Amber

Traffic & Transportation Direction

Orana Battery Energy Storage System

6945 Goolma Road, Montefiores

Traffic Impact Assessment

March 2023

Reference: 370 rep 230331 final

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Traffic Impact Assessment

Prepared for: NGH Pty Ltd

Status: Final report

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Contact

Website: www.amberorg.com.au E: info@amberorg.com.au Phone: 1800 022 363

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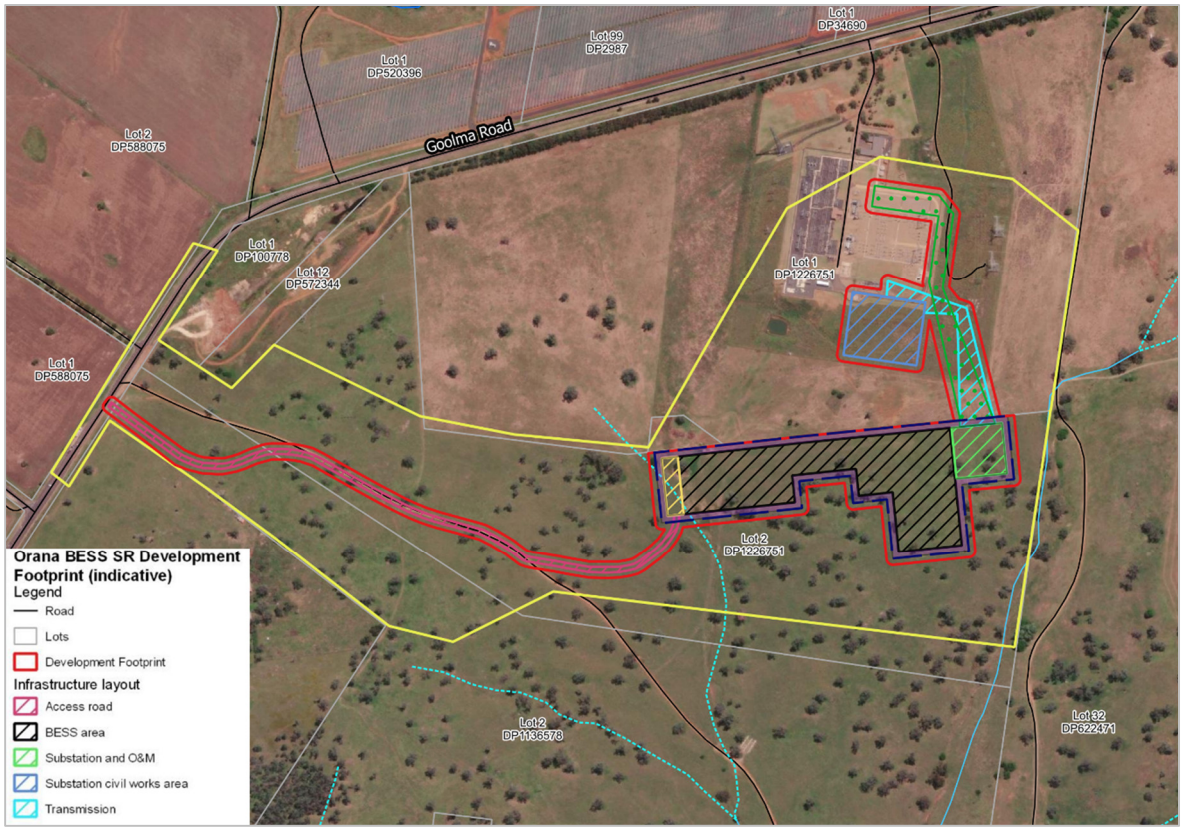
1. Background

1.1 Background

Amber Organisation Pty Ltd has been engaged by NGH Pty Ltd to conduct a review of the traffic implications of the Orana Battery Energy Storage System (BESS) and prepare a Traffic Impact Assessment. The BESS is proposed to have a capacity of up to 400MW and is located at 6945 Goolma Road, Montefiores. Access to the site is proposed via an existing driveway that connects with Goolma Road which is proposed to be realigned to improve sight distance at the intersection.

Figure 1 shows the proposed layout of the site in relation to the road network, access location and existing infrastructure.

Figure 1: Site Layout



Source: NGH Pty Ltd

The BESS is proposed to be constructed in two stages with each stage expected to take 9-12 months and have a peak period of 6 months. Stage 1 is expected to start in Q4 2023 and Stage 2 is expected to start in Q2 2024, with the stages not expected to overlap. A maximum workforce of 150 personnel would be on-site during peak construction periods. The workforce is expected to primarily be located in Wellington and the nearby regional centres, with all plant expected to be delivered from the Port of Newcastle.

1.2 Environmental Assessment Requirements

NSW Department of Planning & Environment issued Secretary's Environmental Assessment Requirements (SEARs) for the project. A response to each of the traffic related SEARS has been provided below which demonstrates the DPE issued SEARs are suitably addressed within the report.

Table 1: Response to SEARs

SEARs	Response
An assessment of the peak and average traffic generation, including over-dimensional vehicles, construction worker transportation and transport of materials by rail.	Section 3 of the report provides an assessment of the peak and average traffic generation of the site during construction, operation, and decommissioning. The assessment provides a review of the Level of Service of Goolma Road and demonstrates the road network is able to accommodate the vehicle movements in a suitable manner including OSOM vehicles and construction worker transport.
An assessment of the likely transport impacts to the site access route, site access point(s), any Crown land, particularly in relation to the capacity and condition of the roads, road safety and intersection performance.	The access route utilises roads that are designated for B-Double vehicles as outlined within the TfNSW Restricted Access Vehicle Map. The site access is proposed to be provided with a BAL and BAR turn treatment and the access design has been prepared based on a swept path assessment for a B-Double vehicle. Accordingly, the roads along the access route are able to accommodate the loads and type of vehicle movement to be generated during construction of the BESS.
A cumulative impact assessment of traffic from nearby developments.	The assessment presented within Section 3 indicates that the Uungula Wind Farm and Wellington South BESS projects have the potential to have overlapping construction periods at the same time as the project. An assessment has been undertaken which demonstrates Goolma Road is expected to continue to operate with an acceptable level of service during this time and it is recommended that an OSOM vehicle movements be coordinated to reduce the impact to the road network.
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 authority.	The recommendations provided within Section 5, which should be included in the future CTMP, would ensure the construction traffic would create a minimal impact to the capacity and safety of the surrounding road network.

1.3 Purpose of Document

This Traffic Impact Assessment has been prepared to assess the construction, operational and decommissioning traffic impacts, and the access arrangements of the BESS. It is based on surveys

and observations at the site and our experience of similar developments elsewhere. The assessment responds to the SEARs and details how road impacts of the project traffic, particularly from heavy vehicle use and oversize and overmass vehicles, will be avoided or managed using road-use management strategies.

More specifically, the report addresses the following key matters:

- Details of both light and heavy vehicle traffic volumes and proposed transport routes;
- An assessment of the potential traffic impacts of the project on road network function and safety;
- An assessment of the capacity of the existing road network to accommodate the type and volume of traffic generated by the project;
- Details of measures to mitigate and / or manage potential impacts, including construction traffic control, road dilapidation surveys and measures to control soil erosion and dust generated by traffic volumes; and
- Details of access roads and how these connect to the existing road network and ongoing operational maintenance.

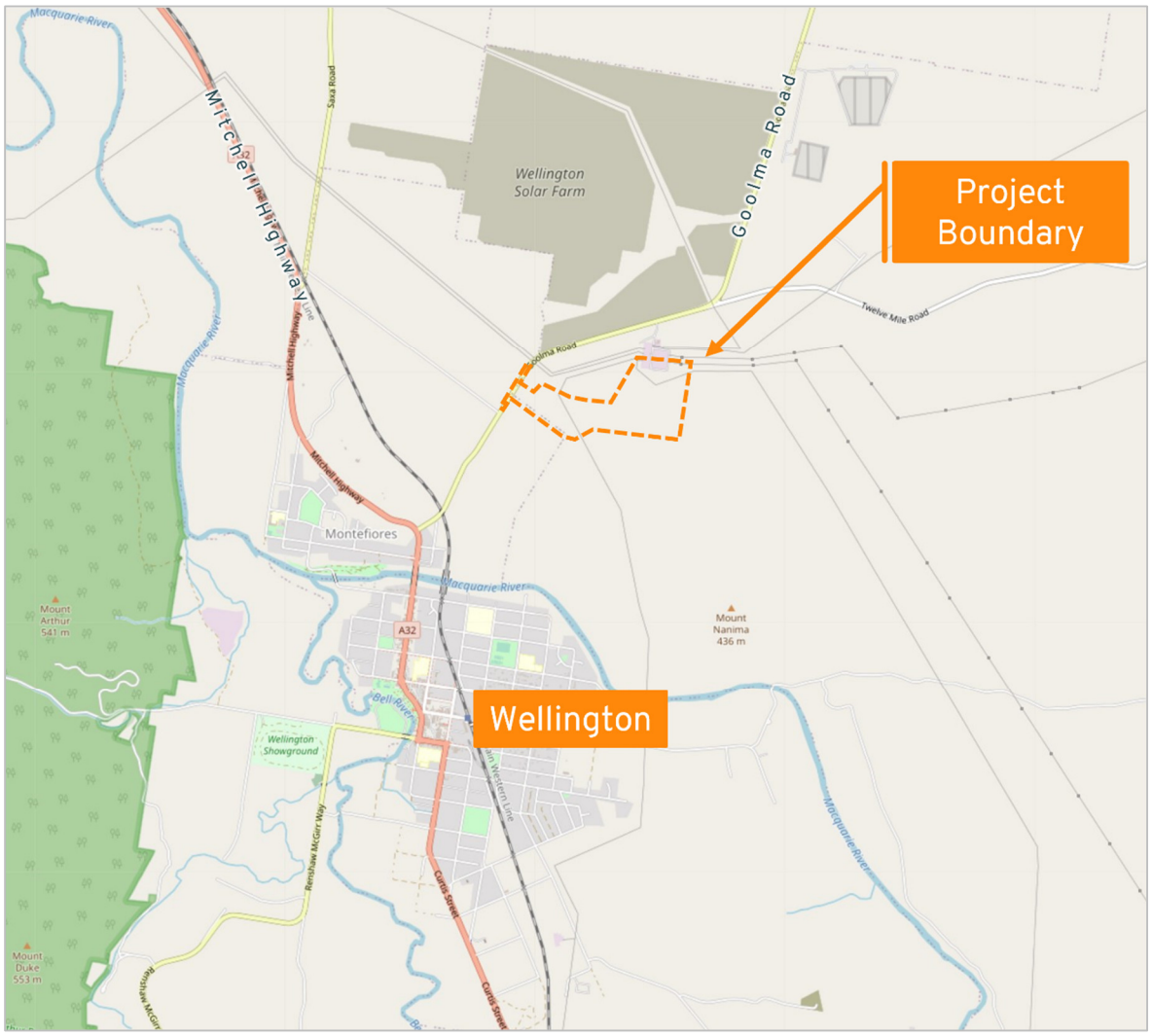
The traffic assessment has been undertaken in accordance with the *RTA Guide to Traffic Generating Developments* and relevant Austroads Guidelines. It has also been undertaken in conjunction with consultation with Transport for NSW and Dubbo Regional Council.

2. Existing Conditions

2.1 Site Location

The site is located on the south-eastern side of Goolma Road approximately 2.0 kilometres northeast of Wellington. Figure 2 shows the location of the site in relation to the surrounding transport network. The figure shows the site has good access to the State road network via Goolma Road and Mitchell Highway which link with nearby regional towns.

Figure 2: Site Location



Source: OpenStreetMap

The site is zoned SP2 – Infrastructure under the Dubbo Local Environmental Plan and is occupied by agricultural use. Land immediately surrounding the site is a mixture of RU1 - Primary Production, and R5 – Large Lot Residential zone and is primarily occupied by agricultural use.

Figure 3 provides an aerial photograph of the site and the surrounding area and shows the Wellington Substation is located immediately north of the site. It also shows the site has a frontage to Goolma Road of approximately 90 metres and access to the site is currently provided via a private access road.

Figure 3: Aerial Photograph of the Site and Surrounding Area

Source: SixMaps

2.2 Road Network

Goolma Road is a State Road under the care and management of Transport for NSW. It runs in a general northeast-southwest alignment between Castlereagh Highway in Gulgong and Mitchell Highway in Wellington. It has a sealed carriageway width of approximately 7 metres which accommodates one lane of traffic in each direction, and it has a speed limit of 100km/hr at the site frontage.

2.3 Traffic Volumes

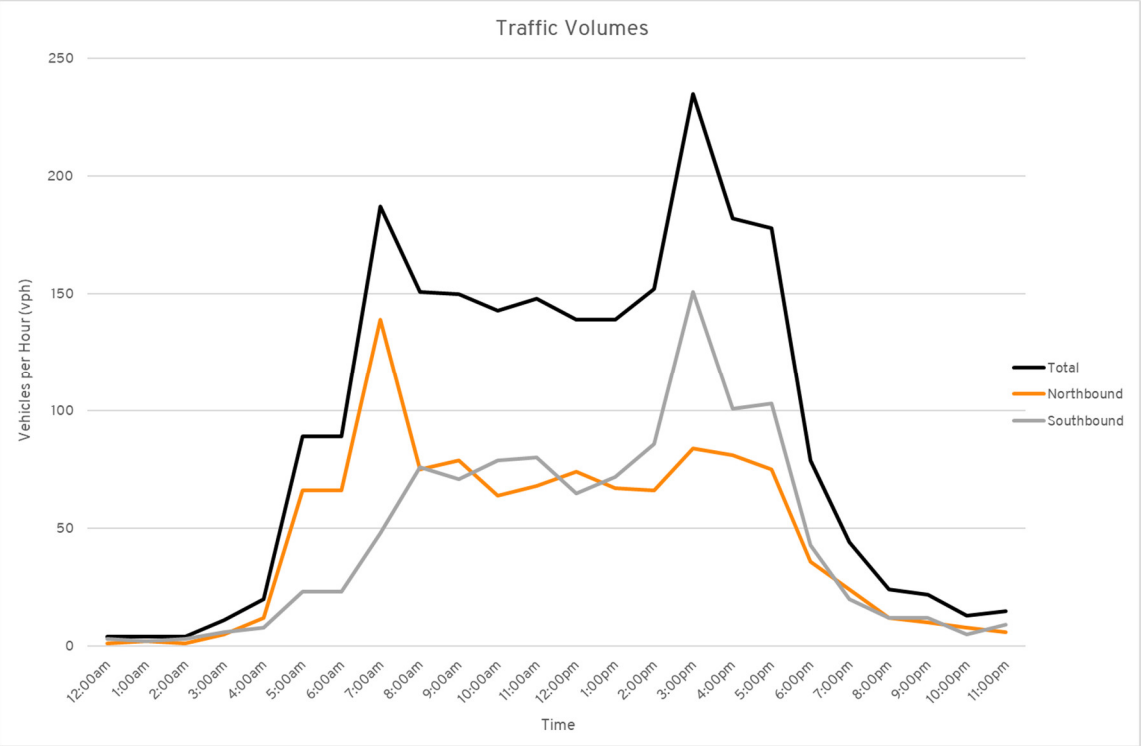
Amber commissioned a tube count on Goolma Road at the site frontage in order to determine the existing road environment. The tube count was undertaken from Monday 12 September to Monday 19 September 2022. The survey results are summarised in Table 2.

Table 2: Goolma Road Traffic Volumes

	Traffic Volumes (vpd)	Weekday AM (vph)	Weekday PM (vph)	85th Percentile Speed	Heavy Vehicle Percentage
Northbound	1,212	165	87	94.1km/hr	16%
Southbound	1,189	58	167	96.5km/hr	
Both Directions	2,401	223	255	95.3km/hr	

The traffic volumes for Goolma Road for each hour have been separated into north and southbound movements and are shown in Figure 4.

Figure 4: Goolma Road Traffic Volume Data

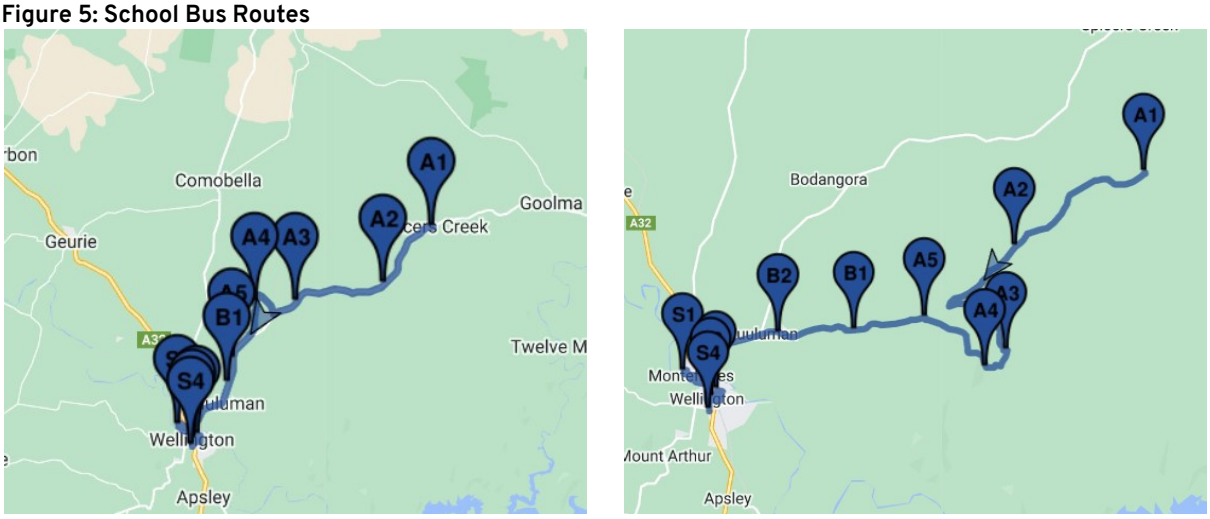


The survey data indicates Goolma Road currently experiences most traffic movements between the hours of 7:00am and 5:00pm. The data also indicates the road experiences pronounced morning and evening peak hours with the majority of vehicle movements being northbound in the morning peak and southbound in the evening peak. Overall, the survey data suggests that Goolma Road currently accommodates a moderate level of traffic.

2.4 Public Transport Services

No public transport services operate within the vicinity of the site. However, two school bus routes operate along Goolma Road which are shown below.

Figure 5: School Bus Routes



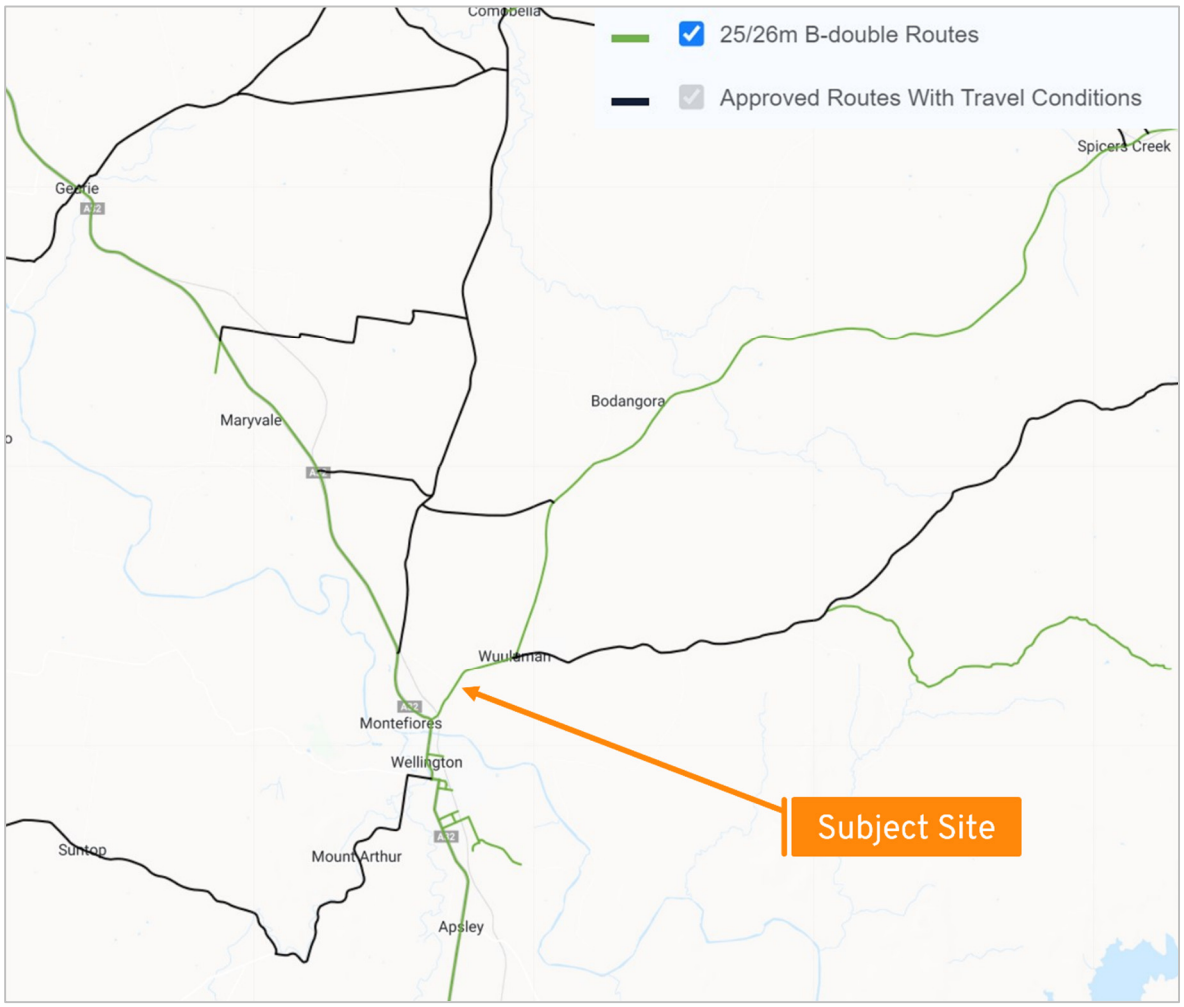
Source: Ogden Coach Services

It is noted that a number of bus services operate within Wellington, including additional school bus services.

2.5 Restricted Vehicle Access

The TfNSW Restricted Vehicle Access Map for the surrounding area is provided within Figure 6. The green lines indicate approved B-Double routes while the black lines represent approved routes with travel conditions. As can be seen from the figure, Goolma Road and Mitchell Highway are B-Double approved routes that feed into the wider State road network.

Figure 6: TfNSW Restricted Access Vehicle Map



Source: TfNSW Restricted Vehicle Access Map

2.6 Crash History

Amber has conducted a review of the TfNSW Centre for Road Safety Crash and Casualty Statistics database for all injury crashes within 1.0 kilometre of the site access. The crash database provides the location and severity of all injury and fatal crashes for the five-year period from 2016 to 2020. The crash search recorded no crashes and as such, it is concluded that the road network is currently operating in a relatively safe manner.

3. Traffic Assessment

3.1 Traffic Generation

3.1.1 Construction

The BESS is proposed to be constructed in two stages with each stage expected to take 9-12 months and have a peak period of 6 months. Stage 1 is expected to start in Q4 2023 and Stage 2 is expected to start in Q2 2024 with the stages not expected to overlap.

A maximum workforce of 150 personnel will be on-site during peak construction periods. Construction activities would be undertaken during standard daytime construction hours, as follows:

- Monday to Friday: 7am – 6pm
- Saturday: 8am – 1pm
- No work on Sundays or public holidays.

Any construction outside of these normal working hours would only be undertaken with prior approval from relevant authorities.

Construction traffic generated by the BESS can broadly be separated into the following categories:

- Light vehicles associated with the workforce accessing the site, including shuttle buses that will be provided that can transport staff to/from the site reducing the need for private vehicle use;
- Heavy vehicles which include the following:
  - Medium and Heavy Rigid Trucks (MRV and HRV as defined within AS 2890.2:2018) will be used to deliver materials and smaller plant;
  - Truck and Dog vehicles will be used to transport earthwork material to/from the site; and
  - Articulated Vehicles and 26 metre long B-Doubles will be used to transport larger plant.

Some oversized and overmass (OSOM) vehicles will be required for the delivery of larger components such as the transformer, site office buildings, and earthmoving machinery. The impacts of the OSOM vehicles are discussed within Section 4 with the following assessment focusing on the impacts of the light and heavy vehicles which generate the bulk of the traffic and represent the typical traffic impact of the project on a day-to-day basis.

The construction traffic volumes for the project have been provided by the Applicant. It is anticipated that during peak construction the site could generate up to 60 heavy and 60 light vehicle movements per day. The vehicle movement calculations provided by the Applicant are included within Appendix A.

It is noted that a vehicle movement is classified as a vehicle travelling in one direction (i.e. a truck accessing the site would generate one movement towards the site and one movement away from the site when it departs).

Table 3 summarises the traffic movements generated during the construction period of the BESS.

Table 3: Traffic Generation During Construction

Vehicle Type	Average Vehicle Movements		Peak Vehicle Movements	
	Daily (vpd)	Peak Hour (vph)	Daily (vpd)	Peak Hour (vph)
Light Vehicles	30	15	40	20
Shuttle Bus	20	10	20	10
Heavy Vehicles	40	4	60	6
Total	**90**	**29**	**120**	**36**

Overall, the site is expected to generate approximately 36 vehicle movements during the morning and evening peak hours during the peak construction period, which will reduce to 29 vehicle movements over the typical construction periods.

As part of the project, the Wellington Substation is proposed to be upgraded with the works to be undertaken by TransGrid personnel. It is understood the works would generate a total of 40 vehicle movements (approximately 4 vehicle movements per day) which are included within the traffic volumes presented within Table 3. The vehicles would access the substation via the existing substation access and are expected to have a minimal impact on the operation of the road network.

3.1.2 Operational Traffic

During operation the BESS is expected to generate a minimal level of traffic associated with maintenance and operation services. The BESS is expected to be operated by up to 6 staff resulting in a traffic generation of up to 12 light vehicle movements per day and occasional heavy vehicle movements which would result in a negligible change to the traffic environment.

3.1.3 Decommissioning Traffic

At the end of the operational life of the project all above ground infrastructure will be dismantled and removed from the project site. Traffic generation during decommissioning would be similar to traffic generation during the average construction period. A comprehensive Construction Traffic Management Plan would be prepared prior to the decommissioning phase in conjunction with the relevant road authorities. This would aim to ensure adequate road safety and road network operations are maintained.

3.2 Traffic Distribution

Traffic accessing the site will do so via the existing site access to Goolma Road. The Applicant has advised that the workforce is expected to primarily be located in Wellington and Dubbo, with some construction personnel to potentially be located within other nearby regional centres such as Orange or Mudgee. All plant is expected to be delivered from Port of Newcastle.

The following provides a breakdown of the anticipated access distribution for each of the vehicle classifications outlined within Table 3:

- Light Vehicles and Shuttle Buses: It is anticipated that 95% of staff will access the site from the south and 5% will access the site from the north.

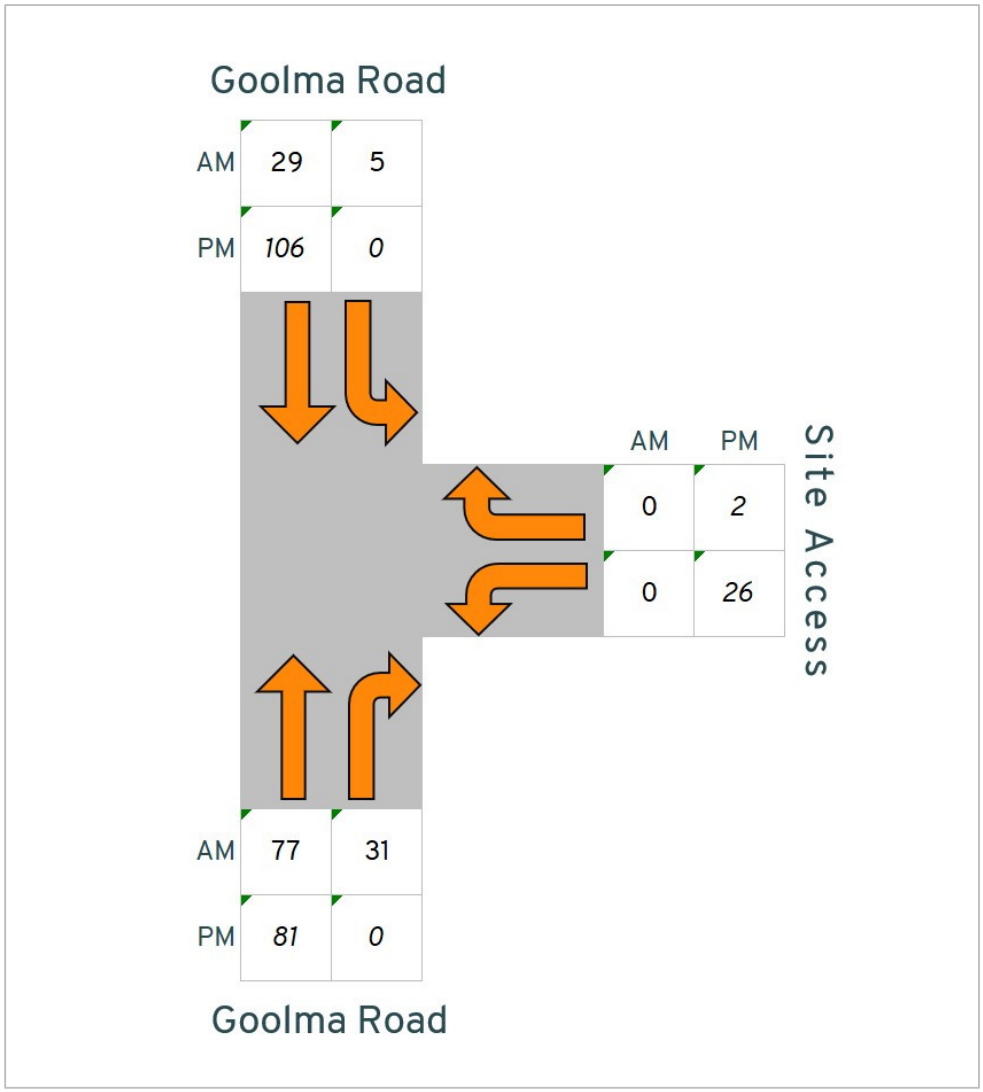
- Heavy Vehicles: It is anticipated that vehicle movements on the road network will be distributed evenly between north and southbound movements. Heavy vehicles accessing the site from the chosen delivery port would enter from the north, and vehicles associated with the delivery and collection of equipment and materials would predominantly enter the site from the south.

During the morning peak all vehicle movements will be towards the site and in the evening peak all vehicle movements will be away from the site. Heavy vehicle movements will be distributed throughout the day and will be split evenly between inbound and outbound movements.

The peak hour for construction will occur at the start and end of the day when staff are transported to/from the site. The majority of staff will typically arrive on-site between 6:00am and 7:00am. However, staff generally have staggered finish times which results in the evening peak hour being less pronounced. For the purposes of this assessment, it has been assumed that all staff depart between 5:00pm and 6:00pm and the evening peak traffic volumes is 80% of the morning peak volume.

The subsequent traffic volumes at the site access during the morning and evening peak hour are provided within Figure 7, with the through movements on Goolma Road based on the traffic volume data presented within Section 2.3.

Figure 7: Expected Peak Hour Traffic Volumes at Site Access During Peak Construction



3.3 Traffic Assessment

Level of Service is a qualitative measure used to describe the operating conditions of a section of road or an intersection. Levels of Service are designated from A to F from best (free flow conditions) to worst (forced flow with stop start operation, long queues and delays) and represent the perception of the road conditions by motorists including speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and safety.

The *RTA Guide to Traffic Generating Developments*, dated October 2002, suggests that ideally rural roads should not exceed service volumes at Level of Service C. At this level, whilst most drivers are restricted in their freedom to manoeuvre, operating speeds are still reasonable and acceptable delays are experienced. Table 4.5 of the RTA Guide sets out two-way hourly road capacities for two-lane roads for different levels of service with a design speed of 100 km/hr based on different terrain types.

The traffic volumes expected to be accommodated on the surrounding road network during the peak hour are shown within Table 4 which has been based on the existing volumes presented within Section 2.3 and the traffic volumes for the site presented within Figure 7.

Table 4: Expected Peak Hour Traffic Volumes During Construction

Road	AM Peak (6:00am)			PM Peak (5:00pm)		
	Existing Volume	Expected Volume	LOS	Existing Volume	Expected Volume	LOS
Goolma Road	106vph	137vph	A	187vph	211vph	A

Therefore, during the peak hours of the BESS construction Goolma Road would accommodate up to approximately 211 vehicles per hour during peak construction, which is well within the capacity of the road network and the road is expected to continue to operate with a good level of service based on Table 4.5 of the RTA Guide.

During the middle of the day the traffic movements are expected to be predominantly associated with heavy vehicles with approximately 6-8 vehicle movements per hour. This increase in traffic can be readily accommodated on the road network.

Accordingly, the road network is able to readily accommodate the traffic generated by the development during the construction and operational periods.

3.4 Cumulative Traffic Impacts

The BESS is proposed to be constructed in two stages with each stage expected to take 12 months and have a peak period of 5-6 months. Stage 1 is expected to start in Q4 2023 and Stage 2 is expected to start in Q2 2024 with the stages not expected to overlap. The assessment outlined earlier demonstrates that the road network will continue to operate with ample spare capacity even during the peak construction period of the BESS.

A review has been undertaken for the major projects within the vicinity of the site which indicates there is the potential for a number of projects to overlap, particularly from other renewable projects which are outlined below:

- Wellington South BESS is located 300 metres east of the site and is not yet approved. The EIS has been publicly exhibited and the Applicant is now responding to the submissions received.

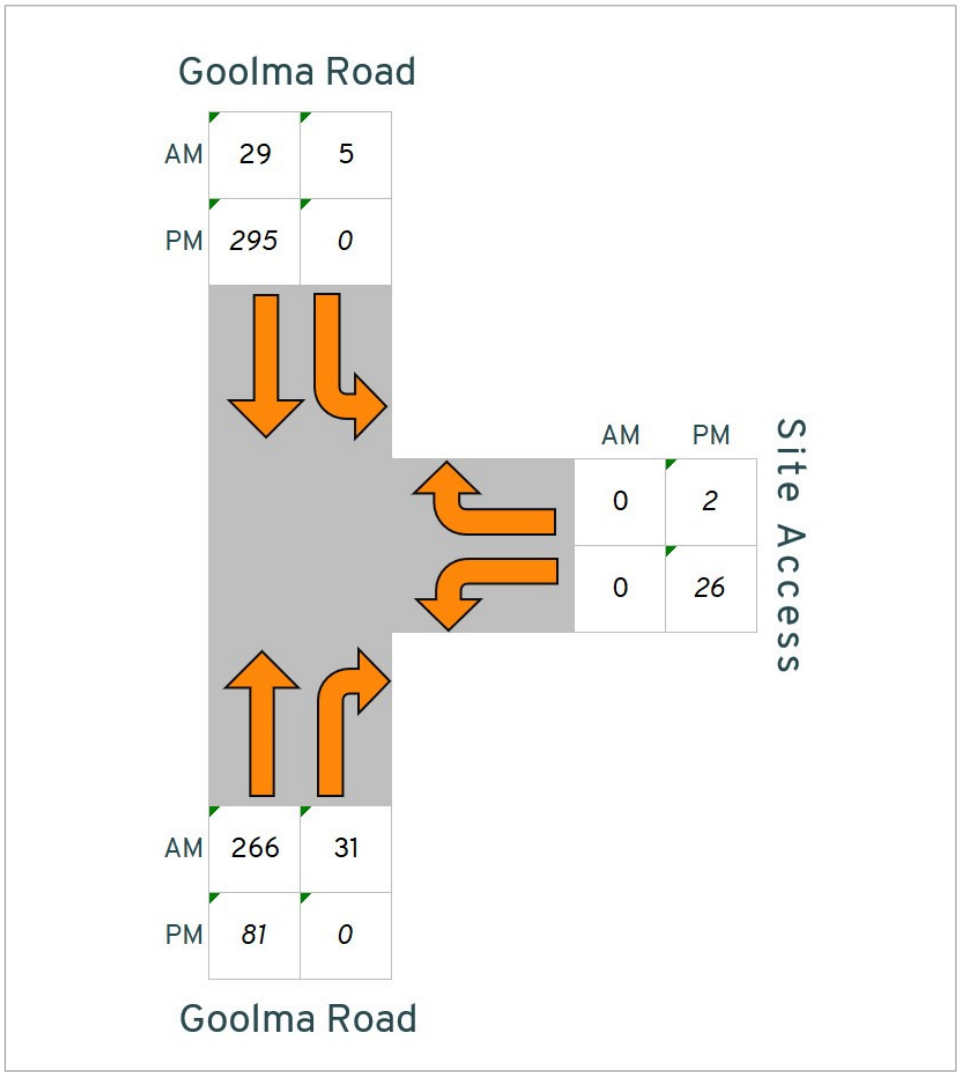
- Uungula Wind Farm is located 18km east of the site and has been approved;
- Wellington North Solar Farm is located 4.5km north of the site with construction understood to have commenced July 2022; and
- Wellington Solar Farm is located north of the site and has completed construction.

The Wellington South BESS and Uungula Wind Farm have the potential to have overlapping construction periods with the proposal. A review of the Traffic Impact Assessments for the projects indicates that they could generate the following traffic movements at the site frontage:

- During peak construction the Wellington South BESS would generate 78 vehicles travelling northeast on Goolma Road and would generate 78 vehicles travelling southwest in the morning and evening peak, respectively.
- During peak construction the Uungula Wind Farm would generate 111 vehicles travelling northeast and 111 vehicles travelling southwest in the morning and evening peak, respectively.

The subsequent traffic volumes at the site access during the morning and evening peak hour are provided within Figure 8.

Figure 8: Traffic Volumes at Site Access During Peak Construction Including Cumulative Volumes



The traffic volumes expected to be accommodated on the surrounding road network during the peak hour with the cumulative traffic volumes are shown within Table 5.

Table 5: Expected Peak Hour Traffic Volumes During Construction with Cumulative Volumes

Road	AM Peak (6:00am)		PM Peak (5:00pm)	
	Expected Volume	LOS	Expected Volume	LOS
Goolma Road	328vph	A	402vph	A

Therefore, in the event the construction periods overlapped the road network is expected to continue to operate with a good level of service. As such, the combined increase in traffic generated by the proposal and these projects is expected to have a minimal cumulative impact on the road network. Further, it is noted that the peak traffic generated by these projects during construction occurs before 7:00am and after 5:00pm which is outside of the peak times of the road network.

Accordingly, the combined increase in traffic generated by the site and these projects is expected to have a minimal cumulative impact on the road network in the surrounding area.

In particular, it is recommended that any future OSOM vehicle movements consider the potential for other similar movements generated by the nearby renewable projects.

4. Route Assessment

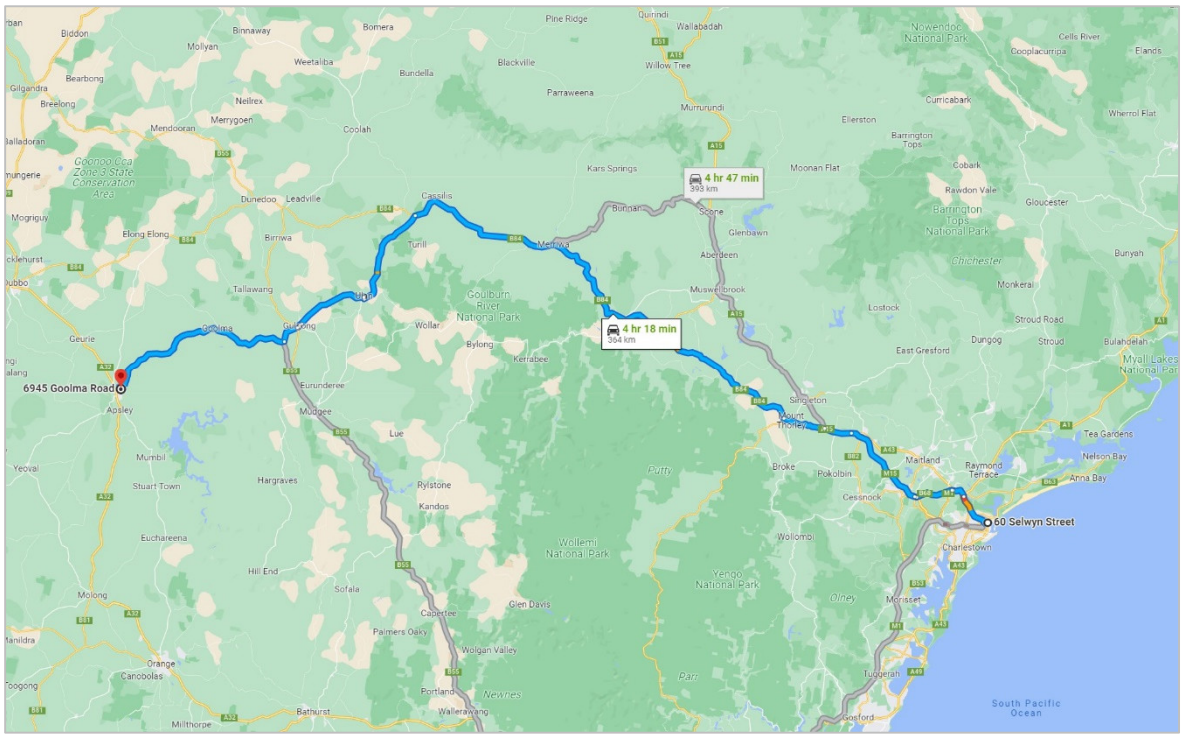
4.1 Plant Delivery – Heavy Vehicles

The Port of Newcastle has been identified as the preferred port where the BESS plant will be imported. The proposed construction traffic access route from the Port of Newcastle to the site is as follows:

- Selwyn Road;
- Industrial Drive;
- Pacific Highway;
- New England Highway;
- John Renshaw Drive;
- Hunter Expressway;
- Golden Highway;
- Castlereagh Highway; and
- Goolma Road, and
- Site access driveway.

Figure 9 show the proposed access route from the port which is the proposed route to be undertaken for all transport vehicles from the port.

Figure 9: Access Route from Port of Newcastle to Site



Source: Google Maps - https://goo.gl/maps/C28Qkuo8NxQaWFD37

The access route utilises roads that are designated for B-Double vehicles as outlined within the TfNSW Restricted Access Vehicle Map. Accordingly, the roads along the access route are able to accommodate the loads and type of vehicle movement to be generated during construction of the BESS.

4.2 Plant Delivery – OSOM Vehicles

The Applicant has advised that the project is expected to generate approximately 6 OSOM vehicle movements during construction (12 vehicle movements with each vehicle accessing and exiting the site). The vehicles would include, but not be limited to, the following deliveries:

- 2 x Power Transformer;
- 2 x HV Switchgear;
- 1 x Control Room.

The largest component to be delivered to the site is expected to be the transformer. The Applicant has advised that the exact transformer model has yet to be determined and as such a transport company is unable to be approached to confirm the configuration of the delivery vehicle. The transformer model would be confirmed following development consent approval.

OSOM vehicles would be subject to separate permit applications and regulations and the relevant permits would be applied for as part of the preparation of the Construction Traffic Management Plan given the exact vehicle layout is unable to be determined at this time. The Applicant has advised that if initial route assessments for the OSOM vehicles identifies that substantial road upgrades are needed then a smaller transformer would be adopted.

A review of the nearby renewable energy projects indicates that the access route has been utilised by other projects in the area such as the Bodangora Wind Farm, Wellington Solar Farm, and Wellington North Solar Farm. Further, the access route from Port of Newcastle is regularly used by renewable energy projects.

Given the route utilises the State road network and has been adopted by other projects it is concluded that the route is able to be utilised by OSOM vehicles associated with the project with permits to be applied for as part of the CTMP.

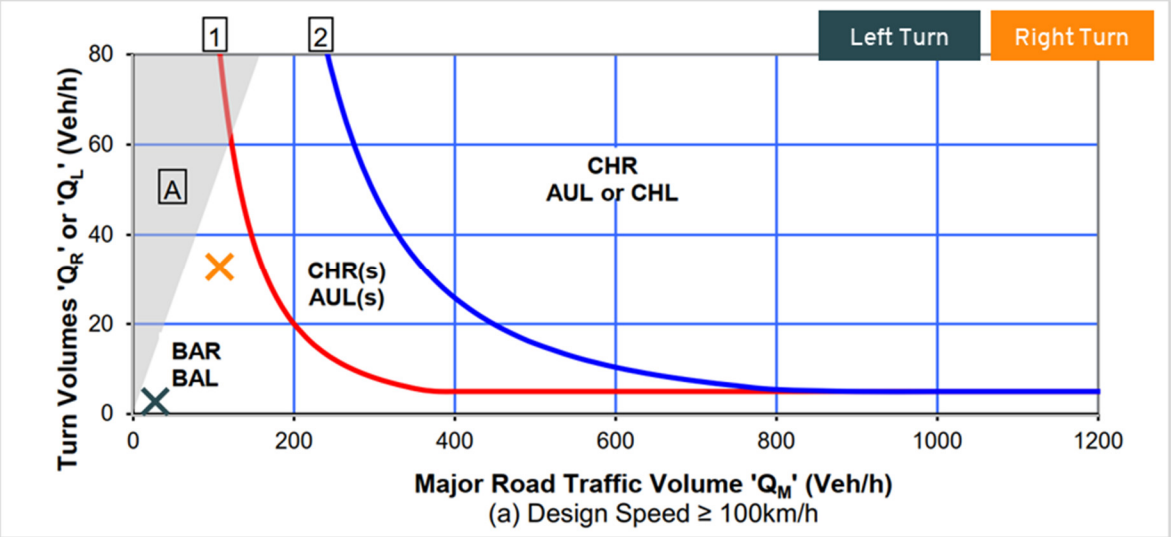
5. Intersection Assessment

5.1 Turn Treatments

Access to the site is proposed via an existing driveway that connects with Goolma Road which is proposed to be realigned to improve sight distance at the intersection. It is noted the 200 metres of transmission line to connect to the existing substation which would not require a separate access.

Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings specifies the turning treatments required at intersections. Figure 3.25 of the guide specifies the required turn treatments on the major road at unsignalised intersections for a design speed of 100km/hr and is provided below in Figure 10.

Figure 10: Figure 3.25 of Austroads Guide to Traffic Management Part 6



During construction of the BESS additional vehicle movements will be generated at the intersection of the site access and Goolma Road. The requirement to provide turn facilities is primarily generated during the morning peak hour when staff access the site which occurs from 6:00am to 7:00am. Table 6 identifies the required turning treatments based on the expected traffic volumes at the intersection.

Table 6: Turning Volumes for Turn Treatment Calculations

Turning Treatment	Traffic Volume (vph)		Requirement
	Turn Volume	Major Road	
Right Turn	31	109	BAR
Left Turn	5	29	BAL

Therefore, the intersection would require a Basic Left Turn (BAL) and a Basic Right Turn (BAR) treatment. The design for the intersection is provided within Appendix B which shows the required left turn treatment is effectively provided via the existing widening of the road to the northeast of the access. It is proposed to provide a Basic Right Turn treatment in accordance with the Austroads Guide.

Accordingly, the proposed access design is concluded to be acceptable and is considered to meet the requirements of the Austroads Guidelines.

In order to confirm the access can accommodate B-Double vehicles a swept path assessment has been provided within Appendix C using the Autodesk Vehicle Tracking software. The assessment demonstrates that the vehicle is able to suitable turn to/from Goolma Road. Accordingly, it is concluded that the site access has been suitably designed and is able to accommodate the vehicles expected to access the site.

5.2 Sight Distance

Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections specifies the Safe Intersection Sight Distance (SISD) as the minimum sight distance which should be provided along the major road at any intersection. Table 3.1 of the guide specifies the SISD required for various design speeds.

The calculation of SISD is based on the operating speed (85th percentile speed) of the road. The operating speed is outlined within the *Austroads Guide to Road Design Part 3: Geometric Design*, as follows:

> *'The term operating speed in this guide refers to the 85th percentile speed of cars at a time when traffic volumes are low, and drivers are free to choose the speed at which they travel (refer to Figure 3.1). The 85th percentile speed is the speed at or below which 85% of cars are observed to travel under free flowing conditions past a nominated point. In effect, this means that designs based on the 85th percentile speed will cater for the majority of drivers.'*

Accordingly, the adopted operating speed is 95km/hr which is based on the 85th percentile speed recorded as part of the tube count survey presented within Section 2.3. The subsequent SISD requirement is 214 metres based on a reaction time of 1.5 seconds. It is noted that there is a minor downward grade from the northeast which equates to less than 2%. The required correction of the SISD in Table 4.2 of the Austroads Guide is 5-6 metres.

In order to confirm the available sight distance at the access, a site visit was undertaken which identified the available sight distance is 224 metres to the northeast and 300+ metres to the southwest. As such, the available SISD exceeds the requirement by 4-5 metres to the northeast and greatly exceeds the requirement to the southwest. Therefore, the sight distance at the access complies with the requirements of the Austroads Guide and vehicles are expected to be able to safely exit the site.

6. Construction Management Plan

A Construction Traffic Management Plan (CTMP) will be prepared prior to construction commencing by the appointed contractor. The CTMP will provide additional information regarding the traffic volumes and distribution of construction vehicles that is not available at this time, including:

- Road transport volumes, distribution and vehicle types broken down into:
  - Hours and days of construction.
  - Schedule for phasing/staging of the project.
- The origin, destination and routes for:
  - Employee and contractor light traffic.
  - Heavy vehicle traffic.
  - Oversize and overmass traffic.

The following provides recommended measures that should be adopted within the CTMP to minimise the impact of construction traffic along the road network:

- Neighbours of the BESS be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access.
- All heavy vehicle movements are recommended to occur outside of school times when school buses are expected on Goolma Road.
- Loading and unloading is proposed to occur within the work area. No street or roads will be used for material storage at any time.
- All vehicles will enter and exit the site in a forward direction.
- Management of vehicular access to and from the site is essential in order to maintain the safety of the general public as well as the labour force. The following code is to be implemented as a measure to maintain safety within the site:
  - Utilisation of only the designated transport routes.
  - Construction vehicle movements are to abide by finalised schedules as agreed by the relevant authorities.
- Implementation of a proactive erosion and sediment control plan for on-site roads, hardstands and laydown areas.
- All permits for working within the road reserve must be received from the relevant authority prior to works commencing.
- A map of the primary haulage routes highlighting critical locations.
- An induction process for vehicle operators and regular toolbox meetings.
- A complaint resolution and disciplinary procedure.
- Local climatic conditions that may impact road safety of employees throughout all project phases (e.g. fog, wet and significant dry, dusty weather).

The above recommendations will ensure the construction traffic will create a minimal impact to the capacity and safety of the surrounding road network.

7. Road Authority Consultation

A draft Traffic Impact Assessment has been submitted to TfNSW for comment. Their response and a subsequent reply are summarised within Table 7.

Table 7: Response to TfNSW Comments

Comment	Response
It is noted that this section of Goolma Road is subject to a number of other developments occurring that will likely have implications for the road environment such as the Uungula Wind Farm realignment of Twelve Mile/Goolma Road and the Wellington South BESS that will be neighbouring this site. The TIA currently presented does not identify the constraints or cumulative impacts with these other projects occurring within this space.	An assessment of the cumulative traffic impacts of nearby projects is provided within Section 3.4 and indicates the road network is expected to continue to operate with a good level of service.
It does not identify the origin and destination of the light and heavy vehicle workforce to the sites or provides inputs to the assumptions made in relation to the light/heavy/OSOM vehicles identified within the report.	The distribution of vehicles is discussed within Section 3.2 with the traffic volume calculations provided within Appendix A.
Will there be a transmission line required to be undertaken as a part of this work? Will that have a separate access with separate vehicles required to enter/exit this access?	The project includes 200 metres of transmission line to connect to the existing substation which would not require a separate access.
Has there been any consideration of the lateral/horizontal and vertical requirements for the OSOM in particular transformers required to move to the site from the route? Will tree clearing, signage removal or any other modifications be required for the route.	The OSOM vehicle route is discussed within Section 4.2. Given the route utilises the State road network and has been adopted by other projects it is concluded that the route is able to be utilised by OSOM vehicles associated with the project with permits to be applied for as part of the CTMP.
It is noted that shuttle buses are proposed as a mitigation measure with no consideration of measures to enforce shuttle buses.	It is understood that the Applicant is seeking to transport at least 80% of the workforce to the site by shuttle bus during peak construction. The size of the on-site car park during construction would prevent a high use of private vehicles.
SISD is not based on the 85th percentile and is actually for the posted speed zone. Meaning the SISD presented as 224 is deficient requires 226m would likely need to take into account the curve and superelevation.	Section 5.2 discusses the sight distance at the site access and indicates that the requirement is based on the 85th percentile speed as outlined within the Austroads Guide. As such, the sight distance complies with the requirements of the Austroads Guide.
What will happen in relation to the OSOM route if the road works for the Twelve Mile Road/Goolma Road intersection have not been completed?	The OSOM vehicles are not required to turn at the intersection and subsequently would be able to travel along Goolma Road. Any OSOM vehicle movements should consider construction works at the intersection as part of the future permit applications.
Please provide the raw data for the tube counts undertaken on Monday 12-19 September 2022.	It is understood that the data has been provided to TfNSW.

In relation to Table 2: Traffic Generating During Construction the Peak Hour for light vehicles is identified as 20 with 10 shuttle buses this is an assumption that 86% of the workforce will be utilising shuttle buses. With no clear measures in relation to enforcement as to how this will be implemented and achievable. Is this for peak construction for the project?	It is understood that the Applicant is seeking to transport at least 80% of the workforce to the site by shuttle bus during peak construction. The size of the on-site car park during construction would prevent a high use of private vehicles.
The peak construction year should take into account the other projects such as Wellington South BESS and Uungula Wind Farm within the background traffic volume assumptions.	An assessment of the cumulative traffic impacts of nearby projects is provided within Section 3.4 and indicates the road network is expected to continue to operate with a good level of service.
Has there been any assessment of capacity of surrounding townships to accommodate the workforce of these simultaneous projects? If workforce can't be accommodated in surrounding townships then this will changed the distribution splits at the proposed access. I imagine this would have been a requirement of the Social Impact Assessment Guidelines.	This is investigated in the social impact assessment and mitigation measures include a specific Industry Participation Plan which would be developed to ensure a focus on maximising the involvement of local people and businesses in the Project and include a Local Procurement Policy and Accommodation and Employment Strategy.
The traffic assessment should be based on the worst case scenario of 150 construction staff and 6 heavy vehicles (is this inclusive of input materials concrete, aggregate etc) entering the site in the AM/PM peak.	The traffic volumes have been based on the worst case scenario.
It is noted that the Mon-Friday construction timeframes are 7-6pm however Table 3: Expected Peak Hour Traffic Volumes During Construction you have stated the AM Peak as 7am and PM Peak as 6pm which is incorrect. As the construction workforce will already be on site or have left the site. The correct peak hour will in face be 6-7am and 5-6pm.	The assessment has been based on the peak hours assuming 6:00am (morning peak) and 5:00pm (evening peak).
The last section notes that there will be no overlap with timeframes with other projects. Reviewing the Wellington South BESS the construction hours will be 7am to 6pm and therefore will have the same AM/PM peak as the proposed project of 6-7am and 5-6pm.	An assessment of the cumulative traffic impacts of nearby projects is provided within Section 3.4 and indicates the road network is expected to continue to operate with a good level of service.
The strategic design provided does not represent the BAL/CHR(S) and should be noted that the whole TIA should be reviewed to address the above discrepancies and will likely require review of the turn warrant assessment and the strategic concept design.	An assessment of the turn treatment requirements based on the revised peak hour times indicates the site access would require a BAR and BAL. The required turn treatments are proposed at the site access.
The strategic concept design should include how the treatments for Wellington South BESS and the proposed treatments for this BESS will work together and be in accordance with Austroads.	The treatment design for the Wellington South BESS is located 1.7km northeast of the project site access and as such, there is no interaction between the designs.
The last swept path identifies that the B-double design vehicle turning right will require to utilise the through lane and the BAL to turn right.	Amber is unsure as to what is being identified in this comment. TfNSW have refused a meeting and subsequently this comment is unable to be addressed.

Dubbo Regional Council was contacted as part of the preparation of the Traffic Impact Assessment. As the site access connects with the State road network Council Officers did not provide any comment on the project in relation to traffic.

8. Conclusion

Amber Organisation has assessed the traffic impacts of the 400MW BESS located approximately at 6945 Goolma Road, Montefiores. Access to the site is proposed via an existing access driveway to Goolma Road, with all plant expected to be delivered from Port of Newcastle. The above assessment determined the following:

- The site is expected to generate up to 60 heavy and 60 light vehicle movements per day during peak construction times, reducing to 50 light vehicle and 40 heavy vehicle movements per day in the average construction period;
- The road network is able to accommodate the traffic generated by the development during the construction, operation and decommissioning stages. Further, the cumulative impact of the site traffic with nearby developments is expected to be minimal;
- The proposed construction traffic access route is designated for B-Double vehicles and as such, the access route is able to accommodate the loads and type of vehicle movements to be generated during construction of the BESS;
- The intersection of the site access and Goolma Road is proposed to be provided with basic left and right turn treatments and adequate sight distance to allow vehicles to safely enter and exit the site; and
- In order to mitigate the impacts of the development during construction a CTMP will be prepared which should include the recommendations provided within this document.

Accordingly, based on the assessment above, it is concluded that the proposed access arrangements for the BESS are suitable to accommodate the expected construction vehicle types and traffic volumes during the construction and operation phase of the project.

Appendix A

Construction Traffic Volumes

Akaysha Energy Orana BESS

Construction Vehicles

Per stage, 200MW/800MWh

Notice to Proceed Stage 1: Mid-2023
Notice to Proceed Stage 2: Q4 2024

No. Battery Segments for 800MWh	1,223	2,446
No. DC Collectors	120	
Battery Segments/DC Collectors per truck	2	
No BESS deliveries	**672**	
Delivery Rate (Segments/week)	100	
No. Weeks	12.23	*Equipment only, excl. concrete, spoil etc*
No. Power Conversion Stations	70	
PCS per truck	1	
No. PCS Deliveries	**70**	
No. Ring Main Units	10	
RMUs per truck	2	
No. RMU Deliveries	**5**	
No. MV Transformers	35	
MVT per Truck	1	
No. MVT Deliveries	**35**	
Subtotal	782	
Day rate	**10.65004**	per day
Other Bulk Equipment Deliveries	**19**	up to per day
ie. concrete, cable drums, structures, gantries etc		
Subtotal "Other" per stage	232.37	
Total per stage	**1,014**	
Total Heavy	**30**	
Bus (Worker Transport)	**10**	up to, per day (5x morning, 5x night)
Light Vehicles	**20**	up to per day (site mgmt only)

OSOM

No. Power Transformers	2
HV Switchgear	2
Control Room	1
	5

Appendix B

Access Design

Orana Battery Energy Storage System

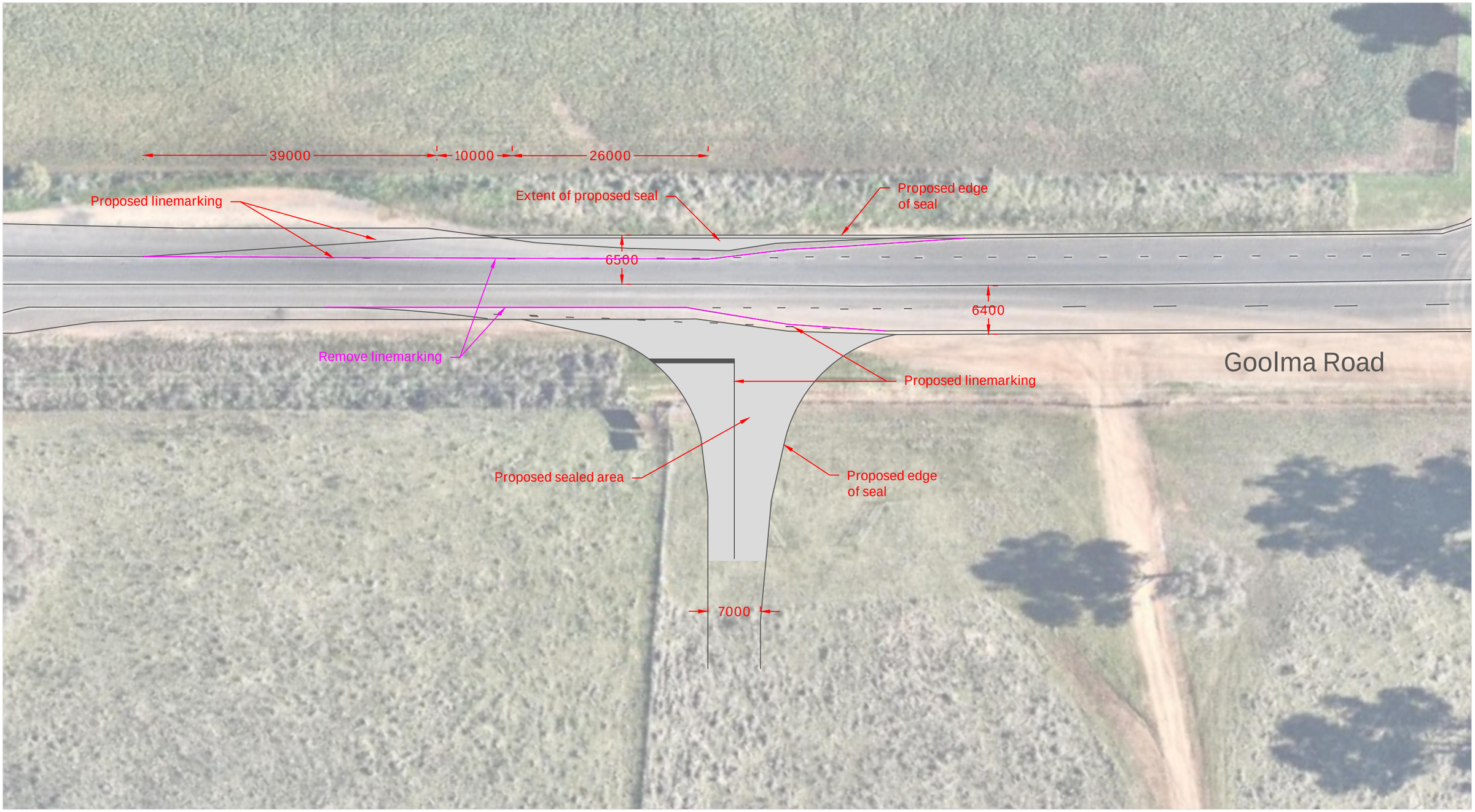
6945 Goolma Road, Wuuluman

Existing Road Layout

DRAWN: MW
DATE: 04/10/2022
DWG NO: 370-S01A
SCALE at A3: 1:500

Amber

01



The following design details have been taken from Austroads Guide to Road Design Part 4A:

Rural Basic Right-turn Treatment (BAR) Section 7.5.1.
1: Design speed of 100km/h.
2: Lane widths of 3.7m have been used.
3: Formation/carriageway widening is 2.8m.
4: Taper lengths calculate to 39m.
5: Storage length is 26m for one 26m design vehicle.

Rural Left-turn Treatment (BAL) Section 8.2.1.
1: Design speed of 100km/h.
2: Lane widths of 3.7m have been used.
3: Formation/carriageway widening is 2.3m.
4: Taper length calculates to 32m.
5: Minimum length of parallel widened shoulder used from Table 8.1 is 25m.

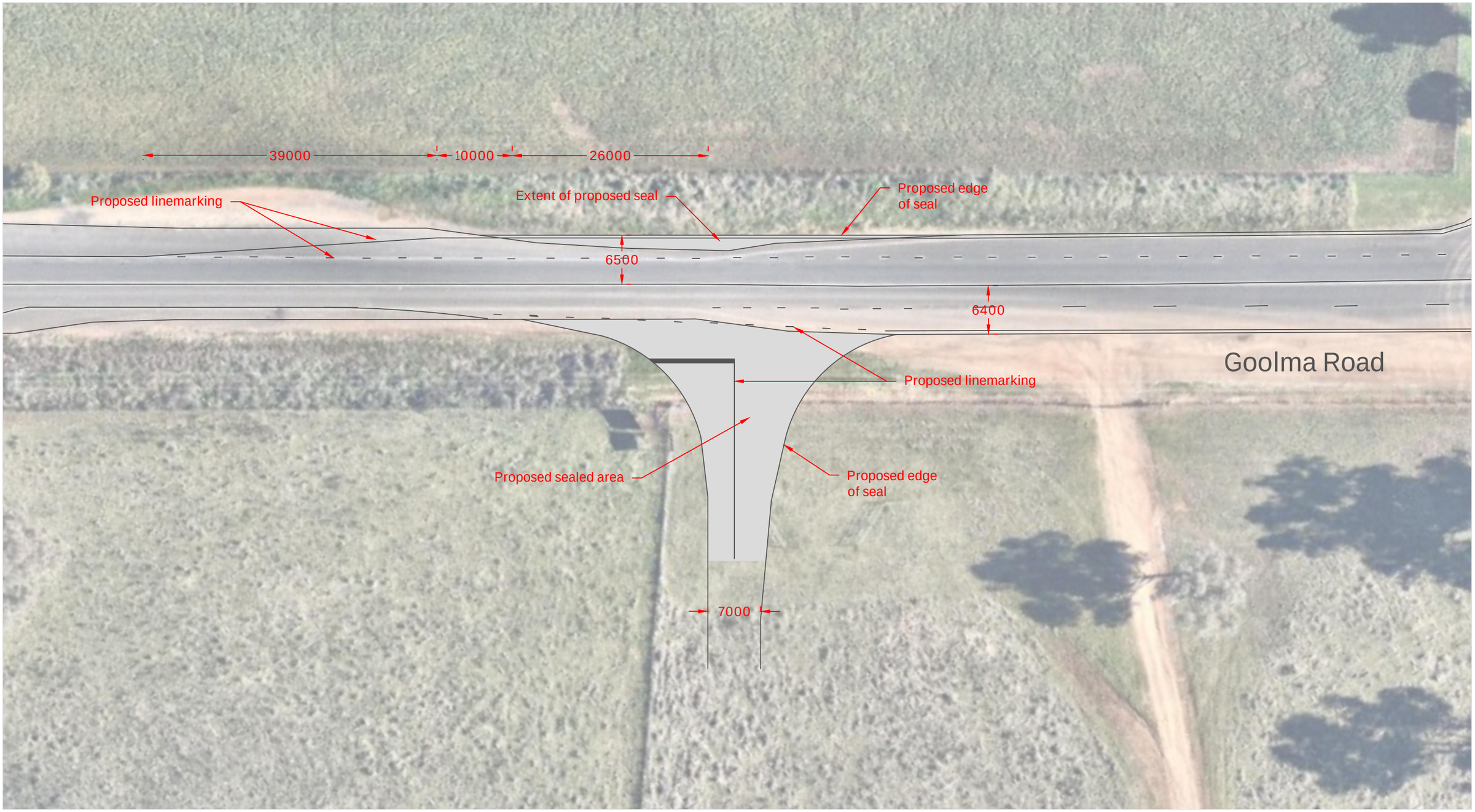
Orana Battery Energy Storage System

6945 Goolma Road, Wuuluman

Proposed Access Design/Amendments

DRAWN: MW
DATE: 04/10/2022
DWG NO: 370-S01A
SCALE at A3: 1:500

Amber 02



The following design details have been taken from Austroads Guide to Road Design Part 4A:

Rural Basic Right-turn Treatment (BAR) Section 7.5.1.
1: Design speed of 100km/h.
2: Lane widths of 3.7m have been used.
3: Formation/carriageway widening is 2.8m.
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4: Taper length calculates to 32m.
5: Minimum length of parallel widened shoulder used from Table 8.1 is 25m.

Orana Battery Energy Storage System

6945 Goolma Road, Wuuluman

Site Access Design

DRAWN: MW
DATE: 04/10/2022
DWG NO: 370-S01A
SCALE at A3: 1:500

Amber

Orana Battery Energy Storage System

6945 Goolma Road, Wuuluman

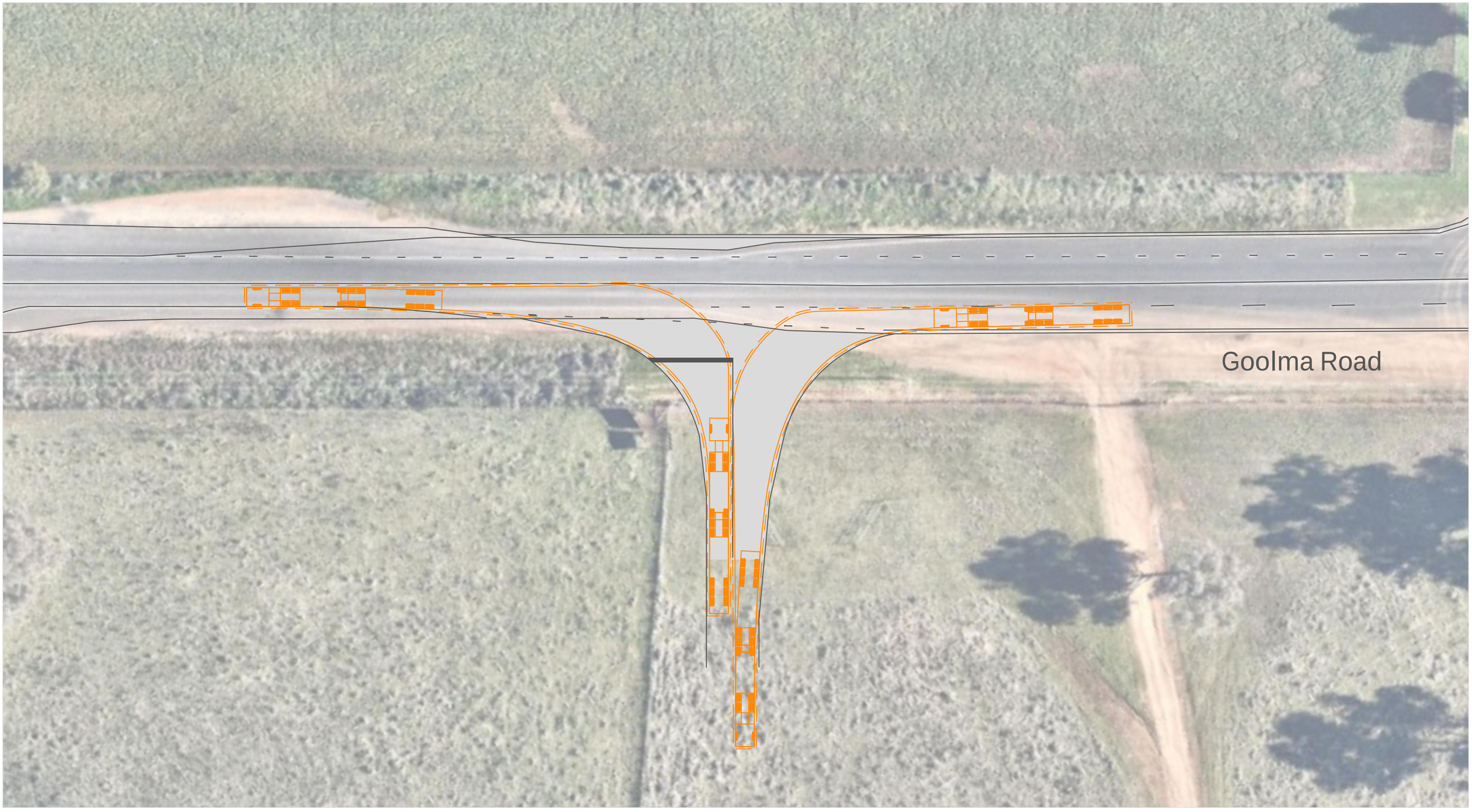
Site Access Design

DRAWN: MW
DATE: 04/10/2022
DWG NO: 370-S01A
SCALE at A3: 1:500

Amber

Appendix C

Swept Path Assessment

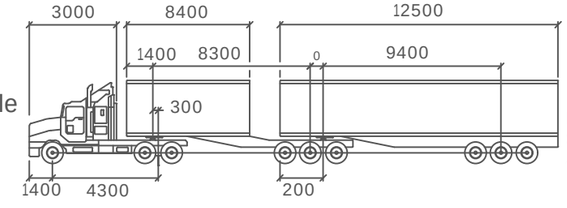


Vehicle Envelope

300mm Clearance

Reverse Manoevure

B-Double



	mm
Tractor Width	: 2500
Trailer Width	: 2500
Tractor Track	: 2500
Trailer Track	: 2500
Lock to Lock	: 6.0s
Steering Angle	: 22.2
Articulating Angle	70.0

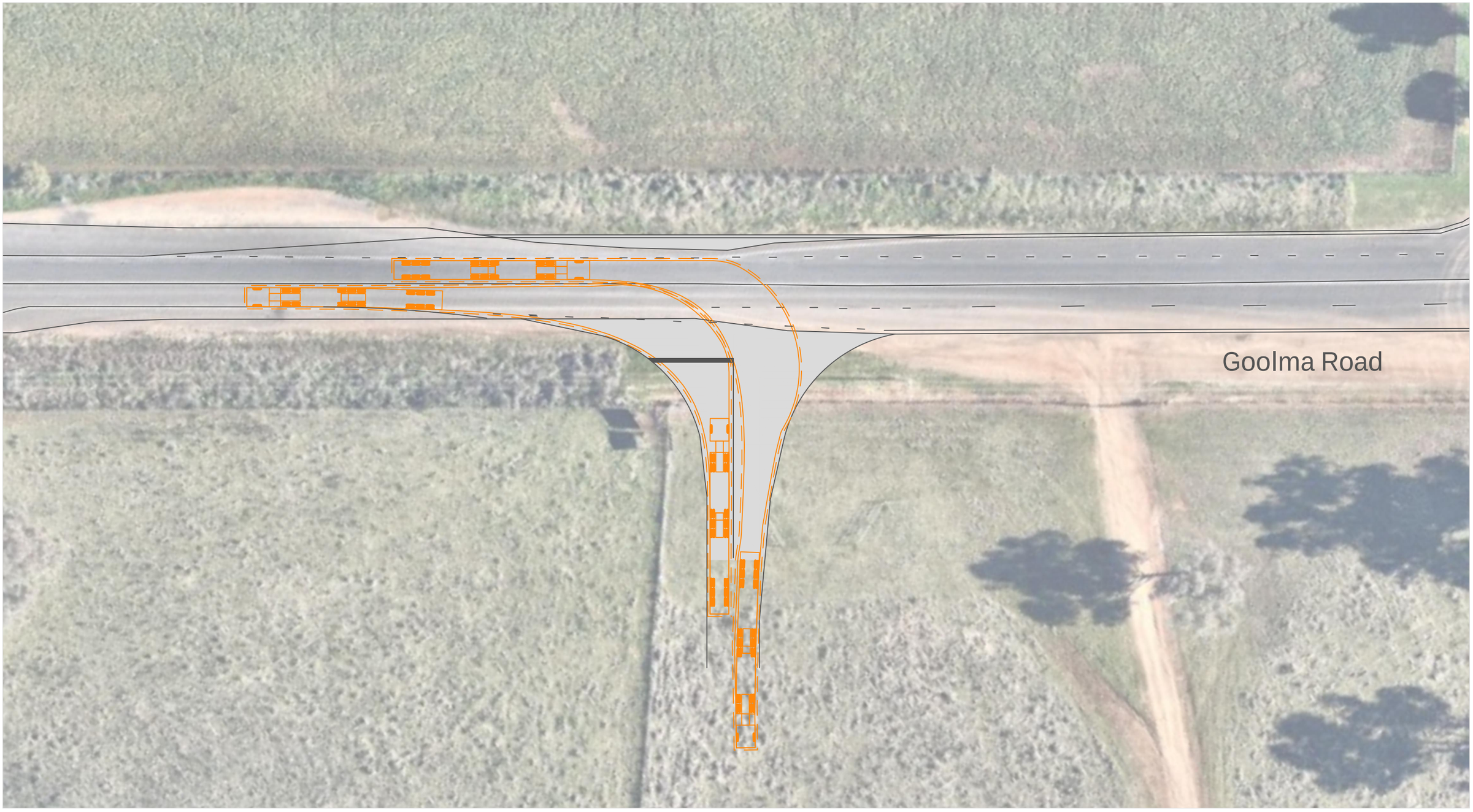
Orana Battery Energy Storage System

6945 Goolma Road, Wuuluman

Swept Path Assessment

DRAWN: MW
DATE: 04/10/2022
DWG NO: 370-S01A
SCALE at A3: 1:500

Amber

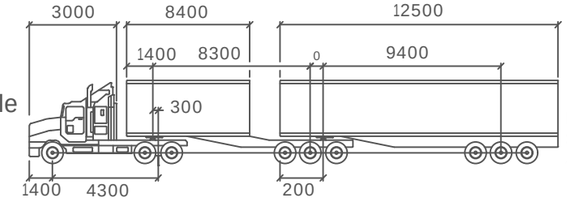


Vehicle Envelope

300mm Clearance

Reverse Manoevure

B-Double



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Trailer Width	: 2500
Tractor Track	: 2500
Trailer Track	: 2500
Lock to Lock	: 6.0s
Steering Angle	: 22.2
Articulating Angle	70.0

Orana Battery Energy Storage System

6945 Goolma Road, Wuuluman

Swept Path Assessment

DRAWN: MW
DATE: 04/10/2022
DWG NO: 370-S01A
SCALE at A3: 1:500

Amber

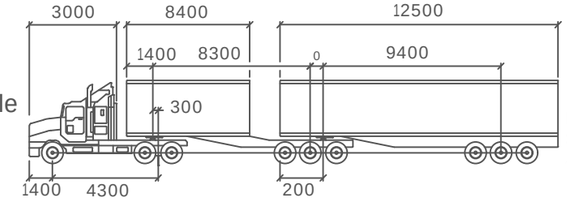
Goolma Road

Vehicle Envelope

300mm Clearance

Reverse Manoevure

B-Double



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Orana Battery Energy Storage System

6945 Goolma Road, Wuuluman

Swept Path Assessment

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Amber