report includes the consideration of the following:

- Existing traffic and transport surrounding the Project Site, including a review of:
  - The road network
  - Parking provision
  - Public transport
  - Pedestrians and bicycle users
  - Road safety.
- Construction traffic and transport associated with the Project
- Operational traffic and transport associated with the Project
- Potential mitigation measures that may be implemented to minimise traffic and transport impacts associated with the Project.

1.3.1. Secretary's environmental assessment requirements

The Secretary's environmental assessment requirements for the Project were issued on 1 February 2022. The requirements specific to transport, and where these requirements are assessed in this report, are outlined in Table 1-1.

Table 1-1: Secretary's environmental assessment requirements (transport)

Secretary's environmental assessment requirements		Where addressed
a.	An assessment of the peak and average traffic generation, including over-dimensional vehicles and construction worker transportation;	Section 3.2, Section 3.3 and Section 4.1.1
b.	An assessment of the likely transport impacts to the site access route(s), site access point(s), any Crown land, particularly in relation to the capacity and condition of the roads, road safety and intersection performance;	Section 3.2.3, Section 3.2.4, Section 3.2.5, Section 3.2.6 and Section 4
c.	A cumulative impact assessment of traffic from nearby developments; and	Section 4.1.1 and Section 4.1.5
d.	Provide details of measures to mitigate and / or manage potential impacts including a schedule of all required road upgrades (including resulting from heavy vehicle and over mass / over dimensional traffic haulage routes), road maintenance contributions, and any other traffic control measures, developed in consultation with the relevant road authorities;	Section 5

1.4. References

In preparing this report, reference has been made to the following:

- *Guide to Road Design Part 3: Geometric Design* (Austroads, 2021)
- *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (Austroads, 2021)
- *Guide to Road Traffic Management Part 6: Intersections, Interchanges and Crossings Management* (Austroads, 2020)
- *Austroads Design Vehicles and Turning Path Templates Guide* (Austroads, 2013)
- *Traffic Modelling Guidelines* (Roads and Maritime Services, 2013)
- *Guide to Traffic Generating Developments* (Roads and Traffic Authority, 2002)
- *Golden Highway Corridor Strategy* (Transport for NSW, 2016)
- *Goulburn River Solar Farm Scoping Report* (Umwelt (Australia) Pty Ltd, 2021).

1.5. Report structure

The report has the following structure:

- Chapter 1 (this chapter) provides an overview of the Project
- Chapter 2 details the existing traffic and transport environment
- Chapter 3 provides a description of the Project
- Chapter 4 provides an assessment of the potential traffic and transport impacts during the construction and operational phase of the Project
- Chapter 5 identifies traffic and transport mitigation and management measures
- Chapter 6 provides a summary of traffic and transport impacts due to the Project.

2. Existing conditions

2.1. Project location

The Project Site is located on Wollara Road, approximately 170 km northwest of Newcastle and is proposed to be constructed on 1,996.5 hectares of freehold land in the locality of Merriwa in the Upper Hunter Region of NSW. The Development Footprint occupies 792.19 hectares of the Project Site.

The Project is bounded by the Goulburn River National Park to the north, east and south, and by Wollara Road to the west. The location of the Project Site and surrounding roads, the rail line and nearby towns are shown in Figure 2-1.

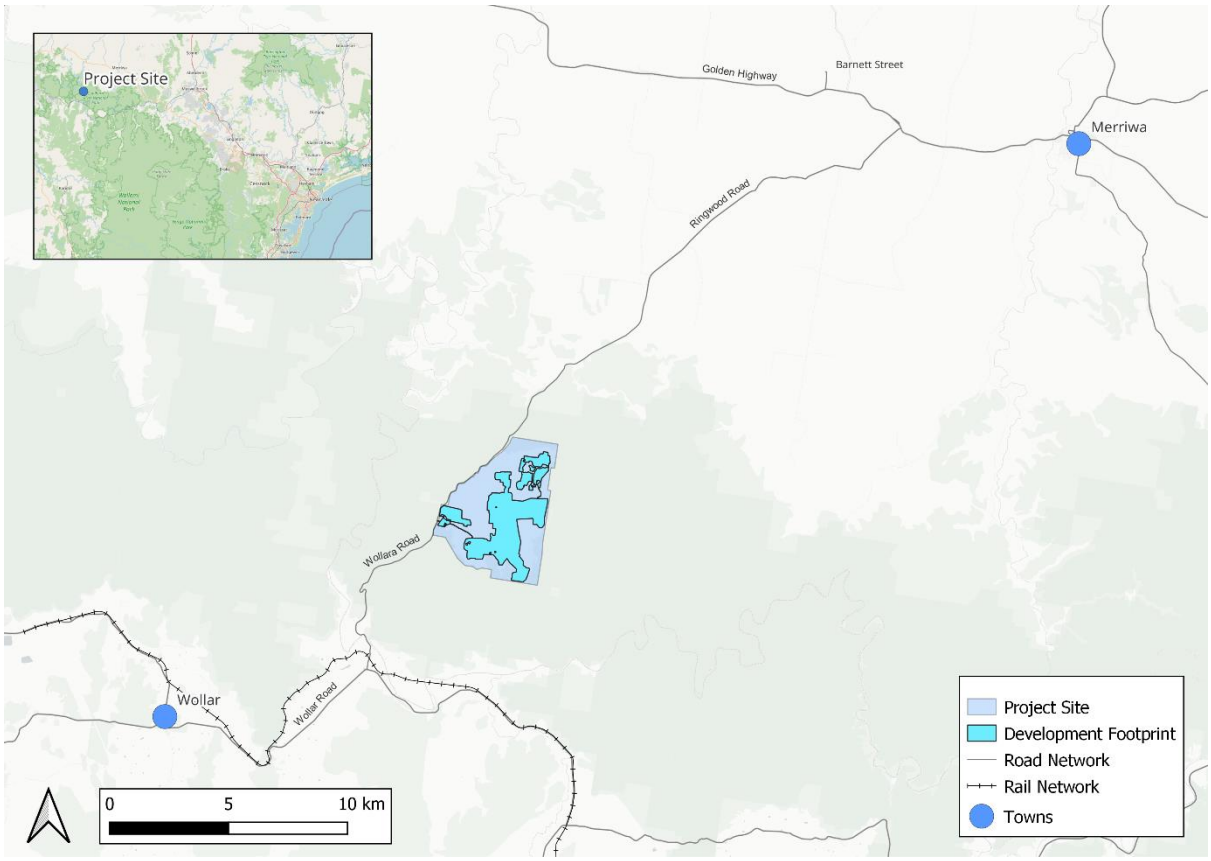


Figure 2-1: Project location

2.2. Road network

The local road network and key intersections for this Project are shown in Figure 2-2. Key roads that would provide access to the Project Site are described below, including Golden Highway, Ringwood Road, Wollar Road, Wollara Road and Barnett Street.

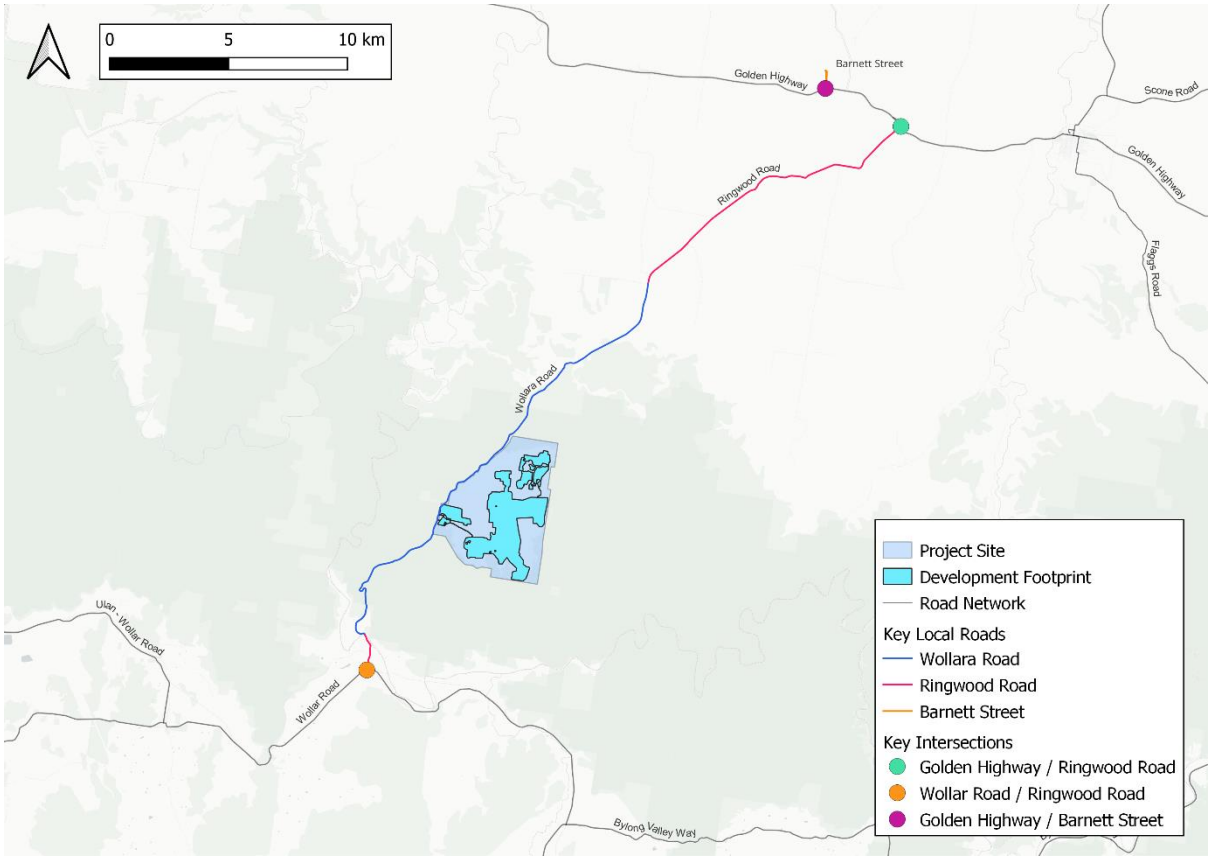


Figure 2-2: Local road network

- **Golden Highway**, which is a key east-west corridor located in the Hunter and Orana regions, connecting Newcastle and Dubbo. The highway is an approved B-double route. The highway is classified as a State road and has a posted speed limit of 100 km/h. Figure 2-3 shows the configuration of the Golden Highway at its intersection with Ringwood Road, as observed during a site visit carried out on 22 September 2021.

Figure 2-3: Golden Highway looking west (left) and east (right)

- **Ringwood Road**, which is a local road forming part of a continuous north-south road corridor with Wollara Road between the Golden Highway and Wollar Road. Ringwood Road is divided into two sections on this corridor, with the northern section running between the Golden Highway and Neverfail Road, and the southern section running between the Goulburn River and Wollar Road. Between these two sections, the road is designated as Wollara Road. Ringwood Road is sealed and generally flat with low vertical grades. The road operates under a default speed limit of 100km/h as there were no regulatory speed signs observed during a site visit carried out on 22 September 2021. However, advisory speed signs (35, 65 and 85km/h) were located at bends along the road alignment. Figure 2-4 shows a typical section of Ringwood Road as observed during the site visit.

Figure 2-4: Ringwood Road looking south (left) and north (right)

- **Wollara Road**, which is a local road forming part of a continuous north-south road corridor with Ringwood Road between the Golden Highway and Wollar Road. The Wollara Road section on this corridor runs between Neverfail Road and the Goulburn River. The road provides direct access to the Project and comprises a combination of sealed and unsealed sections north of the site and

unsealed sections south of the site. The road operates under a default speed limit of 100km/h, as there were no regulatory or advisory speed signs observed during a site visit carried out on 22 September 2021. Figure 2-5 shows a typical unsealed section of Wollara Road as observed during the site visit.

Figure 2-5: Wollara Road looking north (left) and south (right)

- **Wollar Road**, which is an east-west regional road between Bylong at its junction with Bylong Valley Way and Budgee Budgee at its junction with Ulan Road. The road is sealed and has a posted speed limit of 100km/h. Figure 2-6 shows the configuration of Wollar Road at its intersection with Ringwood Road, as observed during a site visit carried out on 22 September 2021. As discussed in Section 2.3, this road does not form part of the proposed transport route for the Project.

Figure 2-6: Wollar Road looking east (left) and west (right)

- **Barnett Street**, which is a north-south access road located approximately 3.8km west of the Golden Highway / Ringwood Road intersection. The road is unsealed and provides access to Lot 1 / DP 1108292. Figure 2-7 shows the configuration of Barnett Street at its intersection with Golden Highway, based on Google Maps imagery from August 2023.

Figure 2-7: Barnett Street view from the east on Golden Highway (left) and from the west (right)

2.2.1. Heavy vehicles

Golden Highway is an approved B-double route and has been identified in the *Golden Highway Corridor Strategy* (Transport for NSW, 2016) as an important connection between the Central West and the Port of Newcastle. There is also a State target to facilitate the movement of high productivity vehicles on the highway in the long term under a package of upgrades funded by the NSW Government's Regional Freight Pinch Point and Safety Program and the Australian Government's Heavy Vehicle Safety and Productivity Package. An overview of proposed upgrades along the Golden Highway to improve the heavy vehicle network is shown in Figure 2-8.

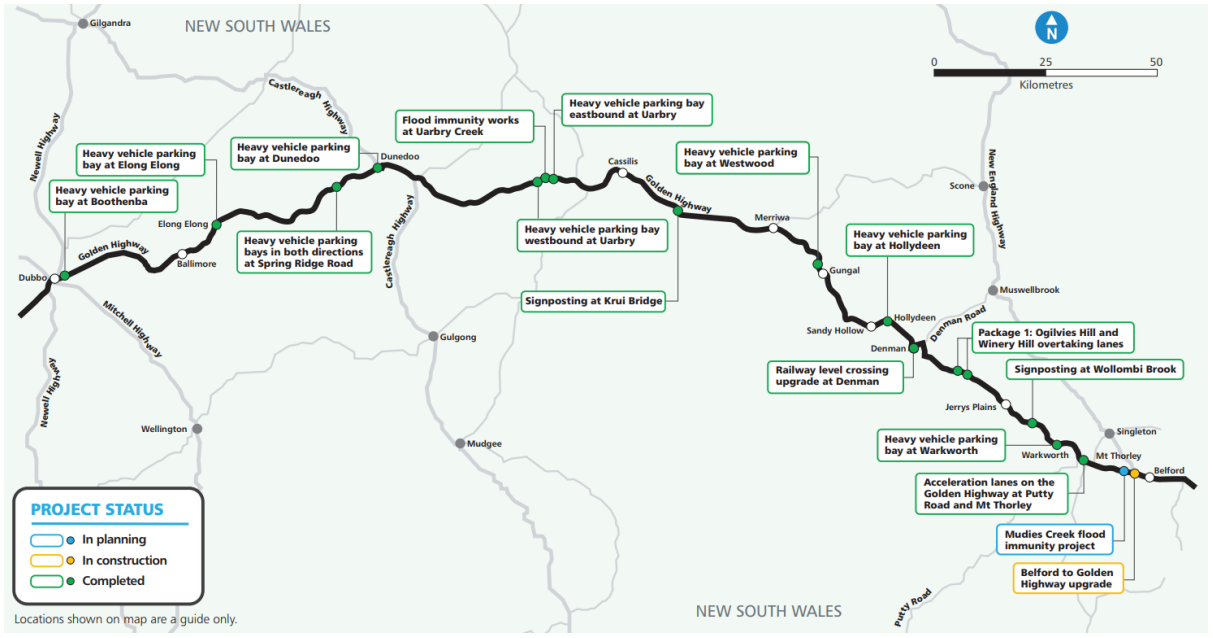


Figure 2-8: Golden Highway upgrades

Source: Golden Highway upgrades overview map (Transport for NSW, 2022)

Wollar Road is also an approved B-double route, however includes an 80km/hr B-double speed limit and may only be used by B-doubles outside of school bus operation times.

Wollara Road and Ringwood Road are not approved B-double routes and hence only heavy vehicles that are classified as a General Access Vehicle (GAV) may use these roads. GAVs include buses and semi-trailers up to 19 metres in length.

A map of the heavy vehicle network surrounding the Project site is shown in Figure 2-9.

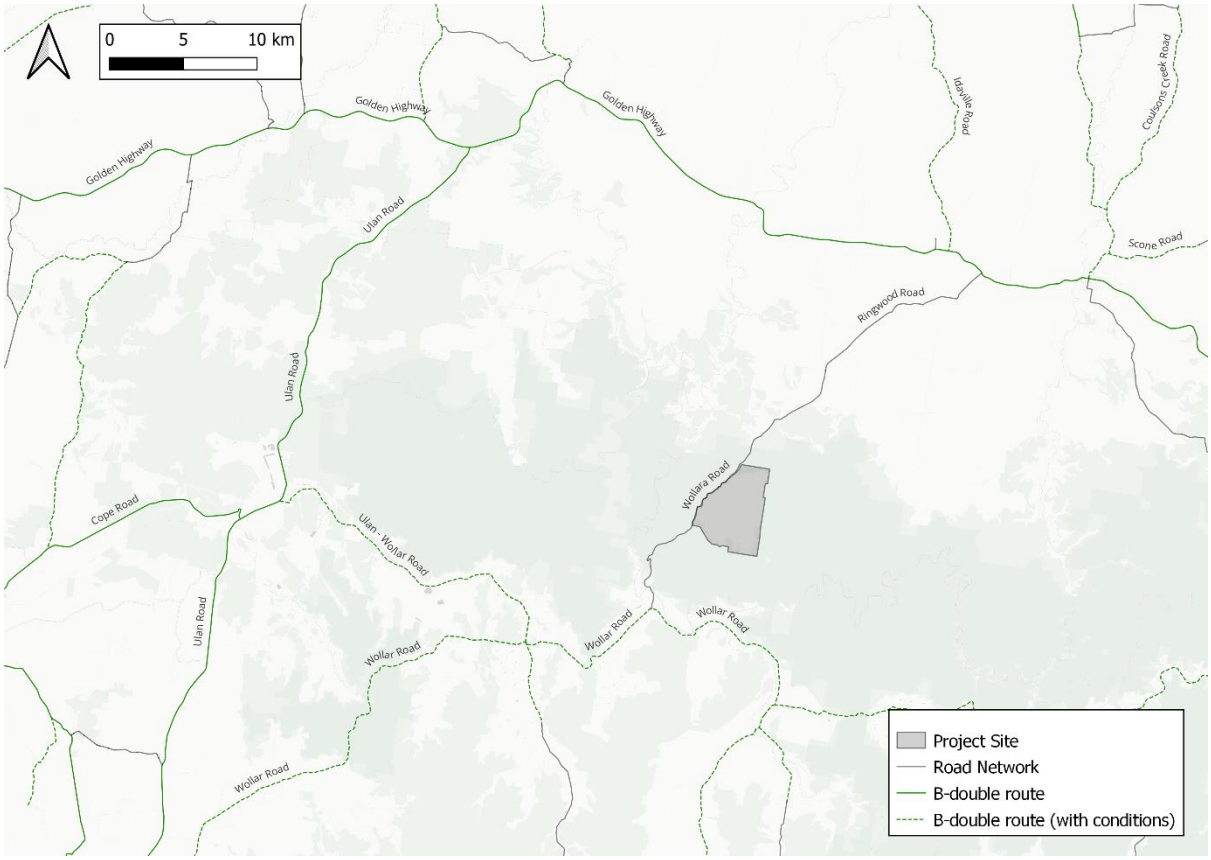


Figure 2-9: Heavy vehicle network

Source: NSW Combined Higher Mass Limits (HML) and Restricted Access Vehicles (RAV) Map (Transport for NSW, 2023)

2.3. Proposed transport route

The transport route for the Project is proposed from the north of the Project Site via the Golden Highway, Ringwood Road, Wollara Road and Barnett Street, with Project construction vehicles restricted to performing a left-in and left-out at the Golden Highway / Ringwood Road intersection which provides the main access to the site. This arrangement is proposed due to existing sight distance deficiencies at the intersection, particularly for vehicles turning right-out of Ringwood Road. Hence, egressing Project construction vehicles would be required to turn left at the intersection, using the proposed acceleration lanes, before utilising the turnaround facility on Barnett Street to return on the Golden Highway in the eastbound direction. Consent has been received from Upper Hunter Shire Council as the road authority, as well as adjacent private landowners for the intended use of the turnaround facility by Project construction vehicles.

The proposed transport route, including the turnaround facility on Barnett Street is shown in Figure 3-2.

An additional transport route for Project light vehicles from the south via Wollar Road, Ringwood Road and Wollara Road was assessed in the EIS. However, the Amended Project does not propose to use this route, given that the workforce is now proposed to originate predominately from accommodation in and around Merriwa. In addition, access from the south would not be suitable for Project heavy vehicles, due to:

- potential flooding issues at the Ringwood Road and Wollara Road junction over the Goulburn River
- steep grades
- tight turning curves through the National Park
- insufficient safe intersection sight distance (SISD) at the intersection of Ringwood Road and Wollar Road.

Although this route is not proposed for the Amended Project, an assessment of the Wollar Road / Ringwood Road intersection during construction is provided in Appendix B, in the unlikely event that a Project construction light vehicle travels to the site from the south (i.e., due to a worker that lives within the Mid-Western Regional LGA).

2.3.1. Justification of transport route

Due to its isolation, the Project Site can only be accessed via three routes either from the north via the Golden Highway / Ringwood Road intersection or Golden Highway / Redwell Road intersection, or from the south via the Wollar Road / Ringwood Road intersection. These three potential route options were assessed from a traffic compliance, road design suitability and construction practicality perspective in the early stages of the Project as follows:

- Option 1 via the Golden Highway Ringwood Road intersection: This is the proposed transport route for the Project, with Project vehicles using the Golden Highway, Ringwood Road, Wollara Road and Barnett Street. This route comprises primarily a sealed surface, gentle grade changes and wide carriageways. Upgrades required on this route to accommodate Project vehicles are discussed in Section 3.2.5.
- Option 2 via the Golden Highway / Redwell Road intersection: This route would require Project vehicles to travel on the Golden Highway, Redwell Road, Binks Road, Ringwood Road and Wollara Road. This route includes a 10km unsealed section of Redwell Road and Binks Road. Both these roads are also narrow in width. Use of this route for Project vehicles would require private land purchases, road widening and sealing the entire section of Redwell Road and Binks Road. Due to the capital upgrade costs and complexity in acquiring private land to widen these roads, this option was not recommended.
- Option 3 via the Wollar Road / Ringwood Road intersection: This route would require Project vehicles to travel on Wollar Road and Ringwood Road (discussed above). Furthermore, access to these roads from the west would require an

additional travel distance of 107km via the Golden Highway, Ulan Road and Ulan-Wollar Road (Option 3a). Access to these roads from the east would be via Bylong Valley Way (Option 3b). Due to the potential additional travel distance, the unsuitability of Ringwood Road and Wollara Road south of the Project Site for heavy vehicles as discussed in the previous section, and the capital upgrades required, this route was not recommended for heavy vehicles and was proposed for light vehicles only in the EIS.

An overview of the route options assessed is shown in Figure 2-10.

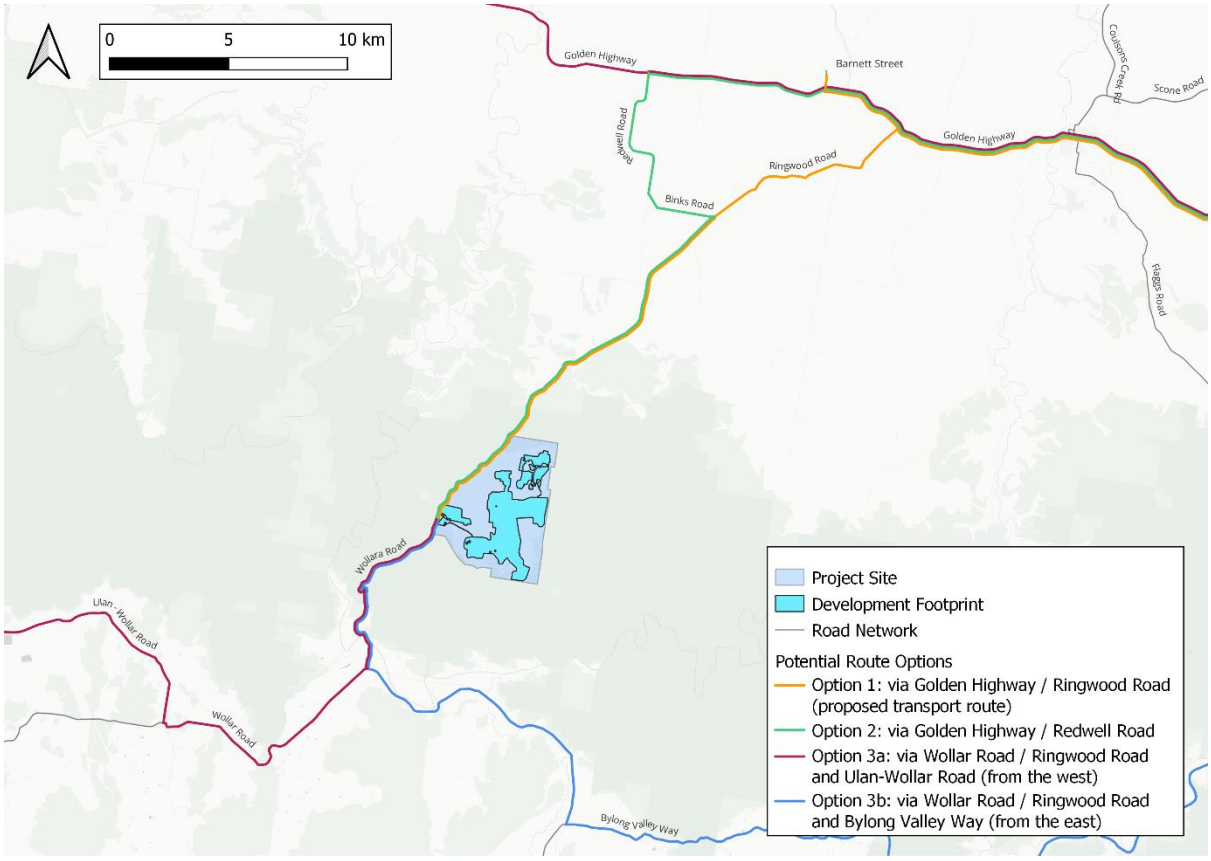


Figure 2-10: Potential route options assessed

2.3.2. Intersection layout and geometry

Intersections assessed include Golden Highway / Ringwood Road, Golden Highway / Barnett Street and Wollar Road / Ringwood Road. These intersections are priority controlled and include basic left turn and right turn treatments, except at the following:

- Golden Highway / Ringwood Road: existing auxiliary left turn lane on the Golden Highway in the westbound direction
- Golden Highway / Barnett Street: existing auxiliary right turn lane on the Golden Highway in the westbound direction

2.3.3. Safe intersection sight distance (SISD)

The SISD is the minimum sight distance which should be provided on the major road at any intersection.

Given that the Golden Highway / Ringwood Road and Golden Highway / Barnett Street intersections are proposed to be used by Project construction vehicles travelling to and from the site, an assessment of SISD was undertaken at these intersections and is shown in Table 2-1. Although Project construction vehicles would not be travelling through the Wollar Road / Ringwood Road intersection, for completeness, SISD checks were also undertaken at this intersection.

Table 3.2 of the *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (Austroads, 2021) outlines sight distance requirements for a variety of design speeds and was used to assess SISD.

Table 2-1: SISD checks

Intersection	Posted Speed (km/hr)	Design Speed (km/hr)	Reaction Time (sec)	Grade (%)	Required SISD (m)
Golden Highway / Ringwood Road	100	110	2*	2 (Golden Highway westbound) -2 (Golden Highway eastbound)	277m looking east from Ringwood Road 292m looking west from Ringwood Road
Golden Highway / Barnett Street	100	110	2.5	1 (Golden Highway westbound) -4 (Golden Highway eastbound)	296m looking east from Barnett Street 316m looking west from Barnett Street
Wollar Road / Ringwood Road	100	110	2.5	2 (Wollar Road westbound) -3 (Wollar Road eastbound)	294m looking east from Ringwood Road 313m looking west from Ringwood Road

*A two second reaction time has been applied, given that drivers would be alert near the intersection due to the road alignment, additional signage located on approach to the intersection and the speed survey results outlined in Section 2.3.5

At the Golden Highway / Ringwood Road intersection, the required SISD of 292 metres is achieved for a vehicle on Ringwood Road looking west. However, the required SISD of 277 metres is not achieved for a vehicle on Ringwood Road looking east. Currently an SISD of 180 metres is achieved, which is deficient by 97 metres. The non-compliant SISD to the east is due to the existing road geometry of the Golden Highway. The SISD checks at this intersection are provided in Appendix C (refer to drawings 0305-INF-LS-SIGHT_SISD-01 to

0305-INF-LS-SIGHT_SISD-04). As a result of the deficient SISD to the east, it is not proposed for Project construction vehicles to perform a right turn at the intersection.

Upgrades are proposed to accommodate Project construction vehicles performing a left turn at the Golden Highway / Ringwood Road intersection and are discussed in Section 3.2.5. The strategic design of the intersection, including swept paths and sight distance checks carried out, is provided in Appendix C.

At the Golden Highway / Barnett Street intersection, the required SISD of 296 metres for a vehicle on Barnett Street looking east and 316 metres for a vehicle on Barnett Street looking west are both achieved. Hence, no intersection geometry upgrades are required for the Project to use this intersection.

At the Wollar Road / Ringwood Road intersection, the required SISD of 294 metres is achieved for a vehicle on Ringwood Road looking east. The required SISD of 313 metres is not achieved for a vehicle on Ringwood Road looking west. Currently an SISD of 170 metres is achieved, which is deficient by 143 metres. Since Project construction vehicles would not be using this intersection, upgrades have not been proposed. Additional details on the SISD checks carried out at this intersection is provided in Appendix D.

2.3.4. Existing traffic volumes

Intersection turning movement volumes were collected at the Golden Highway / Ringwood Road intersection on Thursday, 31 March 2022, from 6:00am to 10:00am and 3:00pm to 7:00pm, and the Wollar Road / Ringwood Road intersection on Thursday, 7 April 2022, from 6:00am to 10:00am and 3:00pm to 7:00pm. On the surveyed day, the Golden Highway / Ringwood Road intersection experienced a morning peak hour from 7:15am to 8:15am and an evening peak hour from 3:00pm to 4:00pm, and the Wollar Road / Ringwood Road intersection experienced a morning peak hour from 6:00am to 7:00am and an evening peak hour from 5:30pm to 6:30pm. Peak hour traffic volumes at these intersections are shown in Figure 2-11 and Figure 2-12.

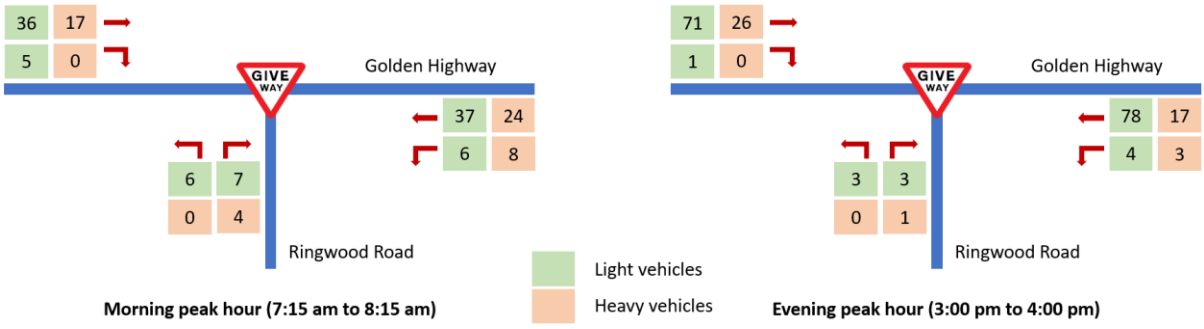


Figure 2-11: Peak hour traffic volumes at the Golden Highway / Ringwood Road intersection

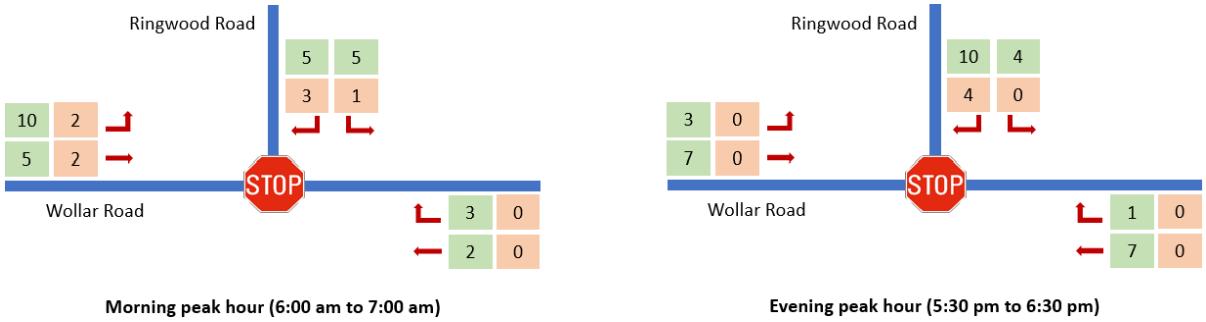


Figure 2-12: Peak hour traffic volumes at the Wollar Road / Ringwood Road intersection

At the Golden Highway / Ringwood Road intersection, evening peak hour volumes are generally higher than morning peak hour volumes. In addition, traffic volumes turning into and out of Ringwood Road are low, with Golden Highway eastbound and westbound through vehicles as the major movements at the intersection.

At the Wollar Road / Ringwood Road intersection, traffic volumes are low during both peak hours, with each movement being undertaken by 14 vehicles or less on the surveyed day.

Traffic volumes on the Golden Highway were also collected as part of the speed surveys carried out in 2023 as discussed in Section 2.3.5. A review of the 2023 volumes on the Golden Highway from the speed surveys for the same morning and evening peak hours showed a similar volume compared to the 2022 intersection counts.

Hourly traffic volumes in both directions along Ringwood Road were also collected over a one-week period from Thursday, 31 March 2022, to Wednesday, 6 April 2022. Figure 2-13 and Figure 2-14 show the bi-directional hourly average traffic volumes observed on Ringwood Road during the surveyed week on weekdays and weekends, respectively.

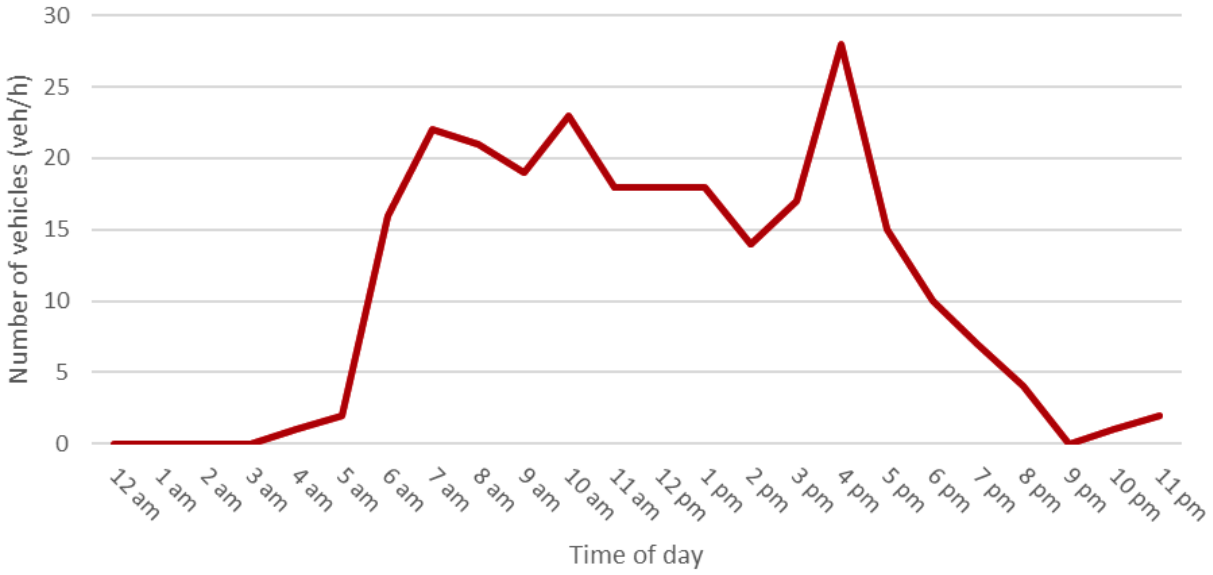


Figure 2-13: Average weekday traffic volumes on Ringwood Road

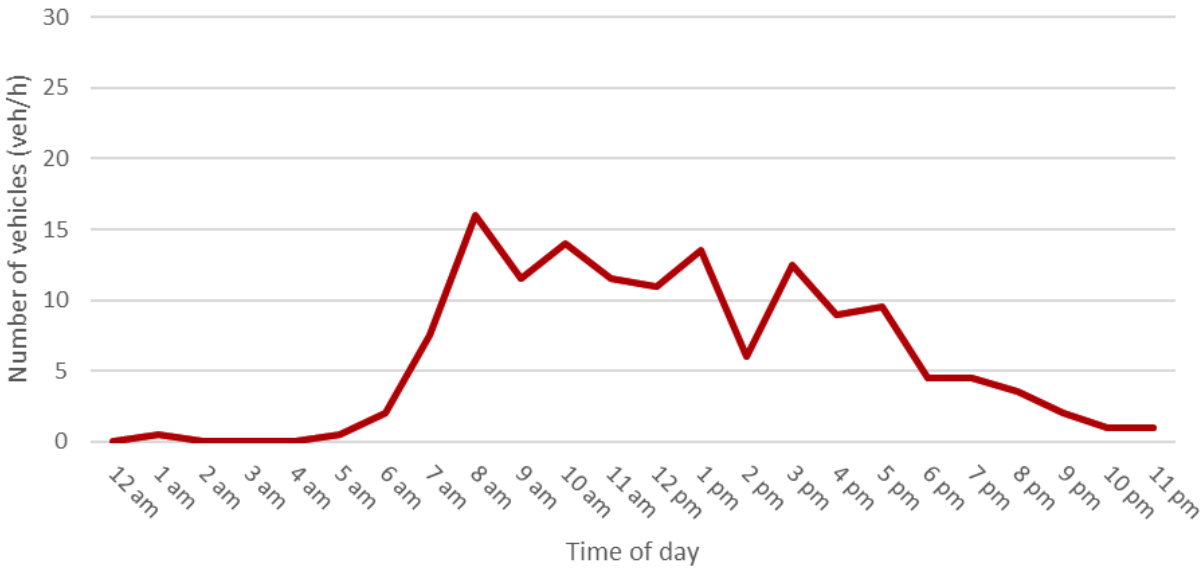


Figure 2-14: Average weekend traffic volumes on Ringwood Road

Ringwood Road carried low traffic volumes on the surveyed weekdays, with a maximum average hourly volume of 28 vehicles observed from 4:00pm to 5:00pm. Traffic volumes were lower on the surveyed weekend, with a maximum average hourly volume of 16 vehicles observed from 8:00am to 9:00am.

2.3.5. Existing speed

A speed survey on the Golden Highway approximately 70 metres east of Ringwood Road was carried out over a one-week period from Tuesday, 31 October 2023, to Monday, 6 November 2023. Table 2-2 shows the 85th percentile speed and average speed recorded on the Golden Highway in both directions over the survey period.

Table 2-2: Golden Highway speed summary (7-days)

Direction	Posted speed limit (km/hr)	85th percentile speed (km/hr)	Average speed (km/hr)
Golden Highway eastbound	100	98.8	84.9
Golden Highway westbound	100	99.9	81.1

As shown in Table 2-2, the 85th percentile speed on the Golden Highway in both directions was observed to be close to the posted speed limit, and may indicate that the majority of drivers ignore the advisory speed limit signage to reduce their speed to 75km/hr near the Golden Highway / Ringwood Road intersection. However, average speeds of approximately 85km/hr in the eastbound direction and 81km/hr in the westbound direction were closer to the advisory speed limit.

2.3.6. Existing intersection performance

An assessment of intersection performance has been based on criteria outlined in the *Guide to Traffic Generating Developments* (Roads and Traffic Authority, 2002). The average delay assessed for signalised intersections is for all movements, and for priority (sign-controlled) intersections is for the worst movements and is expressed in seconds per vehicle. Table 2-3 shows the criteria adopted for the intersection performance assessment.

Table 2-3: Intersection performance criteria

Level of service	Average delay per vehicle	Traffic signals and roundabouts	Give-way and stop sign
A	Less than 15	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, required other control mode
E	57 to 70	At capacity; at signals, incidents will cause delays. Roundabouts	At capacity, required other control mode
F	Over 70	Extra capacity required	Extreme delay, traffic signal or other major treatment required

Golden Highway / Ringwood Road and Wollar Road / Ringwood Road were modelled using *SIDRA Intersection* modelling software. *SIDRA Intersection* is a micro-analytical tool for evaluation of intersection performance in terms of capacity, Degree of Saturation (DOS), Level of Service (LOS), average delay and queue length, and is an appropriate tool for modelling individual intersections.

The existing performance of the modelled intersections in SIDRA is shown in Table 2-4 and Table 2-5.

Table 2-4: Existing intersection performance (2022) – Golden Highway / Ringwood Road

Period	Approach	DOS	Average delay (sec/veh)	LOS	95% back of queue (m)
Weekday morning peak (7:15am to 8:15am)	Golden Highway eastbound	0.04	8	A	<5
	Golden Highway westbound	0.04	9	A	<5
	Ringwood Road northbound	0.02	7	A	<5
	Overall intersection	**0.04**	**9**	**A**	**<5**
Weekday evening peak (3:00pm to 4:00pm)	Golden Highway eastbound	0.06	8	A	<5
	Golden Highway westbound	0.06	9	A	<5
	Ringwood Road northbound	0.01	7	A	<5
	Overall intersection	**0.06**	**9**	**A**	**<5**

Table 2-5: Existing intersection performance (2022) – Wollar Road / Ringwood Road

Period	Approach	DOS	Average delay (sec/veh)	LOS	95% back of queue (m)
Weekday morning peak (6:00am to 7:00am)	Wollar Road eastbound	0.01	8	A	<5
	Wollar Road westbound	<0.01	8	A	<5
	Ringwood Road southbound	0.01	9	A	<5
	Overall intersection	**0.01**	**9**	**A**	**<5**
Weekday evening peak (5:30pm to 6:30pm)	Wollar Road eastbound	0.01	8	A	<5
	Wollar Road westbound	<0.01	8	A	<5
	Ringwood Road southbound	0.02	9	A	<5
	Overall intersection	**0.02**	**9**	**A**	**<5**

As shown in Table 2-4 and Table 2-5, both intersections operate at LOS A with spare capacity, low average delays and minimal queues on all approaches during the morning and evening peak hour.

2.4. Turning areas

Section 2.3 identifies that Project construction vehicles would be restricted to a left in, left out arrangement at the Golden Highway / Ringwood Road intersection. This would require the use of a turning area to enable Project construction vehicles to return east, where the majority of Project construction vehicle movements would originate from.

Project construction vehicles could use the turnaround facility located on Barnett Street, approximately 150 metres north of its intersection with Golden Highway. An alternative turning area is located approximately 40km further west at the Cassilis Park Rest Area. The Project has consent from Upper Hunter Shire Council and relevant private landowners to use the Barnett Street turnaround facility for Project construction vehicles. The Barnett Street turnaround facility has been assessed and does not require any changes to the intersection geometry to support Project construction vehicle movements.

East of the Golden Highway / Ringwood Road intersection, there are no formal turning areas. Hence, Project construction vehicles would need to use the local roads in Merriwa to perform a U-turn if they are required to access the Project Site from the west (i.e., due to a worker that lives west of Ringwood Road, or if a Project construction vehicle travelling from Merriwa misses the left-turn into Ringwood Road).

Figure 2-15 shows the location of the identified turning areas.

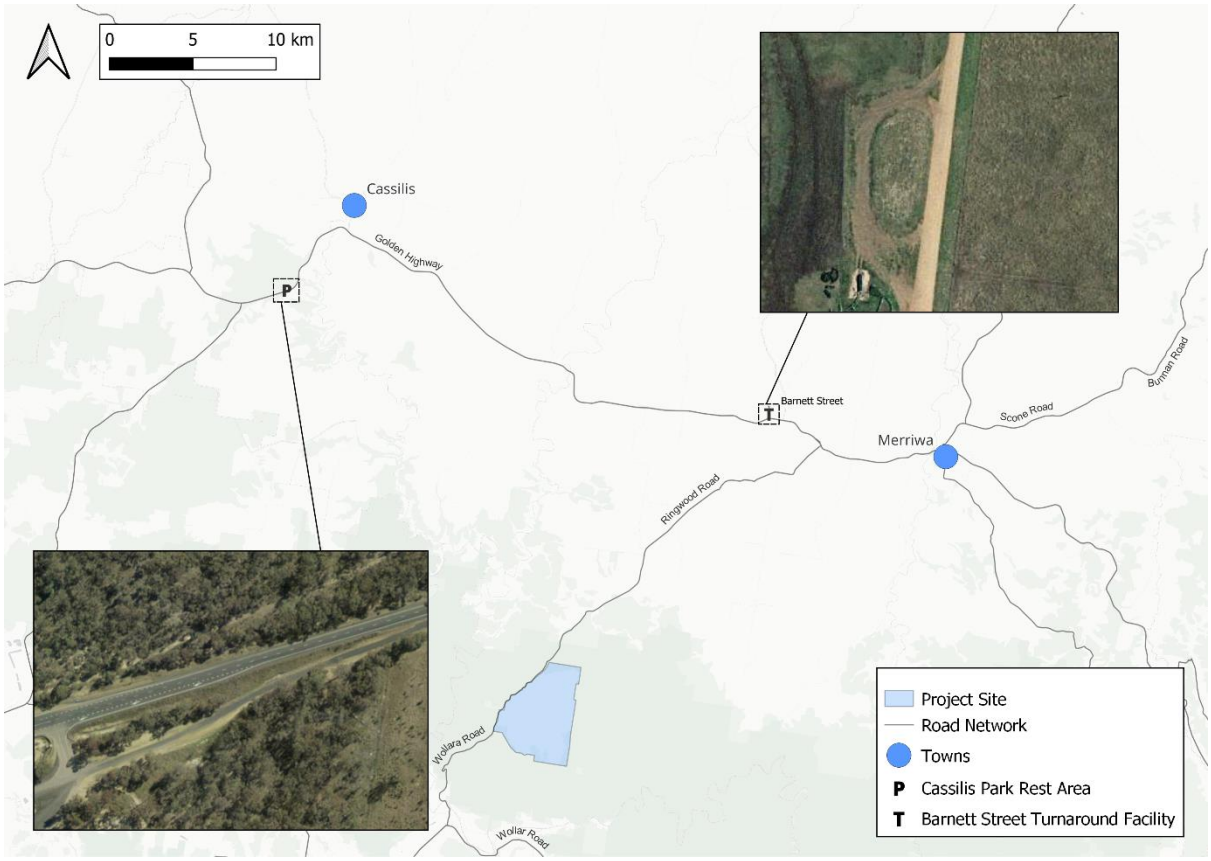


Figure 2-15: Turning area locations

2.5. Parking

There are no formal parking facilities located near the Project Site. A heavy vehicle rest area is located on the northern side of Golden Highway, approximately 300 metres west of the Ringwood Road / Golden Highway intersection, as shown in Figure 2-16. The Cassilis Park rest area shown in Figure 2-15 is also used for short-term parking, however is located a considerable distance from the Project Site.

The closest formal parking facilities are located in the towns of Merriwa and Wollar, both some 20-30 kilometres from the site.

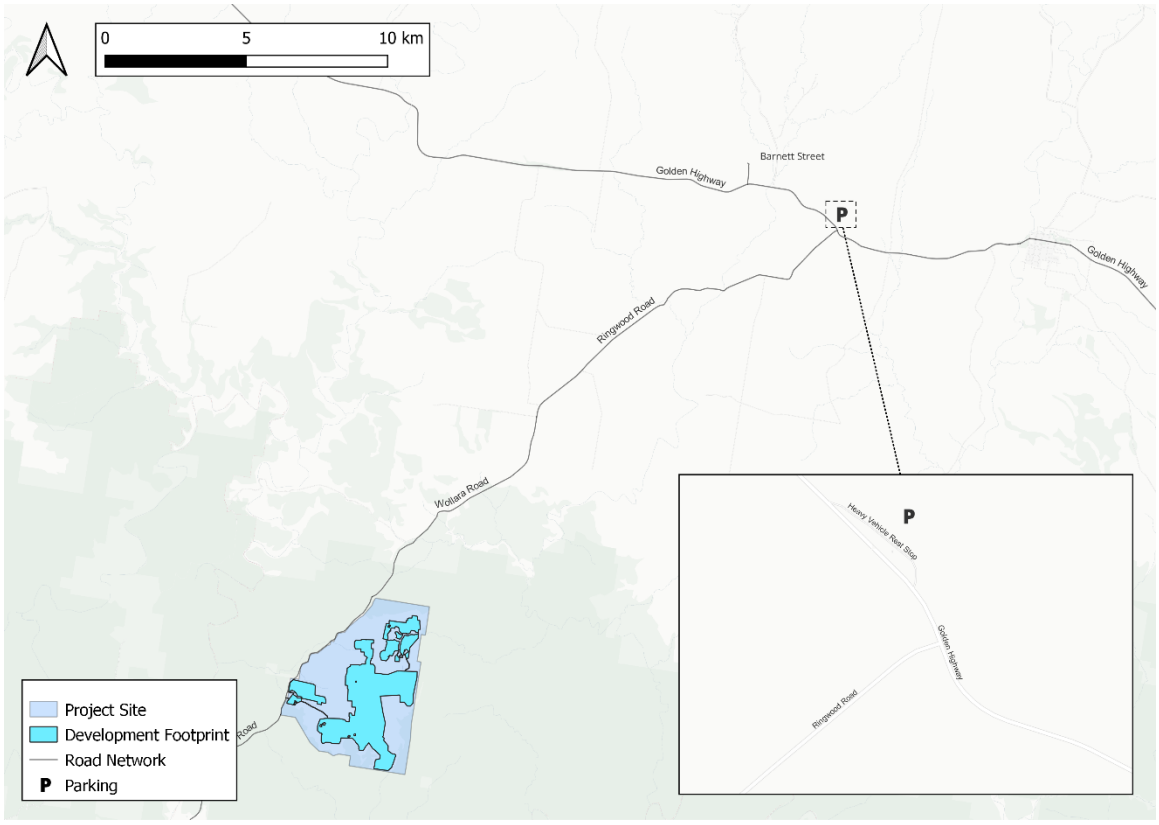


Figure 2-16: Heavy vehicle rest area

2.6. Public transport

2.6.1. Bus network

TransCare, a private bus operator, provides a weekday bus service between Merriwa and Scone via the Golden Highway. The bus route operates once per day, with an additional service between Merriwa and Singleton operating once a month. These private bus services connect Merriwa to the NSW rail network at Aberdeen, Scone, Muswellbrook and Singleton.

Merriwa is also served by another private bus operator, Sid Foggs, as part of its Dubbo to Newcastle route. This route operates three days per week. Figure 2-17 shows the bus routes operated by TransCare and Sid Foggs.

A school bus route operated by Osborn's Transport between Merriwa and Scone serves the Merriwa Pre-School, Scone Grammar School and Scone High School. This route runs along Ringwood Road, Golden Highway and the local road network in Merriwa before proceeding to Scone via Scone Road and Bunnan Road. One service is provided on school days in each direction, corresponding to the school start and finish times.

South of the Project Site, a school bus route operated by Ogden's Coaches runs on the local road network in Wollar before proceeding to Mudgee via Wollar Road and Ulan Road. This route serves students and staff from Cudgegong Valley Public School, Mudgee High School,

Mudgee Public School and St Matthews Catholic School. One service is provided on school days in each direction, corresponding to the school start and finish times.

On the proposed transport route, informal bus stops that serve the Merriwa to Scone school bus route are located on Ringwood Road east of Flight Springs Road, at the intersection of Golden Highway and Ringwood Road, and on Golden Highway near Avocado Road. A bus stop which serves the routes operated by Transcare and Sid Foggs is also located on the Golden Highway in the Merriwa town centre near the Post Office.

The Project is committing to improving the bus stop at the Golden Highway / Ringwood Road intersection. Details on the proposed upgrades for the Merriwa-Scone school bus stop area are detailed in Section 3.6.

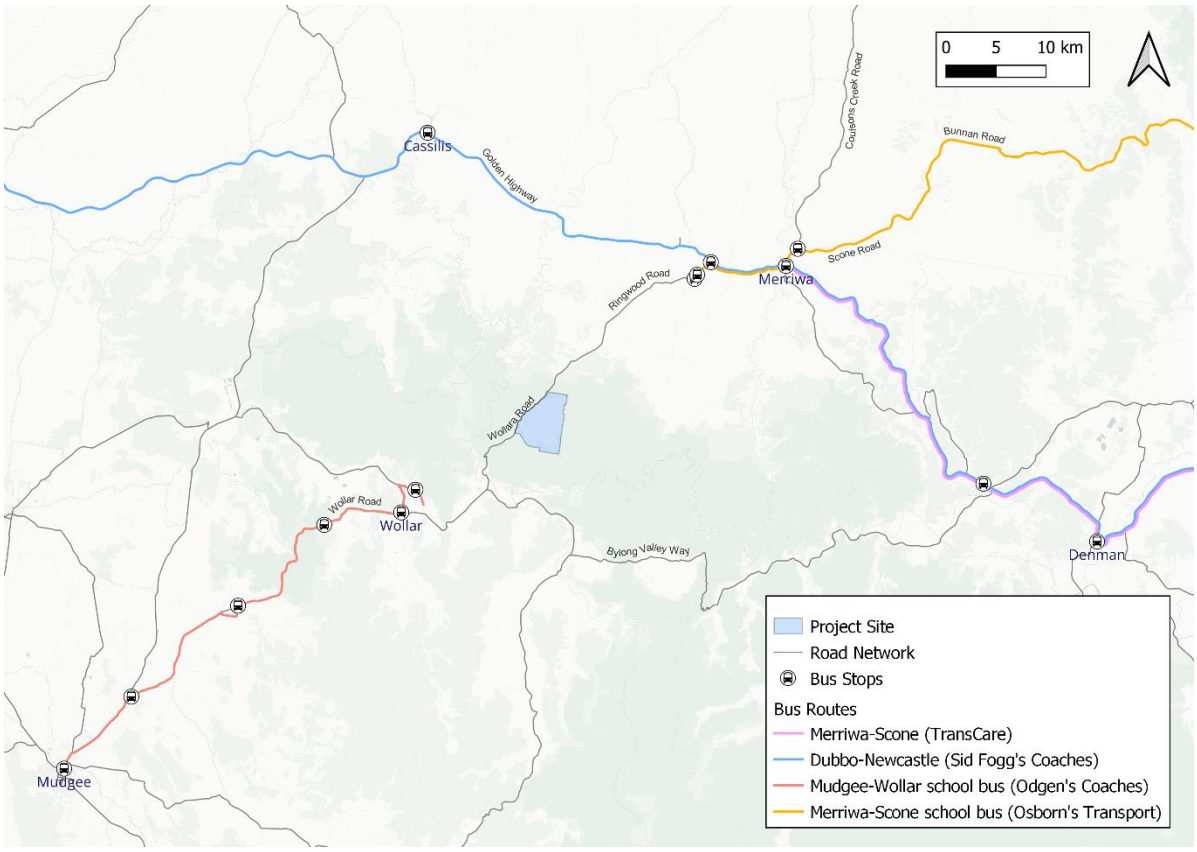


Figure 2-17: Bus routes

Source: Merriwa – Sandy Hollow – Denman – Muswellbrook Bus Timetables (Transcare, 2023), Dubbo to Newcastle Express Coach Services (Sid Foggs, 2023), S823 Merriwa to Scone School via Bunnan Rd (Transport for NSW, 2023) and Mudgee school route – Wollar (Ogden's Coaches, 2023)

2.6.2. Rail network

The Sandy Hollow – Gulgong rail line, primarily used to transport coal from the Ulan mines, passes through Wollar (Figure 2-1). This rail line is owned by Transport for NSW and is operated by the Australian Rail Track Corporation (ARTC). The rail line has multiple level crossings on Ulan Road, Wollar Road and Ringwood Road, south of the site.

Another rail line exists between Merriwa and Sandy Hollow and is part of the Country Regional Network (CRN), owned by Transport for NSW. However, this line is currently non-operational.

2.7. Active transport

The pedestrian and cycle network surrounding the Project Site is limited. There are no formal pedestrian and cycle facilities provided on Golden Highway, Ringwood Road, Wollara Road and Wollar Road. The closest pedestrian facilities are provided at Merriwa town centre. An off-road 700m long shared path is located in Merriwa and passes underneath the Golden Highway, providing a connection between the Merriwa Showgrounds and Dutton Street.

Sections of the Golden Highway are defined cycle routes by using the road shoulder or parking lane (in Merriwa). There is also a short, shared path in Merriwa along the eastern side of the Merriwa River. Figure 2-18 shows the cycle network surrounding the site.

Bicycle NSW identifies a scenic cycle route between Bylong and Merriwa. The recommended route travels along Golden Highway, Forest Reserve Road, Killoe Road, Ringwood Road, Wollara Road, Wollar Road and Bylong Valley Way. An additional four scenic cycle routes (Merriwa to Sandy Hollow, Muswellbrook Explorer Loop, Merriwa to Scone and Merriwa to Willow Tree) are also identified. However, these routes travel away from Merriwa and the Project site to the east. These scenic cycle routes are also shown in Figure 2-18.

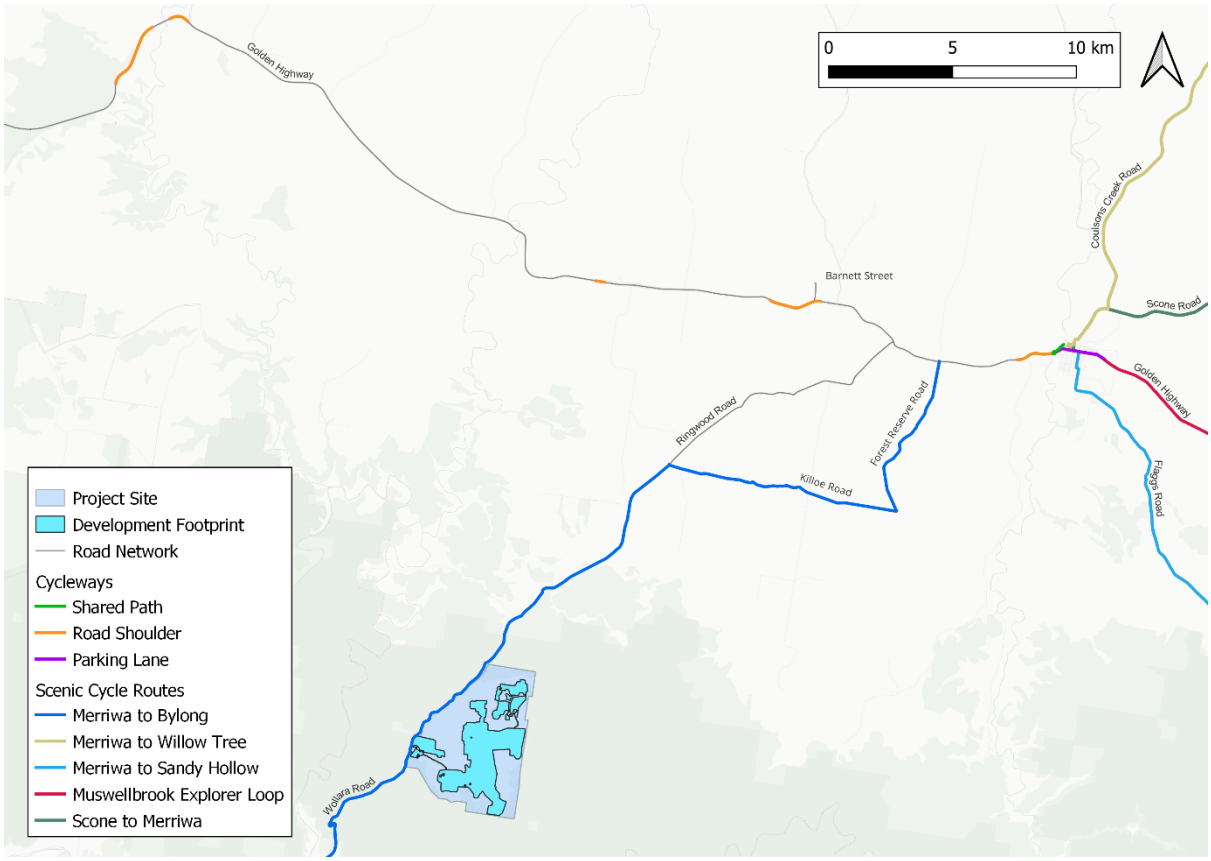


Figure 2-18: Cycle network

Source: Cycleway finder (Transport for NSW, 2023) and NSW Riding Map – Hunter Valley & Northern Tablelands (Bicycle NSW, 2023)

2.8. Road safety

A summary of crash data on roads surrounding the Project Site for the most recent five-year period with available data (2018 to 2022) from Transport for NSW's *Centre for Road Safety* is shown in Figure 2-19.

In the five-year period from 2018 to 2022, a total of 70 crashes were recorded on roads shown in Figure 2-19. This includes 37 crashes in Merriwa and one crash in Wollar. Three crashes occurred on Wollara Road and Ringwood Road, with two of these crashes resulting in moderate injury. Crashes along the Golden Highway were generally dispersed with increased occurrences in and around the Merriwa town centre. Five crashes occurred on the Golden Highway between Ringwood Road and Barnett Street, with three crashes resulting in moderate or serious injury. One crash occurred at the Wollar Road / Ringwood Road intersection resulting in a serious injury. Of the 37 crashes that occurred in Merriwa, 26 resulted in at least one injury and an additional three crashes result in a fatality.

Crash data by Road User Movement (RUM) code is provided in Appendix E.

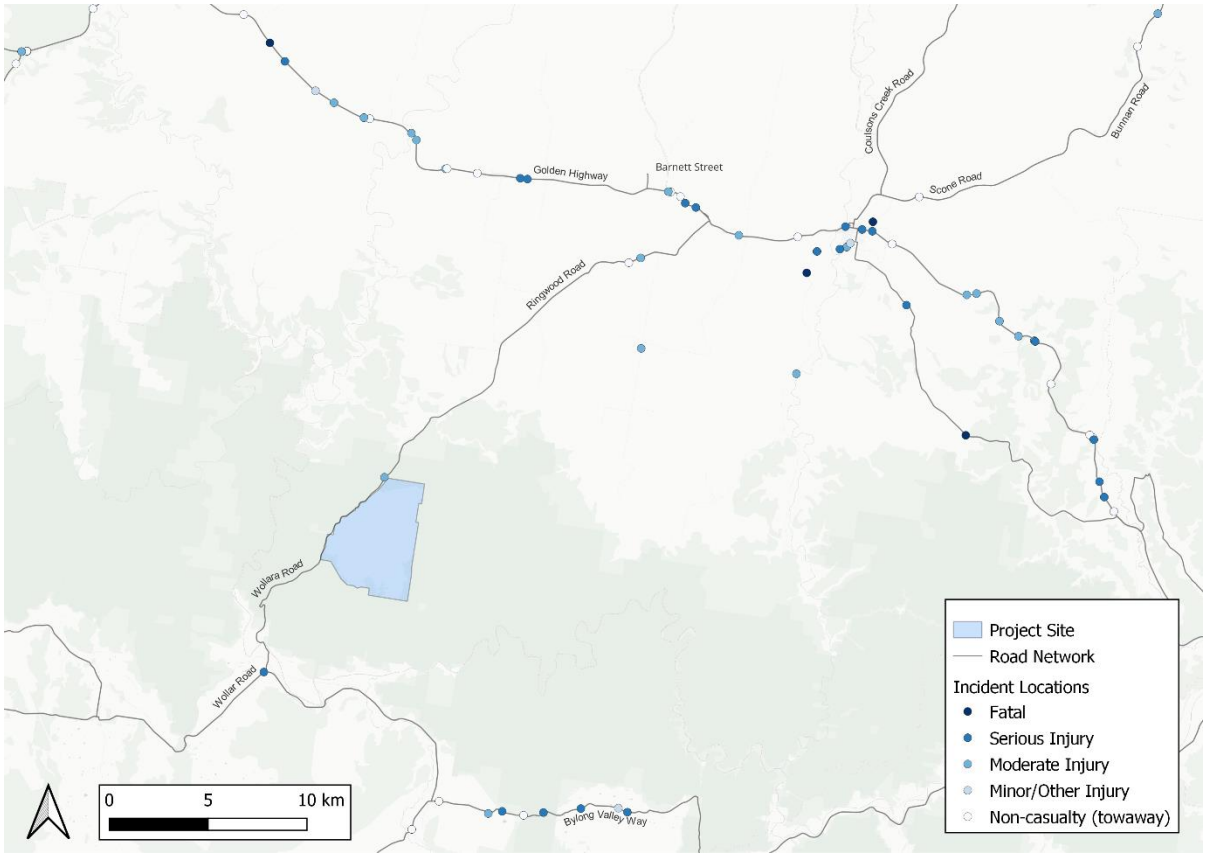


Figure 2-19: Vehicle incident locations

3. Proposed development

3.1. Goulburn River Solar Farm

Key components of the Project are proposed to include:

- Approximately 1 million bifacial solar PV modules in an east-west single-axis tracking arrangement with an approximate height of five metres above ground level
- A centralised BESS with an approximate 450 MWp and 900 MWh capacity or a decentralised BESS with an approximate 580 MWp and 1160 MWh capacity. The BESS would be housed in a series of outdoor containers grouped together adjacent to the substation
- Onsite 500 kV switchyard and substation, with underground electrical conduits and cabling leading into the yard and overhead lines reaching above to the existing transmission line. An additional tower may be erected on the current line to accommodate the grid connection
- Onsite power line connection via underground electrical conduits and cabling
- Communications tower, up to 30 metres high, providing communications, radio and cellular services to the site and wider region
- Internal and perimeter access allowing for site maintenance
- Site office and operations and maintenance building with parking for the operations team
- A primary solar farm site access point off Wollara Road at an existing driveway to the south. Two emergency access points are proposed off Wollara Road (for emergency and National Parks and Wildlife Service access only), one opposite the White Box Trail and one north of the White Box Trail
- Drainage line crossings if and where required to manage existing surface water flows (to be determined during further design development) and access points for construction purposes
- Perimeter security fencing, crossing gates, water tanks or dams, and potential alternate internal secondary access points (within the Project site) to facilitate sheep grazing.

An overview of the footprint for the EIS Project compared to the Amended Project is shown in Figure 3-1.

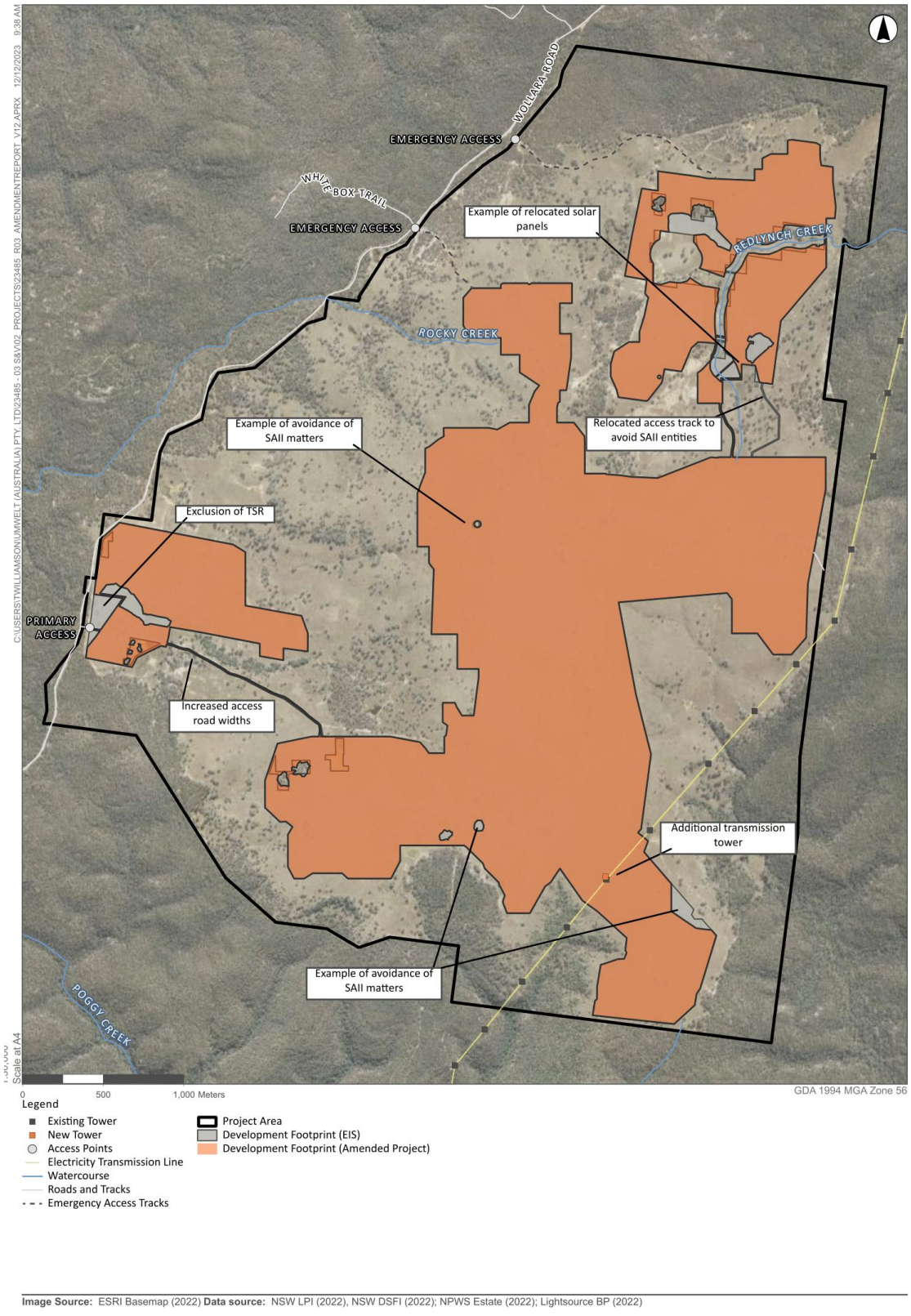


Figure 3-1: Project footprint

3.2. Construction activities

3.2.1. Working hours

Subject to approval, construction is expected to commence in 2024 and take up to 27 months to complete.

Construction activities would mostly occur from 6:00am to 6:00pm, Monday to Saturday.

3.2.2. Construction compound areas

Construction compound areas (including laydown areas, security hut and temporary parking) are proposed within the Project Site as shown in Figure 3-1.

3.2.3. Construction vehicle routes

As discussed in Section 2.3, roads forming part of the construction vehicle route for light vehicles and heavy vehicles include the Golden Highway, Ringwood Road, Wollara Road and Barnett Street as follows:

- Ingress: Golden Highway westbound, left-turn onto Ringwood Road southbound, continue straight onto Wollara Road southbound, left-turn into site
- Egress: Right-turn out of site onto Wollara Road northbound, continue straight onto Ringwood Road northbound, left-turn onto Golden Highway westbound, right-turn onto Barnett Street northbound, U-turn via turnaround facility approximately 190 metres north and continue onto Barnett Street southbound, left-turn onto Golden Highway eastbound.

Standard Project construction vehicles, including light vehicles, shuttle buses and heavy vehicles, are anticipated to originate from the Golden Highway east of Ringwood Road. This is due to the Port of Newcastle being the main receival port for the Project, the presence of industry and services to the east (Merriwa, Scone, Muswellbrook etc) and the absence of population centres to the west along the Golden Highway.

The majority of light vehicle and shuttle bus trips would be to and from accommodation in and around Merriwa. Merriwa is identified as the preferred option to house the construction workforce in the Project's Accommodation and Employment Strategy (submitted as part of the Amendment Report, Umwelt 2023).

Upgrades are proposed to facilitate the left-in, left-out arrangement for Project construction vehicles at the Golden Highway / Ringwood Road intersection, and include a 325m acceleration lane in the westbound direction. This will ensure a compliant intersection arrangement for these movements. The proposed intersection upgrade is discussed in Section 3.2.5.

To ensure that Project vehicles are only performing a left-in, left-out at the intersection, management and mitigation measures would be required, as discussed in Section 5.

All deliveries to site (excluding oversized loads discussed in Section 3.2.4 and Section 3.3.2) would be carried out by 19 metre semi-trailers to comply with heavy vehicle restrictions on Wollara Road and Ringwood Road. These deliveries would be conducted via the Hunter Expressway, New England Highway, Golden Highway, Ringwood Road, Wollara Road and Barnett Street. One primary access point is proposed on Wollara Road. The proposed construction vehicle routes and site access are shown in Figure 3-2.

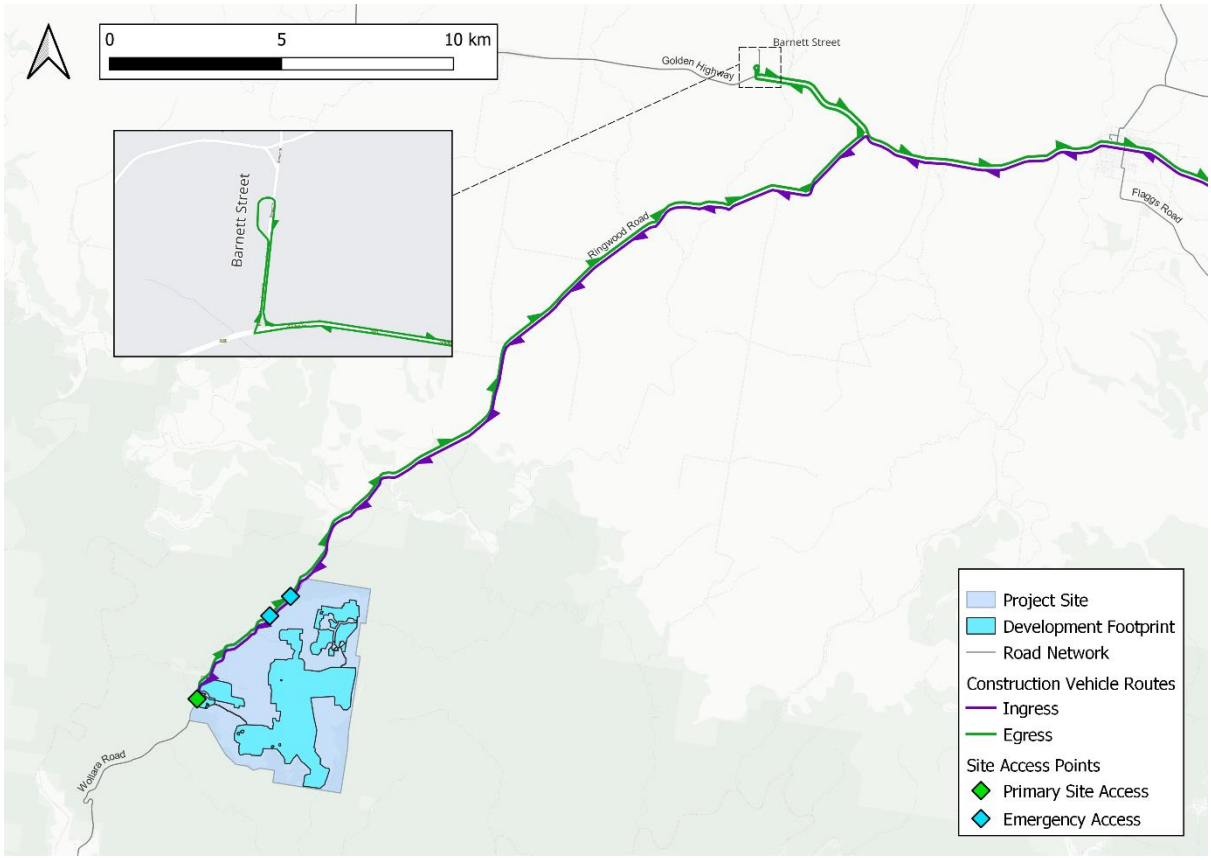


Figure 3-2: Construction vehicle routes and site access

3.2.4. Oversize overmass vehicle routes

Transportation of large Project infrastructure would require OSOM vehicles exceeding the regulatory limits of standard vehicle dimensions of 19m in length, 2.5m in width, 4.3m in height and 42.5t in weight (depending on axle groups). OSOM vehicles are expected to travel to the site from Port of Newcastle via Industrial Drive, Pacific Highway, Newcastle Inner City Bypass, Newcastle Road, Hunter Expressway, New England Highway and Golden Highway, as shown in Figure 3-3. These are all approved B-double roads and are suitable for the OSOM vehicles considered for this project.

OSOM vehicles would return via the same roads in the reverse direction. Contrary to standard Project construction vehicles, egressing OSOM vehicles are proposed to perform a right-turn from Ringwood Road to the Golden Highway in the eastbound direction, as these movements would be undertaken outside of peak periods and under additional traffic control and management.

A review of the OSOM vehicle route shown in Figure 3-3 was undertaken with the infrastructure in its current condition. The causeways at Bow River and Killoe Creek require upgrades (discussed in Section 3.2.5) to facilitate the swept path of the OSOM loads, as shown in Appendix F. At other locations along the route, traffic management measures (such as those identified in Section 5) are necessary, and would be outlined in a Construction Traffic Management Plan (CTMP), to be developed by the construction contractor during detailed investigation of the OSOM vehicle route at a later stage of the Project. To inform the OSOM vehicle route assessment, Lightsource bp has obtained a Transport Management Plan developed by Rex J Andrews for a project located further west of the Project Site (see Appendix G). The Transport Management Plan includes an assessment of the same OSOM vehicle to be used by this Project and OSOM vehicle route from the Port of Newcastle to the Golden Highway / Ringwood Road intersection. Hence, the required traffic management measures to accommodate OSOM vehicles for this Project would be the same (up until the Golden Highway / Ringwood Road intersection) and include:

- Pacific Highway / Newcastle Inner City Bypass – Due to the intersection geometry, traffic management may be required so that OSOM vehicles can negotiate the left turn from Pacific Highway onto Newcastle Inner City Bypass.
- Newcastle Inner City Bypass in Sandgate and Jesmond – Due to vertical limitations at four overpasses along the Bypass, OSOM vehicle loads may need to be lowered to ensure enough clearance is provided.
- New England Highway / Golden Highway – The NSW Government is currently upgrading this intersection as part of the New England Highway Upgrade between Belford and Golden Highway, which is scheduled for completion in late 2024. A review of available public information shows that the existing and proposed intersection design could accommodate OSOM vehicles. As part of the detailed OSOM route assessment, the progress of the New England Highway Upgrade project would be checked to determine if traffic management measures are required.
- Golden Highway / Putty Road / Mount Thorley Road intersection – Due to the intersection geometry, traffic management may be required so that OSOM vehicles can negotiate the right turn from Golden Highway/Putty Road onto Golden Highway/Mount Thorley Road.
- Golden Highway near Ogilvies Hill and Winery Hill – Due to some steep grades, additional pull trucks may be required to assist OSOM vehicle movements through this area.
- Golden Highway at Denman Bridge – Due to vertical and horizontal limitations at the Denman Bridge truss structure, OSOM vehicle loads may need to be lowered to ensure enough clearance is provided.
- Golden Highway / Ringwood Road intersection – Due to the intersection geometry, traffic management may be required so that OSOM vehicles can turn into and out of Ringwood Road.
- Ringwood Road and Wollara Road – The causeways at Bow River and Killoe Creek were identified as inadequate to accommodate OSOM vehicles. Hence, culvert upgrades (discussed in Section 3.2.5) are proposed and would be

designed and constructed to be able to accommodate the OSOM vehicles generated by the Project (see Appendix F).

Parking bays for fatigue breaks that can accommodate the proposed OSOM vehicles are located near the New England Highway / Golden Highway interchange in Whittingham (115m x 9m clearance), near the Golden Highway / Putty Road intersection in Mount Thorley (100m x 10m clearance), on the Golden Highway west of the United Colliery Mine in Warkworth (100m x 8m clearance), near the Golden Highway / Honey Lane intersection in Sandy Hollow (50m x 4m clearance), near the Golden Highway / Westwood Road intersection in Gungal (70m x 6m clearance) and near the Golden Highway / Brisbane Street intersection in Merriwa (100m x 5m clearance).

Swept paths of the OSOM vehicles at the Golden Highway / Ringwood Road intersection and at the site access is discussed in Section 3.2.6, and when combined with the Transport Management Plan by Rex J Andrews, provides an assessment of the entire OSOM route proposed for this Project.

The movement of OSOM vehicles would require a permit to access public roads with escort vehicles as part of a convoy. In obtaining a permit, a CTMP, as discussed above, would need to be prepared by the construction contractor and include details such as the route, duration, road closures, traffic detours, notifications and any required Traffic Guidance Schemes.

Details of the proposed OSOM vehicle dimensions including swept paths along sections of Wollara Road and Ringwood Road are provided in Appendix F.

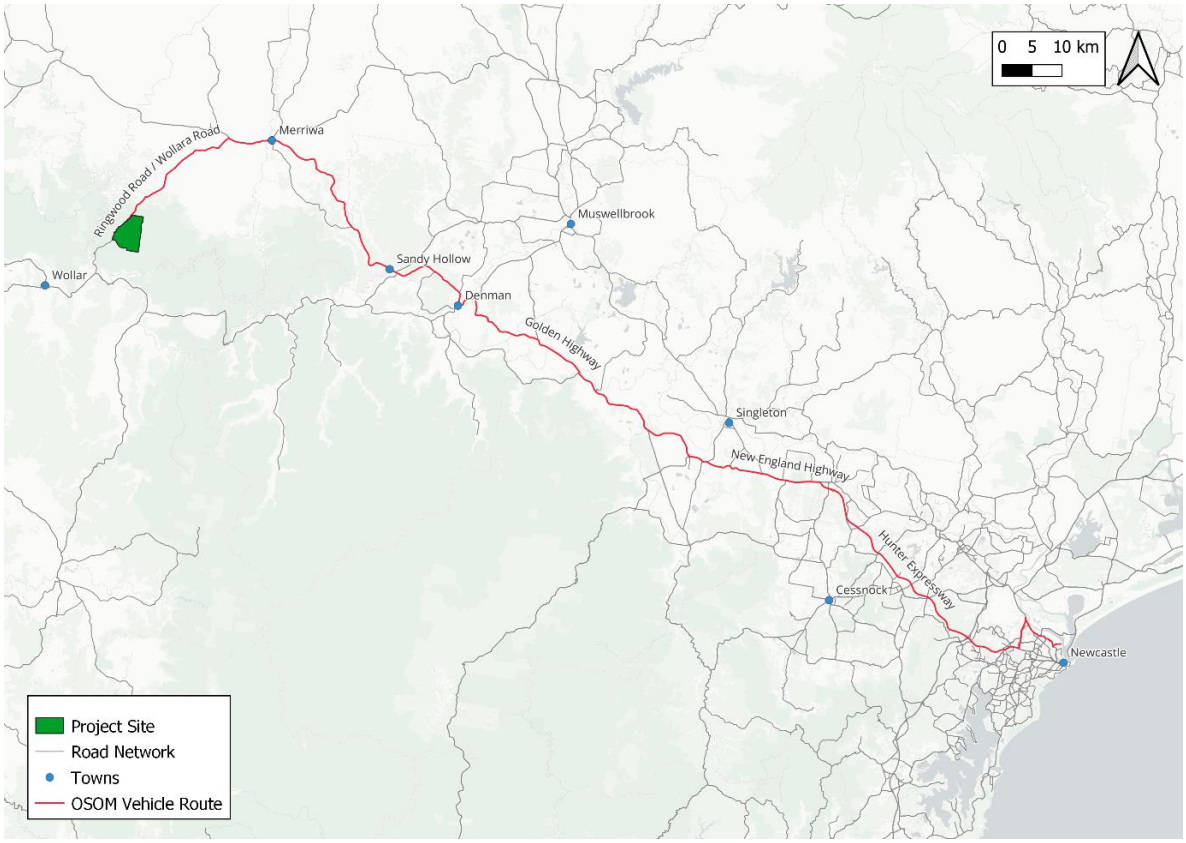


Figure 3-3: Indicative OSOM vehicle route

3.2.5. Intersection, road and culvert upgrades

A summary of the proposed intersection, road and culvert upgrades are shown in Table 3-1 and would be undertaken in consultation with Upper Hunter Shire Council, Transport for NSW and National Parks and Wildlife Service. These upgrades are discussed in further detail in the sections below.

Table 3-1: Schedule of intersection, road and culvert upgrades

Works to be carried out	Reason	Timing
Upgrade of Ringwood Road north of the National Park including a 1.8km section to be widened and resealed between Bow River and Killoe Creek and a 1.6km section to be realigned, widened and sealed between Killoe Creek and Binks Road	Community benefit	Prior to construction of the Project
Upgrade of Wollara Road with realignment, widening and resealing of a 4.7km unpaved section between the National Park and 1621 Wollara Road	Community benefit	Prior to construction of the Project
Intersection upgrades at Golden Highway / Ringwood Road with a compliant left-turn in and left-turn out arrangement, and pruning and vegetation removal to improve sight lines	Improve safety	Prior to construction of the Project
Additional signage and linemarking at the Golden Highway / Barnett Street intersection	Improve safety	Prior to construction of the Project

Additional signage at the primary site access	Improve safety	Prior to construction of the Project
Installation of a culvert on Ringwood Road at Bow River	Accommodate construction vehicles including OSOM loads	Prior to construction of the Project
Installation of a culvert on Ringwood Road at Killoe Creek	Accommodate construction vehicles including OSOM loads	Prior to construction of the Project

Culvert upgrades

As discussed in Section 3.2.4, upgrades to the two water crossings on Ringwood Road at Bow River and Killoe Creek are required to accommodate the loading from Project construction vehicles. Improvements to road flood immunity are an expected auxiliary benefit of the proposed culvert upgrades. These upgrades include:

- Installing culverts designed to accommodate two-way heavy vehicles, including B-doubles and various farm machinery over the Bow Creek and Killoe Creek
- Culvert width of 7 m (3.5 m lane width) with a sealed carriageway, guardrails, signage and associated drainage works
- Stockpile site to be located on disturbed land within the road reserve, in consultation with Upper Hunter Shire Council
- Temporary side track at both locations to facilitate access during construction.
- All culvert upgrades designed to B-double standards. However, the Project would only use 19 metre semi-trailers, with the exception of OSOM loads under permit.

Road upgrades

A review of the roads forming part of the transport route was undertaken based on a drive-through visual inspection. This inspection identified that sections of Ringwood Road and Wollara Road had poor pavement condition and poor drainage. Upper Hunter Shire Council were contacted to determine the existing pavement profile of these roads and if any works had been carried out on these roads with available design drawings. Since conducting the initial inspection, Upper Hunter Shire Council has conducted repairs to the road pavement to reduce the surface defects. While the roads have surface defects in sections, they are sufficient to accommodate the 19 metre semi-trailers proposed for the Project.

The proponent has committed to further road upgrades which are not required for the Project but are a benefit to the community under a Voluntary Planning Agreement with Upper Hunter Shire Council as follows:

- Widening and resealing of a 1.8km section of Ringwood Road between Bow River and Killoe Creek.
- Realignment, widening and sealing of an additional 1.6km section of Ringwood Road between Killoe Creek and Binks Road.
- Realignment, widening and sealing of a 4.7km unpaved section of Wollara Road between the Goulburn River National Park boundary and 1621 Wollar Road.

These upgrades would include 8m bitumen-sealed formation with a minimum of 500mm unsealed shoulders. The horizontal and vertical alignment of the proposed road would ensure safe sight distance, safe movement of longer vehicles, and an improved road network for the users. All road upgrades have been designed to B-double standards. However, the Project would use 19 metre semi-trailers, with the exception of OSOM loads.

The footprint of the proposed road and culvert upgrades are shown in Figure 3-4 and Figure 3-5. Drawings of these upgrades are provided in Appendix H.

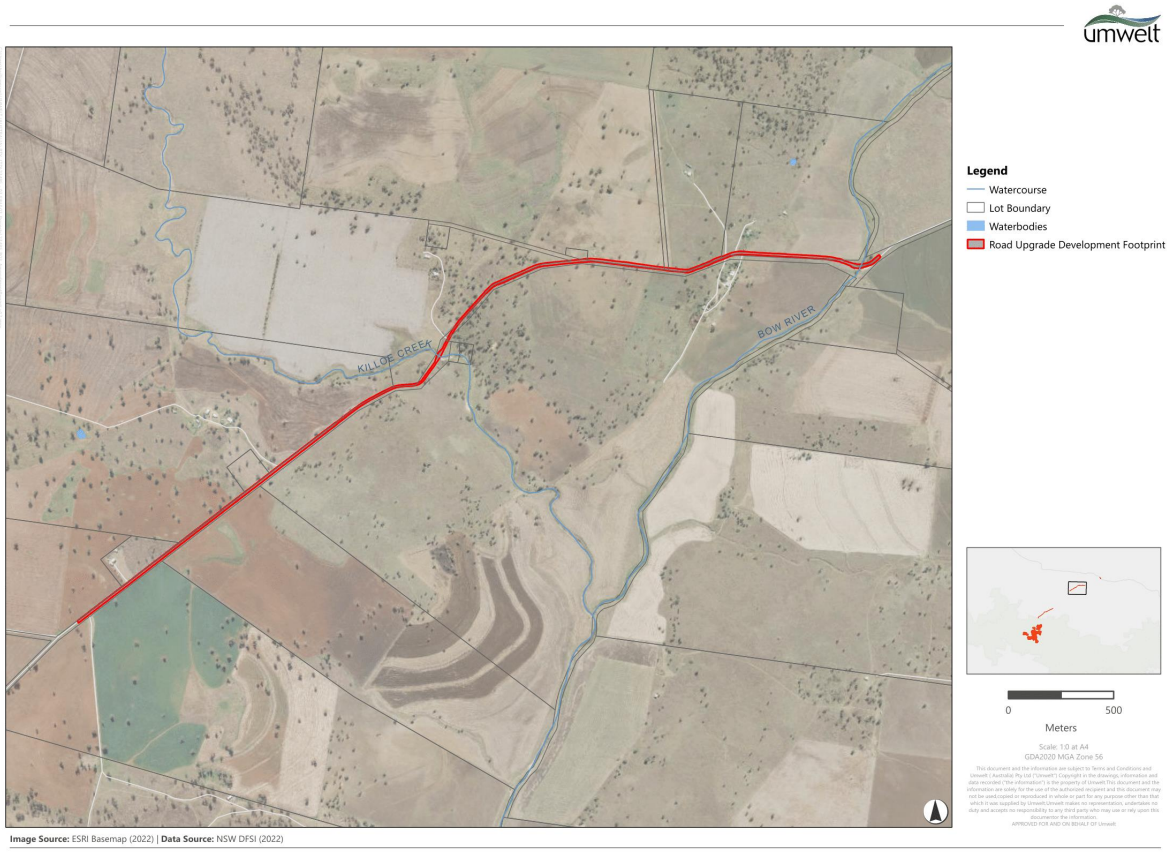


Figure 3-4: Road and culvert upgrade footprint along Ringwood Road

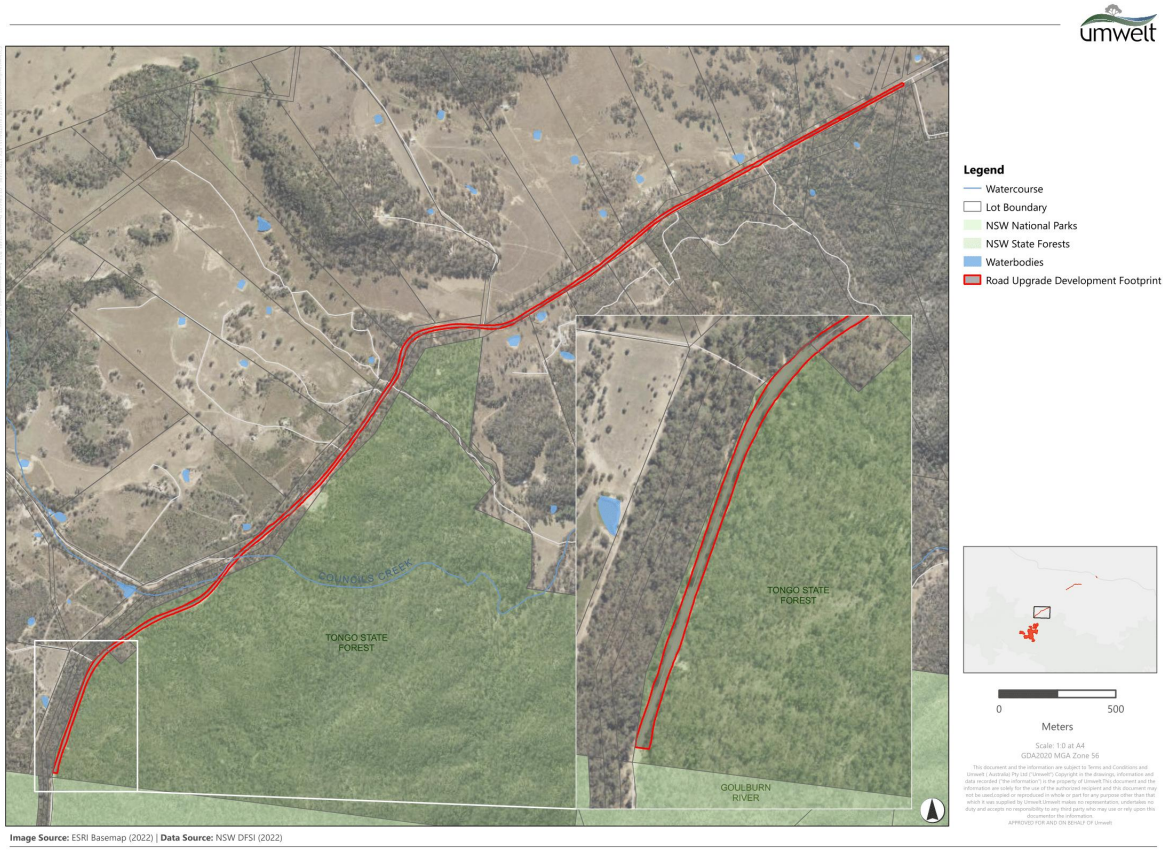


Figure 3-5: Road upgrade footprint along Wollara Road

Intersection upgrades

As discussed in Section 2.3.3 and as observed during the site inspection, existing sight distance at the intersection of Ringwood Road and Golden Highway is restricted. To provide a safe intersection arrangement for the Project, DPE and Transport for NSW were consulted and a number of investigations were carried out. The development of the intersection design is summarised in Table 3-2.

Table 3-2: Golden Highway and Ringwood Road intersection design development

Design item	Investigations carried out	Outcome
SISD from Ringwood Road looking east to westbound traffic on Golden Highway	• Speed survey on Golden Highway to confirm the 85th percentile speed (99.9 km/h as outlined in Section 2.3.5). • Investigations to modify Ringwood Road vertical alignment. • Investigations to modify the horizontal and vertical alignment of Golden Highway.	It was not possible to provide adequate sight distance for this movement that would be practical for the Project. To overcome this, a new acceleration lane for the left turn from Ringwood Road onto Golden Highway westbound was proposed. Project construction vehicle movements (left-in, left-out only) would be enforced as per the management and mitigation measures outlined in Section 5.
Acceleration lane out from Ringwood Road into Golden Highway	• Review of traffic volumes (to provide an appropriate treatment). • Entry speed into acceleration. • Safety of motorists.	A 325m acceleration lane, which meets the requirements for a light vehicle was implemented in the design. It would be impractical to provide a compliant acceleration lane for a heavy vehicle (lane length required would be in excess of 1km) A painted median to facilitate the left turn has been proposed rather than a kerb median which would not fit the character of the intersection arrangement and potentially introduce a new hazard to motorists.
Deceleration lane into Ringwood Road from Golden Highway	• Reverse engineering of the deceleration lane design. • Review of traffic volumes (to provide an appropriate treatment).	The existing deceleration lane taper was found to be non-compliant in length for the design speed along Golden Highway. The line marking was amended to provide a compliant taper.

Following the design development process and discussions with DPE and Transport for NSW, upgrades proposed at the Golden Highway / Ringwood Road intersection include:

- Pruning and removal of vegetation and select trees on Lot 1 / DP 34496. Currently estimated at 6 established trees to be removed.
- Construction of a 325m acceleration / merge lane to allow vehicles to safely turn left onto the Golden Highway from Ringwood Road. Potential earthworks on Lot 1 / DP 34496 and potential realignment of the existing low voltage power line to provide clearance to the acceleration lane.
- Extension of the existing Golden Highway westbound and Ringwood Road left-in deceleration lane taper to 30m.
- Formalisation of the informal bus stop on Ringwood Road at the intersection with Golden Highway (Lot 7303 / DP 1146691).

The intersection upgrade footprint is shown in Figure 3-6. Drawings of the proposed intersection upgrades are provided in Appendix C.

Figure 3-6: Intersection upgrade footprint at Golden Highway / Ringwood Road

As discussed in Section 3.2.3, Project construction vehicles would use the turnaround facility on Barnett Street to return on the Golden Highway in the eastbound direction. No intersection geometry changes are required to accommodate these movements on Barnett Street. Notwithstanding, the addition of a give-way line and associated signage on Barnett Street is recommended to indicate that vehicles exiting Barnett Street are to provide right of way to vehicles on Golden Highway. Additional signage on both Golden Highway approaches to the intersection is recommended to warn general traffic that trucks are turning at the intersection.

Installation of warning signs (“Symbolic Truck”) are recommended near the primary site access point. These are shown in Appendix I.

3.2.6. Swept paths

Swept paths along the proposed construction vehicle route were assessed and are provided in Appendix C, Appendix F, Appendix I and Appendix J.

A review of the swept paths for a low loader / semi-trailer (19 metre length as per *Austroads Design Vehicles and Turning Path Templates Guide* (Austroads, 2013)) showed the following:

- At the upgraded Golden Highway / Ringwood Road intersection (Section 3.2.5), semi-trailers can safely perform a left-turn into and out of Ringwood Road and light vehicles (non-project related traffic) can safely perform a right-turn into and out of Ringwood Road
- At the Golden Highway / Barnett Street intersection, semi-trailers can safely perform a right-turn into and left-turn out of Barnett Street, with no intersection upgrades required
- At the turnaround facility on Barnett Street approximately 190 metres north of the Golden Highway, semi-trailers can safely perform a U-turn, with no road upgrades required
- The primary site access point in its current configuration may only be able to accommodate one vehicle in or out at a time due to the density of surrounding vegetation. Hence, single vehicle entry/exit would be provided at the primary access, with no vegetation removal required. Traffic management would be used to control vehicle movements at the site access by managing vehicles leaving the site and giving right-of-way to vehicles entering the site, as outlined in a CTMP to be prepared prior to the commencement of construction, as discussed in Section 5.

The two emergency access points (existing tracks) would be used for site emergency access and egress, and as general access for National Parks and Wildlife Service only, and not for construction access.

3.3. Traffic generation

3.3.1. Workforce

The workforce anticipated during construction of the Project includes an approximate 350 construction jobs created during peak construction. This would comprise licensed electrical and mechanical trade personnel, machinery operators, riggers and labourers. The breakdown of workforce personnel during the construction program is shown in Figure 3-7.

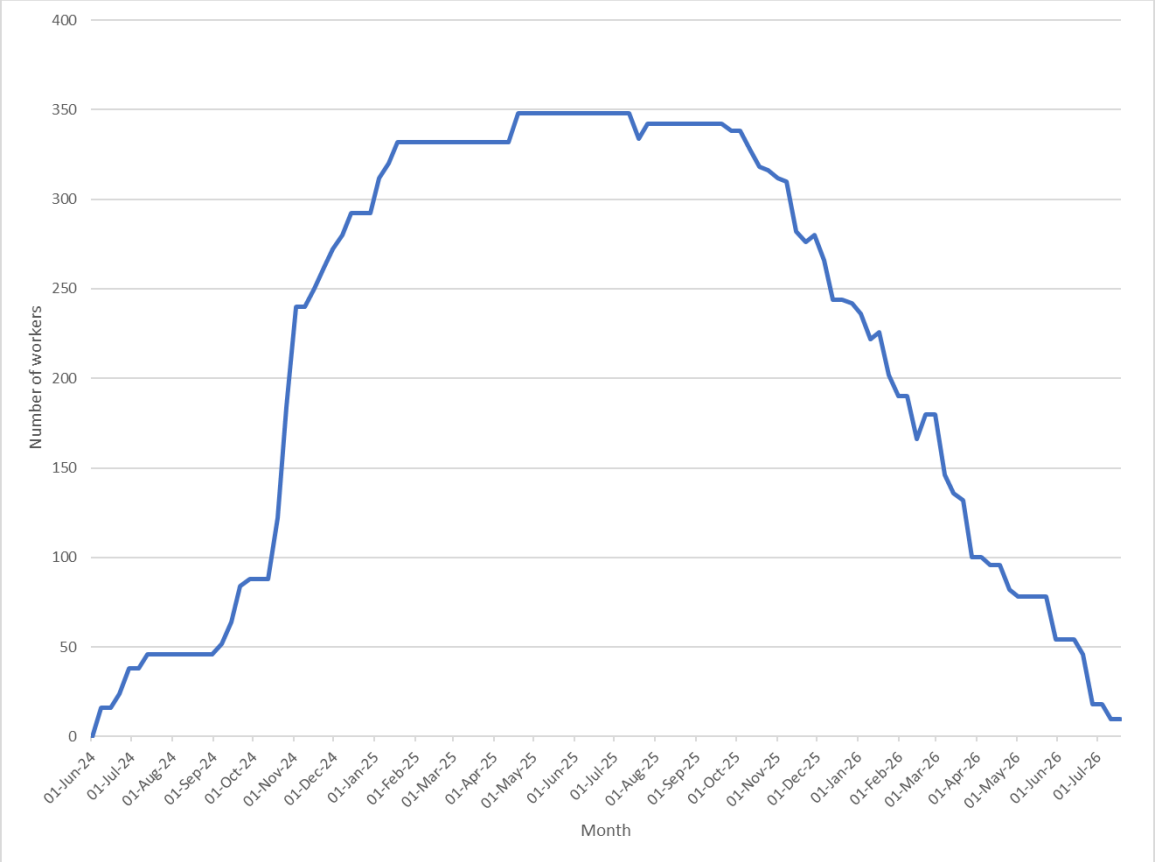


Figure 3-7: Workforce breakdown

3.3.2. Construction traffic

During peak construction, the following trips are anticipated to be generated by the Project:

- Light vehicles – 60 two-way trips per day (120 light vehicle movements per day)
- Shuttle buses – 15 two-way trips per day (30 shuttle bus movements per day)
- Heavy vehicles – 55 two-way trips per day (110 heavy vehicle movements per day).

It is noted that the number of light vehicle movements may decrease where the geographic location of workers enables additional shuttle bus movements to be facilitated. This is likely, given that the Project Accommodation and Employment Strategy (supporting the Amendment Report, Umwelt 2023) recommends that construction accommodation be centred in Merriwa.

As discussed in Section 3.2.3, egressing Project construction vehicles would use the Barnett Street turnaround facility to return east on the Golden Highway. There would be shuttle bus use from 6:00am and delivery (light vehicle) use periodically throughout the day. The majority of use will be for construction workers at the end of their shift, likely between 5:30pm and 6:30pm.

In addition, 6 to 12 oversized loads (OSOM vehicles) are expected throughout the construction period, with a maximum of two loads per day. Hence, the Project would generate a maximum total of 12 inbound and 12 outbound OSOM vehicle movements, with no more than 2 inbound and 2 outbound OSOM vehicle movements in one day. As discussed in Section 3.2.4, these movements would only occur during off-peak periods when traffic volumes are low and under additional traffic control and management.

Mobilisation would occur during the first months of the construction program, with more intense construction occurring during mechanical completion. Following this, the Project would move into the commissioning phase during the final months of the construction program.

3.3.3. Operational traffic

During operation, it is likely that up to 10 staff would be on-site concurrently. Staff travelling to and from the site during operation of the Project would generate on average, 10 two-way trips per day (20 light vehicle movements per day).

3.4. Turning areas

As outlined in Section 2.4, the Barnett Street turnaround facility would be used by egressing construction vehicles.

Additionally, while not proposed as part of the Project, should any Project construction vehicles originate from west via the Golden Highway in the eastbound direction, they would be restricted from a right turn into Ringwood Road from the Golden Highway. These vehicles would be directed to Merriwa and use the local road network to turn around and travel on the Golden Highway in the westbound direction to access the site. This would enable a left in movement to be undertaken at the Golden Highway / Ringwood Road intersection.

A suitable turn around route in Merriwa could include Dutton Street, Mackenzie Street and Bow Street. As shown in Figure 2-9, Dutton Street south of the Golden Highway is an approved B-double route. Turn around options in Merriwa have been identified for contingency use only, with no Project construction vehicles anticipated to use this route unless they miss the Ringwood Road and Golden Highway intersection and need to re-approach the Project Site from the east. Use of these local roads by construction vehicles (excluding OSOM vehicles) would be subject to swept paths and sight distance checks, to be carried out as part of the CTMP. Furthermore, Upper Hunter Shire Council would be consulted if regular use of the local road network in Merriwa is required.

3.5. Parking

On-site parking would be provided for all vehicles during construction and operation of the Project.

3.6. Public transport

As part of the proposed intersection upgrade of Golden Highway / Ringwood Road discussed in Section 3.2.5, the existing informal bus stop on Ringwood Road at the intersection with Golden Highway would be formalised. This bus stop is used by one school bus route operated by Osborn's Transport, with one service in the morning and afternoon during school drop off and pick up.

3.7. Active transport

It is not anticipated that any movements associated with the Project would be facilitated via active transport modes.

4. Transport impact assessment

4.1. Construction impacts

4.1.1. Impacts on the road network

Intersection performance

The peak construction year as assessed is expected to occur in 2025, representing a worst-case scenario when background traffic volumes and construction volumes are at their highest. A two per cent per year background traffic growth rate has been applied to the 2022 traffic volumes collected, based on corridor growths outlined in the *Golden Highway Corridor Strategy* (Transport for NSW, 2016).

In addition to background traffic growth, peak hour traffic volumes generated by other nearby projects were included in the modelling assessment. EIS as well as TTIAs for the projects outlined in Section 4.1.5 were reviewed on the DPE Major Projects website. This review was undertaken to determine the likely peak hour volumes generated by transport movements through the Golden Highway / Ringwood Road intersection.

These individual project volumes are shown in Table 4-1 and provide an indicative cumulative total for transport movements on the Golden Highway.

Table 4-1: 2025 peak hour volumes from other projects

Project name	Light vehicles	Heavy vehicles	Assumptions
Stubbo Solar Farm	N/A	6	• Light vehicle routes do not overlap with Project
Liverpool Range Wind Farm	10	26	• Derived from peak daily volumes • 16 per cent of daily volume to occur during peak hours, as per Austroads Guide to Road Traffic Management Part 6 • One third of daily light vehicle trips to/from Merriwa via Golden Highway, as outlined in planning documents
Valley of the Winds Wind Farm	N/A	4	• Light vehicle routes do not overlap with Project
Tallawang Solar Farm	75	15	• A quarter of light vehicle trips to/from Merriwa via Golden Highway, as outlined in planning documents • 10 per cent of daily heavy vehicle volume to occur during peak hours, as outlined in planning documents
Birriwa Solar Farm	N/A	14	• Light vehicle routes do not overlap with Project
Spicers Creek Wind Farm	N/A	27	• Light vehicle routes do not overlap with Project
Bowdens Silver Project	N/A	5	• Light vehicle routes do not overlap with Project

Project name	Light vehicles	Heavy vehicles	Assumptions
			• Heavy vehicles derived from peak daily volumes • 16 per cent of daily volume to occur during peak hours, as per Austroads Guide to Road Traffic Management Part 6
Cumulative total	**85***	**97****	

*85 inbound trips during the morning peak hour and 85 outbound trips during the evening peak hour
**97 inbound and 97 outbound trips during the morning peak hour and evening peak hour

Peak hour construction volumes used in this assessment have been determined by applying the following assumptions to the daily construction volumes outlined in Section 3.3.2:

- All light vehicle and shuttle bus trips assumed to travel inbound during the morning peak hour and outbound during the evening peak hour to represent a worst-case scenario. In reality, the majority of light vehicle and shuttle bus trips would likely occur before the morning peak hour and after the evening peak hour
- All inbound construction vehicles assumed to originate north of the site from Golden Highway east of Ringwood Road
- All outbound construction vehicles assumed to travel north of the site towards destinations accessible from Golden Highway east of Ringwood Road
- Ten percent of daily heavy vehicle trips to occur during the peak hours
- Inbound and outbound heavy vehicle trips to occur during both peak hours
- Oversized vehicle trips would not occur during the peak hours
- Shuttle buses have been classified as a heavy vehicle for modelling purposes.

Construction peak hour volumes for the Project and adopted for the intersection performance assessment are shown in Figure 4-1. The Project peak hour volumes include:

- Light vehicles: 60 inbound trips during the morning peak hour and 60 outbound trips during the evening peak hour
- Shuttle buses: 15 inbound trips during the morning peak hour and 60 outbound trips during the evening peak hour
- Heavy vehicles: 6 inbound and 6 outbound trips during the morning and evening peak hour.

The peak hours modelled represent the road network peak hour (when background traffic volumes are highest), with peak Project construction vehicle hourly volumes, representing a worst-case scenario.

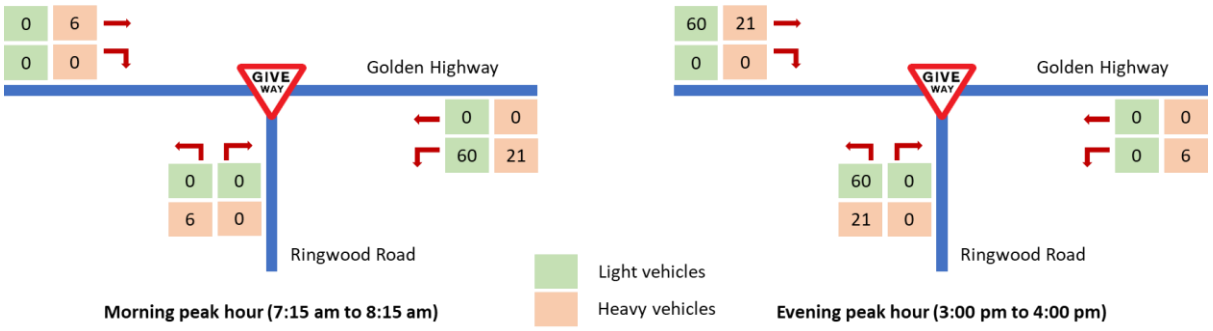


Figure 4-1: Goulburn River Solar Farm Project construction peak hour traffic volumes at the Golden Highway / Ringwood Road intersection

The performance of the modelled Golden Highway / Ringwood Road intersection in SIDRA with and without Project construction vehicles in 2025 is shown in Table 4-2 (Project only) and Table 4-3 (cumulative construction).

Table 4-2: Intersection performance during construction (Project only) – Golden Highway / Ringwood Road

Approach and peak period	2025 base				2025 construction			
	DOS	Average delay (sec/veh)	LOS	95% back of queue (m)	DOS	Average delay (sec/veh)	LOS	95% back of queue (m)
Weekday morning peak (7:15am to 8:15am)								
Golden Highway eastbound	0.05	8	A	<5	0.05	8	A	<5
Golden Highway westbound	0.05	9	A	<5	0.07	9	A	<5
Ringwood Road northbound	0.02	7	A	<5	0.02	8	A	<5
Overall intersection	**0.05**	**9**	**A**	**<5**	**0.07**	**9**	**A**	**<5**
Weekday evening peak (3:00pm to 4:00pm)								
Golden Highway eastbound	0.07	8	A	<5	0.12	8	A	<5
Golden Highway westbound	0.06	9	A	<5	0.06	10	A	<5
Ringwood Road northbound	0.01	7	A	<5	0.06	9	A	<5
Overall intersection	**0.07**	**9**	**A**	**<5**	**0.12**	**10**	**A**	**<5**

Table 4-3: Intersection performance during construction (cumulative) – Golden Highway / Ringwood Road

Approach and peak period	2025 cumulative base				2025 cumulative construction			
	DOS	Average delay (sec/veh)	LOS	95% back of queue (m)	DOS	Average delay (sec/veh)	LOS	95% back of queue (m)
Weekday morning peak (7:15am to 8:15am)								
Golden Highway eastbound	0.15	9	A	<5	0.15	10	A	<5
Golden Highway westbound	0.19	9	A	<5	0.19	9	A	<5
Ringwood Road northbound	0.03	12	A	<5	0.04	13	A	<5
Overall intersection	**0.19**	**9**	**A**	**<5**	**0.19**	**13**	**A**	**<5**
Weekday evening peak (3:00pm to 4:00pm)								
Golden Highway eastbound	0.21	8	A	<5	0.26	8	A	<5
Golden Highway westbound	0.16	9	A	<5	0.16	10	A	<5
Ringwood Road northbound	0.01	12	A	<5	0.07	15	B	<5
Overall intersection	**0.21**	**12**	**A**	**<5**	**0.26**	**15**	**B**	**<5**

As shown in Table 4-2, the addition of Project only construction traffic on the road network would result in minimal impacts, with average delay and increasing by up to one second and no change to LOS.

As shown Table 4-3, the addition Project construction traffic with cumulative volumes generated by other projects on the road network would result in a minor increase in the average delay at the Golden Highway / Ringwood Road intersection. The increase in delay is calculated to be 4 seconds during the morning peak hour and 3 seconds during the evening peak hour.

As a result of increased traffic volumes on the Golden Highway, vehicles turning right from Ringwood Road to Golden Highway would wait slightly longer at the intersection prior to completing the turning manoeuvre. It is noted that construction vehicles would not be undertaking this movement.

Although there is a minor increase in the average delay, the intersection would still operate with spare capacity and at an acceptable LOS A during the morning peak hour and LOS B during the evening peak hour.

Overall impacts on intersection performance during construction are anticipated to be minor.

Intersection, road and culvert upgrades

Prior to the commencement of construction of the Project, the proposed intersection, road and culvert upgrades on the Golden Highway, Ringwood Road and Wollara Road north of the National Park would impact vehicles that travel on these roads. These upgrades are discussed further in Section 3.2.5.

Impacts are anticipated to be minor given the low volume of traffic using Ringwood Road and Wollara Road, short term and temporary nature of the works, and the spare capacity available on the Golden Highway. Furthermore, the number of construction vehicles generated during the upgrades would be significantly lower than the number of construction vehicles generated during construction of the Project. The community would be notified of any works proposed and changed road conditions, so that impacted road users can plan their trips well in advance of the proposed changes.

Warrants for intersection improvements

The *Guide to Road Traffic Management Part 6: Intersections, Interchanges and Crossings Management* (Austroads, 2020) specifies warrants for additional turning bays at an intersection, based on a combination of peak hour through and turning traffic movements. Figure 4-2 and Figure 4-3 show the warrants for turn treatments at unsignalised intersections and the approach to calculate major road traffic volumes, respectively.

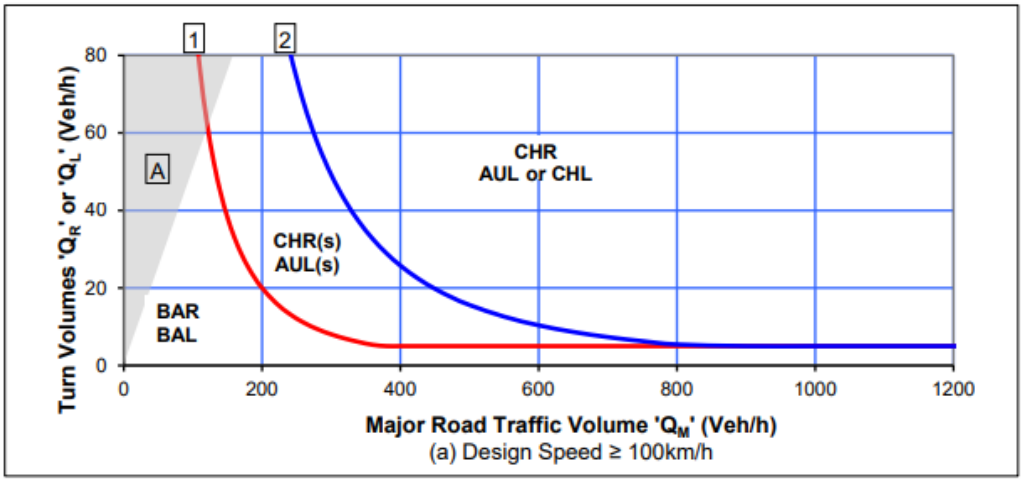
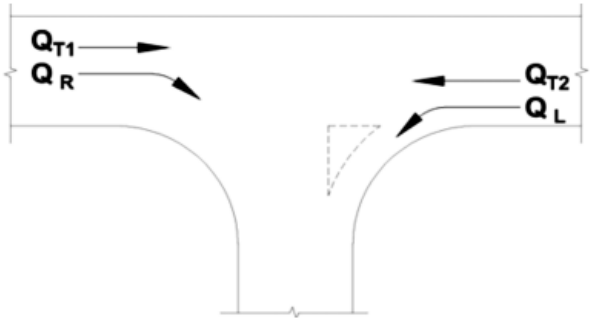


Figure 4-2: Warrants for turn treatments on the major road at unsignalised intersections



Road type	Turn type	Splitter island	Q_M (veh/h)
Two-lane two-way	Right	No	= $Q_{T1} + Q_{T2} + Q_L$
		Yes	= $Q_{T1} + Q_{T2}$
	Left	Yes or no	= Q_{T2}
Four-lane two-way	Right	No	= 50% x $Q_{T1} + Q_{T2} + Q_L$
		Yes	= 50% x $Q_{T1} + Q_{T2}$
	Left	Yes or no	= 50% x Q_{T2}
Six-lane two-way	Right	No	= 33% x $Q_{T1} + Q_{T2} + Q_L$
		Yes	= 33% x $Q_{T1} + Q_{T2}$
	Left	Yes or no	= 33% x Q_{T2}

Figure 4-3: Calculation of major road traffic volume

Approach traffic volumes at the Golden Highway / Ringwood Road intersection in 2025 with and without construction traffic are shown in Table 4-4 (Project only) and Table 4-5 (cumulative construction). The peak hour volumes in Table 4-5 include those generated by other projects, as outlined in Table 4-1.

Table 4-4: Traffic volumes for turn treatments analysis (Project only)– Golden Highway / Ringwood Road

Movement	2025 base		2025 construction	
	Morning peak hour	Evening peak hour	Morning peak hour	Evening peak hour
Major road traffic volume (Q_M) for left turn	64	101	64	101
Major road traffic volume (Q_M) for right turn	145	211	232	298
Left turn volume (Q_L)	14	7	95	13
Right turn volume (Q_R)	5	1	5	1

Table 4-5: Traffic volumes for turn treatments analysis (cumulative) – Golden Highway / Ringwood Road

Movement	2025 base		2025 construction	
	Morning peak hour	Evening peak hour	Morning peak hour	Evening peak hour
Major road traffic volume (Q_M) for left turn	246	198	246	198
Major road traffic volume (Q_M) for right turn	424	490	511	577
Left turn volume (Q_L)	14	7	95	13
Right turn volume (Q_R)	5	1	5	1

The turn warrants assessment with Project only volumes at the Golden Highway / Ringwood Road intersection is shown in Figure 4-6 and Figure 4-7.

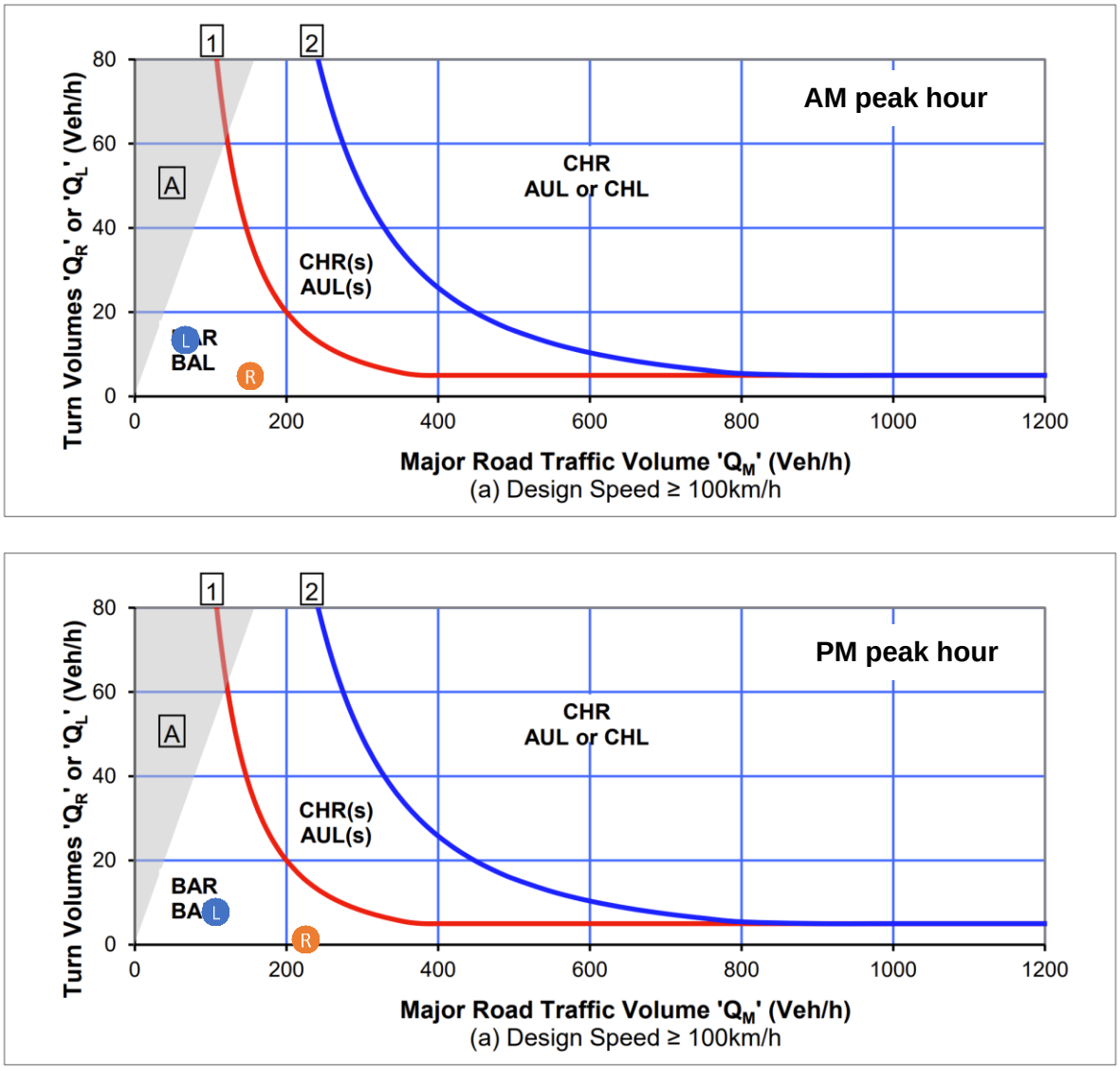


Figure 4-4: Golden Highway / Ringwood Road 2025 base turn warrants assessment

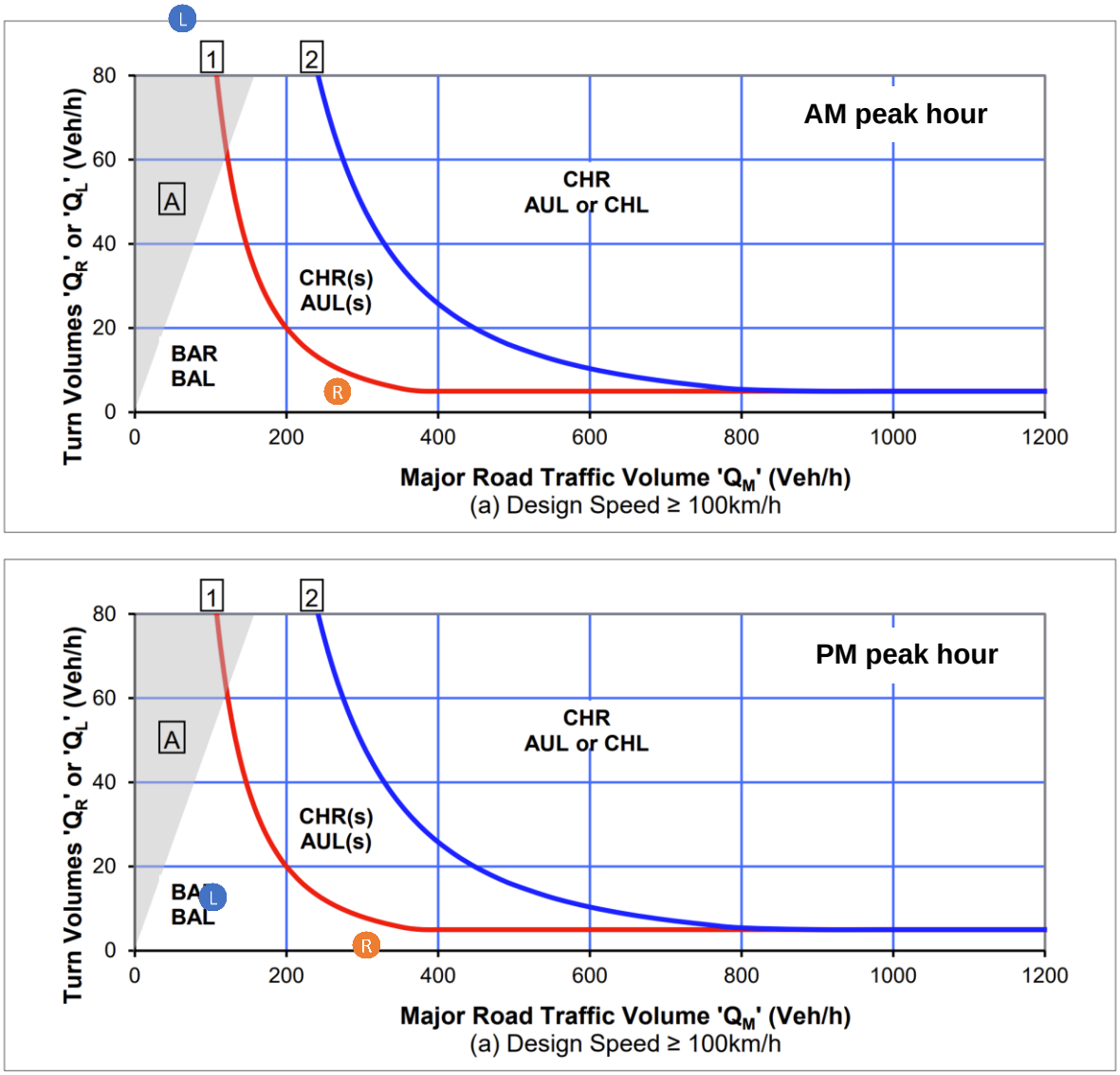


Figure 4-5: Golden Highway / Ringwood Road 2025 construction turn warrants assessment

The assessment found that with and without Project only vehicles and no additional traffic generated by other projects, the intersection should have at minimum basic left and basic right turn treatments. Given that the intersection currently has an auxiliary left turn lane and a basic right turn treatment, no additional changes to the existing intersection arrangement would be required.

The turn warrants assessment for the Project inclusive of cumulative totals at the Golden Highway / Ringwood Road intersection is shown in Figure 4-6 and Figure 4-7.

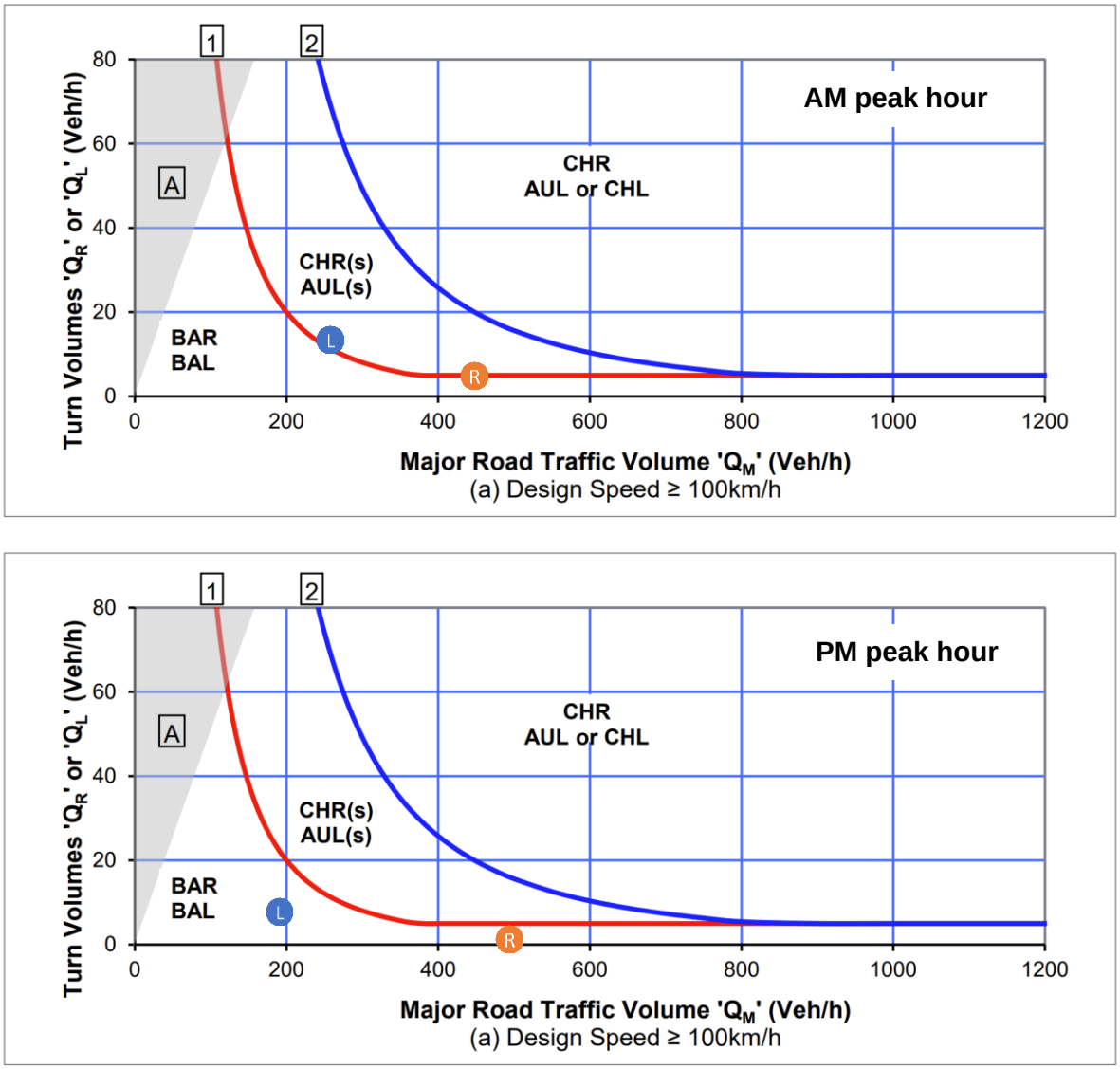


Figure 4-6: Golden Highway / Ringwood Road 2025 cumulative base turn warrants assessment

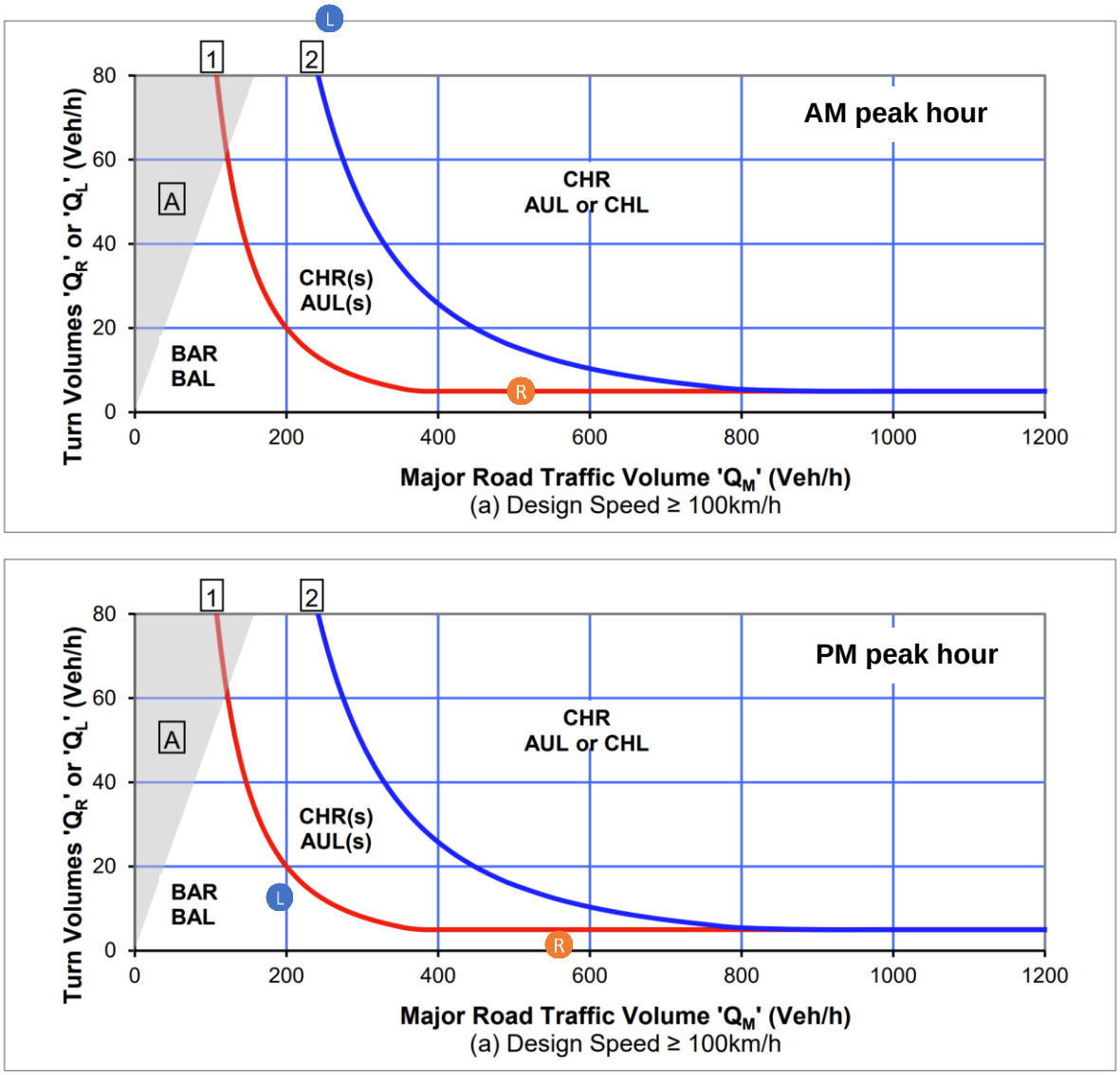


Figure 4-7: Golden Highway / Ringwood Road 2025 cumulative construction turn warrants assessment

The assessment found that an auxiliary left turn lane (full or short) is required and a channelised right turn lane (short) may be required to meet the turn warrants assessment for the morning peak hour. A basic left turn lane and right turn lane is required to meet the turn warrants assessment for the evening peak hour. The intersection currently has an auxiliary left turn lane (short) and a basic right turn lane.

The turn warrants assessment with cumulative construction traffic is marginally above the threshold for a full auxiliary left turn lane however the cumulative volumes used in the assessment are a worst-case scenario. The likely volumes would be lower and within the threshold for a short auxiliary left turn lane.

This conclusion is based upon the following:

- The assumed 16 per cent of daily construction vehicles generated by the Liverpool Range Wind Farm and Bowdens Silver Project to occur during the peak hours is the upper percentage of the recommended range specified in the Austroads Guide to Road Traffic Management Part 6
- The 75 inbound light vehicles during the morning peak hour generated by the Tallawang Solar Farm assumes that all workers from Merriwa travel to the site by car. The Traffic Impact Assessment for this project states that there is potential for staff to travel by buses from off-site hubs which would reduce the peak staff traffic generation
- The 97 heavy vehicles generated by other projects have been assumed to originate and terminate in areas east of the Golden Highway / Ringwood Road intersection. In reality, a portion of these trips would not travel through the intersection, particularly for the Liverpool Range Wind Farm, where the assumed 26 heavy vehicles include internal trips between site access points, quarries and batch plants proposed for the project further west of the intersection
- Peak construction of the Stubbo Solar Farm is anticipated in 2024. Hence, the six heavy vehicles generated during peak construction of this project would likely be lower in 2025.
- Construction of the Birriwa Solar Farm is anticipated to commence in late 2025. Hence, the 14 heavy vehicles generated during peak construction of this project would likely be lower in 2025.
- The Project would likely generate a higher number of shuttle buses due to the accommodation proposed in Merriwa, resulting in a lower number of light vehicles and an overall lower number of total vehicles.

In addition, a number of constraints exist on the Golden Highway on approach to Ringwood Road, and the extension of the existing short auxiliary left-turn lane to a full length would require extensive design development and construction works resulting in additional environmental impacts and significant capital expenditure to conduct the road upgrade. It is noted that this section of Golden Highway is on an incline, and the speed survey measured an 85th percentile speed of 99.9km/h on the Golden Highway on approach to Ringwood Road. Hence, it is more than likely that a motorist would be travelling slower than 100km/h at the taper of the deceleration lane. Due to this, it has been deemed that the implementation of a full length auxiliary left turn lane is not necessary. Notwithstanding, to improve safety at the intersection, a review of existing advisory signage on approach to the intersection would be undertaken and modifications or additional signage would be installed, in line with Australian Standards 1742.2.

As mentioned in Section 3.2.5, the design of the proposed intersection upgrade would implement an extension to the existing taper to be compliant.

Given that project construction vehicles are not proposed to perform a right turn at the intersection and the assessed cumulative volumes are on the threshold of a basic right turn and channelised right turn (short), the existing basic right turn treatment was retained.

This proposed intersection arrangement is supported by the 2025 intersection performance results where the intersection would operate with spare capacity and at a good LOS during construction.

4.1.2. Impacts on parking

During construction, impacts on parking are not anticipated given that on-site parking would be provided for all vehicles generated by the Project. Furthermore, no formal parking facilities are located within close proximity to the site.

4.1.3. Impacts on public transport

Bus network

Minimal impacts are anticipated on bus services that travel on the Golden Highway given the infrequency of these bus services, the low volume of peak hour construction traffic generated by the Project, and the ample spare capacity available on the road network.

The school bus route that operates on Ringwood Road towards Merriwa and Scone would experience minor impacts due to the additional construction traffic using this road and the increase in left-in and left-out movements at the Golden Highway / Ringwood Road intersection. As discussed in Section 3.6, the informal bus stop at this intersection would be formalised as part of the proposed intersection upgrade, improving amenity for school students and parents/carers that use this bus stop. Furthermore, the school bus service during the morning and afternoon (one service in each direction during school days) would not coincide with peak construction vehicle movements. Hence, restrictions to heavy vehicle movements would not be required. Notwithstanding, mitigation measures are recommended to minimise the impact on students and parents/carers that use the bus stops on Ringwood Road and are discussed in Section 5.

Rail network

The level rail crossings located on Ulan Road, Wollar Road and Ringwood Road south of the site would not be traversed by construction vehicles. Hence, no impacts are anticipated on the rail network.

4.1.4. Impacts on active transport

No impacts on the pedestrian network are anticipated during construction given the limited pedestrian infrastructure that surrounds the Project Site.

Impacts on the cycle network would be limited to the potential interaction of cyclists with Project construction vehicles on the Golden Highway, Ringwood Road or Wollara Road and during intersection, culvert and road upgrades at these locations.

Given that sections of the Golden Highway are designated cycle routes via the road shoulder or parking lane, cyclists that currently travel on the Golden Highway would be experienced riders. In addition, Ringwood Road and Wollara Road form part of a recommended scenic cycle route. However, no formal cycle infrastructure is provided. Therefore, cyclist volumes on the Golden Highway, Ringwood Road and Wollara Road would likely be low and hence, the overall impact on cyclists is anticipated to be minor.

4.1.5. Cumulative construction impacts

Projects within proximity to the Project site that have construction programs that overlap with construction of this Project may present cumulative impacts relating to the combined increased demand on local infrastructure, transport, and services. Projects that have been considered for the cumulative construction impact assessment are shown in Table 4-6.

Table 4-6: Relevant projects in proximity to site

Project	Status	Proximity and location	Key project details
Stubbo Solar Farm	Approved but currently seeking a modification related to the access road	50 kilometres west	• Planning approval for a 400 MW AC Solar farm • Construction commenced 2023 • 24-26 month construction program • Peak workforce of approx. 400 workers • Located within the Central West Orana Renewable Energy Zone (CWO REZ)
Wollar Solar Farm	Approved	22 kilometres south-west	• Planning approval for a 290MW AC Solar Farm • Construction commenced Q3 2022 • 12-18 month construction program • Peak workforce of approx. 400 workers
Dunedoo Solar Farm	Approved	70 kilometres north-west	• Planning approval for a 55MW AC Solar farm • Construction commencement: 2023 • 12 Month construction program • Peak workforce of approx.100 – 125 workers • Located within the CWO REZ
Liverpool Range Wind Farm	Approved but currently seeking a modification	55 kilometres north-west	• Planning approval for up to 282 wind turbines • Modification Application submitted • Construction commencement: TBC • 36 month construction program • Located within the CWO REZ
Valley of the Winds Wind Farm	Proposed	57 kilometres north-west	• Proposal for up to 131 wind turbines • Response to Submissions phase • Construction commencement: Q1 2024 • 24-42 month construction program • Peak workforce of approx. 400 workers • Located within the CWO REZ
Bowdens Silver Project	Approved	45 kilometres south-west	• Planning approval for an open cut silver mine • Construction commencement: TBC • 18 month construction program • Peak workforce of approx. 180 workers

Barneys Reef Wind Farm	Proposed	50 kilometres west	• Proposal for up to 69 wind turbines • Environmental Impact Statement being prepared • Construction commencement: Q3 2024 • 28 month construction period • Located within the CWO REZ
Tallawang Solar Farm	Proposed	50 kilometres west	• Proposal for a 500MW solar farm • Response to Submissions phase • Construction commencement: Mid 2024 • 34 month construction period • Located within the CWO REZ
Birriwa Solar Farm	Proposed	60 kilometres north-west	• Proposal for a 600MW solar farm • Response to Submissions phase • Construction commencement: Late 2025 • 28 month construction period • Located within the CWO REZ
Merriwa Solar Farm	Proposed	30-kilometres north-west	• Proposal for a 550MW solar farm and 400MW battery • Environmental Impact Statement being prepared • 18 month construction period and 2025 completion
Spicers Creek Wind Farm	Proposed	80 kilometres west	• Proposal for up to 1117 wind turbines • Response to Submissions phase • Construction commencement: Within 1 to 5 years following approval • 40-48 month construction period • Located within the CWO REZ
Sandy Creek Solar Farm	Proposed	83 kilometres west	• Proposal for a 750MW solar farm • Environmental Impact Statement being prepared • Located within the CWO REZ
Cobbora Solar Farm	Proposed	82 kilometres west	• Proposal for a 700MW solar farm • Environmental Impact Statement being prepared • Located within the CWO REZ

Construction vehicle routes for the Stubbo Solar Farm that overlap with the construction vehicle routes for the Goulburn River Solar Farm include the Golden Highway. A review of the proposed construction program indicates that the project would be completed in 2025 and may overlap with the construction program of this Project. Peak construction for the Stubbo Solar Farm is anticipated in 2024, with 230 light vehicle and 60 heavy vehicle two-way trips forecast per day. Given that peak construction of Stubbo Solar Farm would occur prior to peak construction of this Project and that light vehicles would not travel on the Golden Highway near Merriwa, cumulative vehicle generation during the period when construction overlaps between the two projects is anticipated to be lower than the peak construction vehicles generated by this Project.

Construction vehicle routes for the Wollar Solar Farm that overlap with the construction vehicle routes for the Goulburn River Solar Farm include the Golden Highway, Ringwood Road and Wollara Road for light vehicles and heavy vehicles. No road upgrades are proposed as part of this project along Ringwood Road and Wollara Road, with the majority of

vehicles accessing the Wollar Solar Farm further west via Ulan Road, Wollar Road and Barigan Road. Peak construction for the Wollar Solar Farm is anticipated in 2023, with 100 light vehicle and 72 heavy vehicle two-way trips per day. Given that peak construction of the Wollar Solar Farm would occur prior to peak construction of this Project and that construction of the Wollar Solar Farm may be completed by 2025, cumulative vehicle generation in the event that construction is delayed and there is an overlap between the two projects is anticipated to be lower than the peak construction vehicles generated by this Project.

Construction vehicle routes for the Dunedoo Solar Farm that overlap with the construction vehicle routes for the Goulburn River Solar Farm include the Golden Highway for heavy vehicles. Peak construction for the Dunedoo Solar Farm is anticipated in 2024, with 24 light vehicle and 80 heavy vehicle two-way trips per day. Given that peak construction of the Dunedoo Solar Farm would occur prior to peak construction of this Project, light vehicles would not travel on the Golden Highway near Merriwa, and that construction of the Dunedoo Solar Farm may be completed by 2025, cumulative vehicle generation in the event that construction is delayed and there is an overlap between the two projects is anticipated to be lower than the peak construction vehicles generated by this Project.

Construction vehicle routes for the Liverpool Range Wind Farm, Valley of the Winds Wind Farm, Bowdens Silver Project, Tallawang Solar Farm, Birriwa Solar Farm and Spicers Creek Wind Farm include the Golden Highway. A review of available construction information for these projects indicates that if approved, construction of the Valley of the Winds Wind Farm, Tallawang Solar Farm and Birriwa Solar Farm would coincide with the construction program for this Project. The construction commencement year for the Liverpool Range Wind Farm, Bowdens Silver Project and Spicers Creek Wind Farm is not known. The forecast peak daily construction volumes for these projects include:

- Liverpool Range Wind Farm: 178 light vehicle and 160 heavy vehicle two-way trips
- Valley of the Winds Wind Farm: 253 light vehicle and 36 heavy vehicle two-way trips
- Bowdens Silver Project: 100 light vehicle and 31 heavy vehicle two-way trips
- Tallawang Solar Farm: 300 light vehicle and 135 heavy vehicle two-way trips
- Birriwa Solar Farm: 373 light vehicle and 120 heavy vehicle two-way trips
- Spicers Creek Wind Farm: 295 light vehicle and 48 heavy vehicle two-way trips.

Although peak construction for these projects may occur at the same time, the Golden Highway is the only common construction vehicle route and has sufficient spare capacity to accommodate the construction vehicles generated by these projects. Furthermore, light vehicles generated by the Valley of the Winds Wind Farm, Bowdens Silver Project, Birriwa Solar Farm and Spicers Creek Wind Farm would not travel on the Golden Highway near Merriwa.

Projects that are currently in the planning and approval stage with limited available construction information include:

- Barneys Reef Wind Farm
- Merriwa Solar Farm
- Sandy Creek Solar Farm
- Cobbora Solar Farm.

Cumulative construction impacts are anticipated to be minor given the following:

- A number of projects identified in Table 4-6 are either in the early planning stages or would be completed prior to the commencement of construction of this Project
- Those in the early planning stages do not have sufficient construction and traffic information available and if approved are likely to commence after this Project and as such the peak traffic periods would not intersect
- Peak construction of Stubbo Solar Farm, Wollar Solar Farm and Dunedoo Solar Farm would occur prior to peak construction of this Project
- Golden Highway forms part of the construction vehicle routes for the Wollar Solar Farm, Stubbo Solar Farm, Dunedoo Solar Farm, Liverpool Range Wind Farm, Valley of the Winds Wind Farm, Bowdens Silver Project, Tallawang Solar Farm, Birriwa Solar Farm and Spicers Creek Wind Farm. This road has spare capacity (as shown in Section 4.1.1) and would be able to accommodate the additional through movement vehicles generated by these projects
- During peak construction of this Project and non-peak construction of other projects, the surrounding road network would be able to accommodate the additional construction vehicle volumes due to the spare capacity available.

4.2. Operational impacts

Operation of the solar farm would require up to 10 concurrent staff members on-site, with 10 two-way light vehicle trips anticipated per day. In addition, infrequent heavy vehicle deliveries may be required during this phase. Parking would be provided on site for operational staff and heavy vehicle deliveries. Due to the low volumes of operational traffic and provision of parking on-site, minimal impacts on the road network, parking, public transport network and active transport network are anticipated.

5. Mitigation and management measures

Most long-term impacts of the Project would have been addressed through the design process. However, residual impacts that arise from engineering constraints or from construction activities, and which cannot be removed through the design could be managed through mitigation measures.

Mitigation and management measures recommended to minimise impacts on the traffic and transport during construction and/or operation of the Project are shown in Table 5-1.

Table 5-1: Traffic and Transport mitigation and management measures for the Project

Aspect	Mitigation and/or management measures	Timing
Intersection, road and culvert upgrades	Upgrades to Ringwood Road and Wollara Road (including culverts) and the Golden Highway / Ringwood Road intersection, as described in this TTIA	Early construction
Project vehicles at Golden Highway / Ringwood Road	The left-in, left-out arrangement for Project construction vehicles at the Golden Highway / Ringwood Road intersection would be enforced by implementing the following: • Periodic monitoring camera to be installed at the intersection, with footage to be reviewed to ensure necessary corrective measures are taken to ensure compliance • Traffic controllers to undertake spot checks at the intersection for compliance • Site inductions and daily toolbox talks for drivers to include return route identification • Installation of additional signage on Ringwood Road stating that “site traffic must turn left” • As part of the CTMP to be prepared post-approval, a Vehicle Movement Plan (VMP) that clearly shows the construction vehicle routes and permitted movements. The CTMP would also include a Drivers Code of Conduct that construction vehicle drivers would need to read and sign to confirm their responsibilities and reinforce correct behaviour	Construction
CTMP	Prior to the commencement of construction, a CTMP would be prepared in accordance with relevant guidelines and in consultation with Transport for NSW, Upper Hunter Shire Council, National Parks and Wildlife Service and any other relevant stakeholders. The CTMP would outline how construction activities would avoid, mitigate and manage risks involving construction activities, users of the traffic and transport network (including impacted students and parent/carers that use the school bus service on Ringwood Road) and residents. The CTMP would include: • Driver Code of Conduct requirements for all heavy vehicle operators and construction workers. • Traffic Guidance Schemes to alert road users to changed traffic conditions as a result of roadworks or increased traffic activity as a result of the Amended Project.	Pre-construction

	• Vehicle Movement Plans to indicate preferred travel paths for construction vehicles entering, leaving or crossing traffic streams, where required. • Traffic Staging Plans, where required including drawings, that show how traffic will pass safely through or around road construction work sites during various work stages. • Measures to ensure access to adjacent properties during road construction activities are maintained. • Details of any proposed detours. • Details of persons responsible for specific traffic management operations.	
OSOM vehicles	A detailed OSOM vehicle route assessment would be undertaken by the construction contractor and outlined in the CTMP. The CTMP would discuss any traffic management measures required and include details on the OSOM vehicle route, duration, road closures, traffic detours, notifications and any required Traffic Guidance Schemes. This is expected to include: • using spotters at pinch points • limiting OSOM movements to off-peak periods • undertaking OSOM movements under police escort • the use of manual traffic control at specific locations in accordance with an appropriately designed Traffic Guidance Scheme are required.	Construction
Heavy vehicles	Deliveries to site (excluding oversized loads) would be carried out by 19 metre semi-trailers to comply with heavy vehicle restrictions on Wollara Road and Ringwood Road	Construction
Permits and licences	Where relevant, Road Occupancy Licences (ROLs) and crane permits would be submitted and approved prior to the closure of any roads	Construction
Community consultation	The community would be notified in advance of proposed road and transport network changes through appropriate media and other forms of community liaison	Pre-construction Construction Operation
Shuttle buses	Shuttle buses will operate between accommodation sites in Merriwa and site, and construction workers would be encouraged to carpool or use the shuttle buses	Construction
Project parking	Parking requirements for the Project during construction and operation would be provided on-site, and parking would not be provided on public roads adjacent to the site	Construction Operation
Signage and linemarking	Additional signage and linemarking is recommended at the Golden Highway / Barnett Street intersection and installation of warning signs (“Symbolic Truck”) are recommended near the primary site access point	Early construction
Transport for NSW	Transport for NSW would continue to be consulted on upgrades required at the Golden Highway / Ringwood Road intersection	Pre-construction Construction
National Parks and Wildlife Service	National Parks and Wildlife Service would continue to be consulted on road upgrades required near the Goulburn River National Park	Pre-construction Construction
Upper Hunter Shire Council	Upper Hunter Shire Council would continue to be consulted on upgrades required on Golden Highway,	Pre-construction

	Ringwood Road and Wollara Road and if regular use of the local road network in Merriwa is required	Construction
School buses	Osborn's Transport, Merriwa Pre School, Scone Grammar School and Scone High School would be consulted on the proposed formalisation of the bus stop on Ringwood Road at the Golden Highway intersection and informed of the additional construction traffic that would be generated by the Project.	Pre-construction Construction

6. Summary and conclusions

The key findings of the traffic and transport impact assessment of the Project include the following:

- The Project is proposing significant road upgrades to the Golden Highway / Ringwood Road intersection and along Ringwood Road and Wollara Road to accommodate the project and enhance the road infrastructure for the benefit of the local community
- The upgrade of the Golden Highway / Ringwood Road intersection would contribute to the safety of the community and project related traffic using the intersection during construction, while ensuring intersection use by Project vehicles is compliant with the guidelines. This includes restricting Project construction vehicles to performing a left-in, left-out at the intersection, implementing a compliant taper for the left-in deceleration lane and a new acceleration lane for the left-out.
- The Bow River and Killoe Creek culvert upgrades would facilitate the delivery of the OSOM loads to the site and improve existing deficiencies on the road network.
- The widening and sealing of 3.4km of Ringwood Road and 4.7km of Wollara Road would benefit the community and reduce impacts on residents
- Additional trips generated by the Project during construction would have a minor impact on road network performance
- Additional trips generated by the Project during operation of the Project would not have a material impact on road network performance
- No impacts are anticipated on parking and the pedestrian network
- Minor impacts are anticipated on the bus network and would be limited to the potential interaction of bus services with construction vehicles on Ringwood Road and the Golden Highway. These impacts are offset by the formalisation of some bus stops.
- Minimal impacts are anticipated on the cycle network and would be limited to the potential interaction of cyclists with construction vehicles on surrounding roads
- Cumulative construction impacts are anticipated to be minor given that the Golden Highway is the only common construction vehicle route for the majority of nearby relevant projects and has spare capacity to accommodate cumulative construction vehicle volumes. In addition, peak construction of some projects would not coincide with peak construction of this Project.
- Minimal impacts are anticipated on the traffic and transport network during operation of the Project, due to the anticipated low traffic volumes generated
- Prior to the commencement of construction and following engagement of the engineering, procurement and construction contractor, a detailed CTMP would be prepared, including an OSOM vehicle route assessment.

Appendix A Response to submissions on the traffic and transport assessment

Agency or user group	Response to submission	Where addressed in Amended Traffic and Transport Assessment
Transport for NSW	***Submission:*** *The Traffic Impact Assessment proposes to use the Ringwood Road/Golden Highway intersection as a construction route for light and heavy vehicles. TfNSW notes that safe intersection sight distance (SISD) at this intersection does not comply with Austroads requirements. TfNSW does not support the proposed use of this route for the development without compliant SISD, alternative access options need to be investigated.* **Response:** Lightsource bp propose changes to the proposed Project transport route and upgrades to the intersection of the Golden Highway and Ringwood Road. The Project transport route changes and upgrades to the Ringwood Road / Golden Highway intersection have been designed in accordance with Austroads standards and in consultation with Transport for NSW.	Section 2.3.2 and Appendix C
	Submission: *Provide or update information related to cumulative impacts of traffic on the classified road network:* *• The cumulative impacts from traffic generated from the construction workforces in terms of the origin-destination routes, access, AM/PM peaks where there is overlap with other projects.* *• The cumulative impacts of heavy vehicle movements in terms of AM/PM peaks and routes where there is an overlap with other projects.* *• Cumulative impacts and consideration in relation to the timing of movements of OSOMs where other projects will be utilising the same routes as proposed for this development.* *• The background traffic volumes identified within the TIA for the Golden Highway/Ringwood Road intersection are to be reflective of the cumulative traffic volumes associated with the other projects occurring concurrently that will be utilising this route for OSOM/LV/HV movements.* **Response:** Anticipated construction vehicle routes were assessed in the TTIA for the EIS and compared with relevant projects in proximity to the site. In the construction traffic modelling assessment, light vehicle and shuttle bus trips were assumed to be evenly distributed on the road network, with equal proportions travelling to and from the site from the north (via Golden Highway) and the south (via Wollar Road). As a result of changes to the transport route and location of workers accommodation (to the east, centred around Merriwa), trip distribution has also been updated and cumulative impacts re-assessed within this report.	Section 3.2.3, Section 3.2.4, Section 3.3, Section 4.1.1 and Section 4.1.5

	Cumulative impacts from heavy vehicles during AM/PM peaks relating to other Projects were also raised. This updated report considers cumulative traffic volumes for heavy vehicles. This has also informed the design of upgrades proposed at the Golden Highway / Ringwood Road intersection. As outlined in the TTIA for the EIS and this report, due to the spare capacity at the Golden Highway / Ringwood Road and Wollar Road / Ringwood Road intersections, the addition of cumulative traffic volumes in the traffic models would likely have minor impact on the intersection performance reported.	
	Submission: *Provide or update information related to heavy vehicle and OSOM routes:* *• Identify the return routes for OSOMs.* *• National Heavy Vehicle Regulator (NHVR) approved routes identified on the Restricted Access Maps (RAV MAP) are to be utilised for the heavy vehicle routes for the proposed development.* *• The TIA is required to include details on the number of OSOM movements, the types of OSOM (escort by pilot or police), the intended time for OSOM movements to occur and identify the location of pullover bays / rest areas (including identification of the sufficient widths, lengths to accommodate the largest OSOM vehicles within the rest areas) along the OSOM routes.* *Due to the significant scope of the transport logistics for OSOM transit, a concept-level route analysis is required to be provided with the SSD application based on high-level swept path analysis to generally indicate locations where civil works are likely to be required.* **Response:** This report provides further information and analysis of the OSOM route including the return route and number of OSOM movements. The OSOM load will be under permit, utilising the Golden Highway, Ringwood Road and Wollara Road. No other projects are proposing to use Ringwood Road and Wollara Road. OSOM movements can be facilitated without additional civil works (as shown in the swept paths appended to this report) beyond those described within the Amended Project and no changes to the OSOM route described within the EIS Project are proposed. A Transport Management Plan has been provided (Appendix G) for the same OSOM configuration utilising the same proposed OSOM route from Newcastle Port (Mayfield Berth) to the intersection of Golden Highway. Individual assessments of the OSOM swept paths along Ringwood Road and Wollara Road have been provided in Appendix F and formed the basis of design for the road upgrades. Hence, an OSOM route assessment of the entire route has been carried out.	Section 3.2.4, Section 3.2.5, Appendix F and Appendix G
	Submission: *Provide or update information related to:* *• Traffic volumes and characteristics* *• Origins, destinations and routes for all vehicle types* *• Access and infrastructure upgrades*	Section 2.2, Section 2.3, Section 2.8, Section 3.2.3,

	• *Road safety assessment* • *Local climate conditions* • *Internal road network* • *Impact on rail corridors and public transport* **Response:** This report provides updates to all components of the TTIA impacted by the Amended Project and in response to the TfNSW submission.	Section 3.2.4, Section 3.2.5, Section 3.3 and Section 4.1
	Additional TfNSW comments on the Golden Highway / Ringwood Road design *Provide longitudinal section for the SISD compliance accounting for grade variation and measured in accordance with distance of 7.0 m (minimum of 5.0 m) from the conflict point on the major road and identify the measures proposed to achieve compliance.* *A seven-day count at the intersection of Ringwood Road/Golden Highway to determine the 85th percentile speed may be an option for reviewing the applicable reaction time. The data collected will have to be reviewed by the design team to ensure the accuracy of the data and to determine if we would consider the 85th percentile as the design speed.* *I would review Austroads Part 3 Geometric Design for further information regarding 85th percentile design speed.* *The reaction time identified is incorrect for the design speed. The required reaction time is 2.5sec (see austroads supplement to part 3 above).* *Have grade corrections have been applied to the calculation of SISD* *No swept paths provided to identify the compliance of the acceleration lane to the east with the design vehicle and the OSOM design vehicle.* *No swept paths identifying the OSOM design vehicle, or the heavy vehicle can be entirely accommodated within the AUL(s).* *The consultants identified the acceleration lane to facilitate left turns out of Ringwood Road have been designed for light vehicles and only achieves 90km/hr and not the design speed for the road this is required to be reviewed to ensure compliance with the design speed.* *The acceleration lane to facilitate the left turn out of Ringwood Road has not been assessed or designed for the Heavy vehicles that do not require escort but an NHVR permit. These vehicles are required to achieve the design speed when merging into the through lane.* *Left in and Left out (LILO) would be the only method to prevent the requirement for the SISD compliance to the east. Project*	Section 2.3, Section 3.2.5, Section 3.2.6, Section 4.1.1, Appendix C and Appendix H

	Response: The intersection has been designed in accordance with the relevant standards and guidelines as specified by Transport for NSW. Project construction vehicles would only perform a left-in and left-out at the intersection due to the sight distance issues from Ringwood Road looking east. The left-out movement would only be undertaken by standard Project construction vehicles and not by OSOM vehicles which require a permit. Speed surveys were collected, however the 85th speed was found to be 99.9km/hr in the westbound direction. Hence, the proposed left-in, left-out arrangement was retained as the preferred intersection design to minimise safety risks. A reaction time of 2 seconds was used at the Golden Highway / Ringwood Road intersection, with justification of this reaction time added to the amended TTIA. Notwithstanding, calculation of SISD using a 2.5 second reaction time was undertaken and would not change the proposed intersection design. Grade corrections have also been applied to the sight distance checks. Swept paths for all movements at the intersection have been appended to the amended TTIA.	
	Additional TfNSW comments on speed survey requirements *Location of tube counts must be at the location of the intersection of Ringwood and Golden Highway and must have been collected in accordance with Austroads Guide to Road Design Part 3.* **Response:** The tubes used for the speed survey were installed in accordance with Austroads and at a location on the Golden Highway approximately 70m east of Ringwood Road. The traffic survey company advised that the placement of the tubes closer to the intersection would likely compromise the results of the speed surveys.	Section 2.3.3
	Additional TfNSW comments on the proposed movements at the Golden Highway / Ringwood Road intersection *It is unclear if the measures proposed would be in place for the life of the development? and how the TMP would be enforced for the life of the development?* *Do light vehicle and heavy vehicle construction routes still require a right in and out of Ringwood Road?* *Revisit the turn warrant assessment due to the potential prohibition on the left in from eastern direction (Merriwa).* *Need to consult with any impacted landowners along the Ringwood Road section that may be impacted by changes to the turning movements at the Ringwood Road/Golden Highway intersection.*	Section 2.3, Section 3.2.3, Section 3.2.4 and Section 4.1.1

	Identify the preference being the physical treatments to ensure the left turn prohibition is enforced. *Review if the left turn prohibited how the transformer movement will be achieved and provide strategic design or traffic control measures for how the transformer movement will be facilitated at this intersection.* *I have been discussing the prohibition on the turning movements and noted that the isolation of the site means that prohibition on turning movements are difficult to achieve.* *The painted median is not a sufficient deterrent to prohibit the right turn out of Ringwood Road.* *Is there still a turn around site to be able to permit the vehicles to pass the intersection turn around and turn left into the site at the intersection?* *There is a rest area within the village of Elong Elong that is within Dubbo Regional Council LGA (this is the closest from the rest area review that we have identified) and the Cassilis Rest Area (this rest area is closer to the site and has existing intersection treatments identified on HV rest area map as TfNSW managed). There may be options to consider use of a local road connection to Golden Highway that has sufficient SISD and existing intersection treatments to facilitate the turn movements.* *Month eight of construction requires 280 staff which is proposed to transport via 60 two-way trips per day, 15 two-way trips per day and 55 two-trips per a day, there is minimal information as to how the shuttle buses and light vehicle numbers will be achieved with strategies/protocols for the 280 staff required to access the intersection at the Ringwood Road/Golden Highway.* **Response:** The proposed measures (left-in, left-out) would be in place for the duration of construction where significant increase in traffic movements would occur. Operational movements would be minimum (up to 10 movements/day) Only OSOM vehicles would perform a right turn from Ringwood Road to the Golden Highway. These movements would be undertaken under traffic management and during off-peak periods. The Project team considered the potential banning of right turn movements at the Golden Highway / Ringwood Road intersection for all traffic (Project and non-Project vehicles) due to the existing sight distance issues. This arrangement would include additional signage, a barrier or median across the intersection, and reconfiguration of the intersection arrangement. However, this proposal was not recommended due to the isolation of the site and the need for general traffic (particularly residents that live along Ringwood Road) to be able to perform right turns at the intersection as there would not be an	

	appropriate alternative route for the community if the right-turn bans were implemented. A turnaround facility on Barnett Street is located near the intersection and is proposed to be used by egressing Project construction vehicles to return on the Golden Highway in the eastbound direction. Since the EIS, the Project has entered into an MOU with a proposed accommodation provider in Merriwa to secure up to 350 beds during Project construction. This would enable the Project to provide additional shuttle bus movements, reducing the number of light vehicle numbers and enabling an increased level of control/compliance for left in/left out traffic movements.	
	Additional TfNSW comments on the turn warrants and/or traffic modelling assessment *No further assessment of the construction traffic volumes has been assessed in relation to the change to the intersection turning movements from all movements to a LILO, arrangement. A further assessment scenario with all vehicles turning left in via the existing AUL(s) is required as the "with development scenario" for SIDRA and turn warrants assessment. The base case is to be reviewed as the existing background traffic at the AM/PM peak+ annual growth rate applied to peak of construction+ any other major projects with cumulative timing passing the intersection of Ringwood Road/Golden Highway.* *The proponents/consultants are required to reassess the change to the traffic distribution and implications with compliance with the existing AUL(s) treatment given the traffic LV/OSOM/HV are required to turn left into the project access. Reassess turn warrants and assess queue length analysis and storage requirements (See Figure 6.4: 95th percentile queue lengths and Figure 6.5: Storage requirements of Guide to Traffic Management Part 3: Traffic Studies and Analysis) of the existing AUL(s).* **Response:** The construction modelling and turn warrants assessment has been updated to include the proposed left-in, left-out arrangements for Project construction vehicles and cumulative peak hour construction volumes generated by other project that travel through the Golden Highway / Ringwood Road intersection.	Section 4.1.1 and Section 4.1.5
	Additional TfNSW comments on OSOM vehicle route assessment *Identify the route from the Port of Newcastle to the site as per SEARs and submission for the EIS exhibition.* *There is an anticipated 6-10 OSOM vehicles a day. It is not known the size of the OSOM vehicles and will have implications to the intersection design. As is standard with any renewable development and requested in the response to the EIS for Goulburn River Solar Farm, TfNSW requires the information in terms of dimensions and type of heavy vehicles (exempt from*	Section 3.2.4 and Section 3.3.2

	escort requirements but requiring an NHVR permit) termed OSOM in the current TIA as a part of the RTS. This is important as it will have a bearing on the scope of the intersection treatments. *It is unclear within the current TIA the LV/Shuttle buses/OSOM/HV/HV exempt from escort and requiring NHVR permit will occur during the AM/PM peak.* **Response:** The return OSOM route has been identified in the amended TTIA. All standard Project construction vehicles would not require a permit as these vehicles are classified as GAV's. OSOM vehicle specifications have been added to the amended TTIA.	
Upper Hunter Shire Council	***Submission:*** *Safety concerns for Golden Highway / Ringwood Road intersection* *Safe intersection sight distance (SISD) of the Golden Highway/ Ringwood Road intersection. Council is concerned that the sight distances along the Golden Highway at the intersection are inadequate to enable vehicles associated with the project, particularly heavy vehicles, to safely negotiate the intersection. Therefore, it is recommended that further investigations be undertaken into upgrading the intersection to improve safety including reviewing speed limits, installing additional warning signs, physical alterations to the intersection (eg. provision of turning lanes), removing roadside vegetation, widening of roadside cuttings or relocating the intersection to improve sight distances.* *Consider the crash data on this location of road within the SISD.* **Response:** Lightsource bp propose changes to the proposed transport route and upgrades to the intersection of the Golden Highway and Ringwood Road. The transport route changes and upgrades to the Ringwood Road / Golden Highway intersection have been designed in accordance with Austroads SISD standards and in consultation with Transport for NSW. This report includes an updated crash analysis and speed surveys, which has informed the development of the proposed intersection upgrade.	Section 2.3.3 and Appendix C
	Submission: *Traffic numbers, considering location of workforce accommodation.* *The assumption that light vehicle and shuttle bus trips will be evenly distributed on the road network, with equal proportions travelling to and from the site from the north and south during construction peak hour is unrealistic for the purpose of assessing intersection performance. It is likely that the majority of vehicles will be travelling between the site and the larger centres of Merriwa and Mudgee.*	Section 2.3, Section 3.2.3 and Section 3.3

	It is recommended that a revised traffic and transport impact assessment be submitted following the completion of a workforce and accommodation strategy. **Response:** Lightsource bp has prepared an Accommodation and Employment Strategy to support the Amendment Report (Umwelt 2023). The strategy identifies locations for workforce accommodation, providing clearer detail on likely traffic movements of the construction workforce. As part of the accommodation strategy, Lightsource bp have signed an MOU with a local developer who are proposing the development of 500 fully furnished, self-contained ensuite units within the township of Merriwa. Lightsource bp has an option in place to rent up to 300 rooms during the construction period of the Project, with potential to increase the number of rooms if required. This has resulted in amendments to the trip distribution utilised in the TTIA for the EIS, with the revised trip distribution included in this report. As outlined in the EIS, shuttle buses are proposed to be utilised for the majority of the workforce to reduce the number of cars on the road. Based on the proposed accommodation in Merriwa, these shuttles would operate to/from the Merriwa accommodation and the Project. This report addresses the above in further detail.	
General public	***Road use safety submissions*** *The existing gravel road is very narrow with some tight dangerous corners which need to be navigated cautiously - SE-59347494* *I am usually driving in dangerous times such as early in the mornings and late at night, this road is already dangerous with narrow areas of the road, sharp bends and causeways which often become flooded. - SE-59342745* *The main access road to this project is ringwood/wollara road. This road is a typical country road, narrow in places and in poor condition. Many areas of this road need attention and specific areas of concern were highlighted to lsbp at community meetings. - SE-59975243* **Response** In addition to road repairs and upgrades outlined in the EIS, Lightsource bp has committed to upgrading additional sections of Wollara Road and Ringwood Road to improve the safe movement of vehicles, as a component of the Amended Project. The additional road upgrades proposed under the Amended Project include: • Realignment, widening and sealing an additional 1.6 km section of Ringwood Road between Killoe Creek and Binks Road.	Section 3.2.5, Appendix C and Appendix H

	• Realignment, widening and sealing a 4.7 km unpaved section of Wollara Road between the Goulburn River National Park boundary and 1621 Wollara Road. • An acceleration lane allowing vehicles turning left from the Ringwood Road / Golden Highway intersection to safely merge with traffic traveling along Golden Highway. • Formalising the bus layover area at the Ringwood Road / Golden Highway intersection. No upgrades are proposed in the portion of Wollara Road within the Goulburn River National Park, at the request of National Parks and Wildlife Service. It is also reiterated (as outlined in the EIS) that, prior to the commencement of construction, a CTMP would be prepared in accordance with relevant guidelines and in consultation with Transport for NSW, Upper Hunter Shire Council, National Parks and Wildlife Service, Forestry Corporation of NSW and any other relevant stakeholders. The CTMP would outline how construction activities would avoid, mitigate and manage risks involving construction activities, users of the traffic and transport network and residents. Typical measures to be provided in the CTMP include: • Driver Code of Conduct requirements for all heavy vehicle operators and construction workers. • Traffic Guidance Schemes to alert road users to changed traffic conditions as a result of roadworks or increased traffic activity as a result of the Amended Project. • Vehicle Movement Plans to indicate preferred travel paths for construction vehicles entering, leaving or crossing traffic streams, where required. • Traffic Staging Plans, where required including drawings, that show how traffic will pass safely through or around road construction work sites during various work stages. • Measures to ensure access to adjacent properties during road construction activities are maintained. • Details of any proposed detours. • Details of persons responsible for specific traffic management operations. It is also expected that auditing of traffic control measures by suitably qualified persons will be undertaken following implementation to ensure traffic control measures are effective and are not compromising road safety.	
	Road widening and sealing submissions *The existing dirt road MUST be sealed prior to any works commencing on the project. Reasons for this is… Safety for workers and resident whom will be directly impacted by the significant increase in traffic flow and heavy vehicle movements. - SE-59569209* *…the risks and dangers of Bow Crossing & Killoe crossing (2 separate vehicle accidents into the river this year) and that Ringwood Road and Wollara Road are already in poor condition*	Section 3.2.5, Appendix C and Appendix H

	with increased erosion and corrugating being unacceptable and dangerous. The only option for "The Project" must be to redevelop and tar seal these crossings and roads. - SE-59340957 **Response** It is acknowledged that there are narrow sections along these roads, and in order to improve traffic safety, road upgrades were proposed as part of the EIS, including: • Culvert upgrades along Ringwood Road at Bow River and Killoe Creek. • Road repairs along Ringwood Road, including a 1.8 km section to be widened and resealed between Bow River and Killoe Creek. The Amended Project includes additional road upgrades, including: • Realignment, widening and sealing an additional 1.6 km section of Ringwood Road between Killoe Creek and Binks Road. • Realignment, widening and sealing a 4.7 km unpaved section of Wollara Road between the Goulburn River National Park boundary and 1621 Wollara Road, and • An acceleration lane allowing vehicles turning left from the Ringwood Road / Golden Highway intersection to safely merge with traffic traveling along Golden Highway. These upgrades will further improve road safety for existing road users as well as Project-related construction vehicles. Further consideration and assessment of the additional road upgrades proposed under the Amended Project has been undertaken within this report.	
	Increases in traffic submissions *This entire road is already under stress due to increased traffic, this being an arterial road to Bylong and the National Park and now with this "Project" the increase in heavy vehicle traffic poses a huge risk… - SE-59340957* **Response** The number of truck movements and size of vehicles will change during the labour-intensive construction period between months three (3) and 20 of the broader 27-month construction period. As discussed in the EIS, overall impacts on road network performance during construction are anticipated to be minor, with both the Golden Highway / Ringwood Road and Ringwood Road / Wollara Road intersections able to continue to operate with spare capacity, low average delays and minimal queues during the morning and evening peak periods. It is noted that the proposed construction-related traffic increases are temporary in nature and will be substantially reduced during the operations and maintenance phase of the Project, with an anticipated generation of 10 two-way light	Section 3.3, Section 4.1.1 and Section 4.1.5

	vehicle trips per day (on average). Nevertheless, appropriate mitigation measures will be implemented under the CTMP to maintain the safe operation of the road network for all users.	

Appendix B Wollar Road / Ringwood Road construction impact assessment

Intersection LOS

The performance of the modelled Wollar Road / Ringwood Road intersection in SIDRA with and without Project construction vehicles in 2025 is shown in Table B-1.

Table B-1: Intersection performance during construction – Wollar Road / Ringwood Road

Approach and peak period	2025 base / 2025 cumulative base				2025 construction / 2025 cumulative construction			
	DOS	Average delay	LOS	95% back of queue (m)	DOS	Average delay	LOS	95% back of queue (m)
Weekday morning peak (6:00am to 7:00am)								
Wollar Road eastbound	0.01	8	A	<5	0.01	8	A	<5
Wollar Road westbound	0.01	8	A	<5	0.01	8	A	<5
Ringwood Road southbound	0.01	9	A	<5	0.01	9	A	<5
Overall intersection	**0.01**	**9**	**A**	**<5**	**0.01**	**9**	**A**	**<5**
Weekday evening peak (5:30pm to 6:30pm)								
Wollar Road eastbound	0.01	8	A	<5	0.01	8	A	<5
Wollar Road westbound	0.01	8	A	<5	0.01	8	A	<5
Ringwood Road southbound	0.02	9	A	<5	0.02	9	A	<5
Overall intersection	**0.02**	**9**	**A**	**<5**	**0.02**	**9**	**A**	**<5**

Given that Project construction vehicles are not anticipated to travel to the site from the south, the performance of the Wollar Road / Ringwood Road intersection would remain the same with and without construction. As shown in Table B-1, the intersection would operate at LOS A and with ample spare capacity.

There would be no impact on intersection performance during construction.

Notwithstanding, in the event that a light vehicle travels to the site from the south (would be a very low volume, if any, for a worker that lives in a town within the Mid-Western Regional LGA), there would be negligible impacts on intersection performance.

Turn Warrants

Approach traffic volumes at the Wollar Road / Ringwood Road intersection in 2025 with and without construction traffic is shown in Table B-2.

Table B-2: Traffic volumes for turn treatments analysis – Ringwood Road / Wollar Road

Movement	2025 base / 2025 cumulative base		2025 construction / 2025 cumulative construction	
	Morning peak hour	Evening peak hour	Morning peak hour	Evening peak hour
Major road traffic volume (Q_M) for left turn	7	7	7	7
Major road traffic volume (Q_M) for right turn	22	17	22	17
Left turn volume (Q_L)	13	3	13	3
Right turn volume (Q_R)	3	1	3	1

The turn warrants assessment for the Wollar Road / Ringwood Road intersection is shown in Figure B-1. Project construction vehicles are not proposed to use this intersection and no additional turn treatments would not be required to accommodate the base and construction volumes.

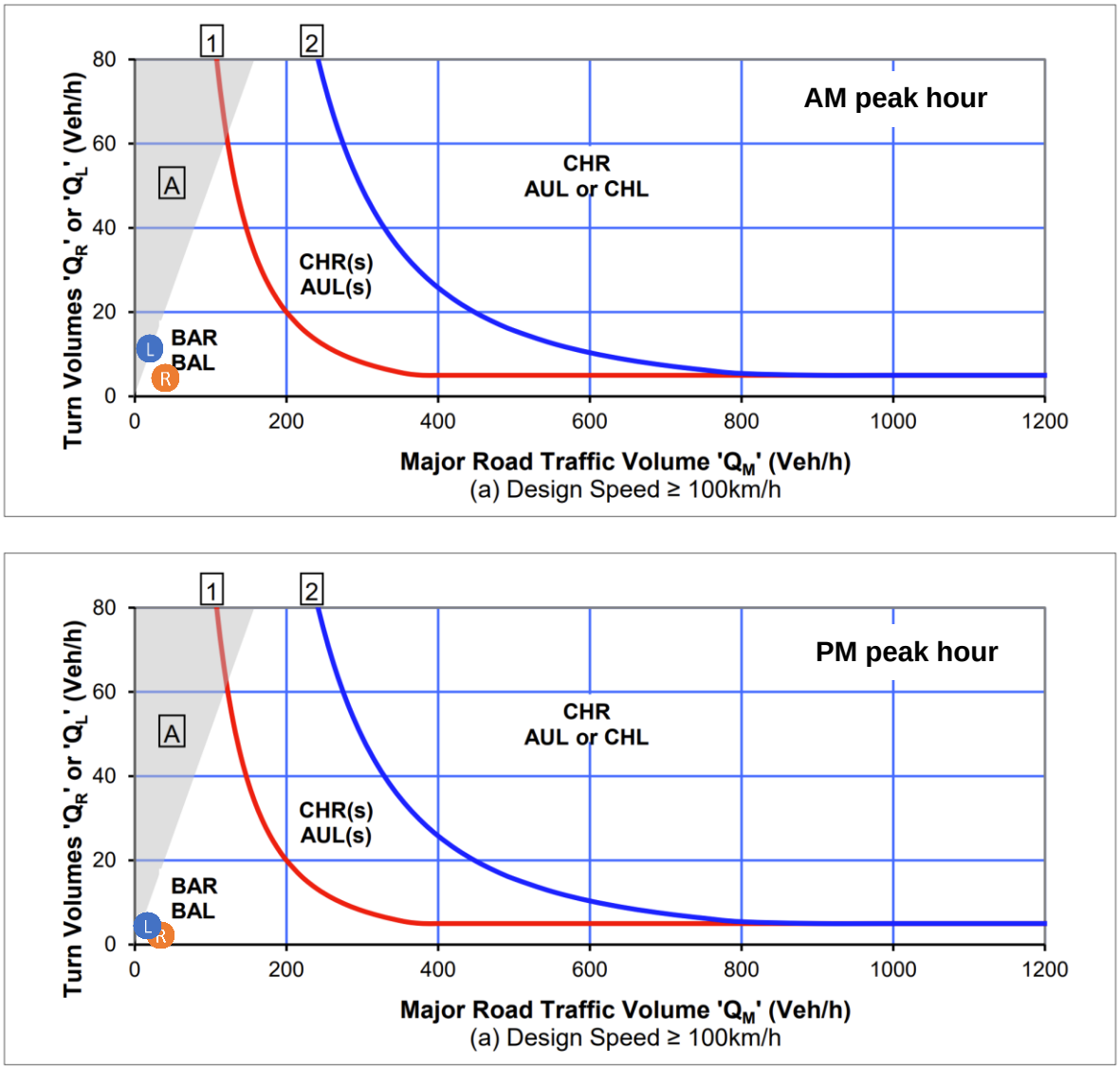


Figure B-1: Wollar Road / Ringwood Road 2025 base and construction turn warrants assessment

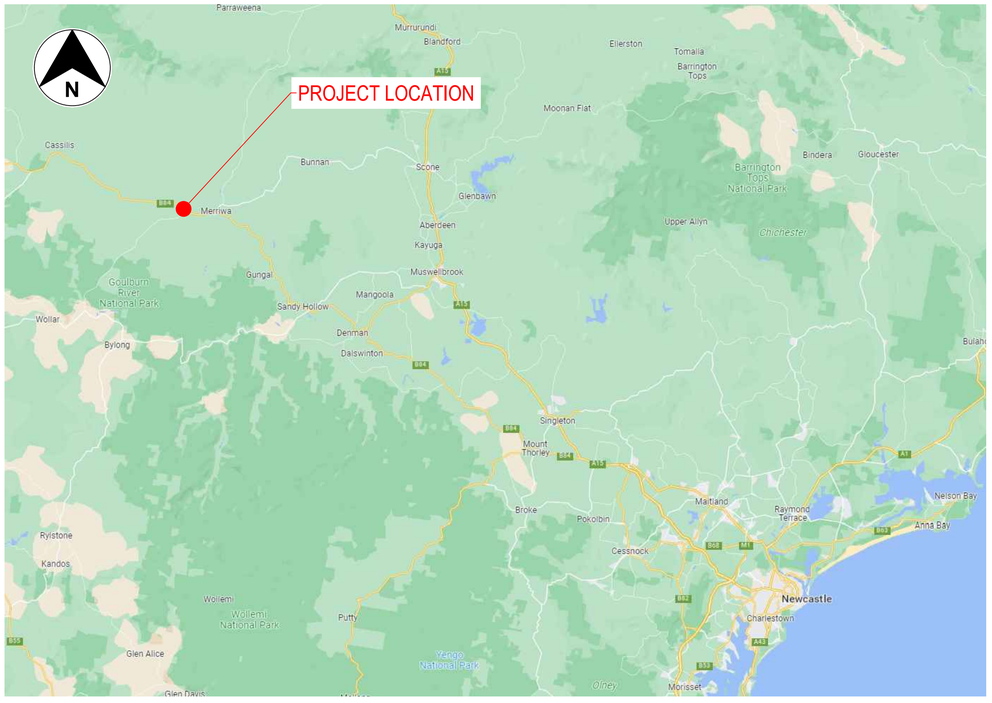
Appendix C Golden Highway / Ringwood Road intersection strategic design

GOULBURN RIVER SOLAR FARM

RINGWOOD ROAD AND GOLDEN HIGHWAY INTERSECTION

ROAD UPGRADE

STRATEGIC DESIGN



LOCALITY PLAN
NOT TO SCALE

DRAWING INDEX

SHEET No.	SHEET TYPE	SHEET DETAILS	No. OF SHEETS	ISSUE
01-GN-0001	ROAD ALIGNMENT	COVER SHEET AND DRAWING INDEX	1 OF 1	A
01-RD-0101	ROAD ALIGNMENT	PLAN	1 OF 3	A
01-RD-0102	ROAD ALIGNMENT	PLAN	2 OF 3	A
01-RD-0103	ROAD ALIGNMENT	PLAN	3 OF 3	A
01-RD-0201	ROAD ALIGNMENT	TYPICAL CROSS SECTION	1 OF 1	A

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CO-ORDINATE SYSTEM: MGA ZONE 56 (GDA2020) HEIGHT DATUM: AHD

PLOT DATE / TIME: 27 October 2023 04:47:49 PM PLOT BY: PakWaHo

TITLE	NAME	DATE
DRAWN	A.REIS	27.10.23
DRG CHECK	B.EVANS	27.10.23
DESIGN	P.PHAM	27.10.23
DESIGN CHECK	D.SHIROKOV	27.10.23
DESIGN MNGR	D.SHIROKOV	27.10.23
PROJECT MNGR	R.BANZON	27.10.23

DRAWINGS / DESIGN PREPARED BY
DESIGNER
turnbull

DRAWINGS / DESIGN PREPARED FOR
CLIENT

DRAWING TITLE
GOULBURN RIVER SOLAR FARM, EIS
RINGWOOD ROAD AND GOLDEN HIGHWAY INTERSECTION
ROAD ALIGNMENT
COVER SHEET AND DRAWING INDEX
A1
SHEET 1 OF 1

DRAWING NUMBER: 0305-DRG-01-RD-0001

ISSUE STATUS: STRATEGIC DESIGN
SHEET No.: 01-RD-0001
ISSUE: A

X:\0305-06-GE-A1.tmf

LEGEND

GENERAL

- DESIGN
- CADASTRAL
- SURVEY
- SAFETY BARRIER

ROAD GEOMETRY

- CONTROL LINE AND CHAINAGE (50)
- MCXX — CONTROL LINE LABEL
- C1 — LINE MARKING LABEL
- EXISTING SIGN

PAVEMENT AND KERBS

- NEW PAVEMENT

NOTES

1. DESIGN IS UNDERTAKEN IN 2D.
2. SURVEY SHOWN HAS BEEN PROVIDED BY UMWELT (11/09/2023).
3. BOUNDARIES HAVE BEEN SOURCED FROM SIX MAPS "Clip 'n' Snip".
4. PAVEMENT DESIGN AND JOINTING IS EXCLUDED.
5. PROPOSED BARRIER LOCATION IS SHOWN INDICITIVELY ONLY.
6. EXISTING GUIDE POSTS ALONG BARRIER EXTENTS ARE TO BE REMOVED.

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PLOT DATE / TIME: 27 October 2023 04:48:16 PM PLOT BY: PakWaHo

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DESIGN	P.PHAM	27.10.23
DESIGN CHECK	D.SHIROKOV	27.10.23
DESIGN MNGR	D.SHIROKOV	27.10.23
PROJECT MNGR	R.BANZON	27.10.23

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DRAWING TITLE
GOULBURN RIVER SOLAR FARM, EIS
RINGWOOD ROAD AND GOLDEN HIGHWAY INTERSECTION
ROAD ALIGNMENT
PLAN

A1
SHEET 1 OF 3

DRAWING NUMBER: 0305-DRG-01-RD-0101

ISSUE STATUS: STRATEGIC DESIGN
SHEET No.: 01-RD-0101
ISSUE: A

LEGEND

GENERAL

- DESIGN
- CADASTRAL
- SURVEY
- SAFETY BARRIER

ROAD GEOMETRY

- 50 — CONTROL LINE AND CHAINAGE
- MCXX — CONTROL LINE LABEL
- C1 — LINE MARKING LABEL
- EXISTING SIGN

PAVEMENT AND KERBS

- NEW PAVEMENT

NOTES

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HEIGHT DATUM: AHD

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PLOT BY: PakWaHo

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DRG CHECK	B.EVANS	27.10.23
DESIGN	P.PHAM	27.10.23
DESIGN CHECK	D.SHIROKOV	27.10.23
DESIGN MNGR	D.SHIROKOV	27.10.23
PROJECT MNGR	R.BANZON	27.10.23

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DRAWING TITLE
GOULBURN RIVER SOLAR FARM, EIS
RINGWOOD ROAD AND GOLDEN HIGHWAY INTERSECTION
ROAD ALIGNMENT
PLAN

A1

SHEET 2 OF 3

DRAWING NUMBER: 0305-DRG-01-RD-0102

ISSUE STATUS: STRATEGIC DESIGN
SHEET No.: 01-RD-0102
ISSUE: A

LEGEND

GENERAL

- DESIGN
- CADASTRAL
- SURVEY
- SAFETY BARRIER

ROAD GEOMETRY

- CONTROL LINE AND CHAINAGE (50)
- MCXX — CONTROL LINE LABEL
- C1 — LINE MARKING LABEL
- EXISTING SIGN

PAVEMENT AND KERBS

- NEW PAVEMENT

NOTES

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3. BOUNDARIES HAVE BEEN SOURCED FROM SIX MAPS "Clip 'n' Snip".
4. PAVEMENT DESIGN AND JOINTING IS EXCLUDED.
5. PROPOSED BARRIER LOCATION IS SHOWN INDICITIVELY ONLY.
6. EXISTING GUIDE POSTS ALONG BARRIER EXTENTS ARE TO BE REMOVED.

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CO-ORDINATE SYSTEM: MGA ZONE 56 (GDA2020) HEIGHT DATUM: AHD

PLOT DATE / TIME: 27 October 2023 04:49:10 PM PLOT BY: PakWaHo

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DESIGN CHECK	D.SHIROKOV	27.10.23
DESIGN MNGR	D.SHIROKOV	27.10.23
PROJECT MNGR	R.BANZON	27.10.23

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DRAWING TITLE
GOULBURN RIVER SOLAR FARM, EIS
RINGWOOD ROAD AND GOLDEN HIGHWAY INTERSECTION
ROAD ALIGNMENT
PLAN
A1
SHEET 3 OF 3

DRAWING NUMBER 0305-DRG-01-RD-0103

ISSUE STATUS: STRATEGIC DESIGN
SHEET No.: 01-RD-0103
ISSUE: A

LEGEND

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EXISTING SURFACE

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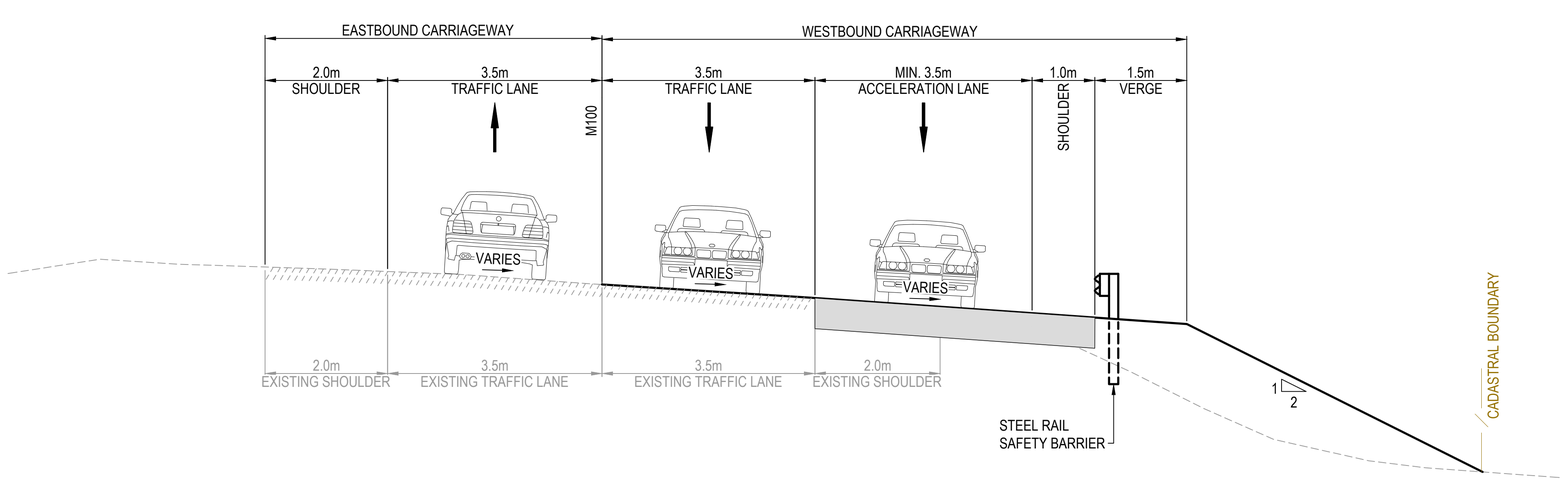

SECTION 1 / RD-0102

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GOLDEN HIGHWAY

NOTE

1. PROPOSED PAVEMENT SHOWN IS INDICATIVE ONLY. PAVEMENT DESIGN AND JOINTING IS EXCLUDED FROM SCOPE OF WORKS.
2. CADASTRAL BOUNDARY SOURCED FROM SIX MAPS "Clip 'n' SNIP".
3. GRADES OF PROPOSED ACCELERATION LANE AND SHOULDER TO MATCH EXISTING CONDITIONS.
4. PROPOSED BARRIER LOCATION IS SHOWN INDICATIVELY ONLY

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DESIGN MNGR	D.SHIROKOV	27.10.23
PROJECT MNGR	R.BANZON	27.10.23

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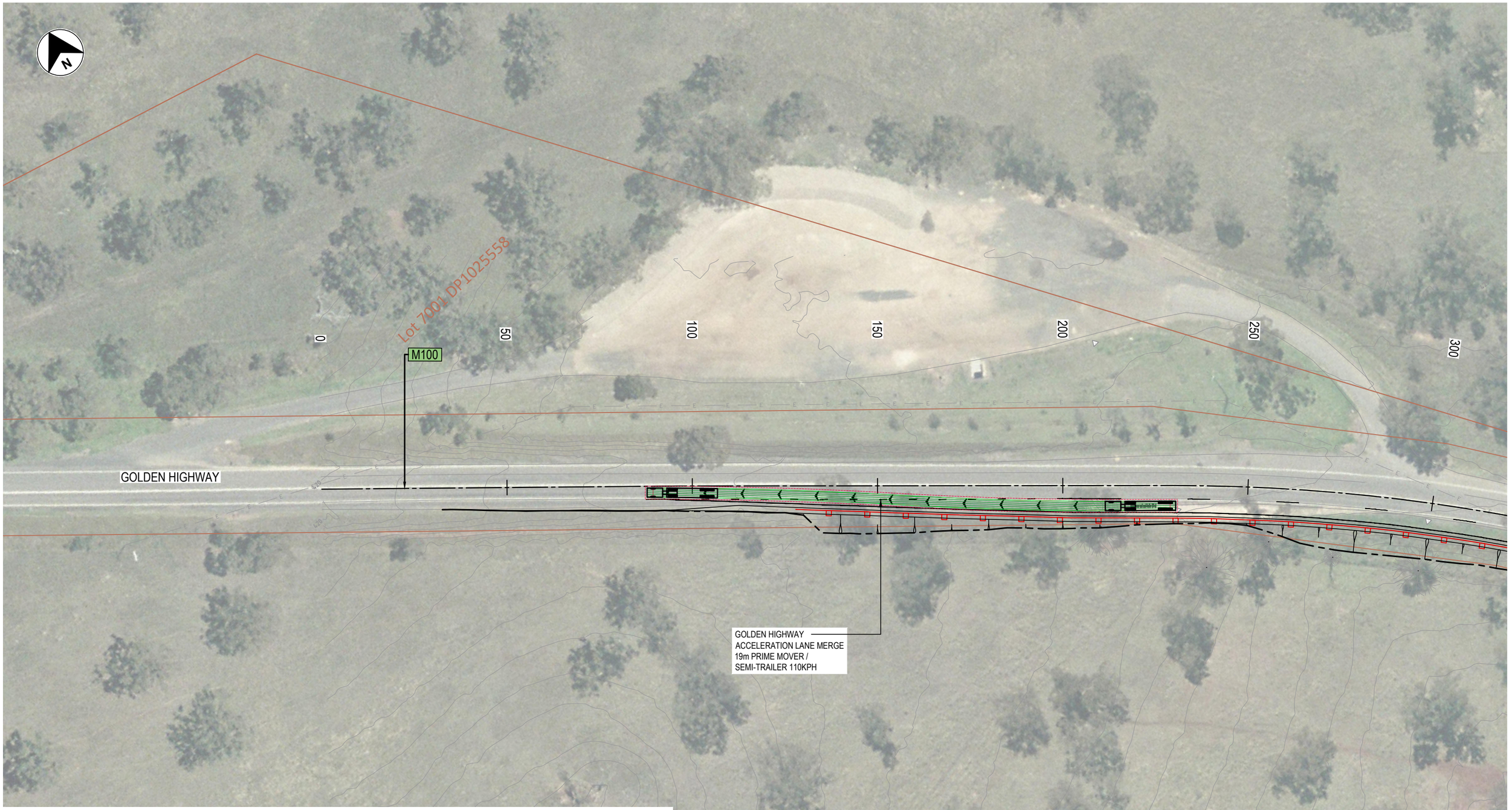
DRAWING TITLE
GOULBURN RIVER SOLAR FARM, EIS
RINGWOOD ROAD AND GOLDEN HIGHWAY INTERSECTION
ROAD ALIGNMENT
TYPICAL CROSS SECTION

A1

SHEET 1 OF 1

DRAWING NUMBER 0305-DRG-01-RD-0201

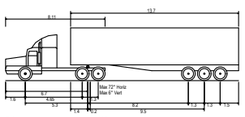
ISSUE STATUS STRATEGIC DESIGN | SHEET No. 01-RD-0201 | ISSUE A



NOTES

1. NO ASSESSMENT HAS BEEN UNDERTAKEN FOR EXISTING PAVEMENT.
2. TURN PATHS PRESENTED IS THE INTENDED OPERATIONS OF TRAFFIC ASSOCIATED WITH GOULBURN SOLAR FARM. ONLY THE DISPLAYED MOVEMENTS WILL BE PERMITTED.
3. SURVEY SHOWN HAS BEEN PROVIDED BY UMWELT (11/09/2023).
4. BOUNDARIES HAVE BEEN SOURCED FROM SIX MAPS "Clip 'n' Snip".
5. NO ASSESSMENT HAS BEEN UNDERTAKEN FOR THE EXISTING GOLDEN HIGHWAY AND RINGWOOD ROAD INTERSECTION RIGHT TURN IN AND RIGHT TURN OUT MOVEMENTS. EXISTING VEHICLE MOVEMENTS AND INTERSECTION LAYOUT TO BE RESPECTED.

VEHICLE TURN PATH PROFILE



Prime mover and semi-trailer (19 m)

Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.540m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	12.500m

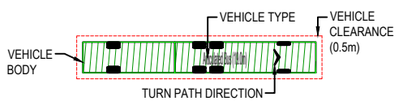
GENERAL

- DESIGN
- CADASTRAL
- SURVEY
- SAFETY BARRIER

ROAD GEOMETRY

- CONTROL LINE AND CHAINAGE (20)
- MCXX — CONTROL LINE LABEL

VEHICLE TURN PATH LEGEND



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FOR INFORMATION ONLY

GOULBURN RIVER SOLAR FARM
RINGWOOD ROAD AND GOLDEN HIGHWAY INTERSECTION
SWEPT PATHS
SHEET 1 OF 4
27/10/2023

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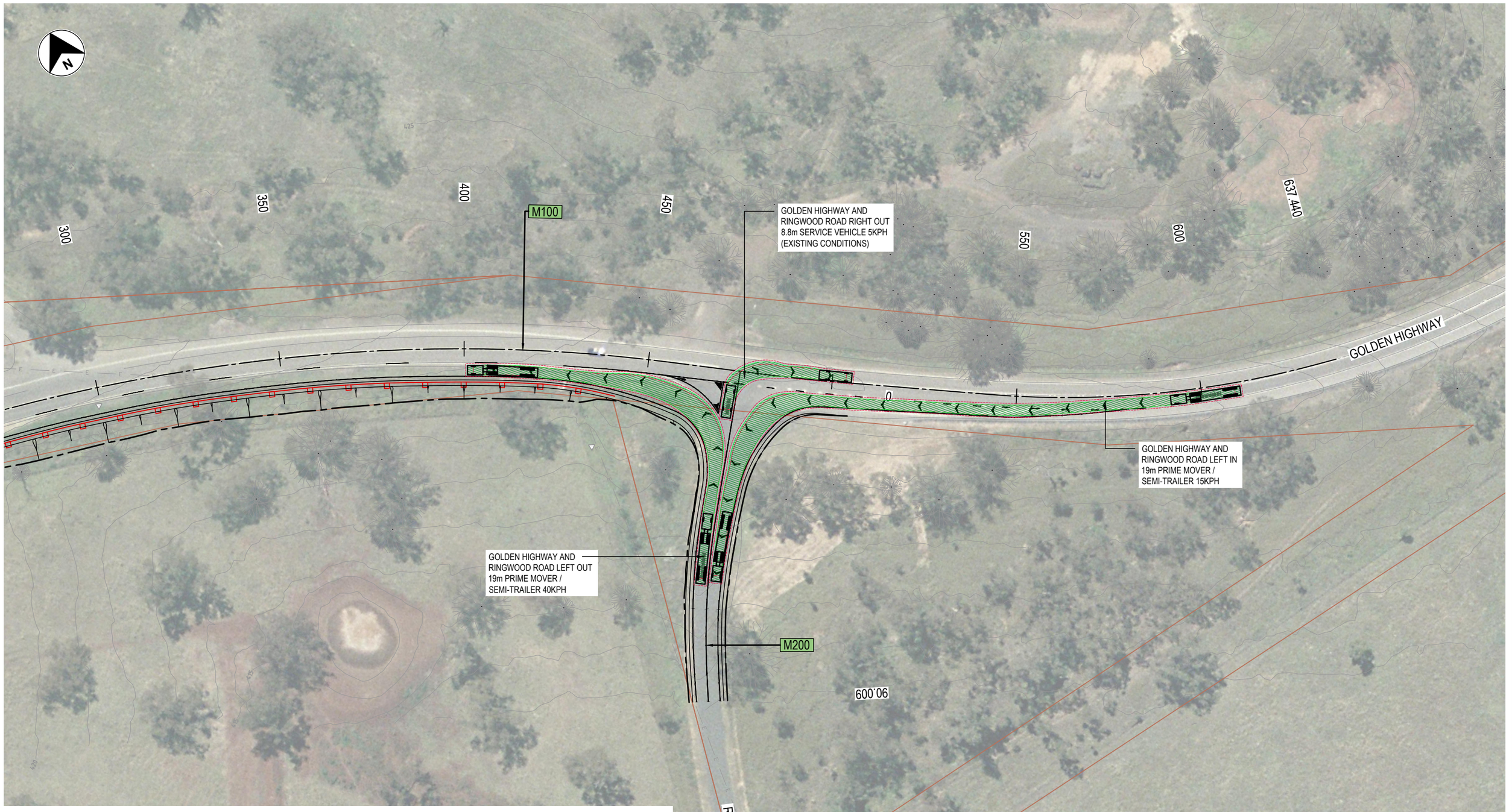
0305-INF-RD-SWEPT-PATH-RINGWOOD-01

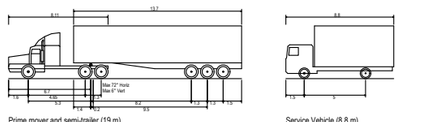


FOR INFORMATION ONLY

NOTES

1. NO ASSESSMENT HAS BEEN UNDERTAKEN FOR EXISTING PAVEMENT.
2. TURN PATHS PRESENTED IS THE INTENDED OPERATIONS OF TRAFFIC ASSOCIATED WITH GOULBURN SOLAR FARM. ONLY THE DISPLAYED MOVEMENTS WILL BE PERMITTED.
3. SURVEY SHOWN HAS BEEN PROVIDED BY UMWELT (11/09/2023).
4. BOUNDARIES HAVE BEEN SOURCED FROM SIX MAPS "Clip 'n' Snip".
5. NO ASSESSMENT HAS BEEN UNDERTAKEN FOR THE EXISTING GOLDEN HIGHWAY AND RINGWOOD ROAD INTERSECTION RIGHT TURN IN AND RIGHT TURN OUT MOVEMENTS. EXISTING VEHICLE MOVEMENTS AND INTERSECTION LAYOUT TO BE RESPECTED.

VEHICLE TURN PATH PROFILE



Prime mover and semi-trailer (19 m)	
Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.540m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	12.500m

Service Vehicle (8.8 m)	
Overall Length	8.800m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.427m
Track Width	2.500m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	12.500m

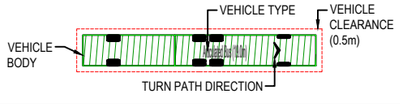
GENERAL

- DESIGN
- CADASTRAL
- SURVEY
- SAFETY BARRIER

ROAD GEOMETRY

- CONTROL LINE AND CHAINAGE (20)
- CONTROL LINE LABEL (MCXX)

VEHICLE TURN PATH LEGEND



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GOULBURN RIVER SOLAR FARM
RINGWOOD ROAD AND GOLDEN HIGHWAY INTERSECTION
SWEPT PATHS
SHEET 2 OF 4
27/10/2023

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0305-INF-RD-SWEPT-PATH-RINGWOOD-02