

Traffic Impact Assessment Report

120 Houghton Road, Yanco, NSW

Project Number 230136

Final 3 Report 7/11/2024

Client ACEnergy Pty Ltd

Document control record

Document prepared by:

Trafficworks Pty Ltd

ABN 59 125 488 977

1st Floor 132 Upper Heidelberg Rd Ivanhoe Vic 3079

PO Box 417 Ivanhoe Vic 3079

Ph (03) 9490 5900

www.trafficworks.com.au

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Executive summary

ACEnergy Pty Ltd engaged Trafficworks to undertake a traffic impact assessment (TIA) for the proposed development of a Battery Energy Storage System (BESS) at **120 Houghton Road, Yanco, NSW** within Leeton Shire Council. (council).

The Yanco BESS includes constructing, operating, and commissioning a BESS with an estimated capacity of approximately 250 MW / 1,100 MWh and associated infrastructure, including transmission and connection works.

This report includes a response to Transport for NSW's (TfNSW) submissions and the Planning Secretary's Environmental Assessment Requirements (SEARs) dated February 2024. The report has also been updated to respond to the comments of the Department of Planning, Housing and Infrastructure (DPHI).

The table below summarises the development site, the proposed development, and our conclusions and recommendations.

Address	120 Houghton Road, Yanco
Zoning	RU1: Primary Production
Proposed development	Battery Energy Storage System (BESS)
Road network	Houghton Road (local road) Irrigation Way (state road)
Traffic generation	Construction phase (per day): — light vehicles = 50 vpd — heavy vehicle = 28 vpd Operation phase (per day): — light vehicles = 10 vpd
Car parking	Construction phase: 25 spaces Operation phase: 5 spaces
Conclusion	We conclude that subject to the implementation of our recommendations, no traffic engineering reasons would prevent the development from proceeding. — the peak hour traffic generation is likely to occur during the construction phase of the development, where the peak hour volumes are expected to be: — 25 light vehicles — 1 heavy vehicle.

-
- the construction phase is expected to take 8 months
 - during the development's operation phase, the peak hour volumes are expected to be up to 5 light vehicles
 - the development site will generate a peak car parking demand of 25 spaces during construction and 5 spaces post-opening
 - the updated development site plan has a designated parking area that can accommodate 25 vehicles during the development's construction phase
 - the sight lines along:
 - Houghton Road at the intersection with Hulme Road are satisfactory
 - Irrigation Way at the intersection with Houghton Road is satisfactory
 - the proposed security gate's setback from the edge of Hulme Road will accommodate the storage of a light vehicle clear of the traffic lane
-

Recommendations

It is recommended that:

- **Recommendation 1:** Irrigation Way and Houghton Road's intersection should be upgraded per the prepared Strategic Design plans
 - **Recommendation 2:** the intersection of Houghton Road, Hulme Road and the development site access should be upgraded in accordance with the prepared Functional Layout plan
 - **Recommendation 3:** implement a traffic management plan to ensure no heavy vehicles arrive and depart simultaneously along Houghton Road.
-

Referenced documents

References used in the preparation of this report include the following:

- Austroads Guide to Road Design
 - Part 4: Intersections and Crossings (AGRD4)
 - Part 4A – Unsignalised and Signalised Intersections (AGRD4A)
- Austroads Guide to Traffic Management
 - Part 6 – Intersections, Interchanges and Crossings Management (AGTM6)
- Australian Standards:
 - AS 2890.1-2004 Parking facilities - Off-street car parking
- RTA Guide to Traffic Generating Developments, Version 2.2, October 2002.
- Transport for New South Wales (TfNSW)
 - Centre for Road Safety development
 - Traffic Volume Viewer
- Leeton Shire Council
 - Local Environment Plan 2014 (LEP)
 - Development Control Plan 2022 (DCP)
 - Engineering Guidelines 2022/23

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1 Introduction

ACEnergy Pty Ltd engaged Trafficworks to undertake a traffic impact assessment (TIA) for the proposed development of a proposed Battery Energy Storage System at **120 Houghton Road, Yanco, NSW** within Leeton Shire Council. (council).

The Yanco BESS includes constructing, operating, and commissioning a BESS with an estimated capacity of approximately 250 MW / 1,100 MWh and associated infrastructure, including transmission and connection works.

This report includes a response to Transport for NSW's (TfNSW) submissions and the Planning Secretary's Environmental Assessment Requirements (SEARs) dated February 2024. The report has also been updated to respond to the comments of the Department of Planning, Housing and Infrastructure (DPHI).

For the details about:

- existing site conditions – see section 2
- description of the proposed development – see section 3.1
- traffic impact of the proposed development – see section 3
- car parking assessment of the proposed development – see section 4
- assessment of the access to the proposed development – see section 5
- our conclusions and recommendations – see section 6.

2 Existing conditions

2.1 Development site

The development site is:

- located at 120 Houghton Road in Yanco
- located within Lot 516 of DP751745 and part of Lot 521 of DP751745
- currently occupied by farmland.

Vehicular access to the development site is available from the existing access point to Hulme Road, connecting to Houghton Road at the northeast corner.

Figure 1 shows the development site's location, surrounded by farmland and rural properties.



Figure 1: Location plan (reproduced from Nearmap)

The development site is located adjacent to an electrical transmission and distribution facility and a sewage treatment plant to the east of Hulme Road (SP2: Infrastructure), as per the Leeton Shire Council's (council) Local Environmental Plan 2014 (LEP). Further to the east, along Houghton Road, near Irrigation Way (a state arterial road), is a GrainCorp facility adjacent to an active railway line.

Figure 2 shows the zoning for the development site and surrounding area.

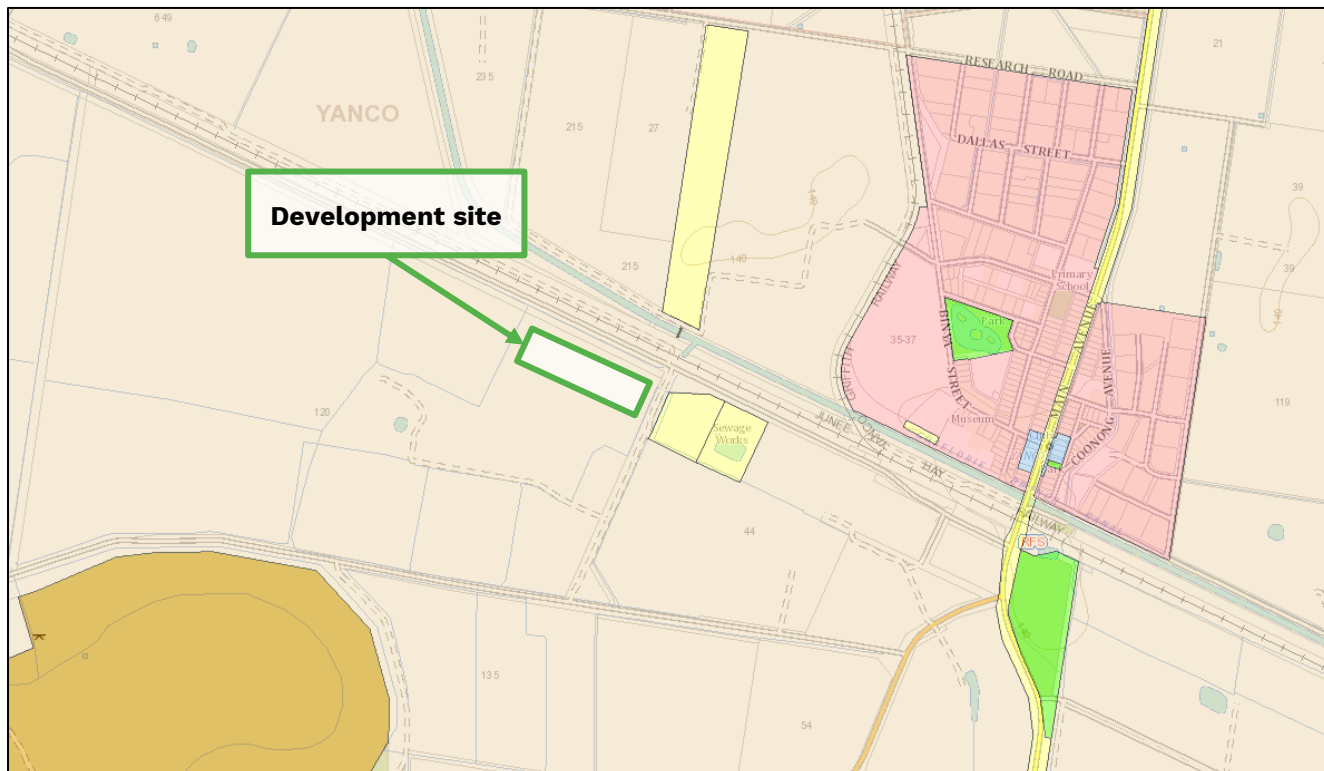


Figure 2: Zoning plan (reproduced from NSW ePlanning Spatial Viewer)

2.2 Road network

The road network includes:

- Irrigation Way (Euroley Road)
- Houghton Road
- Hulme Road.

2.2.1 Irrigation Way (MR80 - Euroley Road)

Table 1 describes the features of this road.

Table 1: Irrigation Way features

Feature	Description
Road type	Classified state arterial road managed by Transport for New South Wales (TfNSW)
Access	Provides access between Narrandera at the southeastern end to Griffith at the northwestern end
Road reservation	— 60 m wide
Carriageway	— 7.6 m wide
Cross section	— two-way undivided road (2 x 3.5 m traffic lanes) — rural open swale drains to each side
Other features	— Railway level crossings north of Houghton Road — Services include one passenger train in each direction per day — During the grain season, GrainCorp may load up 8 trains (at most one per day)
Speed limit	— 60 km/h

Figure 3 and Figure 4 provide further information about the road.



Figure 3: Irrigation Way looking northeast towards the intersection with Houghton Road on the left



Figure 4: Irrigation Way looking southwest towards the intersection with Houghton Road on the right

2.2.2 Houghton Road

Table 2 describes the features of this road.

Table 2: Houghton Road features

Feature	Description
Road type	Local road managed by council
Access	Provides access between Whitton at the northwestern end to Euroley Road / Irrigation Way in Yanco at the southeastern end
Road reservation	60 m wide
Carriageway	9.5 m wide unsealed road formation for the majority of the subject length, including at the intersection with Hulme Road 5.5 m wide sealed road for 600 m from Irrigation Way, past the GrainCorp facility
Cross-section	— two-lane, two-way undivided road — rural open swale drains to each side
Speed limit	100 km/h (assumed default rural limit) A solitary 60 km/h sign is located about 100 m from the intersection with Irrigation Way (northwestern approach) Due to the unsealed road condition/environment, the operating speed is estimated to be 60 to 70 km/h along the subject length.

Figure 5 shows an extract of the land ownership for Houghton Road. Figure 6 and Figure 7 provide further information about the road.

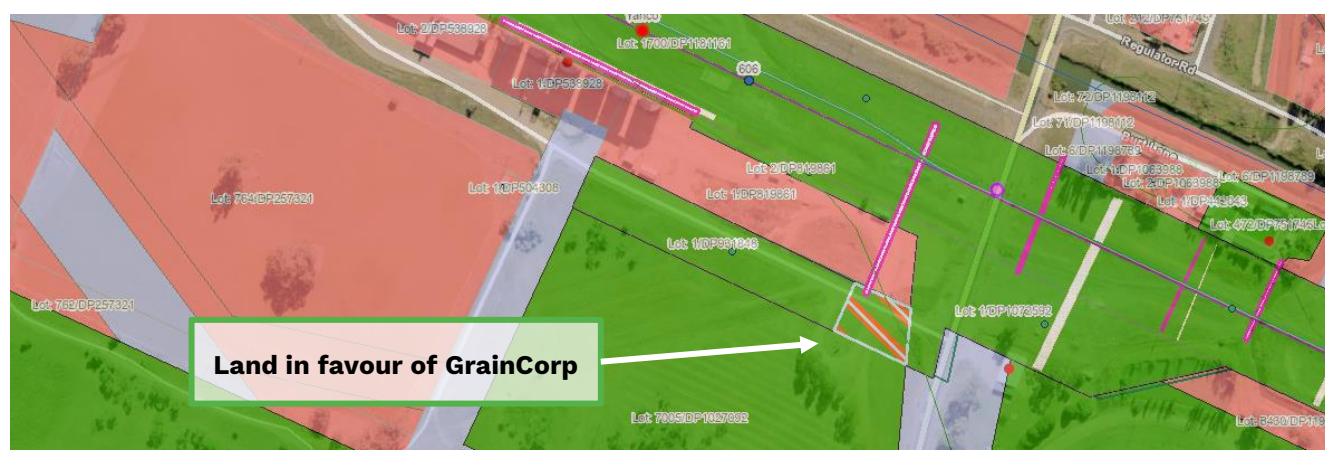


Figure 5: Extract of land ownerships along Houghton Road

The eastern end of Houghton Road runs through land within Lot 1 DP931848 and Lot 1 DP1072592, which are owned by Transport Asset Holdings (TAHE) and managed by UGL Regional Linx on their behalf.

The road alignment passes through these private landholdings and is the subject of a right of access (orange hatch in Figure 5) in favour of GrainCorp land to the north, i.e. Lot 1 DP819861.



Figure 6: Houghton Road looking southeast past the GrainCorp facility on the left



Figure 7: Houghton Road looking southeast towards the intersection with Hulme Road on the right

2.2.3 Hulme Road

Table 3 describes the features of this road.

Table 3: Hulme Road features

Feature	Description
Road type	Local road managed by council
Access	Provides access between Houghton Road at the northeastern end to River Road at the southwestern end
Road reservation	40 m wide
Carriageway	3.0 m wide unsealed road formation
Cross section	— single-lane, two-way, undivided road — rural open swale drains to each side
Speed limit	100 km/h (assumed default rural limit) Due to the unsealed road condition /environment, the operating speed is estimated to be 40 to 50 km/h along the subject length.

Figure 8 and Figure 9 provide further information about the road.



Figure 8: Hulme Road looking southwest from the intersection with Houghton Road, the existing farm gate access to the land where the development site will be located is on the right



Figure 9: Hulme Road looking northeast towards the intersection with Houghton Road, the development site access on the left

2.3 Traffic volumes

2.3.1 Irrigation Way / Houghton Road intersection

Following the RFI from TfNSW, traffic surveys were undertaken at the intersection of Irrigation Way and Houghton Road during the following day and times:

- Thursday, 6 am to 9 am
- Thursday, 3 pm to 6 pm

The results of the surveys determined that the peak hours during the two periods are as follows:

- Thursday, 7 am to 8 am
- Thursday, 4 pm to 5 pm

A summary of the peak-hour surveys is shown in Figure 10 and Figure 11.

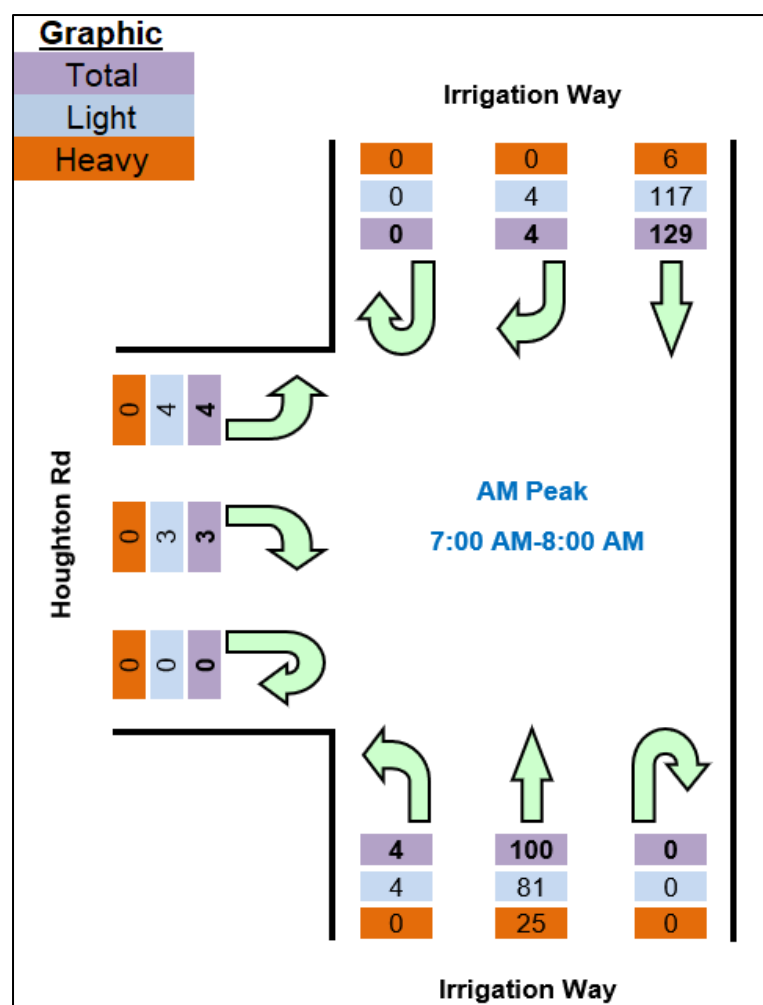


Figure 10: Traffic volumes at the Irrigation Way / Houghton Road intersection on Thursday, 9 May 2024 (AM Peak)

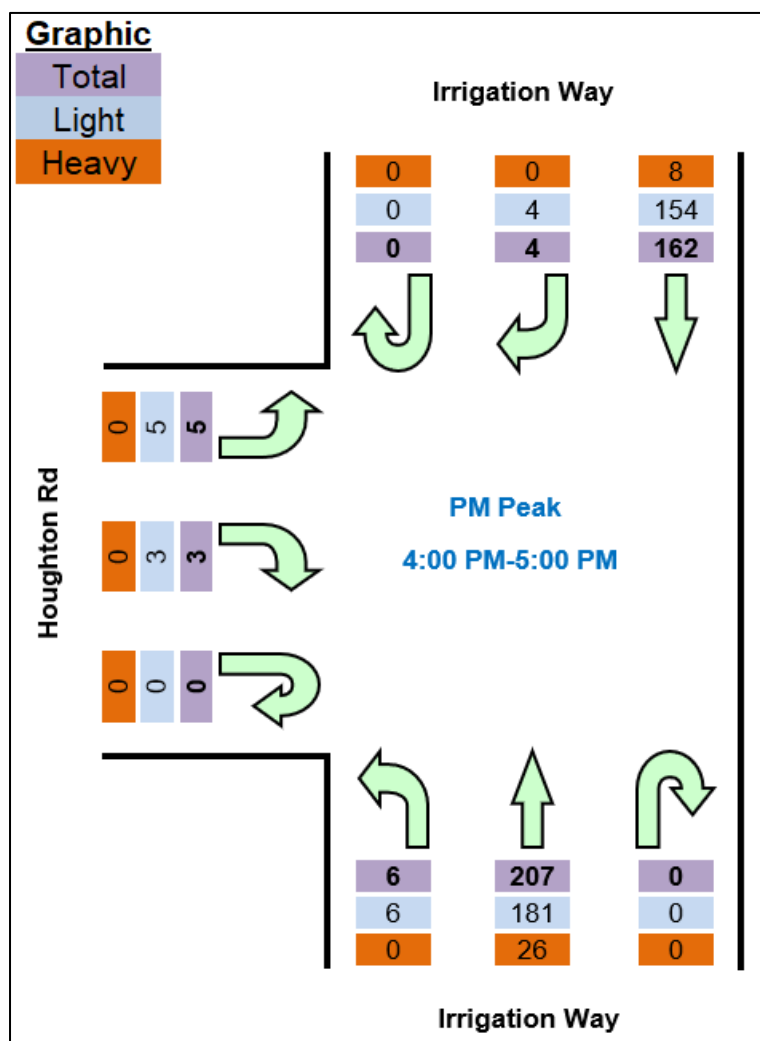


Figure 11: Traffic volumes at the Irrigation Way / Houghton Road intersection on Thursday, 9 May 2024 (PM peak)
Full details can be found in Appendix 1 – Traffic Survey Results.

2.3.2 Hulme Road

No traffic volume data is available for Hulme Road. As a result, the average daily traffic volume has been estimated. The road services 2 dwellings and farmland, estimated to have no more than 20 vpd, equating to a peak hour two-way volume of 2 vph.

2.4 Crash history

The TfNSW Centre for Road Safety website details all injury crashes throughout New South Wales and reports that no casualty crashes have occurred on the roads near the development site in the last five years (2018 - 2022).

Based on this, we conclude that no trend requires immediate investigation.

3 Traffic assessment of the proposed development

3.1 The proposal

The extract of the aerial layout plans (in Figure 12 and reproduced in Appendix 2 – Development Plan), shows the development includes a 250 MW / 1,100 MWh (4-hour storage) facility consisting of:

- BESS lithium-ion battery units, resembling 20ft containers
- MVPS (Medium Voltage Power Station) resembling 40ft containers
- hardstand/storage area
- connection to a 132 kV Transgrid transmission line.

Vehicular access to the proposed development will be via a new access driveway from the northeast via Hulme Road and Houghton Road, connecting to the arterial road network at Yanco (Irrigation Way).

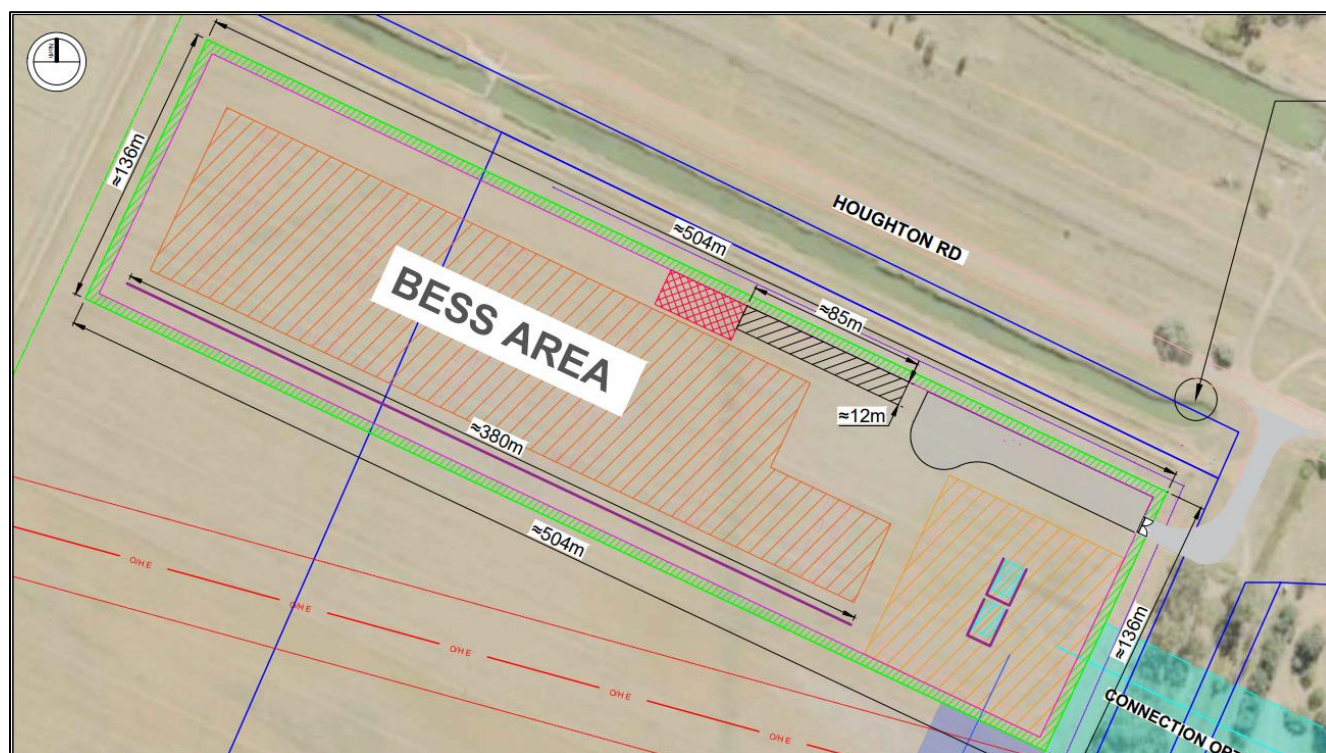


Figure 12: Extract of the development plan

3.1.1 Construction

On-site construction for the proposed BESS is limited mainly to assembly and connecting components with the typical battery energy storage system shipping containers.

The typical construction delivery schedule for this BESS is shown in Table 4.

Table 4: Construction delivery schedule

Time period	Site Works
Months 1 to 2	drainage, road and fencing works installation of concrete footings
Months 3 to 6	cable installation delivery of battery shipping containers and MVPS installation of battery shipping containers and inverter station
Months 6 to 7	electrical installation and cable termination electrical testing
Month 8	commissioning / demobilisation

There is an 8-month construction phase before full operation, with the indicative commencement date of late 2025 (November/December). The peak periods for construction traffic are likely to commence in February/March of 2026.

The proposed work hours during the construction phase are as follows:

- Monday to Friday 7:00 am – 6:00 pm
- Saturday 8:00 am – 1:00 pm
- Sundays and Public Holidays No construction work.

3.1.2 Light vehicle access to the development site

Light vehicles will arrive from Yanco/Leeton/Griffith to the north (approximately 75%) and Narrandera from the south (approximately 25%). Shuttle buses will be provided to reduce traffic vehicle movements during the project's construction phase.

The client has advised that four 22-seat shuttle buses will be included with the construction work vehicles (like utes) to transport staff to and from the subject site. The staff movements will be serviced by the shuttle buses as follows:

- 2x for Yanco
- 1x for Griffith
- 1x for Narrandera.

A code of conduct will be included with the traffic management plan for the construction period to promote safe behaviour when commuting to the worksite.

3.1.3 Heavy vehicle access to the development site

All heavy vehicle traffic from the port in Sydney, hauling the equipment (MVPS, BESS, Cables, etc.) will arrive/depart the development site as follows:

- Arrivals: access from the Hume Highway (M31) via the Sturt Highway (A20) through Wagga Wagga to Narrandera, to Irrigation Way towards Yanco, left onto Houghton Road, left onto Hulme Road, and then into the development site.
- Departures: will follow the same route as arrivals, but in reverse.

The proposed heavy vehicle route is already used by heavy vehicles (including 19 m semi-trailers) and is approved to carry larger vehicles, including 26 m B-doubles. Only the last 800 m on an unsealed section of local road is not currently B-Double approved. Many deliveries will be via rigid 12.5 m single-unit trucks or 19.0 m articulated trucks, but there may also be the occasional delivery by 26 m B-double trucks. At this stage of the project's planning, the client does not know the percentage split of the delivery vehicle types.

The only exception will be for the grid transformers, which will be transported via an oversized-overmass (OSOM) delivery undertaken by a specialist haulage contractor, with approvals from the National Heavy Vehicle Regulator (NHVR).

The above heavy vehicle movements relate to the project's construction phase. During the operational phase, no heavy vehicle movements will occur, with access via light vehicles only (like utes). Only in rare circumstances, like replacing malfunctioning equipment that could not be repaired on-site, would a heavy vehicle be required to access the subject site post-construction.

Figure 13 indicates the routes for all heavy vehicles arriving and departing the development site.

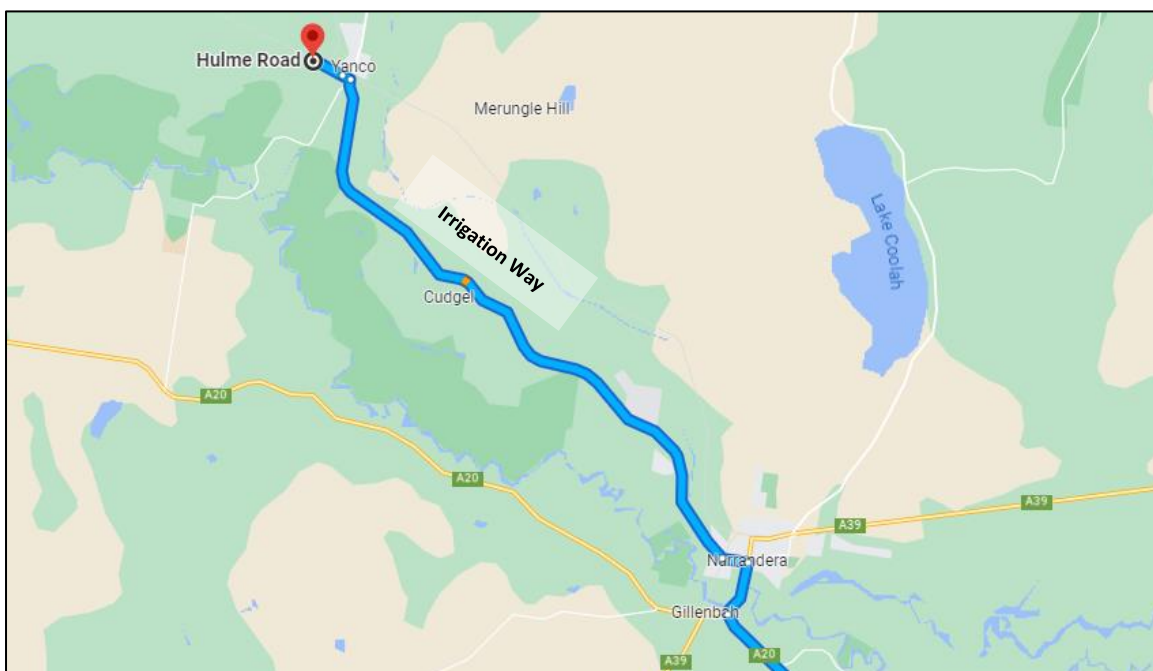


Figure 13: Indicative route for heavy vehicle arrivals/departures from the port in Sydney (source: Google Maps)

The balance of the deliveries to the development site, including materials for site preparation and set up (aggregate, concrete, fencing, etc), will arrive from the north and south along Irrigation Way.

The heavy vehicles are expected to arrive from Yanco/Leeton/Griffith to the north (approx. 30%) and Narrandera from the south (approx. 70%).

3.1.4 OSOM vehicles

Others completed the OSOM route assessment, refer to Appendix 5 – OSOM Route Assessment Report. Further information has been provided by the client as follows:

Load - HV transformers

- Equipment quantity: 2
- Vehicle quantity:
 - 16x 19 m semi-trailers for dismantled components per transformer
 - OSOM: 2x Combination Prime mover and platform trailer
 - 8x pilot vehicles
 - 4x Police escort vehicles
- Movements: one-off
- Timeline: Week 26 of construction

Load – switch rooms/control room

- Specification: 3.5W x 16L x 3.6H. Weight 60t.
- Drawings: N/A
- Equipment qty: 2 switch rooms, 1 control room, 1 O & M room
- Vehicle quantity:
 - OSOM: 4x prime mover and platform trailer
 - 8x pilot vehicles
- Movements: one-off
- Timeline: Week 26 of construction

Cranes:

- Specification: 220t lifting capacity.
- Equipment quantity: 2. One for the BESS area and one for the HV asset

- Vehicle quantity:
 - 8x semi-trailers for components
 - OSOM: 2x Combination Prime Mover and platform trailer. (OSOM for delivering crane base and semi-trailers for dismantled parts. Assemble crane on site)
 - 4x pilot vehicles
- Movements: one-off and stay on site for 10 weeks
- Timeline: Week 18-27 of construction

A maximum of 8 OSOM vehicles, requiring pilots/escorts, will arrive at the subject site throughout construction. The OSOM route assessment report confirms that no height restrictions will prohibit the delivery of any loads to the subject site.

3.1.5 Operation / decommissioning

The proposed use is based on a forty-year lease. If the lease is not renewed after this period, the facility's operator will be obliged to decommission the facility, remove all installations, and remediate the development site back to its pre-existing state.

Upon approval of this application, the responsible authority may require a decommissioning and rehabilitation plan to be submitted for endorsement.

3.1.6 Accommodation needs of the development

Accommodation for workers throughout the 8-month construction phase is expected to be in Yanco / Leeton to the north and Narrandera to the south. Others will prepare the Social Impact Assessment Report and analyse the workers' accommodation.

3.2 Traffic generation

Typically, traffic generation for new developments is estimated using the rates provided in the RTA Guide to Traffic Generating Developments — Version 2.2A 2002 (the RTA Guide). However, the RTA Guide does not include traffic generation rates for BESS facilities.

Therefore, the traffic generation to/from the proposed development was estimated empirically. Traffic generation analysis was undertaken for the development's construction and operational phases to establish the likely peak traffic generation.

3.2.1 Construction phase traffic volumes

Based on the information provided by the client, the peak light vehicle traffic generation will likely occur during months 3 to 6 of the construction phase. Up to 25 construction staff vehicles per day (including the shuttle buses) will access the development site, resulting in a total daily traffic generation of 50 vpd (25 vpd arriving and 25 vpd departing at the end of the shift).

Assuming the construction work will be undertaken during regular working hours, 25 vehicles will be expected to access the development site during peak hours (at the start of the morning shift).

Assessment of the heavy vehicles accessing the development site during the construction phase revealed that peak traffic generation would likely occur during months 3 and later during months 5 to 6. This period includes the delivery of battery shipping containers when up to 14 heavy vehicles will access the development site daily. Therefore, this would result in a total daily traffic generation of 28 vpd (14 vpd arriving and 14 vpd departing). It is unlikely that more than 4 heavy vehicles will arrive within the same hour as deliveries will be managed by the project team (i.e. delivery schedule).

Assuming the construction work will be undertaken during regular working hours, heavy vehicles are anticipated to access the development site outside the commuter peak hours for the surrounding road network. However, conservatively, for this assessment, it has been assumed that a single heavy vehicle will access the development site during the AM (arriving) and PM (departing) peak hours.

3.2.2 Operational phase traffic volumes

The proposed BESS will require on-site surveillance and monitoring of the facility. The compound contains critical infrastructure that requires a high degree of security. Once potential issues are identified, on-site staff can act directly.

Up to 5 light vehicles will attend the development site daily during the operational phase for general maintenance. Therefore, this would result in a total daily traffic generation of 10 vpd (5 vpd arriving and 5 vpd departing) for the project's operational phase.

3.2.3 Peak traffic generation

Assessment of the likely traffic generation volumes during the development's construction and operational phases revealed that the development site's peak traffic generation would occur during the construction phase. Therefore, the assessment was undertaken to determine the traffic implications during this phase.

3.3 Traffic distribution assumptions

Based on the surrounding road network, it has been assumed that:

- For light vehicles:
 - 75% will access the development site to/from the north (Yanco/Leeton/Griffith), entering Houghton Road via a right turn from Irrigation Way
 - 25% will access the development site to/from the south (Narrandera), entering Houghton Road via a left turn from Irrigation Way.

— For heavy vehicles:

- 30% will access the development site to/from the north (Yanco/Leeton), entering Houghton Road via a right turn from Irrigation Way
- 70% will access the development site to/from the south (Narrandera), entering Houghton Road via a left turn from Irrigation Way.

It has been assumed that during the AM peak of the construction phase, 100% of the light/heavy vehicles will enter the development site, and 0% will leave it. Similarly, during the PM peak of the construction phase, 0% of the light/heavy vehicles will enter the development site, and 100% will leave it.

3.4 Anticipated traffic volumes

Given that the proposed BESS will have peak traffic generation during the construction phase, the anticipated development traffic volumes for 2026 (when the facility is under construction) are summarised in Figure 14.

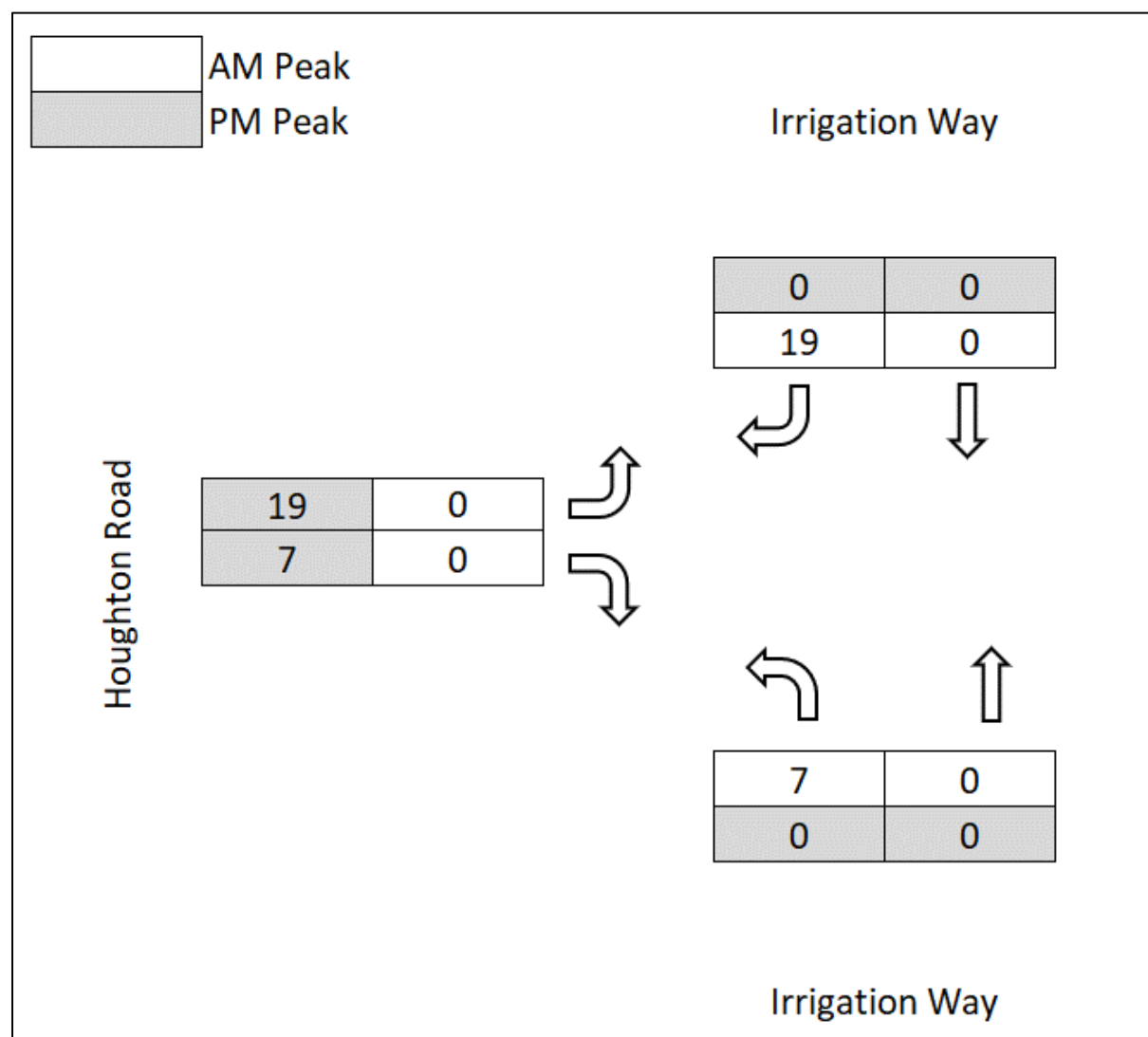


Figure 14: Anticipated traffic volumes for development

3.5 Other construction projects

Origin Energy proposes a 60 MW solar energy facility on approximately 152 ha of land 10 km south of Leeton. Construction will commence in July 2025, 4-5 months before the Yanco BESS project.

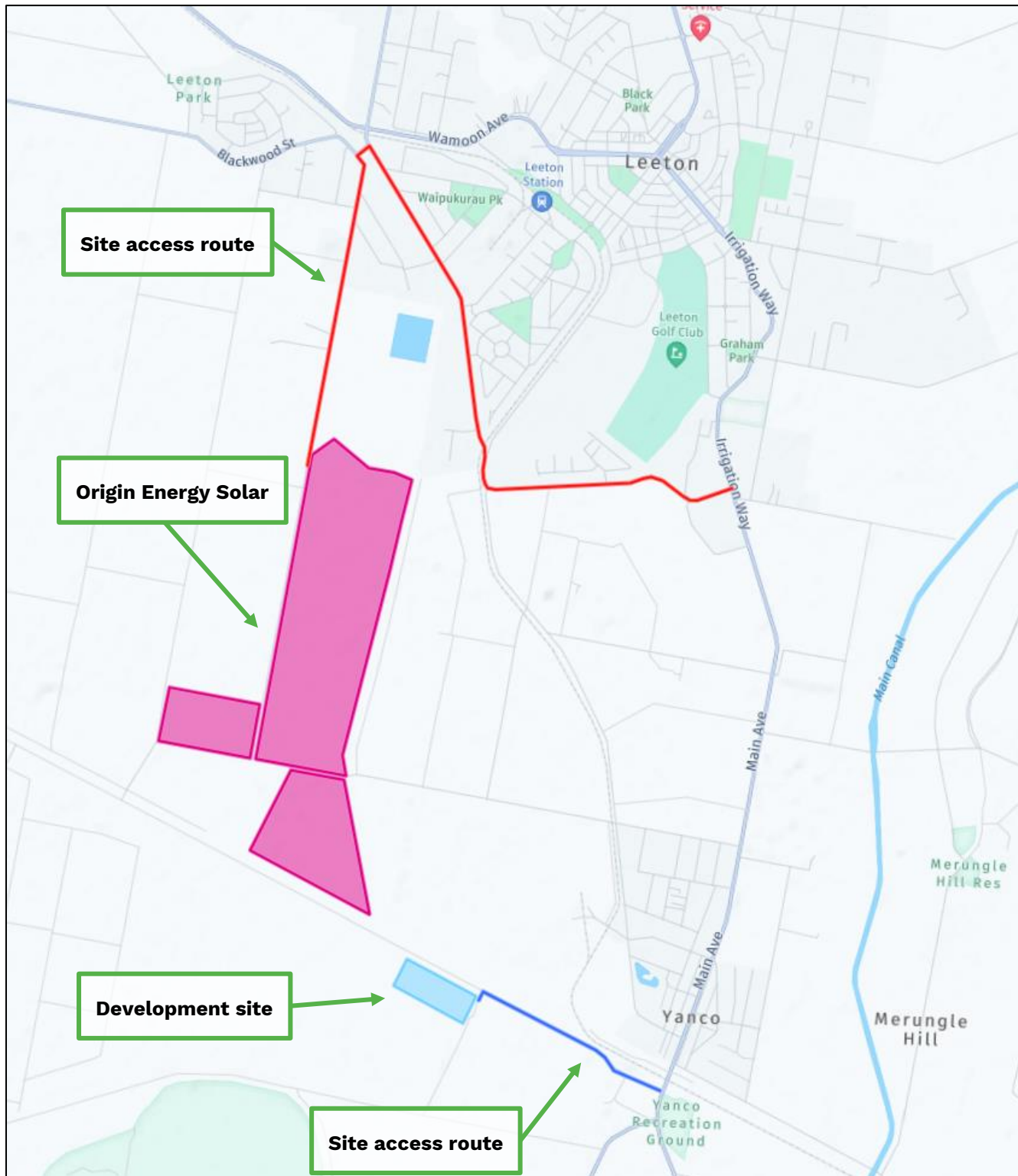


Figure 15: Location of nearby construction projects

According to information provided to our client about the proposed Origin Energy solar energy facility:

- all site traffic will access Irrigation Way at the intersection with McQuillan Road (also refer to Figure 5).
- a maximum of 90 movements per day would be generated during peak operations for the construction phase (approx. one vehicle every 12 minutes¹)
- of the traffic, 10 light vehicles will access the site during the AM peak, with the heavy vehicles spaced out during the day (about 9 vph)

The construction traffic for the two solar energy projects will not occupy the same local road access routes (overlap), so there would be a negligible impact on the local council roads due to the projects being constructed concurrently.

Irrigation Way has peak hour volumes in the AM and PM peak of about 240 vph and 380 vph, respectively. The impacts of the two projects will result in minor increases in the AM and PM traffic on Irrigation Way, as follows:

— Irrigation Way / Houghton Road²

— AM = $14/240 = 5.8\%$

— PM = $14/380 = 3.7\%$

— Irrigation Way / McQuillan Road

— AM = $19/240 = 7.9\%$

— PM = $19/380 = 5.0\%$

This would equate to a negligible increase in traffic on Irrigation Way at the intersections with Houghton Road and McQuillan Road during the concurrent construction of the two solar energy facilities.

¹ From the conclusions of the Origin Energy solar energy facility Traffic Impact Assessment, by Stantec (2019).

² Assuming 100% of HVs travel to/from the south and 50% of LVs travel to/from the south

4 Car parking assessment of the proposed development

4.1 Planning scheme car parking assessment

The RTA Guide provides car parking rates for new developments. However, the parking requirement for BESS facilities is unavailable. Therefore, an empirical assessment was undertaken to estimate the demand for car parking for the proposed development.

Section 3.2.1 outlined that:

- up to 25 light vehicles are anticipated to access the development site per day during construction of the development

Section 3.2.2 outlined that:

- up to 5 light vehicles are anticipated to access the development site daily during operation for facility monitoring and maintenance.

The proposed site plan indicates a hardstand and a formal on-site car parking area to accommodate 25 light vehicles, including the shuttle buses.

5 Access to the development site

5.1 Site access – intersection SISD requirement

The visibility criterion normally applied to intersections is Safe Intersection Sight Distance (SISD) Figure 16 shows the SISD, which:

- is nominated in the Austroads Guide to Road Design, Part 4A (AGRD4) as the minimum distance that should be provided on a major road at any intersection (refer to Section 3.2.2 in AGRD4A)
- provides sufficient distance for the driver of a vehicle on the major road:
 - to observe a vehicle from the minor access approach moving into a collision situation, e.g., in the worst case, stalling across the traffic lanes
 - to decelerate to a stop before reaching the collision point.

The minimum SISD criterion, specified in Table 3.2 of AGRD4A, requires clear visibility for a desirable minimum distance of 151 m, relating to the general reaction time RT of 2 seconds and a design speed of 70 km/h (Design speed = 85th percentile speed or posted speed + 10 km/h).

This applies to the intersections of Houghton Road with Hulme Road and Irrigation Way.

SISD for trucks should also be considered. Design speed for trucks is typically the posted speed limit. Using the SISD criterion specified in section 3.2.2 of the AGRD4A with a 3-second observation time, the SISD for trucks is 142 m for 60 km/h.

The SISD criterion for light and heavy vehicles is satisfied with clear sight lines over 151 m available:

- to the east and west from Hulme Road and the intersection with Houghton Road
- to the north and south from Houghton Road at the intersection with Irrigation Way.

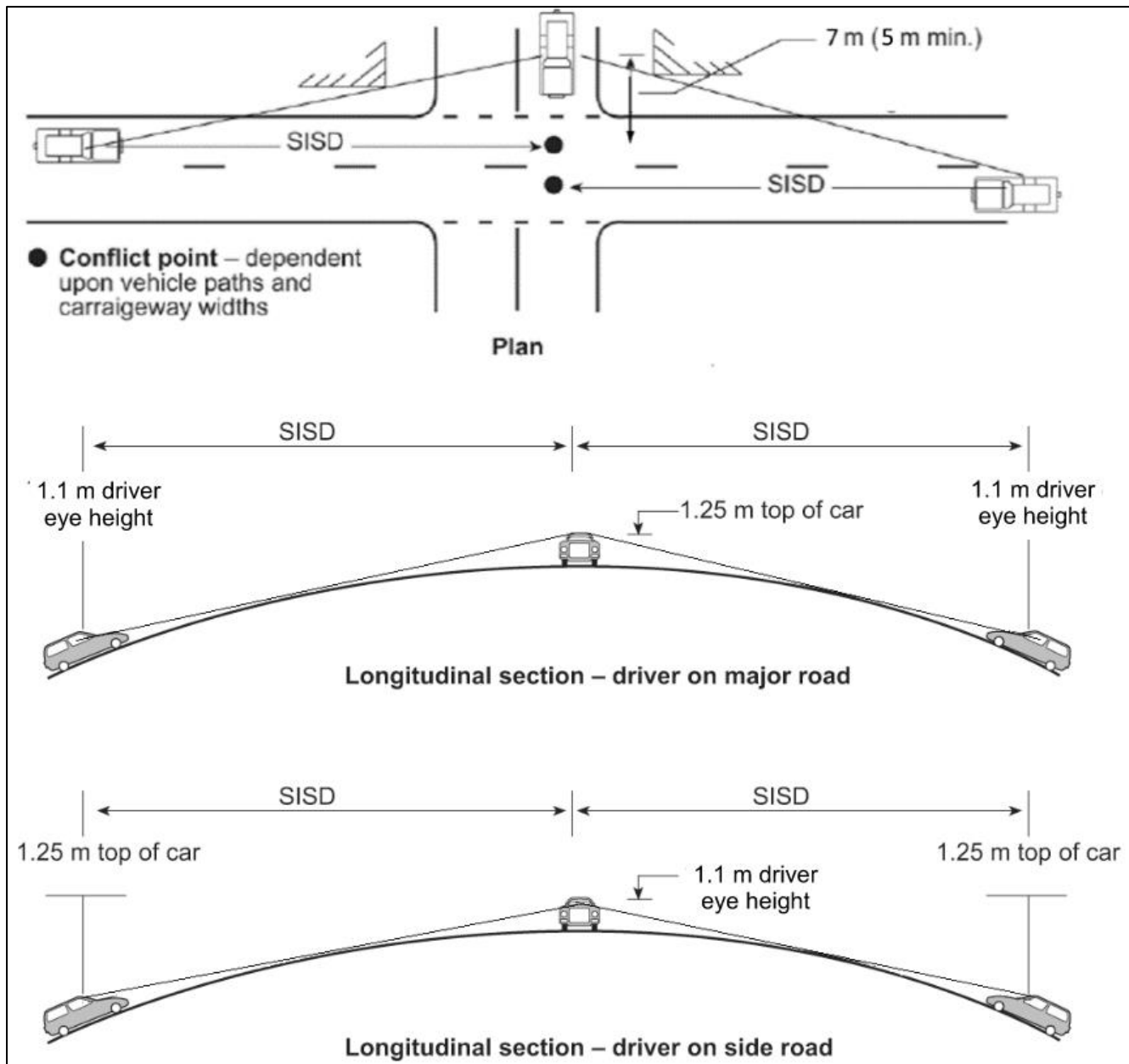


Figure 16: Safe Intersection Sight Distance (SISD) (Source: Figure 3.2 from AGRD4)

5.2 Existing road network impact

We use SIDRA software to analyse the intersections and determine anticipated intersection operations for the proposed development. Typically, the main characteristics used to assess intersection operation are the following:

- degree of saturation (DOS)
- 95th percentile queue lengths
- average delay.

Table 5 explains the intersection operating characteristics.

Table 5: Definitions of intersection operation characteristics

Degree of Saturation (DOS)			Operation
Sign control	Roundabout	Traffic signals	
< 0.6	< 0.6	< 0.6	Excellent operating conditions, minimal delays
0.6 - 0.699	0.6 - 0.699	0.6 - 0.699	Very good operating conditions, minimal delays
0.7 - 0.799	0.7 - 0.849	0.7 - 0.899	Good operating conditions, delays and queuing increasing
0.8 - 0.899	0.85 - 0.949	0.9 - 0.949	Fair operating conditions, delays and queues growing. Any interruption to flow such as minor incidents causes increasing delays
0.9 - 1.0	0.95 - 1.0	0.95 - 1.0	Poor operating conditions, flows starting to breakdown and queues and delays increase rapidly.
> 1.0	> 1.0	> 1.0	Very poor operating conditions with queues and delays increasing rapidly. Once queues develop it takes a significant time for queues to dissipate resulting in long delays to traffic movements

The DOS of an intersection is the ratio between the arrival (demand) flow and the intersection capacity during a given flow period. A degree of saturation of 1.0 is the theoretical capacity of an intersection, achievable if all parameters are optimal. Inefficiencies in driver behaviour and specific site conditions (including sight lines, gap acceptances, and follow-up headways) make this unrealistic in practice.

An intersection's practical degree of saturation (or practical capacity) is a more realistic measure of what can be achieved before it becomes oversaturated, traffic flows break down, and queues and delays increase rapidly.

Austroads Guide to Traffic Management Part 3 (AGTM3) specifies the following target DOS (practical degree of saturation / practical capacity) for different intersection types:

- 0.90 for traffic signals
- 0.85 for roundabouts
- 0.80 for unsignalised intersections.

5.2.1 Intersection analysis

We completed an intersection analysis at Houghton Road and Irrigation Way.

The existing volumes were forecast for 2026 conditions (when the proposed works are likely to take place as follows:

- 1% p.a. increase in the local roads
- 3% p.a. increase in the arterial road

The construction traffic volumes for the 2026 conditions are shown in Figure 17.

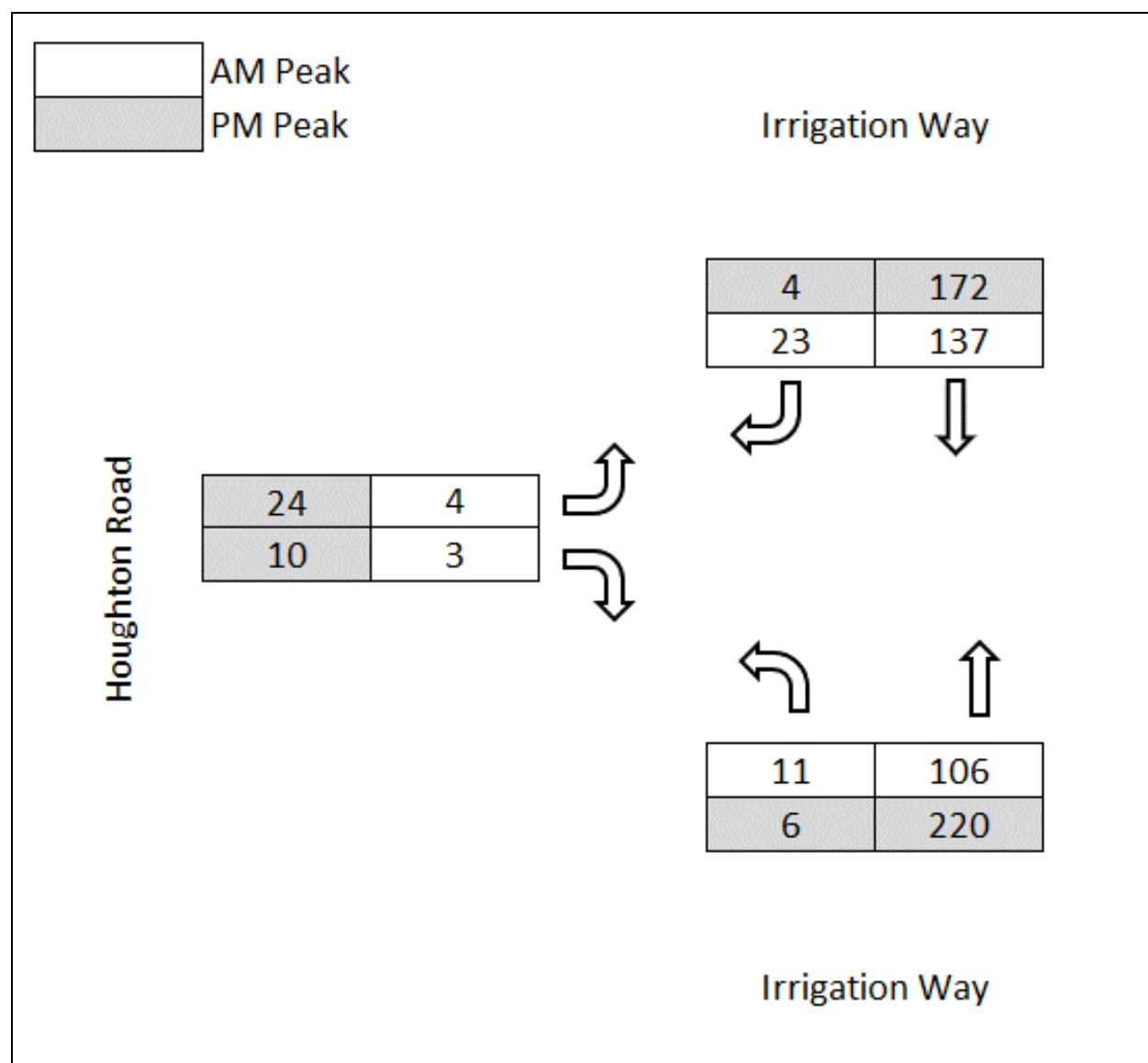


Figure 17: Construction (2026) turning movements

Table 6 provides a summary of the SIDRA assessment. For full SIDRA results, see Appendix 3 – SIDRA Outputs.

Table 6: SIDRA outputs – construction traffic conditions at Houghton Road and Irrigation Way

Movements	DOS		95% queue (m)		Average delay (sec)	
	AM	PM	AM	PM	AM	PM
Irrigation Way (south approach)	0.080	0.132	0.0	0.0	0.8	0.2
Irrigation Way (north approach)	0.110	0.099	2.4	0.2	1.5	0.2
Houghton Road (west approach)	0.006	0.053	0.1	2.1	6.2	9.0

SIDRA analysis reveals that the intersection of Houghton Road and Irrigation Way will operate well under capacity with minimal queuing and delays during construction.

5.3 Turn provisions impact

The traffic turning from major roads into minor roads should not delay through traffic.

Generally, turn treatments from major roads into minor roads at sign-controlled intersections are provided to ensure the intersection's safe and efficient operation.

Figure 17 shows the anticipated traffic generated from the proposed development.

Figure 18 shows the formulas used to determine the major road volume (Q_M).

The results were then applied to Figure 3.26, Austroads Guide to Traffic Management Part 6 (AGTM6), to determine the turning warrants for the intersections.

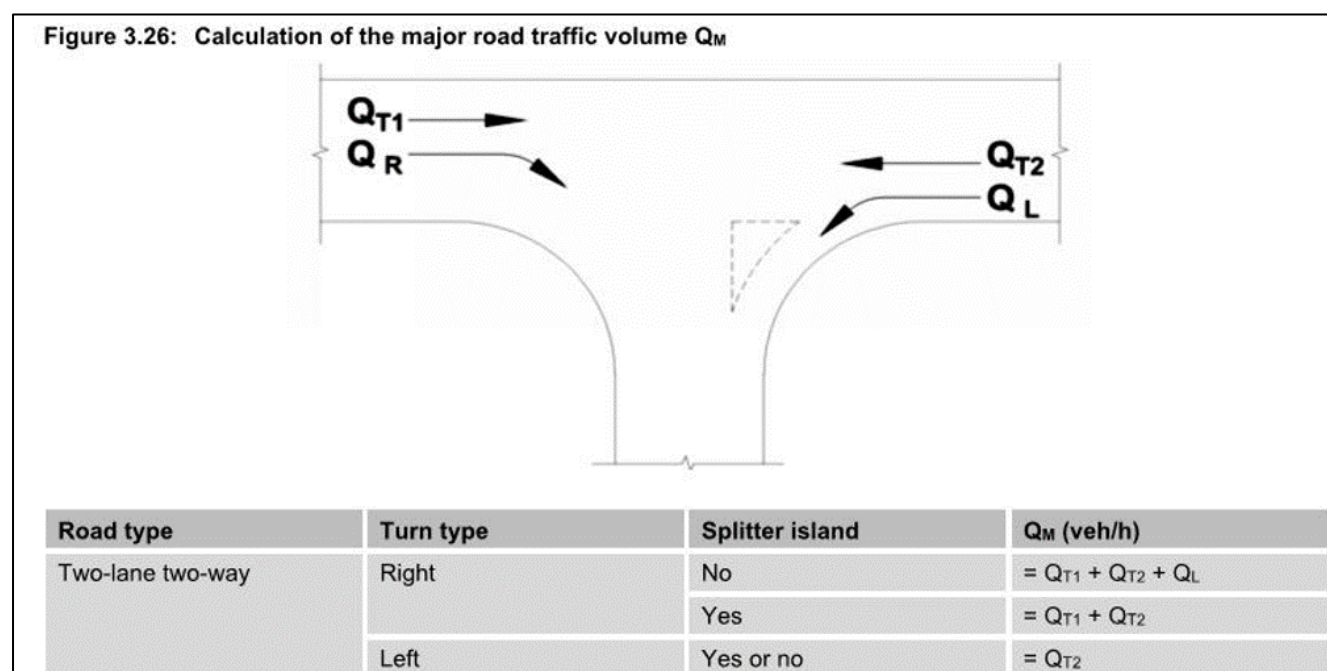


Figure 18: Formulas used to determine major road traffic (Source: Figure 3.26 from AGTM6)

5.3.1 Anticipated conditions for Irrigation Way / Houghton Road intersection

To determine anticipated conditions at the intersection, traffic volumes from Section 3.2 were used to determine the warrants shown in Table 7 and were applied in Figure 18.

Table 7: Turn lane warrants on Irrigation Way at Houghton Road intersection – anticipated conditions

Road	Peak period	Left turn Q_L (vph)	Right turn Q_R (vph)	Through Q_T (vph)	Q_M	Q_M
					Left turn	Right turn
Houghton Road	AM	11	23	Q_{T1}	137	106
				Q_{T2}	106	
	PM	6	4	Q_{T1}	172	220
				Q_{T2}	220	

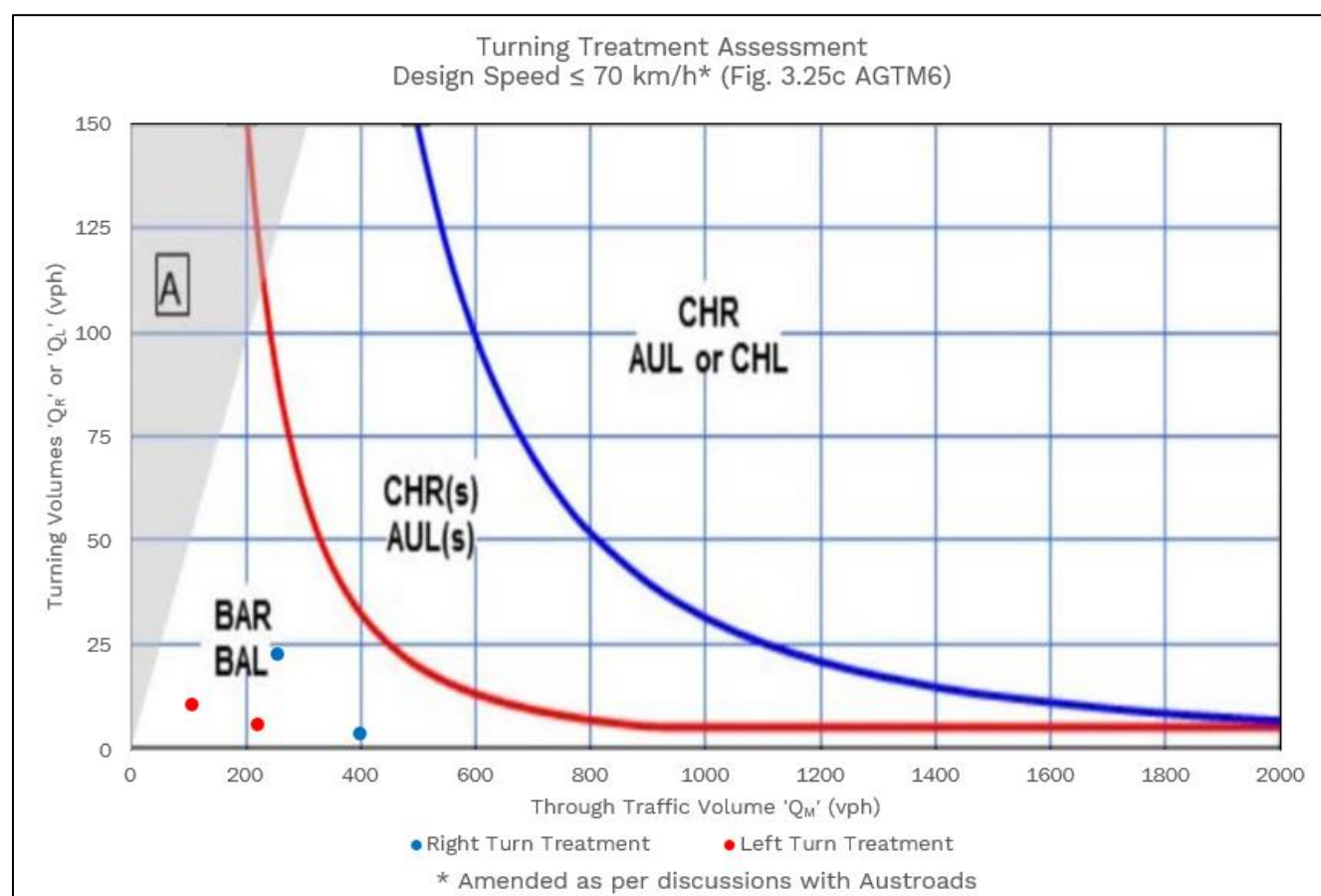


Figure 19: Graph used to determine the turn treatments Irrigation Way at the Houghton Road intersection – anticipated construction peak conditions

Based on the data gathered and reported in this section, our key observations are that:

- a right turn from Irrigation Way into Houghton Road is likely to meet warrants for a BAR treatment in the morning and afternoon peak periods
- a left turn from Irrigation Way into Houghton Road will likely meet warrants for a BAL treatment in the morning and afternoon peak periods.

Given the low traffic volumes and the warrants in the bottom corner of the graph, turn lanes are not considered to be required.

5.3.2 Sensitivity assessment for Irrigation Way / Houghton Road intersection

The traffic distributions for the development traffic were assumed based on a high-level review of the nearby residential centres (to house workers during the construction phase) and where the raw materials and equipment will be arriving from / departing to.

To ensure the turn provision assessment for the anticipated conditions is robust, a sensitivity assessment for the development traffic was conducted, considering the following scenarios:

- 100 % of the development traffic arrives/departs to and from the north
 - i.e. turn right in / left out at the Irrigation Way intersection
- 100 % of the development traffic arrives/departs to and from the south
 - i.e. turn left in / right out at the Irrigation Way intersection

100 % development traffic (to/from the north)

To determine anticipated conditions at the intersection for all traffic to/from the north, traffic volumes from Section 3.2 were used to determine the warrants shown in Table 8 and were applied in Figure 19

Table 8: Turn lane warrants on Irrigation Way at Houghton Road intersection – 100 % development traffic (north)

Road	Peak period	Left turn Q_L (vph)	Right turn Q_R (vph)	Through Q_T (vph)	Q_M	Q_M
					Left turn	Right turn
Houghton Road	AM	4	30	Q_{T1}	106	247
				Q_{T2}		
	PM	6	4	Q_{T1}	220	398
				Q_{T2}		

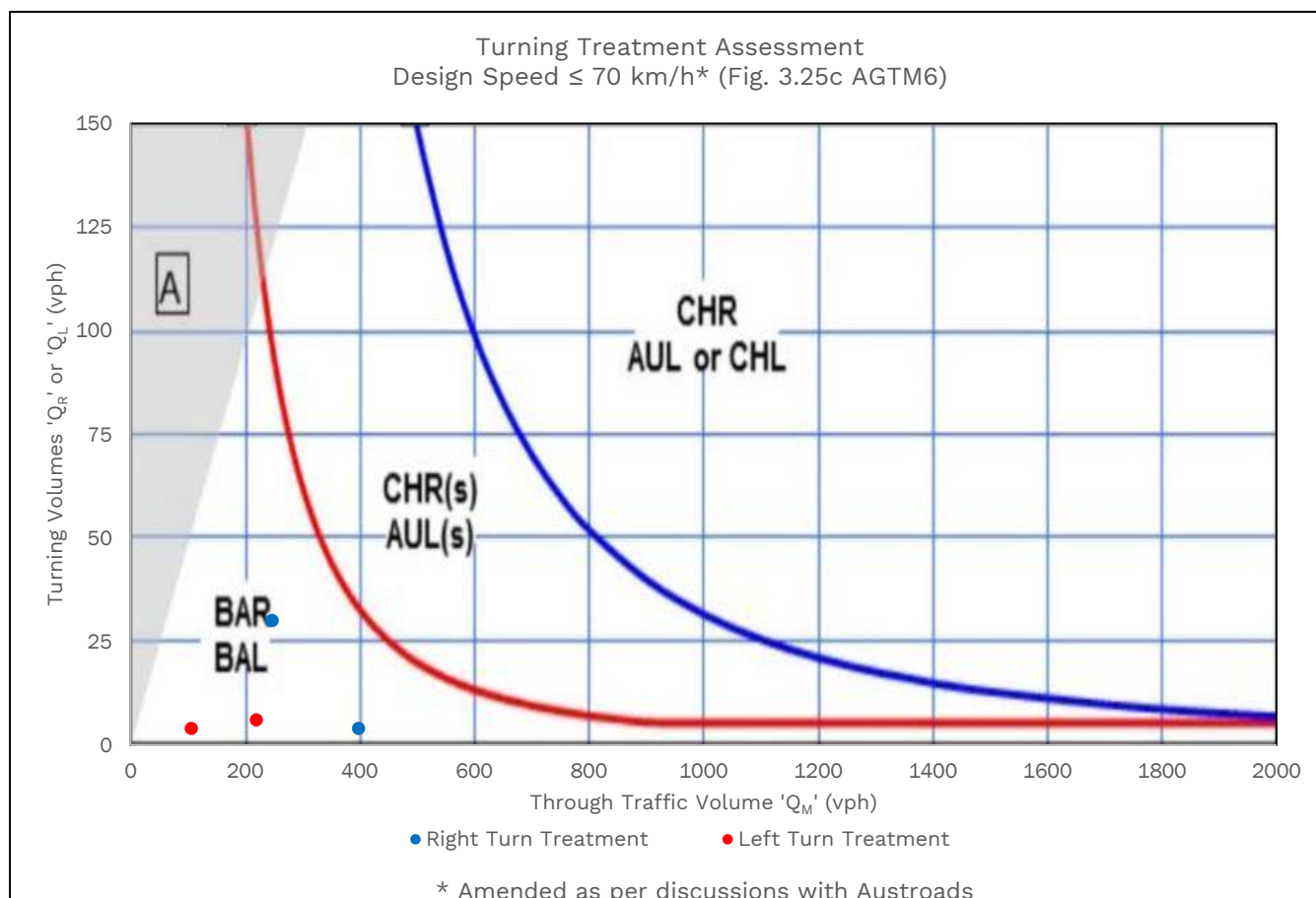


Figure 20: Graph used to determine the turn treatments Irrigation Way at the Houghton Road intersection – 100% development traffic (north)

100 % development traffic (to/from the south)

To determine anticipated conditions at the intersection for all traffic to/from the south, traffic volumes from Section 3.2 were used to determine the warrants shown in Table 9 and were applied in Figure 21

Table 9: Turn lane warrants on Irrigation Way at Houghton Road intersection – 100 % development traffic (south)

Road	Peak period	Left turn Q_L (vph)	Right turn Q_R (vph)	Through Q_T (vph)	Q_M	Q_M
					Left turn	Right turn
Houghton Road	AM	30	4	Q_{T1} 137	106	273
				Q_{T2} 106		
	PM	6	4	Q_{T1} 172	220	398
				Q_{T2} 220		

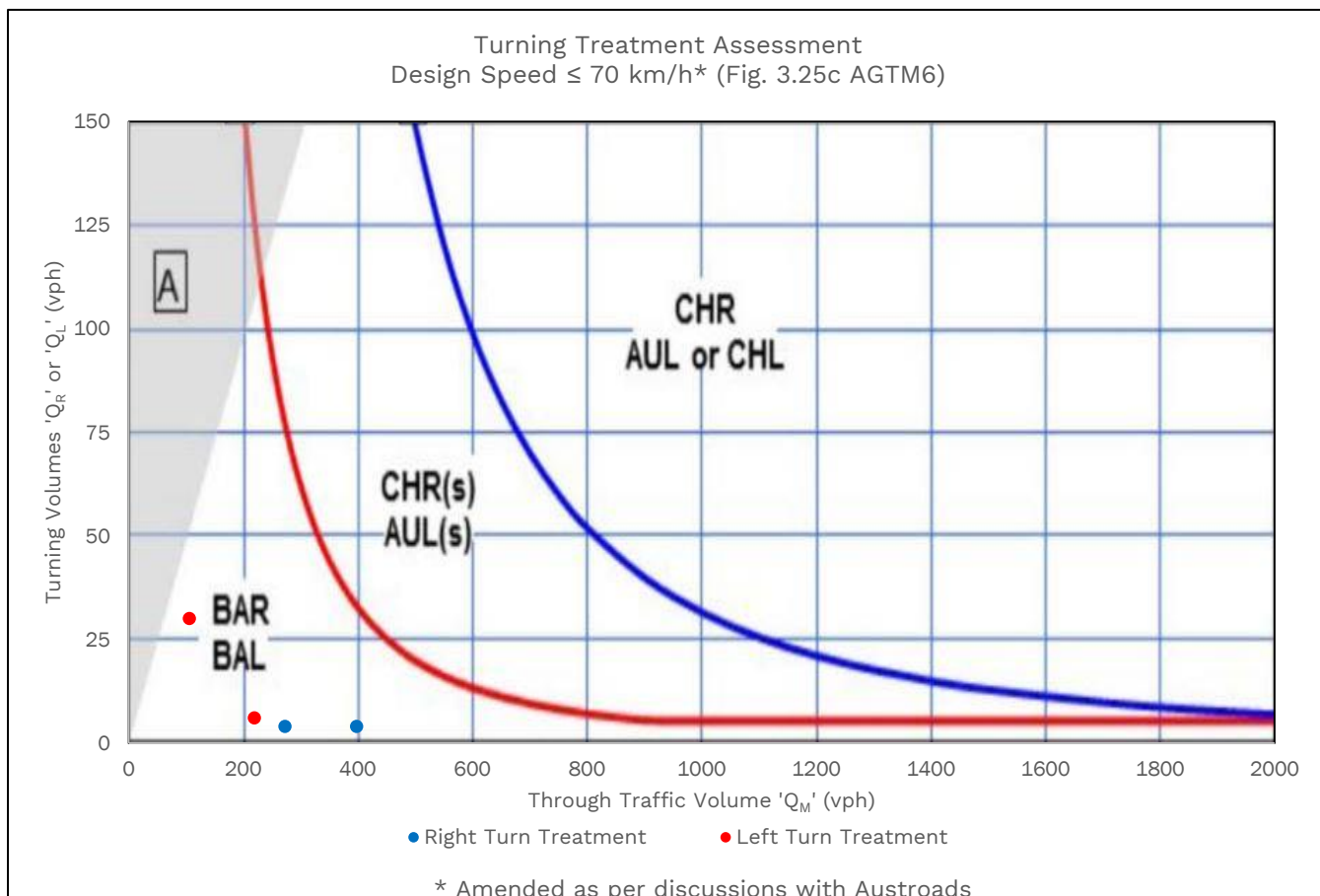


Figure 21: Graph used to determine the turn treatments Irrigation Way at the Houghton Road intersection – 100% development traffic (south)

Based on the data gathered and reported for the sensitivity analysis, our key observations are that the turn lane warrants do not change even if 100% of the development traffic is to/from the north or the south.

Based on previous discussions the client held with representatives of TfNSW about this and other similar projects, whilst the turn lane assessment indicates the warrants are in the corner quadrant of the graph, TfNSW is of the view that there is no lesser treatment than BAR/BAL, and this should be provided at the intersection of Irrigation Way and Houghton Road.

Strategic design plans were prepared for the intersection of Irrigation Way and Houghton Road to accommodate the heavy vehicles accessing the site, refer to A4.1 – Strategic Design – Houghton Road / Irrigation Way for more details.

Recommendation 1: Irrigation Way and Houghton Road's intersection should be upgraded per the prepared Strategic Design plans.

5.3.3 Houghton Road / Hulme Road / Site access intersection

A functional layout plan has been prepared for the intersection of Houghton Road, Hulme Road and the development site access to accommodate the heavy vehicles accessing the site, refer to A4.2 – Functional Layout Design – Development Access / Hulme Road / Houghton Road for more details.

Recommendation 2: the intersection of Houghton Road, Hulme Road and the development site access should be upgraded in accordance with the prepared Functional Layout plan.

5.3.4 Unsealed roads

During the construction phase of the development, heavy vehicles will be using Houghton Road and a short length of Hulme Road to access the development site. Based on previous similar projects, the council is expected to request that Houghton Road and Hulme Road's suitability to accommodate the heavy vehicle traffic generated during the construction phase be assessed as part of the pre-development application advice. As a result, a dilapidation report should be undertaken before and after the construction phase of the development.

During the development site inspection, several vehicles safely passed the Trafficworks vehicle on Houghton Road, and it is expected that a light vehicle and a heavy vehicle could pass safely.

Due to the low volumes of heavy vehicles generated by the development, it is unlikely that two heavy vehicles would need to pass one another on either Houghton Road or Hulme Road. However, a traffic management plan should be implemented for the development site operation to ensure no heavy vehicles arrive and depart simultaneously.

Recommendation 3: implement a traffic management plan to ensure no heavy vehicles arrive and depart simultaneously along Houghton Road.

5.4 Oversized-Overmass vehicle access

Swept path plans have been prepared for the intersections of:

- Irrigation Way and Houghton Road
- Houghton Road, Hulme Road and the development site access.

Please refer to A4.3 – Oversized-Overmass Vehicle Access more details.

5.5 Site security

The proposed development will include installing site security and restricting access to authorised vehicles only. This will involve providing security fencing and gates at the development's entrance.

It is very unlikely that a heavy vehicle will arrive at the development site when the security gate is locked/closed. Therefore, the security gate only needs to be set back a sufficient distance to allow a light vehicle to park clear of any traffic on Hulme Road.

6 Authority Responses

6.1 TfNSW SEARs response

The TfNSW SEARs requirements were detailed in their response dated 20 February 2024, as follows:

- *The Environmental Impact Study to be submitted as part of the environmental planning process will need to include a Traffic Impact Assessment (TIA) to address the impact of traffic.*

TfNSW requires the TIA be tailored to the scope of the proposed development and include, but not be limited to, the following, as shown in Table 10.

Table 10: TfNSW SEARs requirements

TfNSW SEARs requirements	Traffic Engineers Response
Consideration of transport related cumulative impacts associated with the adjacent Whitehaven coal mine construction staff and the staff anticipated for the Whitehaven solar farm will need to be provided. Early discussions with Transport for New South Wales regarding the impact on the intersect of the Kurrajong Creek Road/Kamilaroi Highway.	This is unrelated to the Yanco BESS development, as the referenced location for the “Whitehaven solar farm” is about 550 km northeast of Yanco. We understand this comment is in error and should be disregarded when considering the transport impacts of the Yanco BESS.
Traffic volumes including: — Existing background traffic, — Project-related traffic for each phase or stage of the project, — Projected cumulative traffic at commencement of operation, and a 10-year horizon post commencement.	For traffic, refer to: — Section 2.3 for existing volumes — Section 3.2 for project-related and projected cumulative volumes
Traffic characteristics including: — Number and ratio of heavy vehicles to light vehicles, — Peak times for existing traffic, — Peak times for project-related traffic including commuter periods, — Proposed hours for transportation and haulage, — Interactions between existing and project-related traffic.	For traffic characteristics, refer to: — Section 2.3 for existing traffic — Section 3.2 for development-related traffic

TfNSW SEARs requirements	Traffic Engineers Response
Capacity analysis using Austroads Guide to Road Design at intersections with classified (State) road/s, and where relevant, analysis of any other intersections along the proposed transport route/s.	For capacity analysis, refer to Section 5.2
Heavy vehicle and OSOM routes: — In addition to the requested TIA, Separate Concept-level route analysis based on high level 3D swept path drawings to Identify the return routes for OSOM movements and indicate locations where civil works are needed and indicative pinch points. — The TIA is required to include details of OSOM movements, including volumes, times for OSOM movements to occur and identify the location of pull-over bays / rest areas on OSOM routes (including GPS coordinates) and confirmation such facilities can physically accommodate (in terms of size, width and accessibility) the largest OSOM vehicle. — Undertake a logistics route analysis that includes: — Details of the road geometry and alignment along the identified transport route/s, including existing formations, crossings, bridges, intersection treatments and any identified hazards, including: ▪ Available sight distances at the development site access and nearby intersections and any constraint to achieving the required sight distance for the posted speed limit. ▪ An assessment of turn treatment warrants in accordance with Austroads Guide to Traffic Management Part 6 and Austroads Guide to Road Design Part 4A for intersections on identified transport route/s, identifying the existence of the minimum basic turn treatments	For the OSOM route assessment (completed by others), refer to Appendix 5 – OSOM Route Assessment Report. Further information has been included in the report, refer to Section 3.1.4.

TfNSW SEARs requirements	Traffic Engineers Response
and addressing the need for any warranted higher order treatments. ▪ Bridge Assessments for any at risk bridges on the classified road network due to dimensions and weight of OSOM vehicles. ▪ Swept path analysis demonstrating the largest design vehicle can enter and leave the development, and simultaneously pass through intersections along the proposed transport route/s. The design vehicle templates used in the swept path analysis software are also requested in order for TfNSW to review the performance within the software (e.g. Autodesk Vehicle Tracking or Transoft AutoTURN). — Highlighting each at-risk road structures that the haulage route crosses including bridges, traffic signals, signage, major culverts, and minor culverts that may not meet the desirable cover to cater for proposed axle loads. — 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. Please note NHVR permits do not cover civil works required along any proposed OSOM route. Any works required along the OSOM route must be included within the scope of works in the SSD to ensure the development is constructable. — Identify and provide the following measurements parameters of OSOM components / materials to be moved: — Identify types and numbers of OSOM vehicles proposed to be used for the project.	

TfNSW SEARs requirements	Traffic Engineers Response
— Overall combination load length, width, height and mass for components and nominated vehicles. — Maximum component length, widths and heights (including clearance to overhead obstructions such as structures, utilities and vegetation), — Wheelbase dimensions, — Maximum trailer articulation angle(s), — Minimum overhang heights above the road surface, — Axle loads and axle group loads in terms of both tonnes and Equivalent Standard Axles (refer to Austroads Guide to Pavement Technology).	
Cumulative impacts: — Identify and assess implications of any road and rail projects that may occur during OSOM movements on proposed OSOM routes. — Identify projects that will have overlapping construction periods and assess the cumulative traffic impacts with emphasis on the following: — Cumulative impacts from traffic generated from construction workforces in terms of origin-destination routes, access, AM/PM peaks where they overlap with other projects. — 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 timing of movements of OSOMs where other projects will utilise the same routes as proposed for this development. Please note, given the high number of renewable energy and other large scale projects requiring haulage of OSOM components on the road network, restrictions, and limitations on OSOM	For cumulative impacts, refer to: — Appendix 5 – OSOM Route Assessment Report for all OSOM movements. — Section 3.5 for projects with potential overlapping construction periods.

TfNSW SEARs requirements	Traffic Engineers Response
movements may be imposed. In this regard, it is recommended that you engage earlier with TfNSW's Freight Branch – Special Permits team to discuss access needs and timing.	
Identify accommodation (and transport) needs and facilities available within the local region, to service the project staff, in addition to understanding the cumulative impacts of concurrent accommodation (and transport) needs of staff from other projects. Details of measures employed to promote and enforce safe commuter traffic movements are to be included.	For the project accommodation needs, refer to Section 3.1.6.
Road safety assessment of haulage route/s. Where road safety concerns are identified at specific locations on haulage routes, TfNSW suggests the TIA be supported by a targeted Road Safety Audit undertaken by suitably qualified persons in accordance with Austroads Guidelines	The traffic impact assessment identified no road safety concerns that required action.
A review of crash data along the identified transport route/s for the most recent 5 year reporting period and an assessment of road safety along the proposed transport route/s considering the safe systems principles adopted under Future Transport 2056.	For the review of crash data, refer to Section 2.4.
Project schedule: - Hours and days of work, number of shifts and start and end times, - Identify the approximate project's targeted construction commencement date/s. - Identify the phases and stages of the project, including construction, operation and decommissioning.	For the project schedule, refer to Section 3.1

TfNSW SEARs requirements	Traffic Engineers Response
The origins, destinations and routes for: - Commuter (employee and contractor) light vehicles and pool vehicles (including. shuttle buses), - Heavy (haulage) vehicles, - OSOM vehicles.	For the origins, destinations and routes for: - Light vehicles, refer to Section 3.1.2 - Heavy Vehicles, refer to Section 3.1.3 - OSOM, refer to Appendix 5 – OSOM Route Assessment Report
Identify the necessary road network infrastructure upgrades that are required to cater for and mitigate the impact of project related traffic on both the local and classified road network for the development (for instance, road widening and/or intersection treatments). In this regard, strategic design drawing/s are to be submitted with the SSD application for any identified road infrastructure and access upgrades. Any identified road infrastructure upgrades will need to be to the satisfaction of TfNSW and Council. Works must be appropriately designed in accordance with Austroads Guide to Road Design for the existing posted speed limit, including provision of Safe Intersection Sight Distance (SISD). Note: The design needs to comply with TfNSW Strategic design requirements for DAs.	For the necessary road network upgrades, refer to: Appendix A4.1 – Strategic Design – Houghton Road / Irrigation Way Appendix A4.2 – Functional Layout Design – Development Access / Hulme Road / Houghton Road
The layout of the internal road network, parking facilities and infrastructure.	For the development layout, refer to Appendix 2 – Development Plan
Impact on rail corridors and level crossings along transport route/s detailing any proposed interface treatments, where applicable	The rail line is active but with minimal services, as follows: one passenger train in each direction per day during the grain season. GrainCorp may load up to 8 trains (per year), at most one per day. The traffic impact assessment did not identify any impacts on rail corridors and level crossings that required action.
Controls for transport and use of any dangerous goods in accordance with State Environmental Planning Policy No. 33 – Hazardous and Offensive Development, the Australian	This will be addressed in the Preliminary Hazard Assessment prepared by others for our client.

TfNSW SEARs requirements	Traffic Engineers Response
Dangerous Goods Code and AS4452 Storage and Handling of Toxic Substances.	
Detailed plans identifying the proposed location of any: - Project-related infrastructure within and outside of the project boundary. - Transmission line infrastructure, or any other project-related structures, within a road reserve. In respect to this matter the following information is required: - Overhead clearances, - Construction methods, - Potential traffic mitigation measures for construction, - Location of infrastructure within or adjacent to the road reserve, - Excavation or fill requirements adjacent or within road corridors, - Access required to construct and maintain the infrastructure, - Permanent or temporary connection/access to classified roads.	For any infrastructure related to the project, refer to Appendix 4 – Intersection Designs .

6.2 SEARS Response

The key issues relevant to Transport that were flagged in the SEARs and the traffic engineers' responses are detailed in Table 11.

Table 11: SEARS Key Issues

SEARS Key Issues	Traffic Engineers Response
an assessment of the peak and average traffic generation, including over-dimensional vehicles/ heavy vehicles requiring escort and construction worker transportation	Refer to Section 5.3 for the development traffic impact assessment.
an assessment of the likely transport impacts to the development site access route(s), including over-dimensional vehicles/ heavy vehicles requiring escort, site access point(s),	Concerning transport impacts, refer to the following:

SEARS Key Issues	Traffic Engineers Response
any Crown land, particularly in relation to the capacity and condition of the roads, road safety and intersection performance	— Appendix 5 – OSOM Route Assessment Report, for all OSOM transport impacts — Section 5.2 for intersection performance and for external road impacts — Section 5.4 for access location and operation.
a cumulative impact assessment of traffic from nearby developments	Refer to Section 3.5 for the cumulative impact of other nearby developments.
provide details of measures to mitigate and / or manage potential impacts, including a schedule of all required road upgrades (including those resulting from the 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	Concerning mitigation measures, refer to the following: — Appendix 5 – OSOM Route Assessment Report, for all OSOM transport impacts — Appendix 4 – Intersection Designs for all proposed upgrades.

6.3 Council Response

In an email, dated 19 March 2024, from the Manager of Roads and Drainage, the following comments were provided in response to some matters raised by the client for the development, refer to Table 12.

Table 12: Council response to the client's questions

Client Question	Council Response
Access Issue	
Does the council support the project access to the site via Irrigation Way and Houghton Road?	Yes, the council supports access to the project via Houghton Road and Hulme Road.
Road Upgrades	
We propose the following upgrades and maintenance:	
Upgrading Houghton Road is considered unnecessary	Additional maintenance grading may be required during construction. Increased traffic and additional loads will increase deterioration.
Upgrade the access at the intersection of Houghton Road and Hulme Road	The intersection of Houghton Road and Hulme Road is to be upgraded in accordance with the requirements of the Austroads Guide to Road Design Part 4, which requires minimum servicing of 19 m articulated vehicles. It should be checked against the OSOM Swept Vehicle Path.

Client Question	Council Response
	Similar to the Example of the “Rural Property Access” design shown in Austroads.
Conduct pre- and post-construction Dilapidation Reports to support relevant repair works for any project-related damage on Houghton Road.	Agreed, to be completed by 3 rd party.
We kindly seek council's requirements on building this new road section	As per Council Guidelines – Rural Road specification minimums: — 8 m road pavement formation — 7 m 14/7 mm double-double bitumen seal — Geotechnical investigation and pavement design to be completed in accordance with Austroads Guide to Pavement Technology and Industry Best Practice — Designed for a design period of 20 years — 1% growth rate — Seal width to cater for swept path coverage of the OSOM vehicle.

6.4 DPHI Response

The key issues relevant to transport in the response from DPHI are detailed in Table 13.

Table 13: DPHI Key Issues

DPHI Key Issues	Traffic Engineers Response
Is the current route for heavy vehicles requiring escort (HVRE) suitable? Noting the height restriction of 5.2m, what is the height of HVRE? Pg 6 of the OSOM assessment indicates it would be ~5.5m	The OSOM route assessment confirms the proposed route is suitable, subject to minor upgrades, as listed in the report's Conclusion. Furthermore, refer to p 28 of the OSOM report in Appendix 5 – OSOM Route Assessment Report , where it is confirmed that the load can be lowered to 4.9 m when required.
Has the car parking area been enlarged as per the recommendation of the Traffic Impact Assessment?	The client updated the development plan to include a designated space for the required car parking.

DPHI Key Issues	Traffic Engineers Response
	Refer to Section 4.1 of this report.
How will 25 light vehicles accommodate 70 construction workers?	Refer to Section 3.1.2 of this report.
How many shuttle buses are proposed and are these included in heavy vehicle numbers? Where are they coming from?	Refer to Section 3.1.2 of this report.
Confirm the length of the largest design vehicle? How many 12.5 m single-unit trucks, how many 19 m articulated trucks and how many 26 m, if proposed?	Refer to Section 3.1.3 of this report.
Will any heavy vehicles be required during operations? I.e. for the replacement of any infrastructure.	Refer to Section 3.1.3 of this report.
How many heavy vehicles requiring escort are proposed?	Refer to Section 3.1.4 of this report.
Is the site access subject to upgrades existing at this time?	Refer to Section 3.1 of this report.

7 Conclusions and recommendations

We conclude there are no traffic engineering reasons that would prevent the development from proceeding, as outlined below:

- the peak hour traffic generation is likely to occur during the construction phase of the development, where the peak hour volumes are expected to be:
 - 25 light vehicles
 - 1 heavy vehicle.
- the construction phase is expected to take 8 months
- during the development's operation phase, the peak hour volumes are expected to be up to 5 light vehicles
- the development site will generate a peak car parking demand of 25 spaces during construction and 5 spaces post-opening
- the sight lines along:
 - Houghton Road at the intersection with Hulme Road are satisfactory
 - Irrigation Way at the intersection with Houghton Road is satisfactory
- the proposed security gate's setback from the edge of Hulme Road will accommodate the storage of a light vehicle clear of the traffic lane

However, this TIA has identified several recommendations that need to be addressed:

- **Recommendation 1:** Irrigation Way and Houghton Road's intersection should be upgraded per the prepared Strategic Design plans
- **Recommendation 2:** the intersection of Houghton Road, Hulme Road and the development site access should be upgraded in accordance with the prepared Functional Layout plan.
- **Recommendation 3:** implement a traffic management plan to ensure no heavy vehicles arrive and depart simultaneously along Houghton Road.

Appendix 1 – Traffic Survey Results

TRANS TRAFFIC SURVEY

TURNING MOVEMENT SURVEY

trafficsurvey.com.au



Intersection of Euroley Rd and Irrigation Way, Yanco

GPS -34.608172, 146.408191

Date:	Thu 09/05/24
Weather:	Overcast
Suburban:	Yanco
Customer:	Trafficworks

North:	Irrigation Way
East:	N/A
South:	Irrigation Way
West:	Euroley Rd

Survey Period	AM: 6:00 AM-9:00 AM	PM: 3:00 PM-6:00 PM
Traffic Peak	AM: 7:00 AM-8:00 AM	PM: 4:00 PM-5:00 PM

All Vehicles

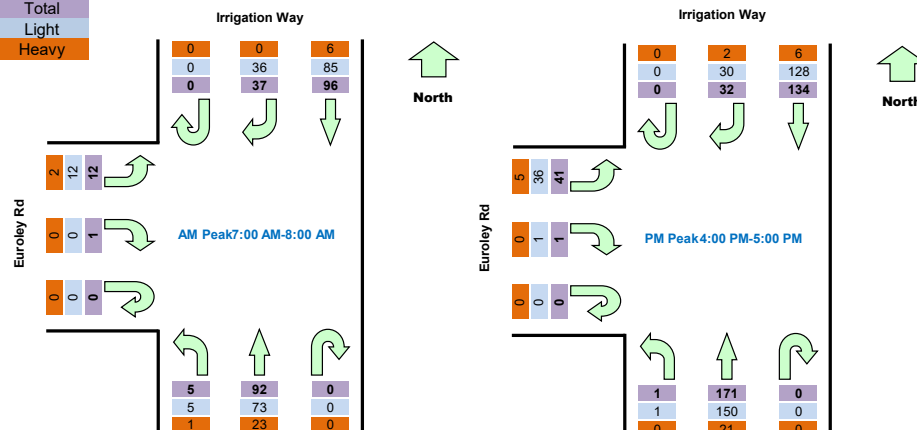
Time		North Approach Irrigation Way			South Approach Irrigation Way			West Approach Euroley Rd			Hourly Total	
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	Hour	Peak
6:00	6:15	0	3	14	0	7	0	0	1	2	175	
6:15	6:30	0	10	17	0	13	0	0	0	1	198	
6:30	6:45	0	11	20	0	25	0	0	0	2	212	
6:45	7:00	0	8	21	0	18	0	0	0	2	223	
7:00	7:15	0	7	19	0	20	1	0	1	2	243	
7:15	7:30	0	10	22	0	21	2	0	0	0	269	
7:30	7:45	0	14	31	0	19	1	0	0	4	298	
7:45	8:00	0	6	24	0	32	1	0	0	6	332	
8:00	8:15	0	12	37	0	21	3	0	0	3	357	Peak
8:15	8:30	0	10	34	0	28	3	0	0	9		
8:30	8:45	0	21	31	0	35	2	0	0	14		
8:45	9:00	0	7	29	0	42	0	0	0	16		
15:00	15:15	0	4	32	0	37	0	0	0	8	336	
15:15	15:30	0	4	32	0	39	0	0	0	8	348	
15:30	15:45	0	5	29	0	35	1	0	0	23	365	
15:45	16:00	0	6	29	0	34	0	0	1	9	364	
16:00	16:15	0	8	31	0	42	0	0	1	11	380	Peak
16:15	16:30	0	9	29	0	48	1	0	0	13	366	
16:30	16:45	0	7	33	0	45	0	0	0	7	358	
16:45	17:00	0	8	41	0	36	0	0	0	10	341	
17:00	17:15	0	4	32	0	31	1	0	0	11	305	
17:15	17:30	0	11	37	0	36	0	0	1	7		
17:30	17:45	0	7	28	0	33	0	0	1	6		
17:45	18:00	0	8	27	0	17	0	0	0	7		

Peak Time		North Approach Irrigation Way			South Approach Irrigation Way			West Approach Euroley Rd			Peak total
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	
7:00	8:00	0	37	96	0	92	5	0	1	12	243
16:00	17:00	0	32	134	0	171	1	0	1	41	380

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy



TRANS TRAFFIC SURVEY

TURNING MOVEMENT SURVEY

trafficsurvey.com.au



Intersection of Houghton Rd and Irrigation Way, Yanco

GPS -34.606560, 146.408497

Date:	Thu 09/05/24
Weather:	Overcast
Suburban:	Yanco
Customer:	Trafficworks

North:	Irrigation Way
East:	N/A
South:	Irrigation Way
West:	Houghton Rd

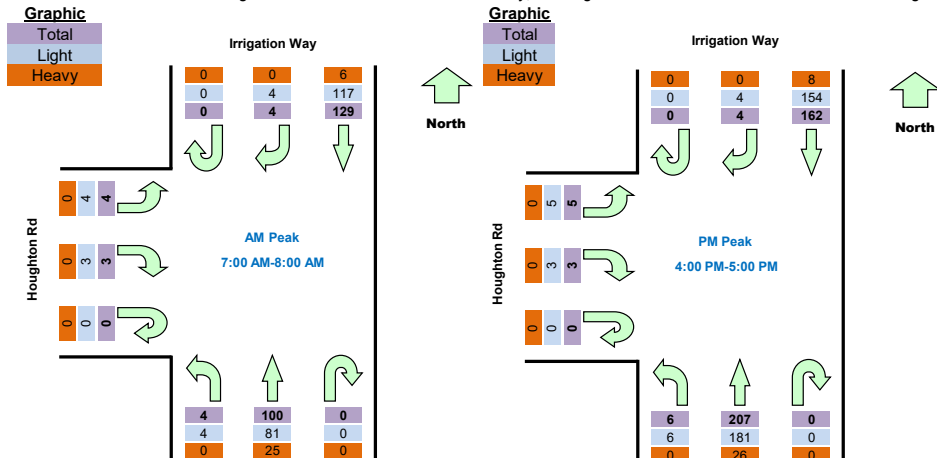
Survey Period	AM: 6:00 AM-9:00 AM	PM: 3:00 PM-6:00 PM
Traffic Peak	AM: 7:00 AM-8:00 AM	PM: 4:00 PM-5:00 PM

All Vehicles

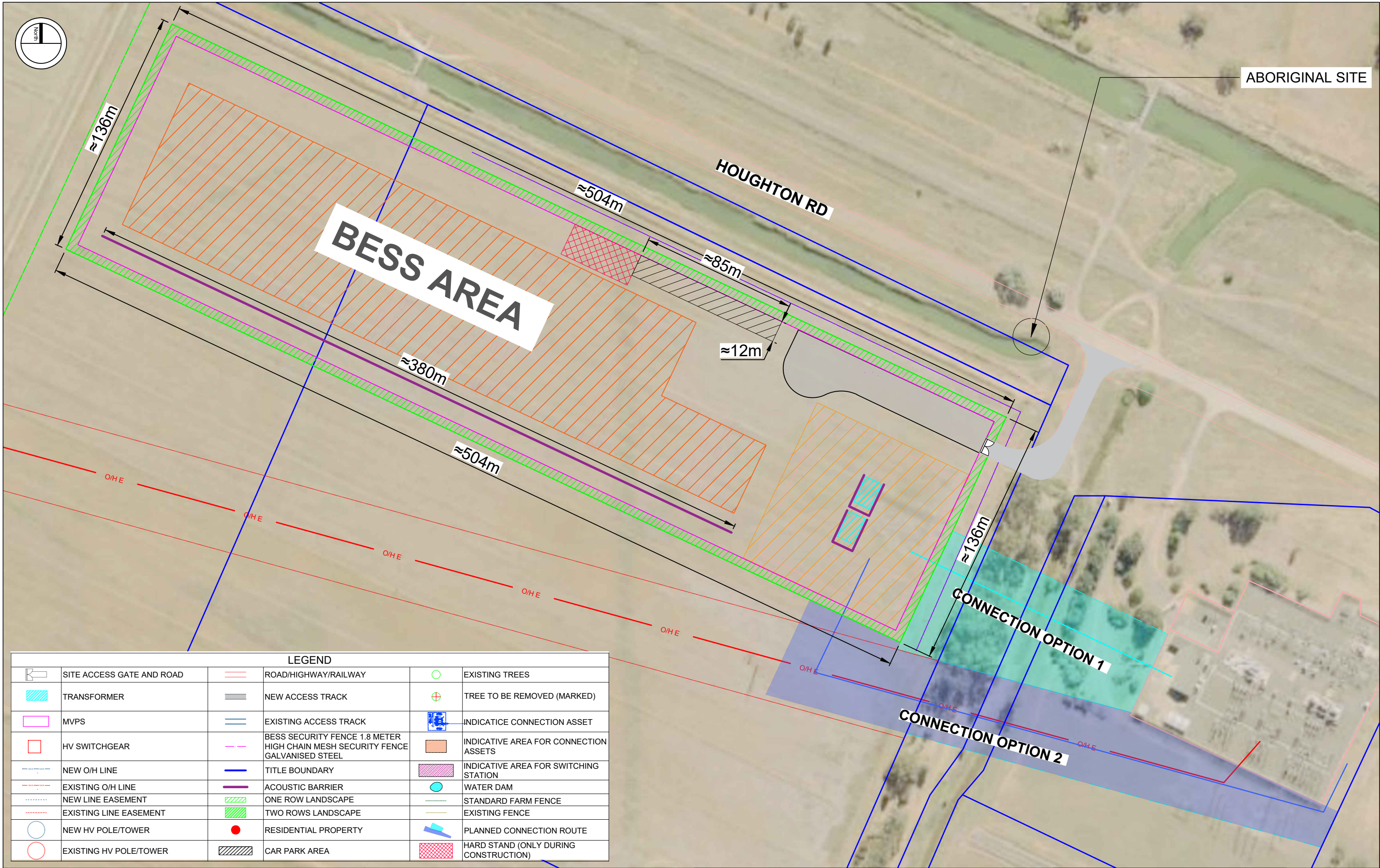
Time		North Approach Irrigation Way			South Approach Irrigation Way			West Approach Houghton Rd			Hourly Total	
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	Hour	Peak
6:00	6:15	0	0	17	0	7	2	0	0	0	181	
6:15	6:30	0	0	28	0	13	0	0	0	1	206	
6:30	6:45	0	4	31	0	25	1	0	0	1	221	
6:45	7:00	0	1	29	0	18	3	0	0	0	226	
7:00	7:15	0	2	25	0	23	0	0	0	1	244	
7:15	7:30	0	1	33	0	21	0	0	0	2	266	
7:30	7:45	0	0	42	0	21	1	0	2	1	289	
7:45	8:00	0	1	29	0	35	3	0	1	0	325	
8:00	8:15	0	0	47	0	23	1	0	2	0	352	Peak
8:15	8:30	0	0	43	0	34	2	0	0	1		
8:30	8:45	0	1	52	0	48	1	0	1	0		
8:45	9:00	0	0	36	0	58	1	0	1	0		
15:00	15:15	1	0	35	0	44	0	0	0	1	341	
15:15	15:30	0	0	34	0	42	3	0	2	0	354	
15:30	15:45	0	1	32	0	58	0	0	2	3	378	
15:45	16:00	0	2	35	0	44	0	0	0	2	371	
16:00	16:15	0	1	39	0	52	2	0	0	0	387	Peak
16:15	16:30	0	2	36	0	64	0	0	1	2	373	
16:30	16:45	0	1	38	0	45	4	0	1	0	368	
16:45	17:00	0	0	49	0	46	0	0	1	3	356	
17:00	17:15	0	2	36	0	41	0	0	0	1	320	
17:15	17:30	0	4	48	0	44	1	0	0	3		
17:30	17:45	0	1	34	0	39	0	0	1	2		
17:45	18:00	0	1	33	0	26	0	0	2	1		

Peak Time		North Approach Irrigation Way			South Approach Irrigation Way			West Approach Houghton Rd			Peak total
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	
7:00	8:00	0	4	129	0	100	4	0	3	4	244
16:00	17:00	0	4	162	0	207	6	0	3	5	387

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.



Appendix 2 – Development Plan



LEGEND									
	SITE ACCESS GATE AND ROAD		ROAD/HIGHWAY/RAILWAY		EXISTING TREES		TREE TO BE REMOVED (MARKED)		INDICATIVE CONNECTION ASSET
	TRANSFORMER		NEW ACCESS TRACK		INDICATIVE AREA FOR CONNECTION ASSETS		INDICATIVE AREA FOR SWITCHING STATION		WATER DAM
	MVPS		EXISTING ACCESS TRACK		STANDARD FARM FENCE		EXISTING FENCE		PLANNED CONNECTION ROUTE
	HV SWITCHGEAR		BESS SECURITY FENCE 1.8 METER HIGH CHAIN MESH SECURITY FENCE GALVANISED STEEL		HARD STAND (ONLY DURING CONSTRUCTION)				
	NEW O/H LINE		TITLE BOUNDARY						
	EXISTING O/H LINE		ACOUSTIC BARRIER						
	NEW LINE EASEMENT		ONE ROW LANDSCAPE						
	EXISTING LINE EASEMENT		TWO ROWS LANDSCAPE						
	NEW HV POLE/TOWER		RESIDENTIAL PROPERTY						
	EXISTING HV POLE/TOWER		CAR PARK AREA						

REVISIONS						PROJECT DETAILS:		DRAWING NR: G-1.0_023109							
REV	STATUS	DESCRIPTION	DATE	D.B.	C.B.	YANCO DISBUTION BESS									
A	CP	INITIAL ISSUE	07/03/2024	XZ	AJ	120 HOUGHTON ROAD, YANCO NSW 2703									
B	CP	ADDED ACOUSTIC BARRIER DETAILS	24/04/2024	XZ	AJ	-34.50097, 146.3939									
C	CP	HIGH LEVEL PLAN LAYOUT	08/07/2024	XZ	AJ	CLIENT DETAILS:									
D	CP	CAR PARK DETAILS AMENDED	01/11/2024	XZ	AJ	ACENERGY PTY LTD									
						DRAWING TITLE:		COPYRIGHT OF THIS DRAWING RESERVED BY ACENERGY PTY LTD. NO PART OF THIS DOCUMENT MAY BE REPRODUCED OR COPIED IN ANY FORM OR BY ANY MEANS WITHOUT CONSENT OF ACENERGY.		DRAWN BY : XZ		APPROVED BY : AJ		PROJECT MGR : LZ	
						AERIAL LAYOUT 1 OF 2									

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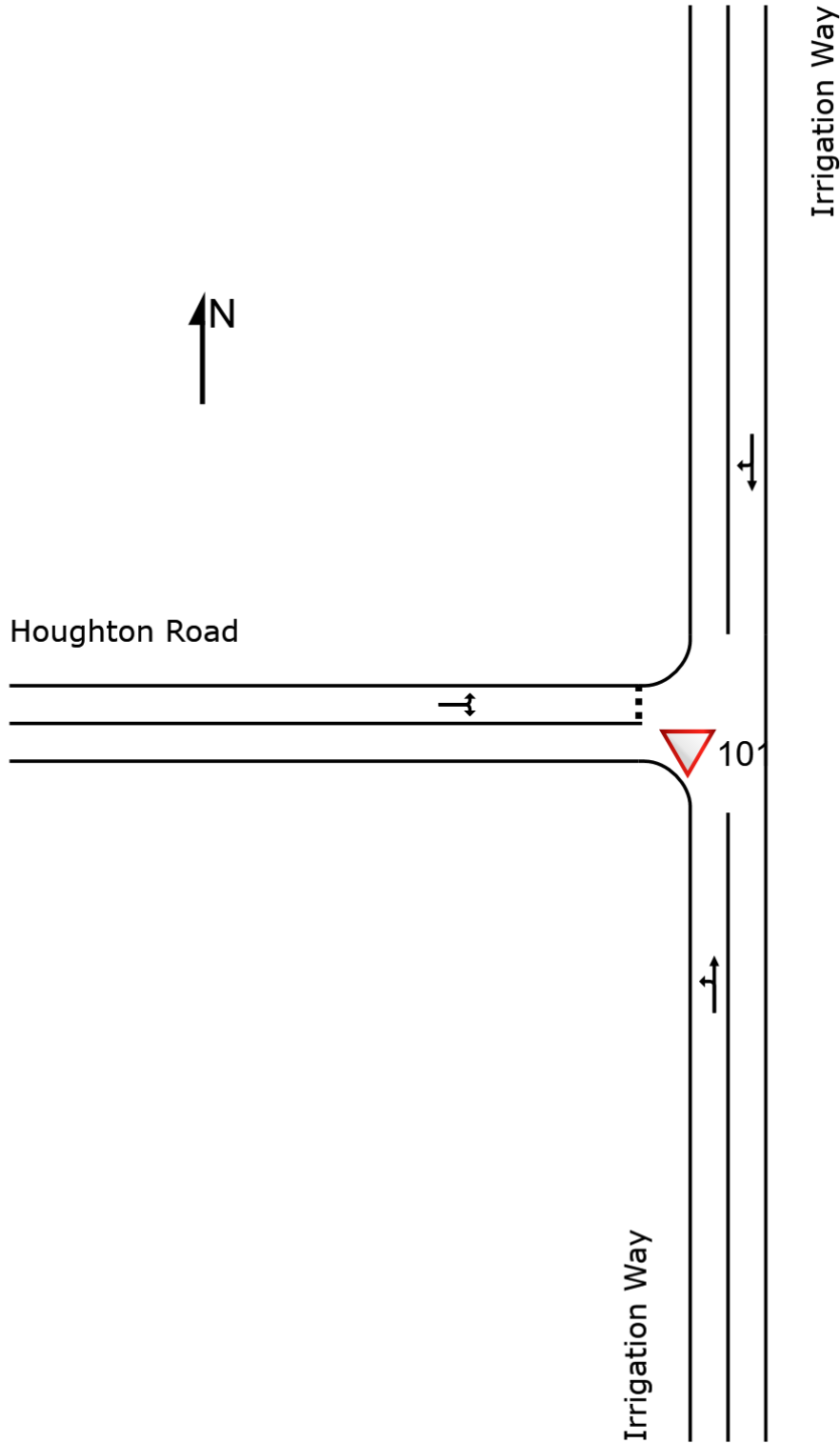
Appendix 3 – SIDRA Outputs

SITE LAYOUT

▼ Site: 101 [AM Peak (Site Folder: Post-Development (2026))]

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

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101 [AM Peak (Site Folder: Post-Development (2026))]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	[Total HV]	[Veh. veh	[Dist] m									
			veh/h	%	veh/h	%	v/c	sec							km/h
South: Irrigation Way															
1	L2	All MCs	16	73.3	16	73.3	0.080	6.4	LOS A	0.0	0.0	0.00	0.07	0.00	53.8
2	T1	All MCs	112	25.5	112	25.5	0.080	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	59.7
Approach			127	31.4	127	31.4	0.080	0.8	NA	0.0	0.0	0.00	0.07	0.00	58.9
North: Irrigation Way															
8	T1	All MCs	144	4.4	144	4.4	0.110	0.2	LOS A	0.3	2.4	0.15	0.18	0.15	58.7
9	R2	All MCs	36	44.1	36	44.1	0.110	6.7	LOS A	0.3	2.4	0.15	0.18	0.15	53.8
Approach			180	12.3	180	12.3	0.110	1.5	NA	0.3	2.4	0.15	0.18	0.15	57.7
West: Houghton Road															
10	L2	All MCs	4	0.0	4	0.0	0.006	5.9	LOS A	0.0	0.1	0.25	0.54	0.25	52.2
12	R2	All MCs	3	0.0	3	0.0	0.006	6.6	LOS A	0.0	0.1	0.25	0.54	0.25	51.9
Approach			7	0.0	7	0.0	0.006	6.2	LOS A	0.0	0.1	0.25	0.54	0.25	52.1
All Vehicles			315	19.7	315	19.7	0.110	1.4	NA	0.3	2.4	0.09	0.14	0.09	58.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [PM Peak (Site Folder: Post-Development (2026))]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

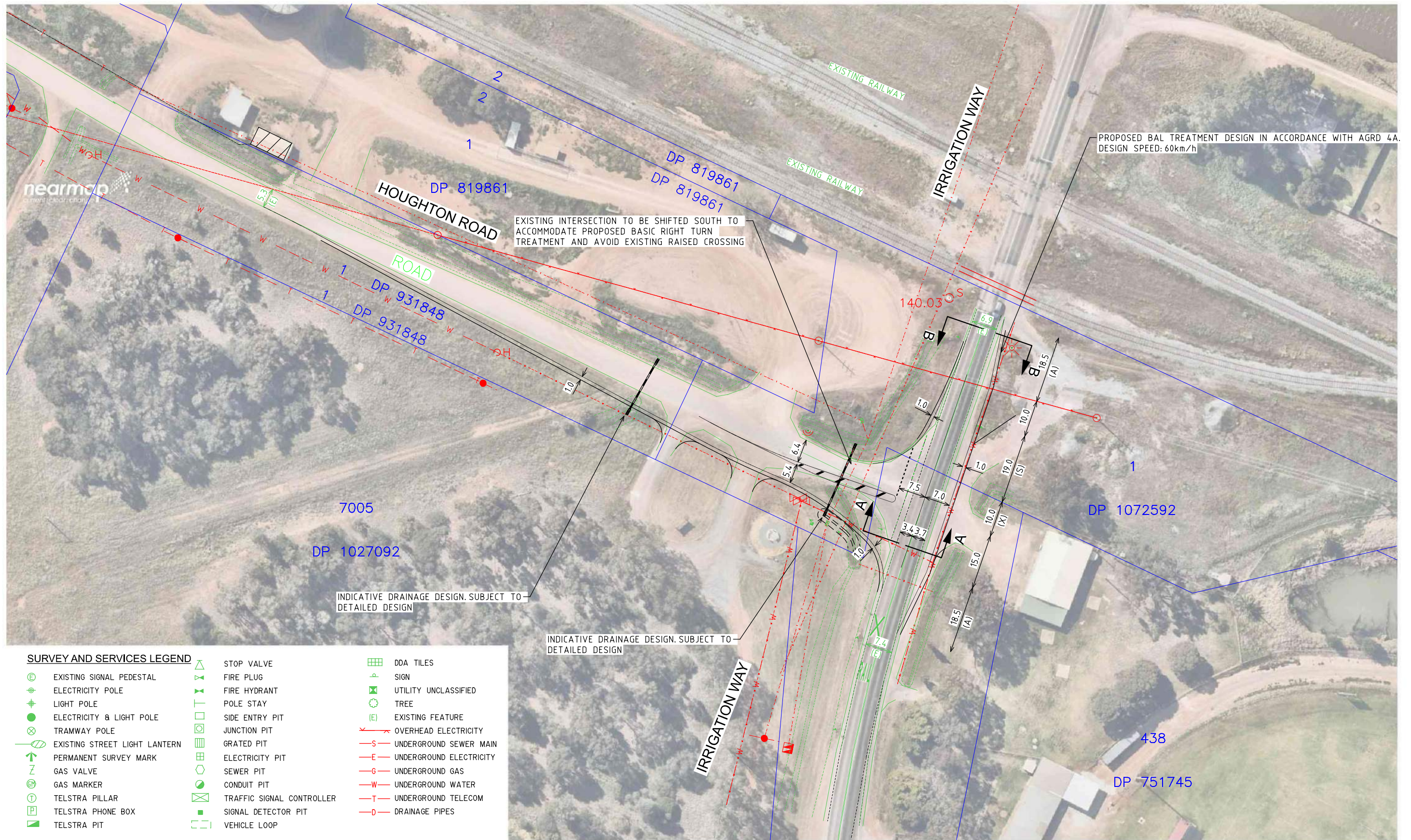
Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	[Total HV]	[Veh. veh	[Dist] m									
			veh/h	%	veh/h	%	v/c	sec							km/h
South: Irrigation Way															
1	L2	All MCs	6	0.0	6	0.0	0.132	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	57.3
2	T1	All MCs	232	12.7	232	12.7	0.132	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.8
Approach			238	12.4	238	12.4	0.132	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.7
North: Irrigation Way															
8	T1	All MCs	181	4.7	181	4.7	0.099	0.0	LOS A	0.0	0.2	0.02	0.02	0.02	59.8
9	R2	All MCs	4	0.0	4	0.0	0.099	5.9	LOS A	0.0	0.2	0.02	0.02	0.02	57.0
Approach			185	4.5	185	4.5	0.099	0.2	NA	0.0	0.2	0.02	0.02	0.02	59.7
West: Houghton Road															
10	L2	All MCs	21	75.0	21	75.0	0.053	8.0	LOS A	0.2	2.1	0.43	0.64	0.43	48.2
12	R2	All MCs	15	78.6	15	78.6	0.053	10.3	LOS B	0.2	2.1	0.43	0.64	0.43	47.7
Approach			36	76.5	36	76.5	0.053	9.0	LOS A	0.2	2.1	0.43	0.64	0.43	48.0
All Vehicles			459	14.2	459	14.2	0.132	0.9	NA	0.2	2.1	0.04	0.07	0.04	58.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Appendix 4 – Intersection Designs

A4.1 – Strategic Design – Houghton Road / Irrigation Way

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SURVEY AND SERVICES LEGEND

	EXISTING SIGNAL PEDESTAL		STOP VALVE		DDA TILES
	ELECTRICITY POLE		FIRE PLUG		SIGN
	LIGHT POLE		FIRE HYDRANT		UTILITY UNCLASSIFIED
	ELECTRICITY & LIGHT POLE		POLE STAY		TREE
	TRAMWAY POLE		SIDE ENTRY PIT		EXISTING FEATURE
	EXISTING STREET LIGHT LANTERN		JUNCTION PIT		OVERHEAD ELECTRICITY
	PERMANENT SURVEY MARK		GRATED PIT		UNDERGROUND SEWER MAIN
	GAS VALVE		ELECTRICITY PIT		UNDERGROUND ELECTRICITY
	GAS MARKER		SEWER PIT		UNDERGROUND GAS
	TELSTRA PILLAR		CONDUIT PIT		UNDERGROUND WATER
	TELSTRA PHONE BOX		TRAFFIC SIGNAL CONTROLLER		UNDERGROUND TELECOM
	TELSTRA PIT		SIGNAL DETECTOR PIT		DRAINAGE PIPES
			VEHICLE LOOP		

Drawing Record

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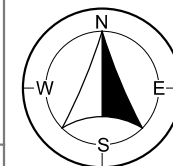
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TRAFFICWORKSTM

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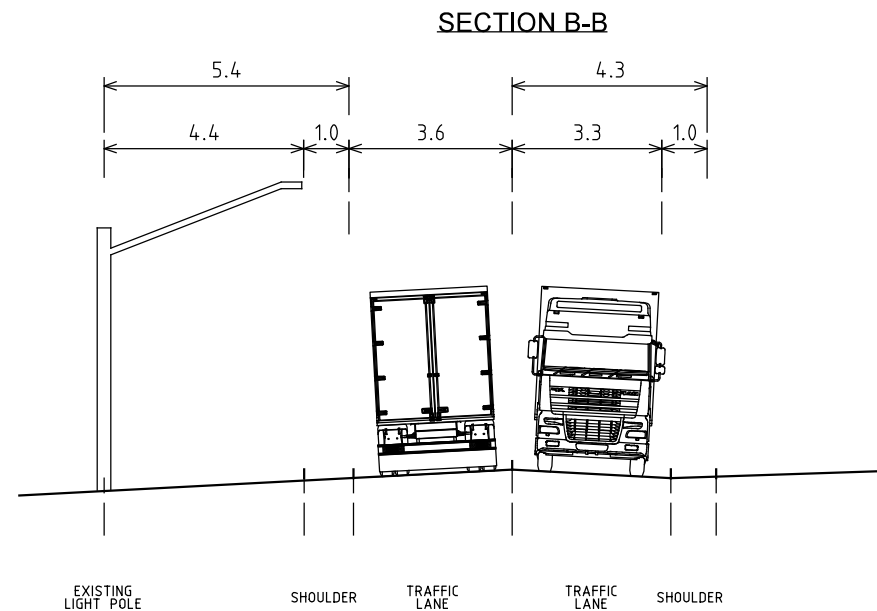
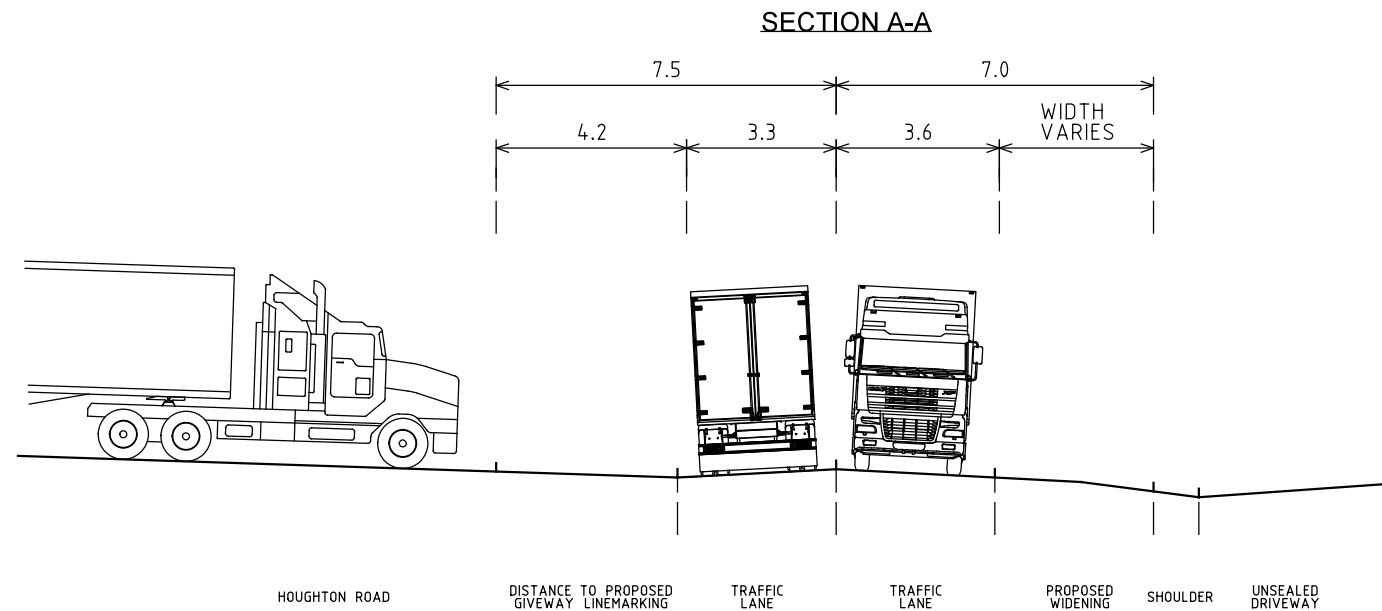
SCALE OF METRES
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**Intersection of Irrigation Way
and Houghton Road**
Leeton Shire Council

Two Dimensional Stratetgic Plan

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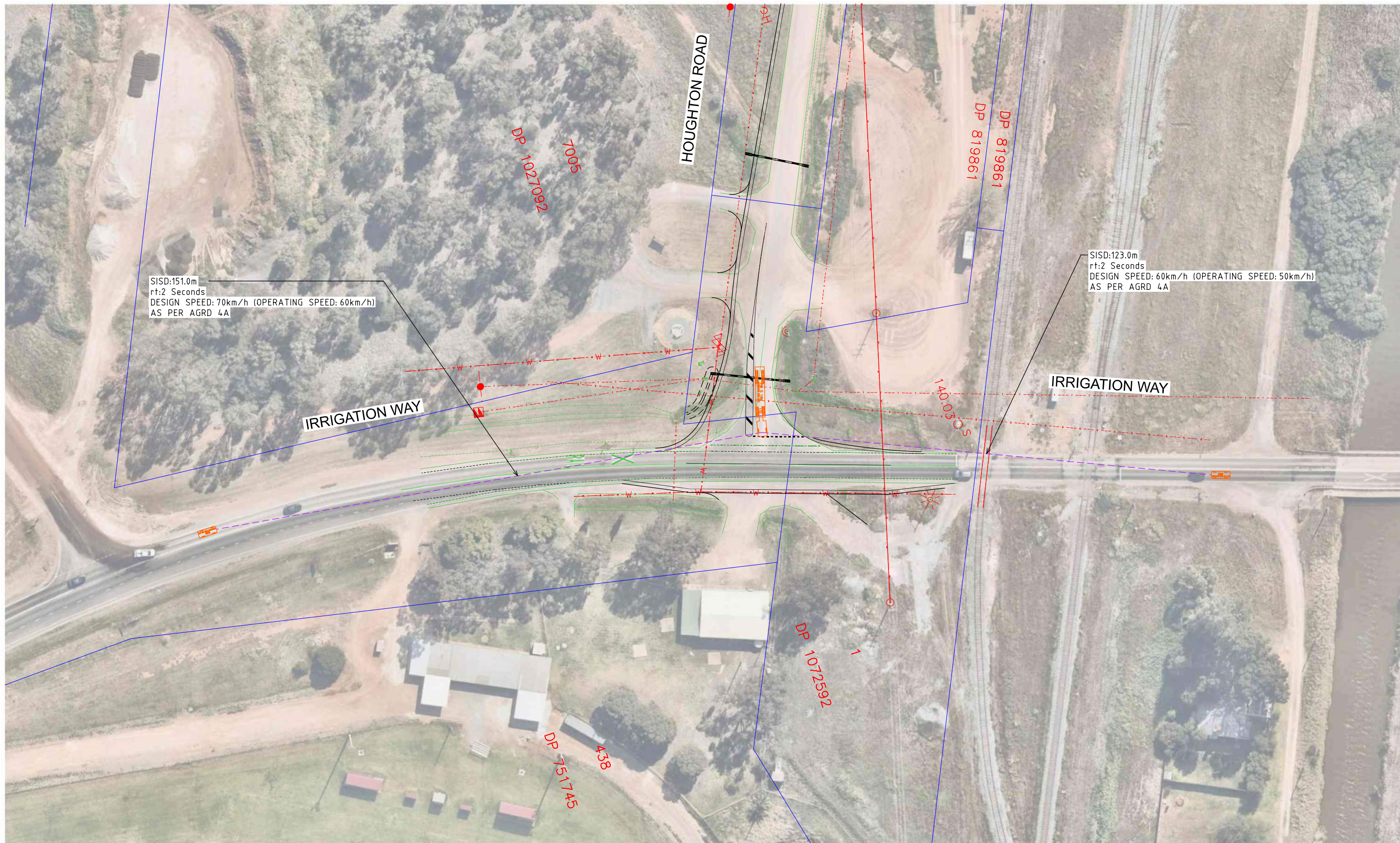
Intersection of Irrigation Way and Houghton Road

Leeton Shire Council

Typical Sections

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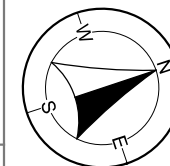
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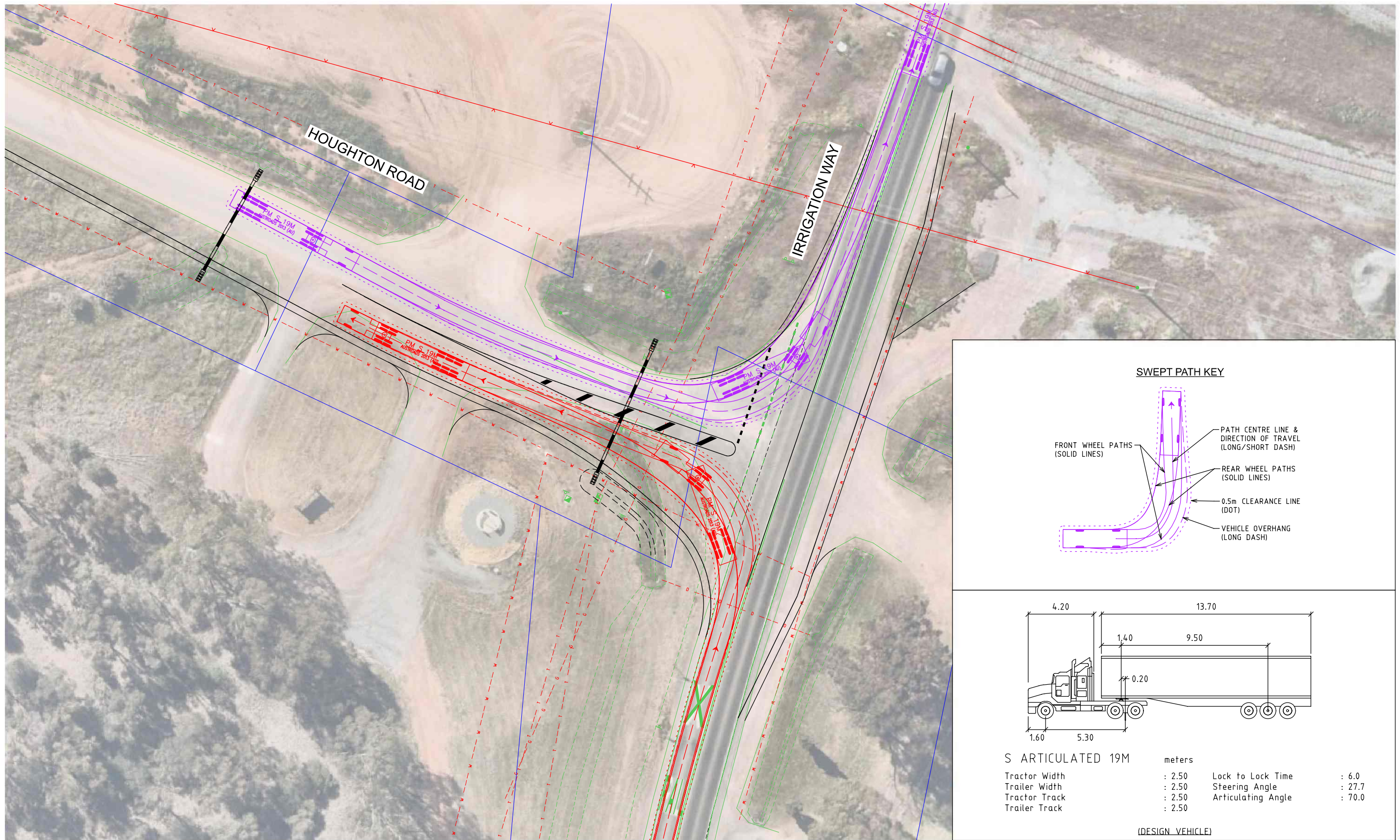
Intersection of Irrigation Way and Houghton Road

Leeton Shire Council

Safe Intersection Sight Assessment

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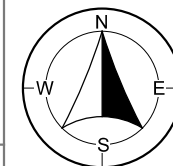
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SCALE OF METRES
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Intersection of Irrigation Way and Houghton Road

Leeton Shire Council

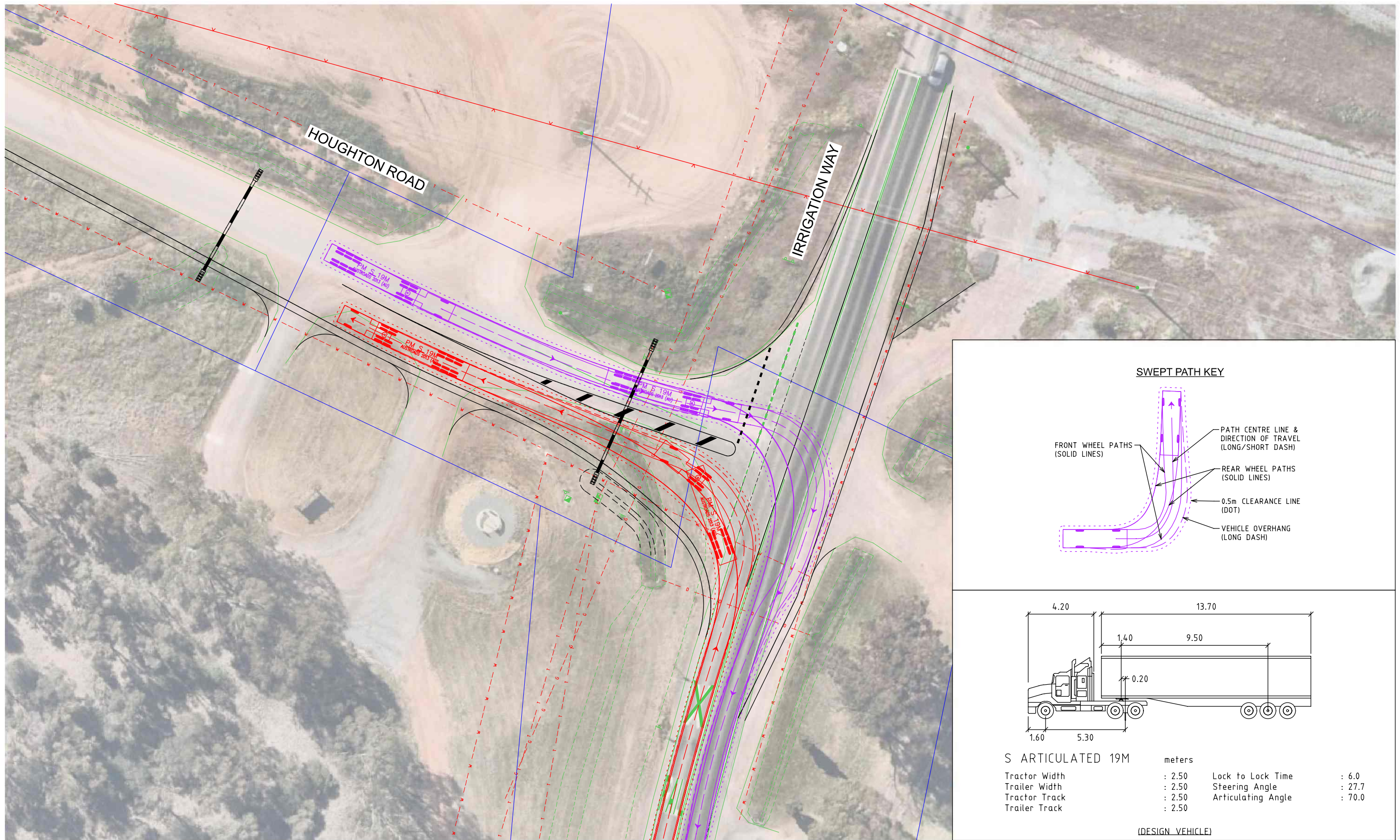
Swept Path Assessment

SHEET NO.
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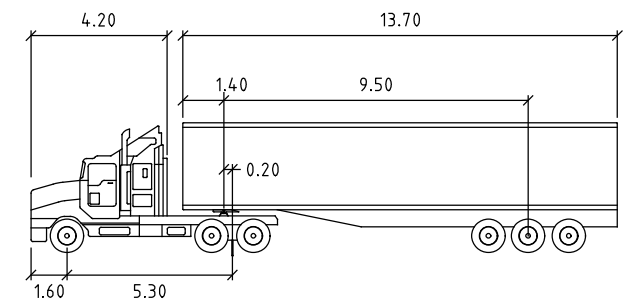
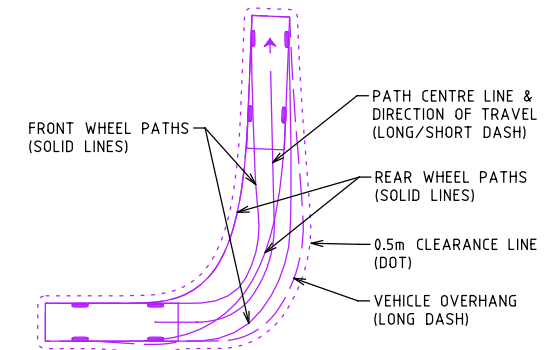
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P5

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SWEPT PATH KEY



S ARTICULATED 19M		metres	
Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 27.7
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		

(DESIGN VEHICLE)

Drawing Record

ISSUE	DRAWN	APP'D	DATE	AMENDMENT
P5	GL	AA	24.07.24	UPDATE OF BASE FILE

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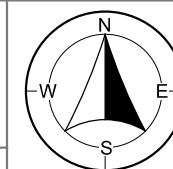
Notes & Legend

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SCALE OF METRES
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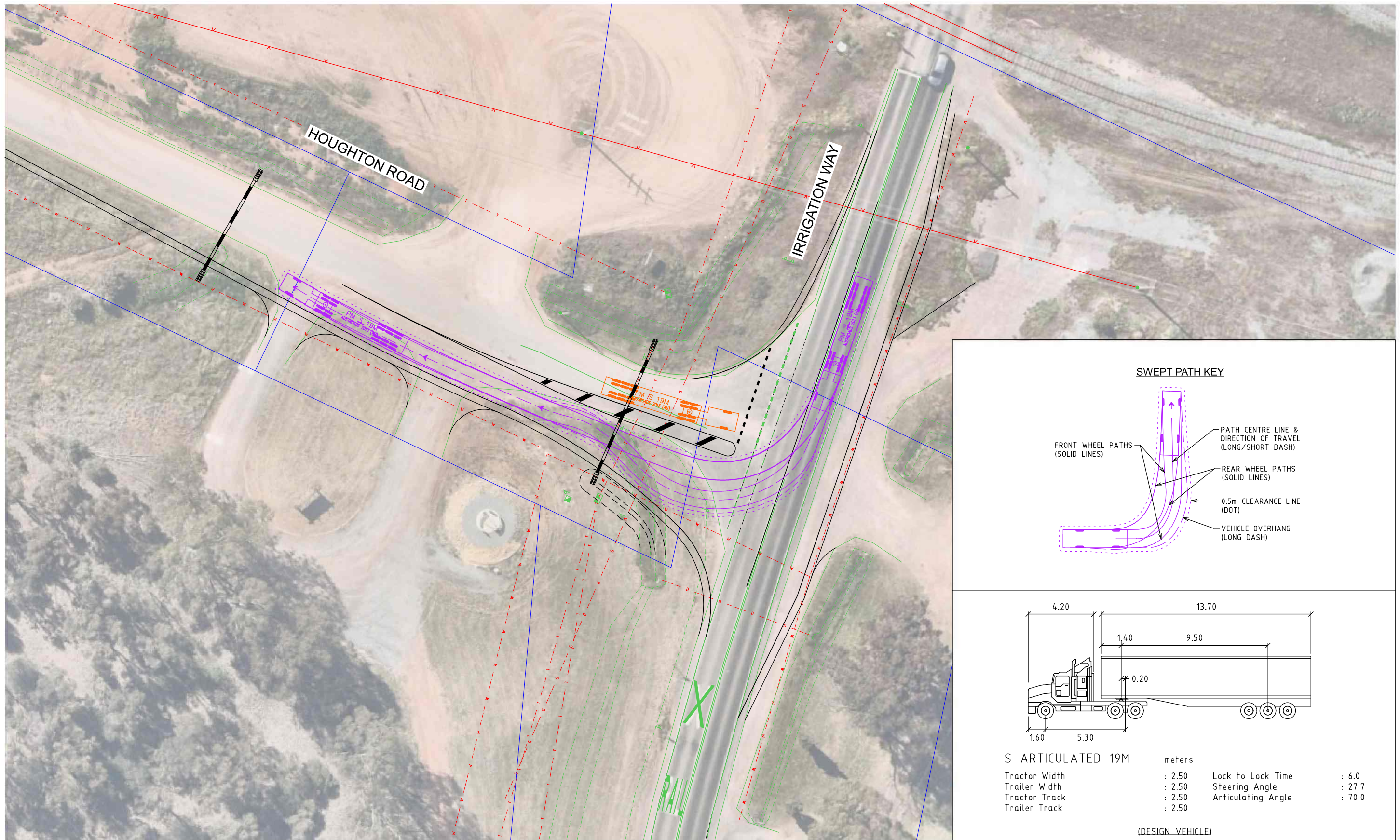
Intersection of Irrigation Way and Houghton Road

Leeton Shire Council

Swept Path Assessment

SHEET NO. 02	DRAWING NO. 230136-SKT-02	ISSUE P5
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Drawing Record

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PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY
SUBJECT TO CHANGE WITHOUT NOTIFICATION
DATE OF ISSUE: 24/07/24

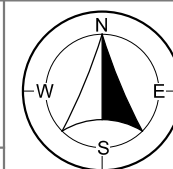
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3. CONSIDERATION SHOULD BE GIVEN TO REPLACING THE EXISTING RIGID POLE ON THE EAST SIDE WITH A SLIP BASE VARIANT.

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SCALE OF METRES
0 5 10

Intersection of Irrigation Way and Houghton Road

Leeton Shire Council

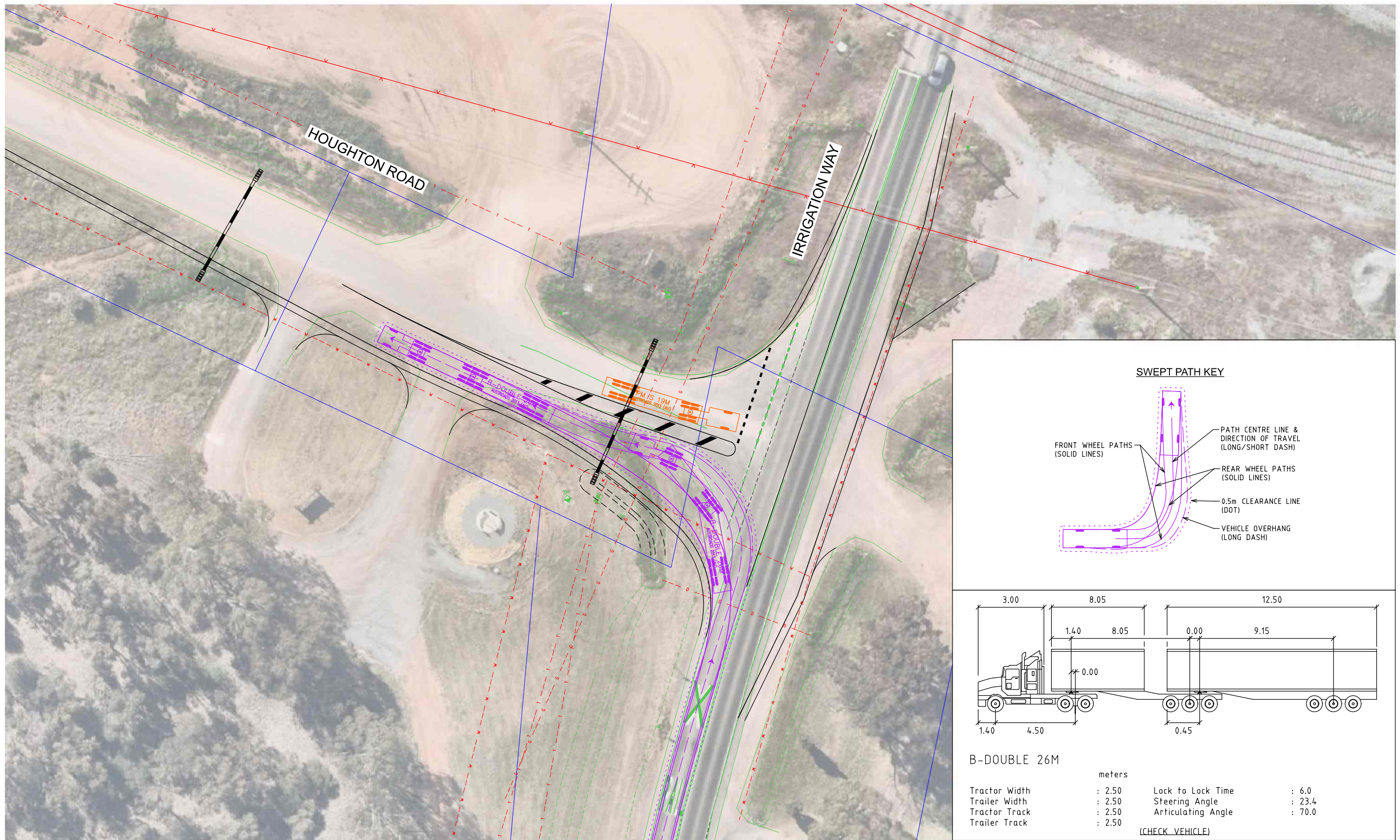
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SHEET NO.
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230136-SKT-03

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P5

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DATE OF ISSUE: 24/07/24

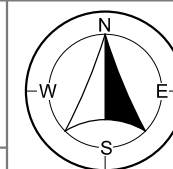
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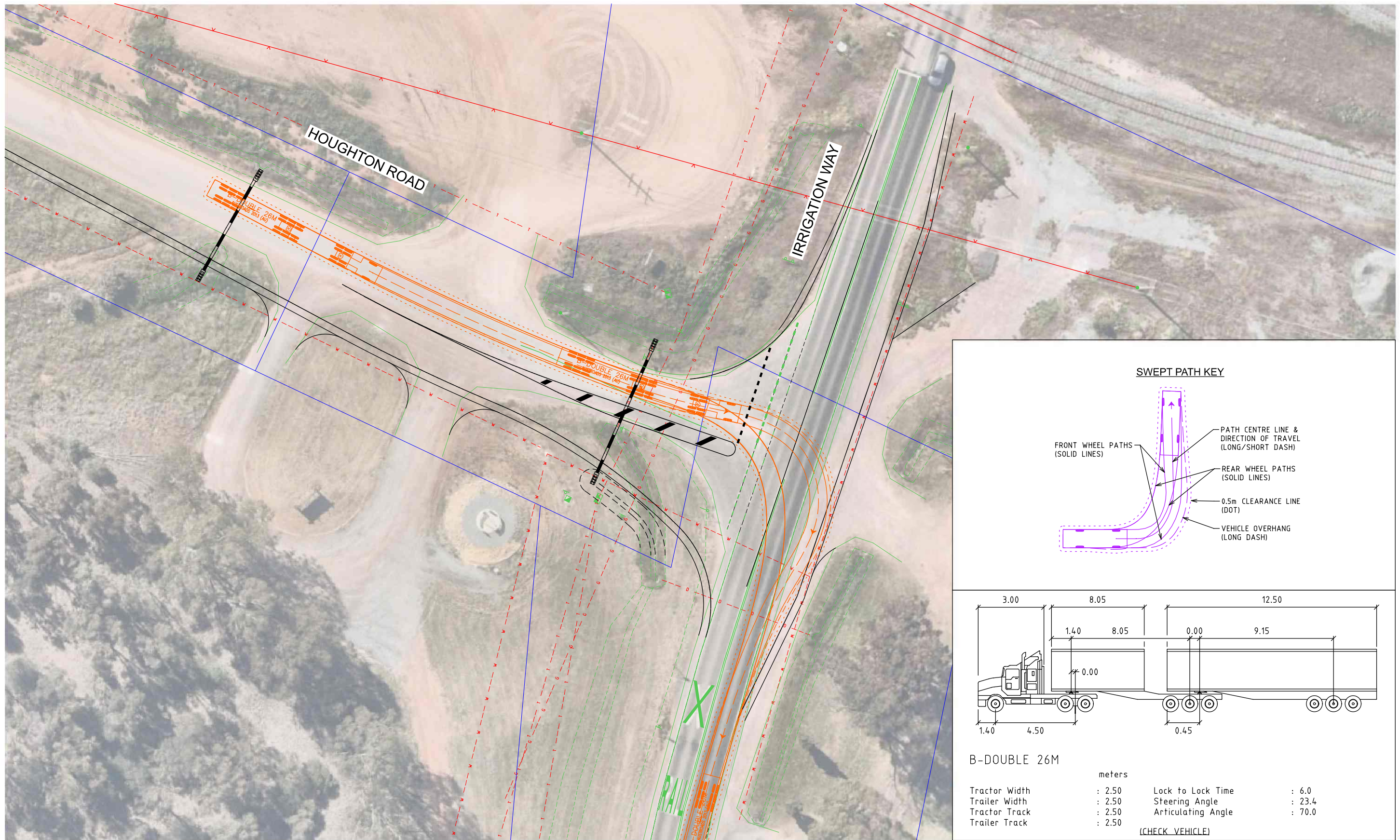
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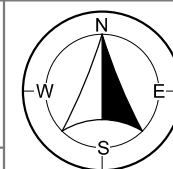
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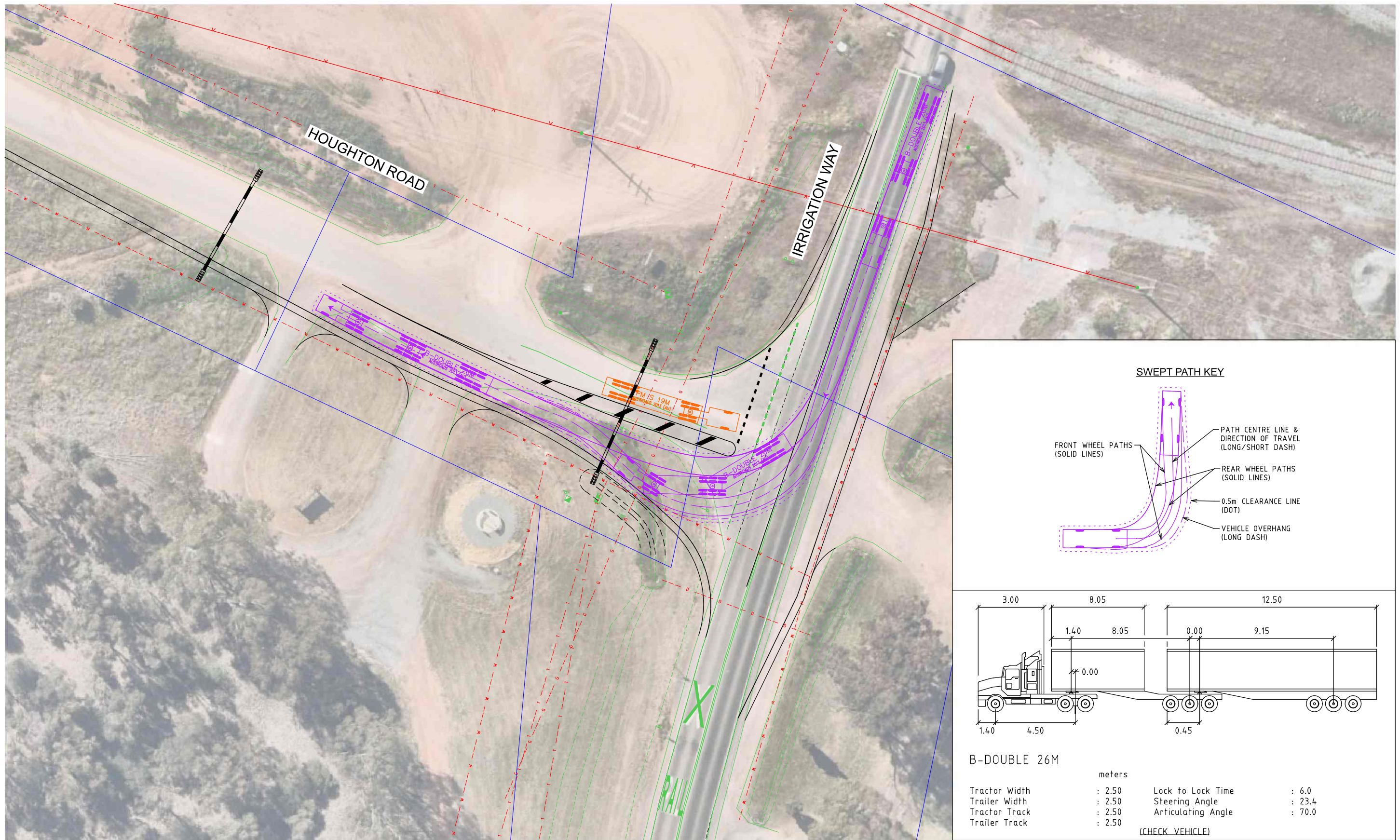
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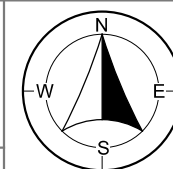
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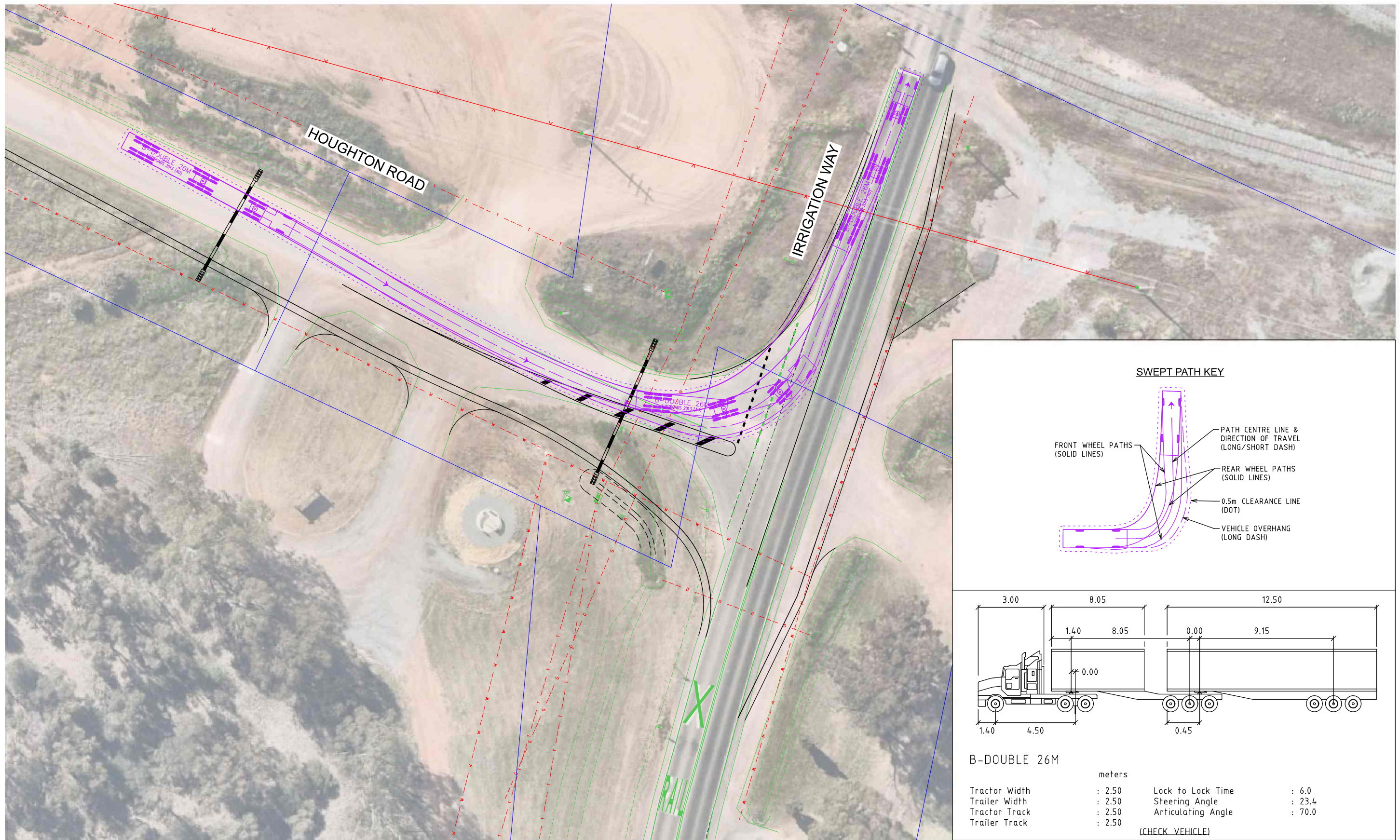
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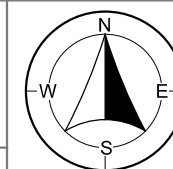
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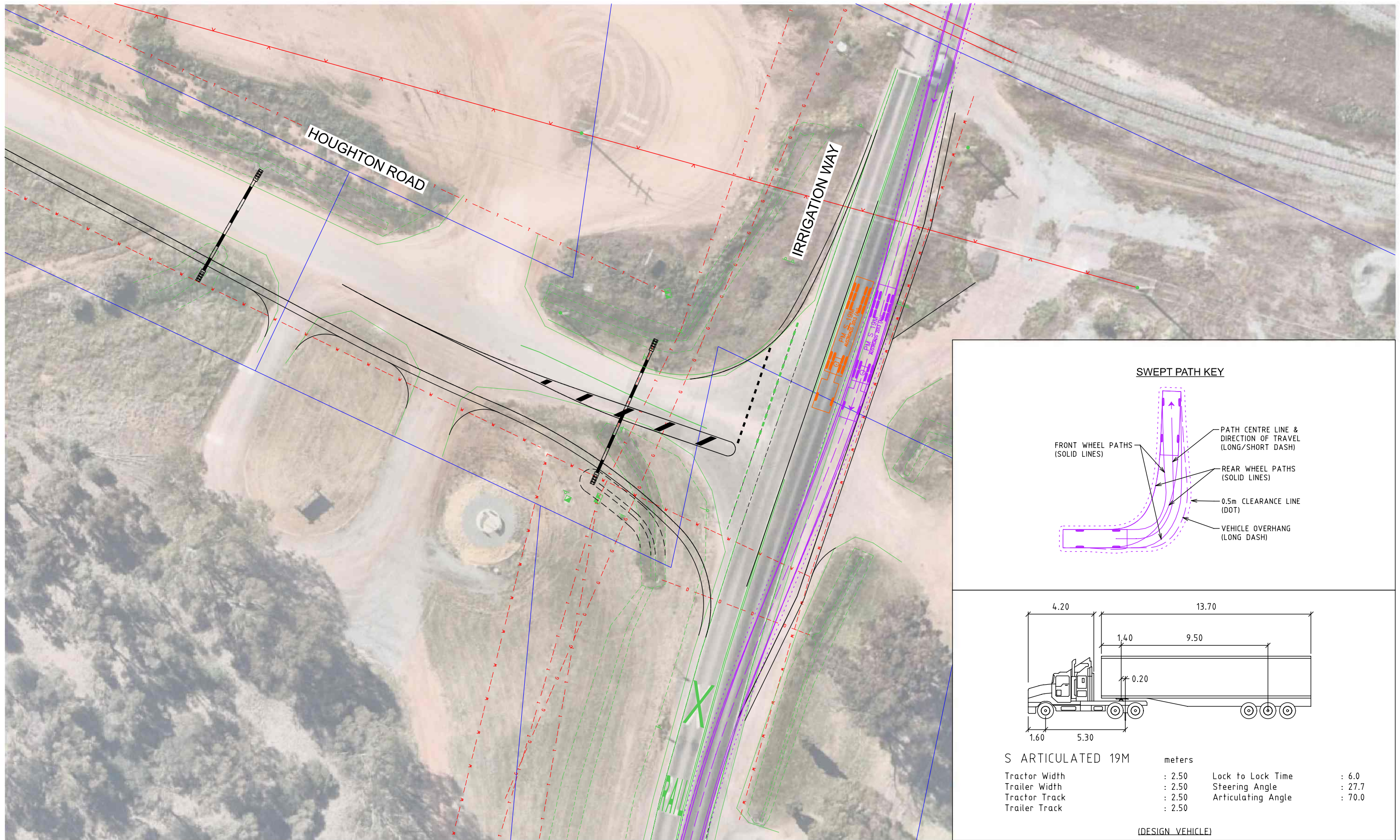
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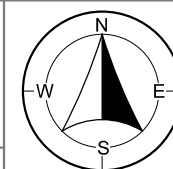
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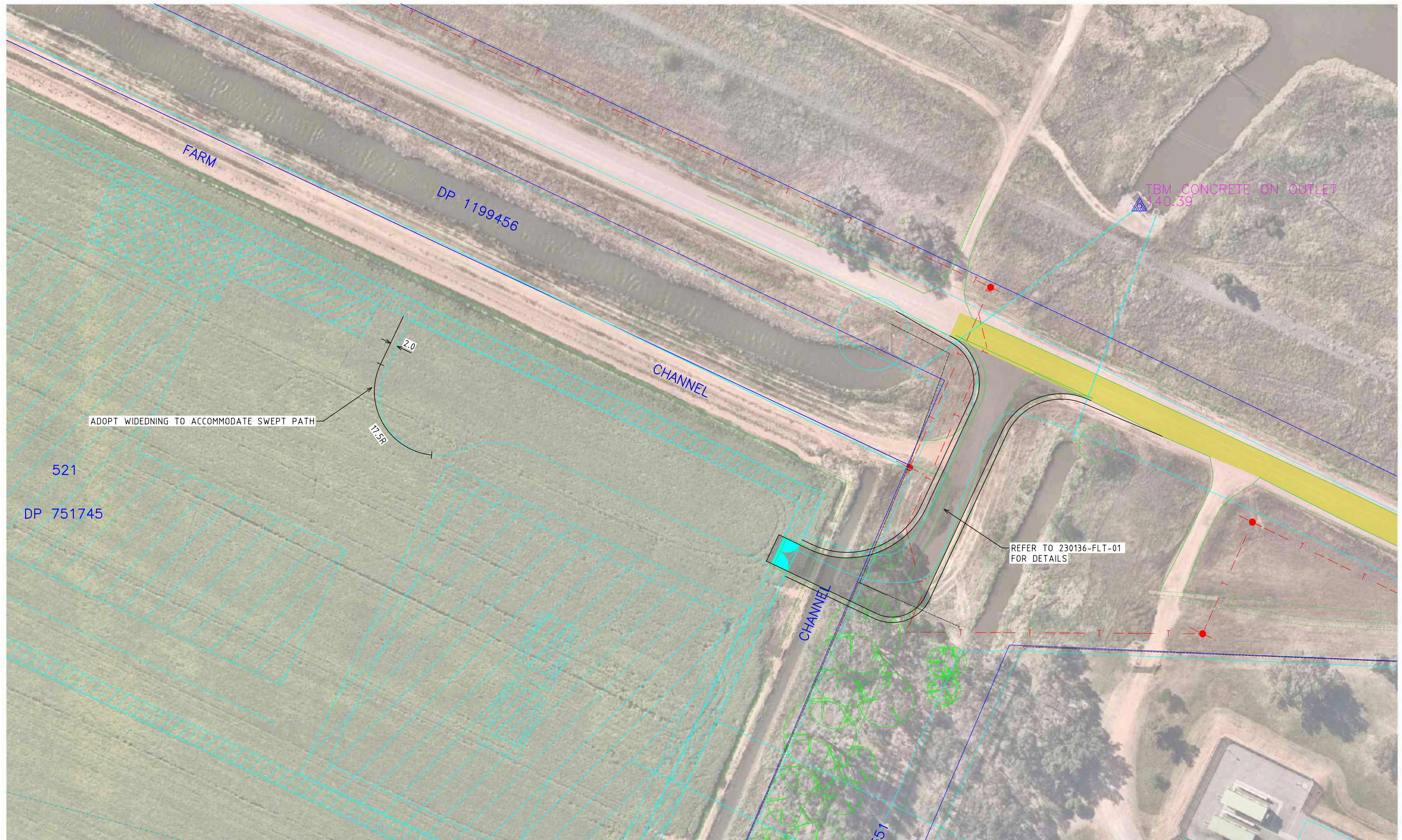
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P5

A4.2 – Functional Layout Design – Development Access / Hulme Road / Houghton Road

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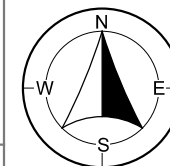
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**Intersection of Irrigation Way
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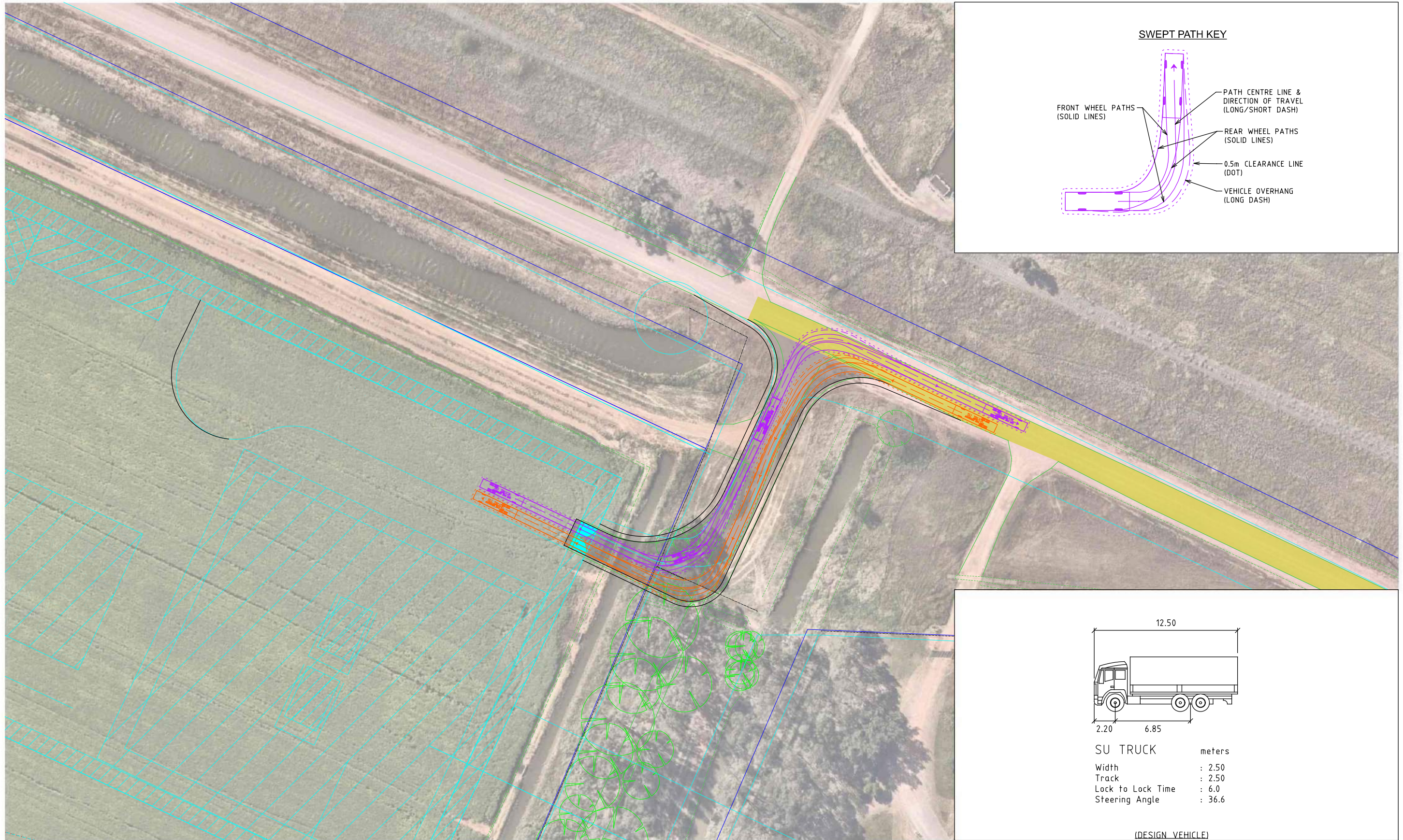
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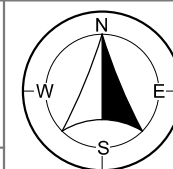
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**Intersection of Houghton Road
and Hulme Road**

Leeton Shire Council

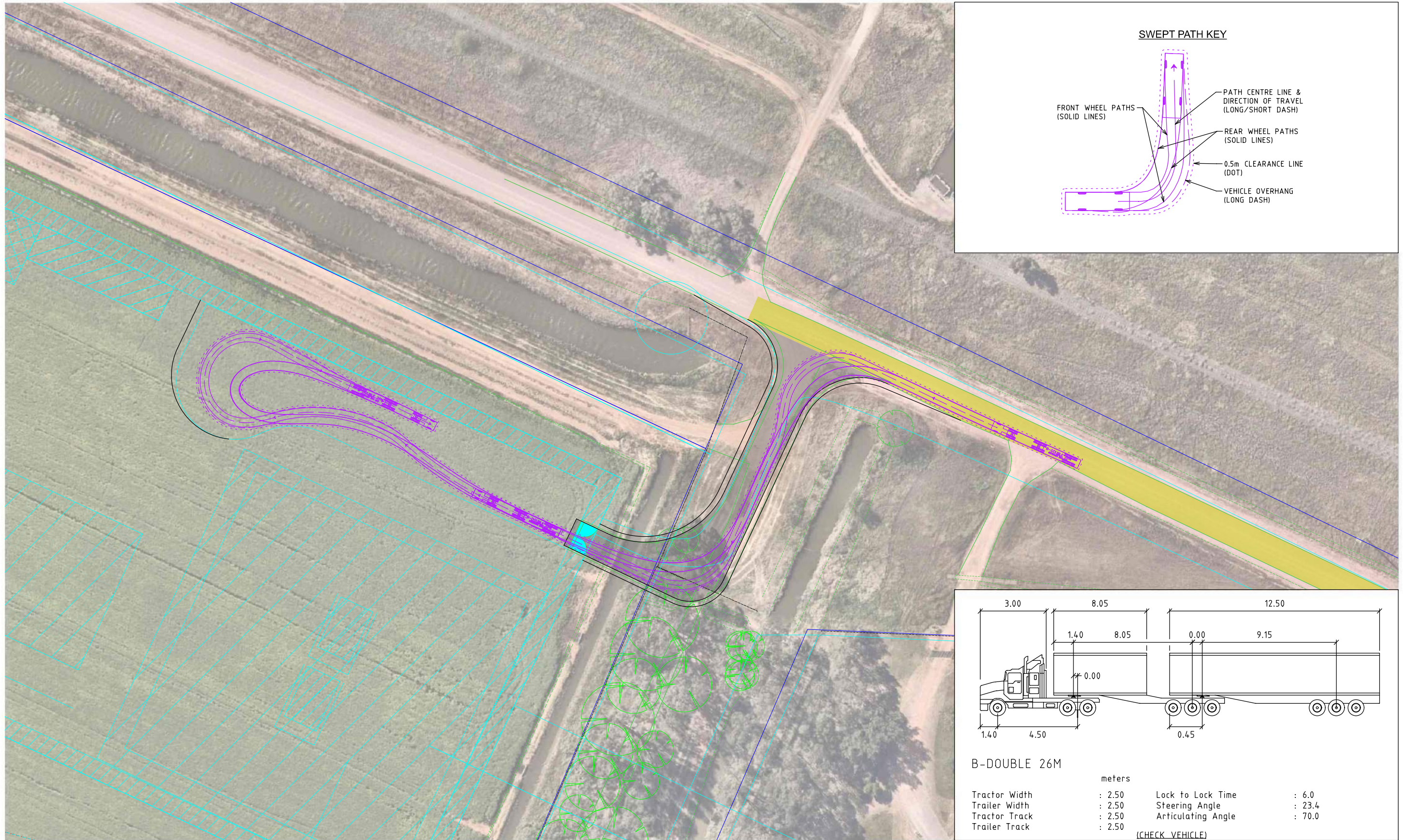
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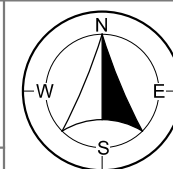
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Intersection of Houghton Road and Hulme Road

Leeton Shire Council

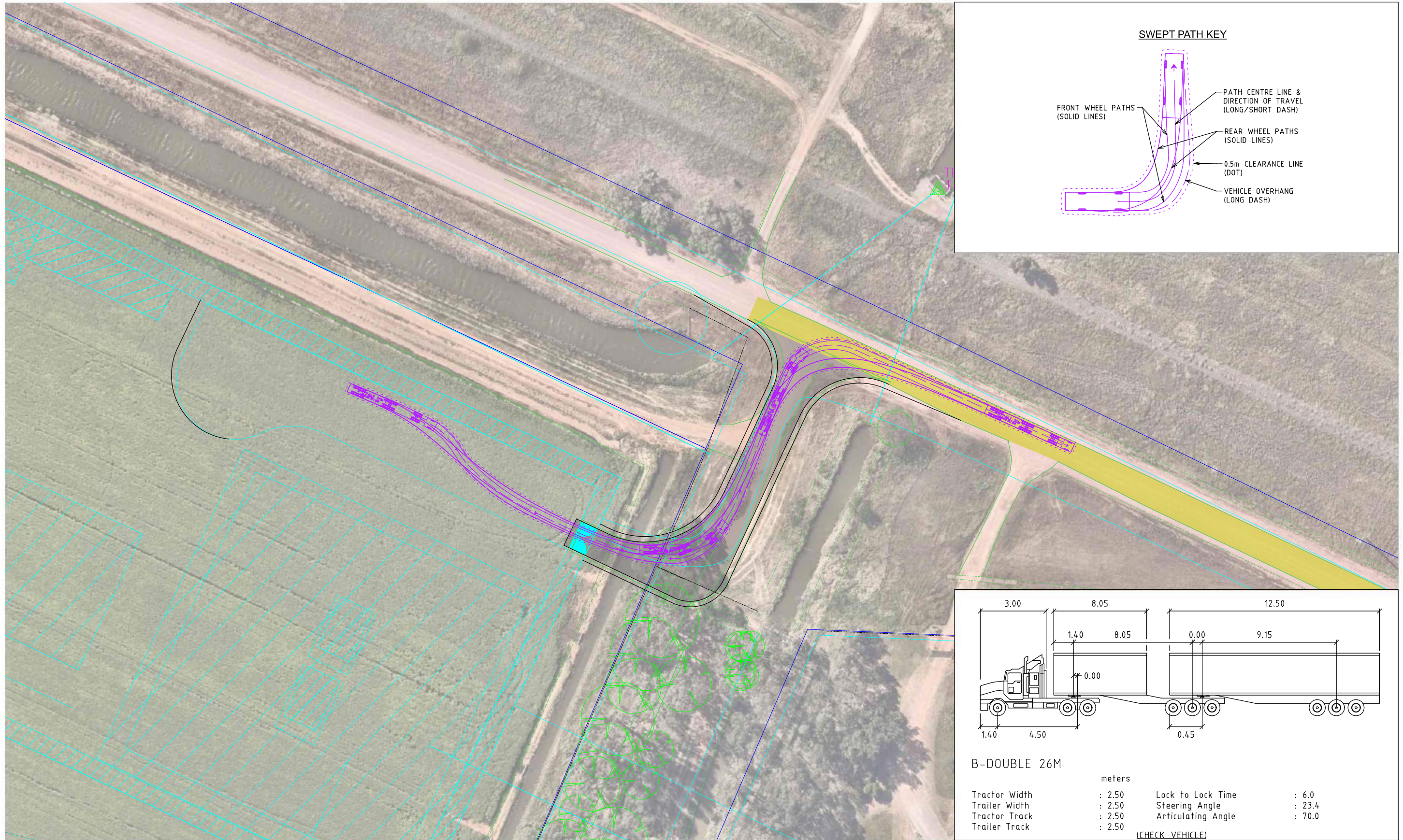
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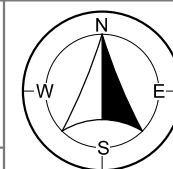
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Swept Path Assessment

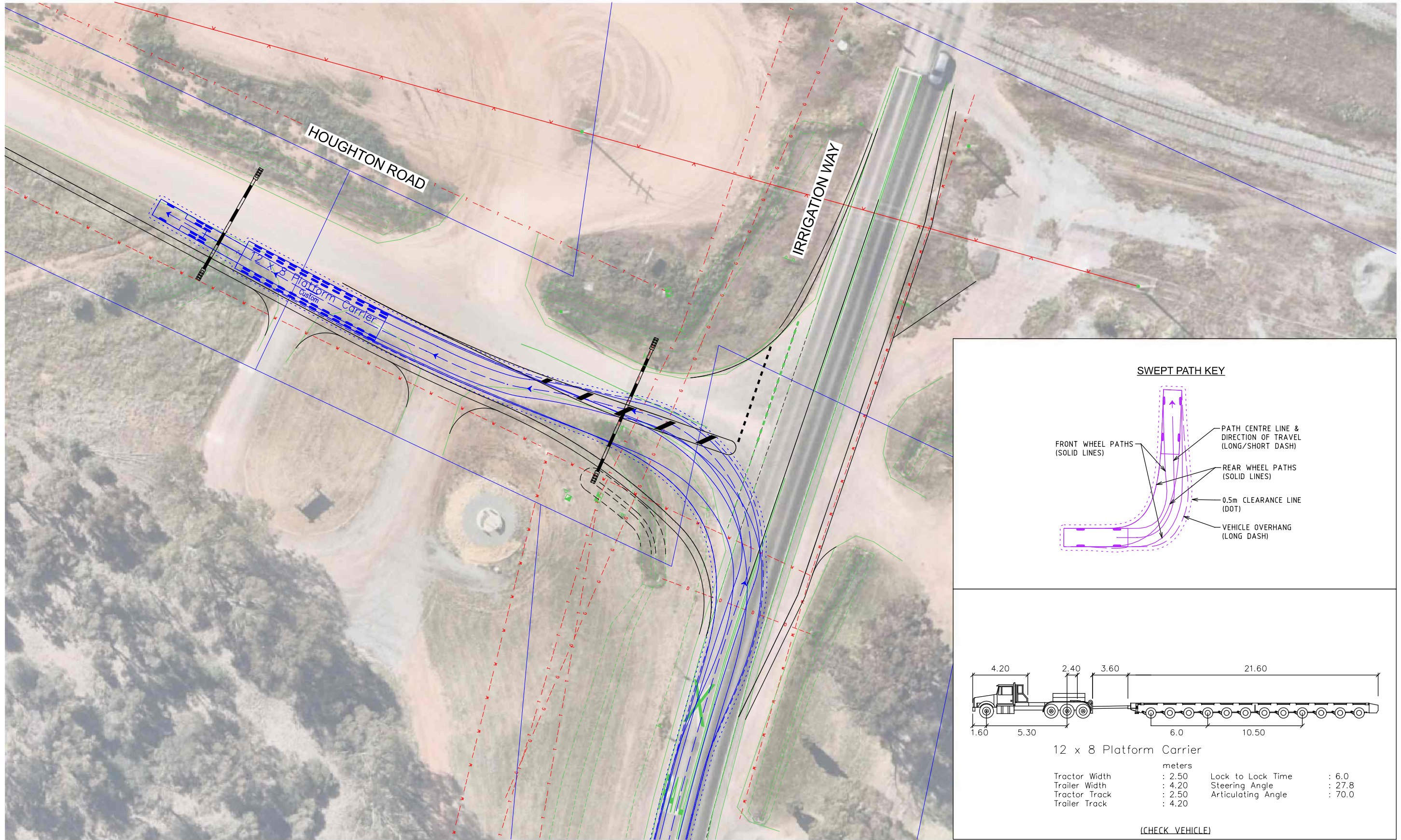
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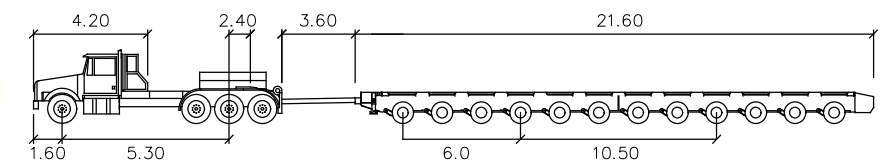
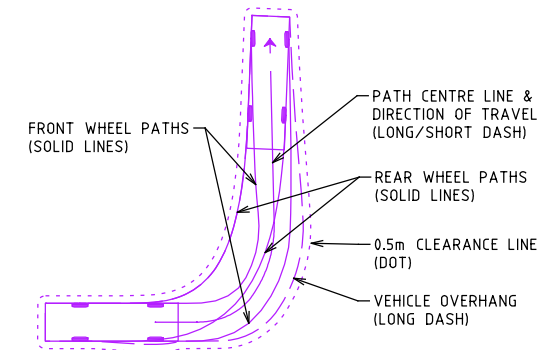
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A4.3 – Oversized-Overmass Vehicle Access

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SWEPT PATH KEY



12 x 8 Platform Carrier

	metres		
Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 4.20	Steering Angle	: 27.8
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 4.20		

(CHECK VEHICLE)

Drawing Record

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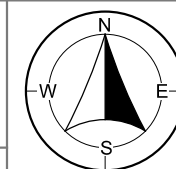
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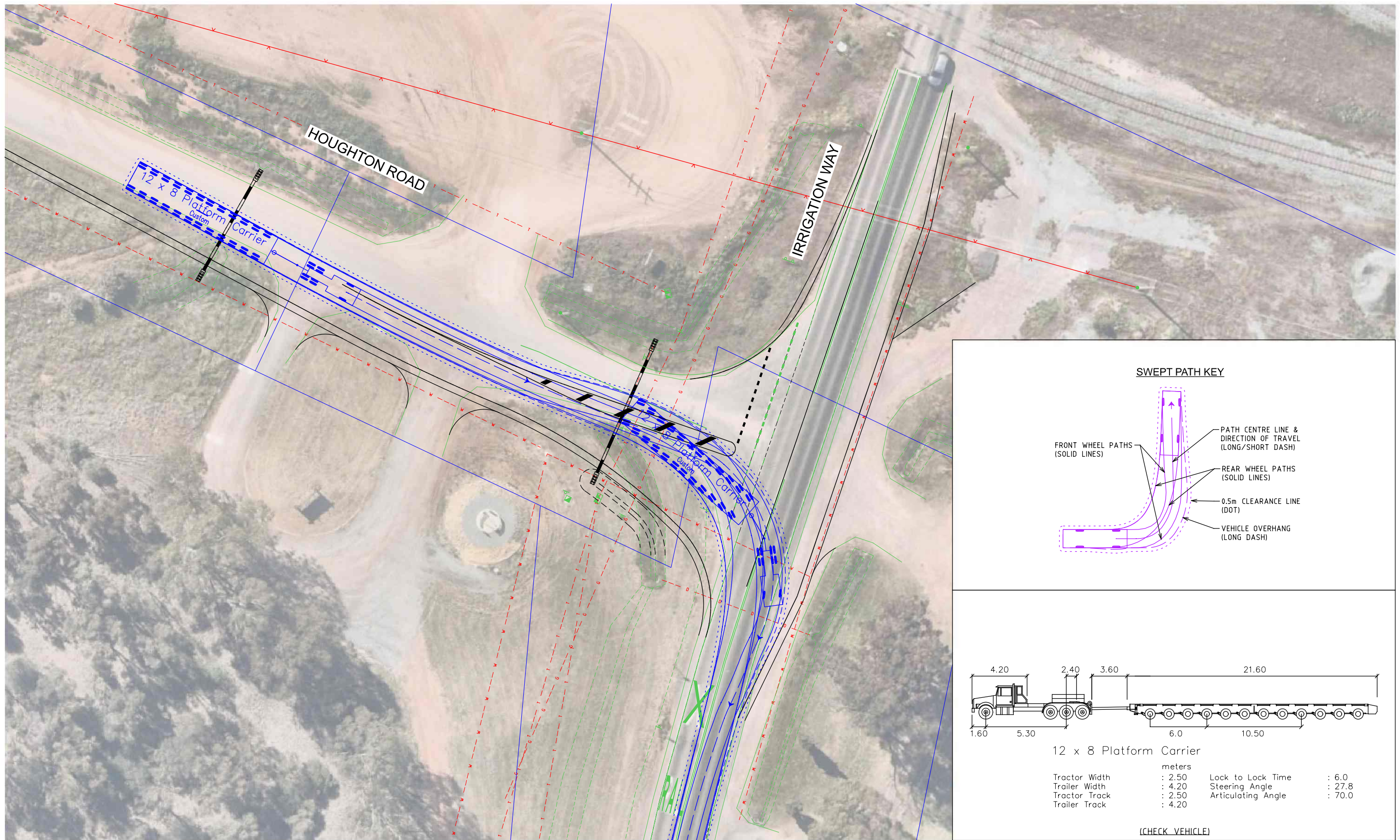
Intersection of Irrigation Way and Houghton Road

Leeton Shire Council

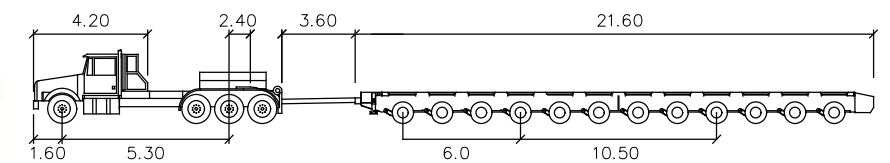
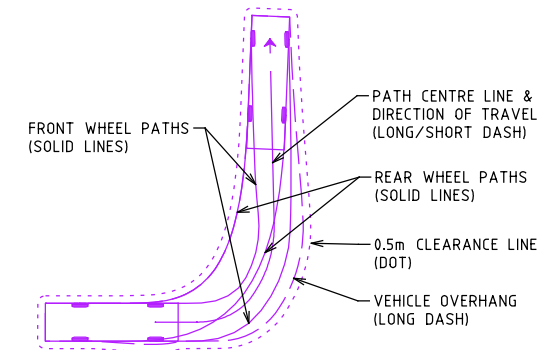
Swept Path Assessment Oversize Vehicle

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SWEPT PATH KEY



12 x 8 Platform Carrier

	meters		
Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 4.20	Steering Angle	: 27.8
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 4.20		

(CHECK VEHICLE)

Drawing Record

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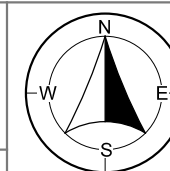
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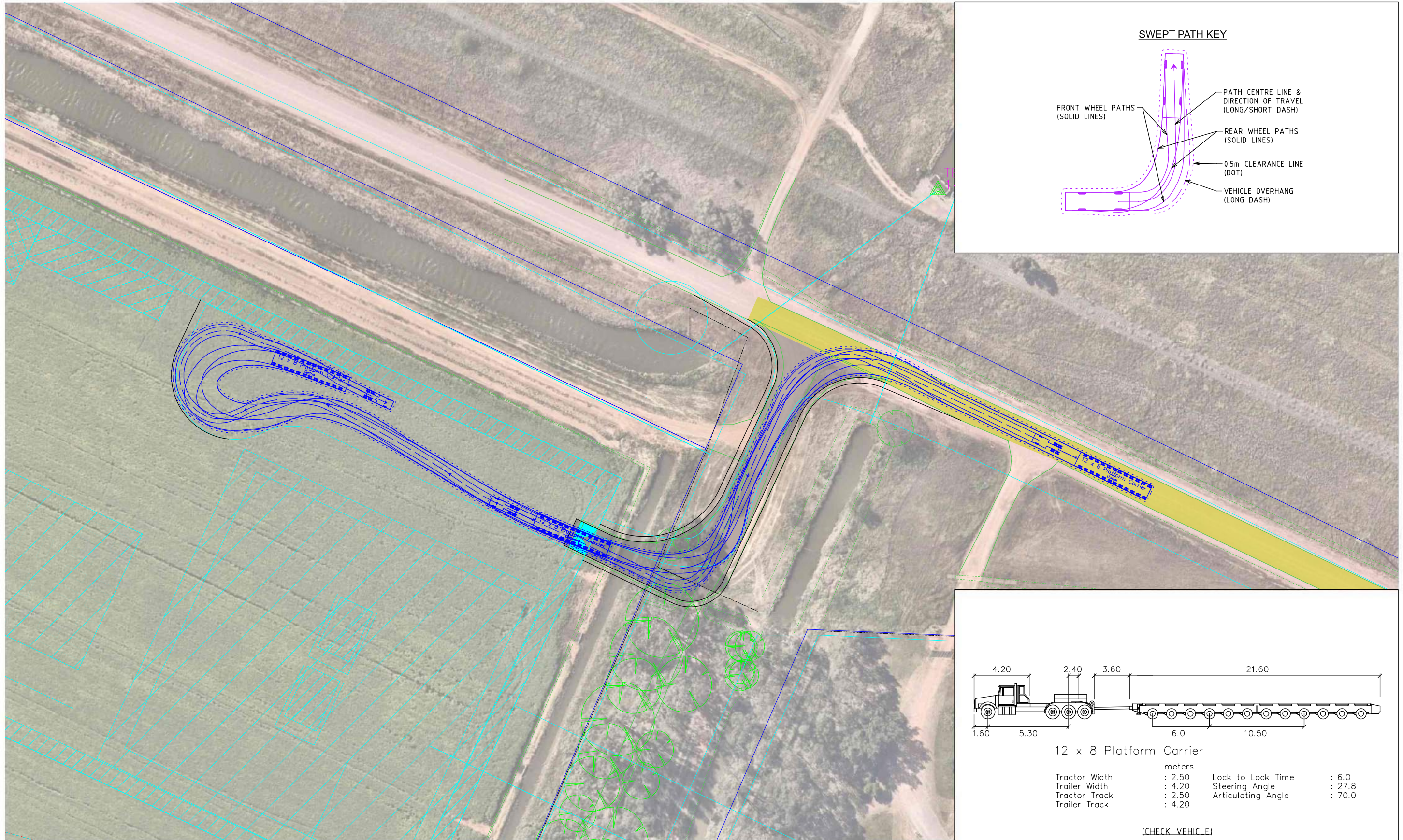
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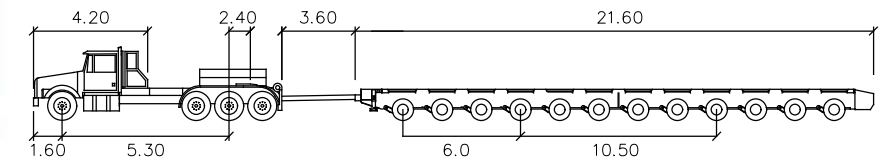
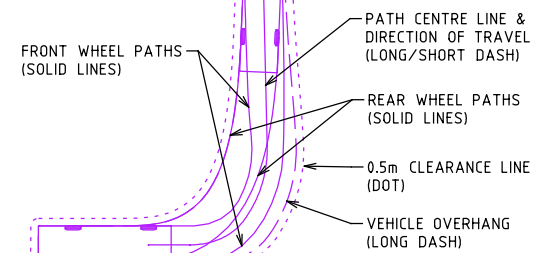
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SWEPT PATH KEY



12 x 8 Platform Carrier

	meters		
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Trailer Width	: 4.20	Steering Angle	: 27.8
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 4.20		

(CHECK VEHICLE)

Drawing Record

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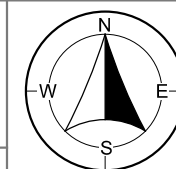
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Intersection of Houghton Road and Hulme Road

Leeton Shire Council

Swept Path Assessment Oversize Vehicle

SHEET NO.
03

DRAWING NO.
230136-SKT_OSV-03

ISSUE
P5

Appendix 5 – OSOM Route Assessment Report

ROUTE STUDY

CLIENT: ACENERGY

PROJECT: YANCO BIG BESS

PORT OF IMPORT: PORT KEMBLA

12/07/2024 REV 03

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7.0 TRANSPORT ROUTE: PORT KEMBLA TO YANCO BIG BESS..... 11

8.0 CONCLUSION 28

9.0 REFERENCES 30

10.0 APPENDIX A: TfNSW BRIDGE INVESTIGATION. 31

1.0 Introduction

This document describes observations and previous experience on sections of this route and outlines the proposed Transport of transformer equipment from Port Kembla to the Yanco Big BESS.

The route survey was undertaken on 28-11-23.

2.0 Evaluation

1	No work required
2	Some Work required
3	Moderate amount of works required
4	Large amount of works required

(Mark below boxes with an X)

		1	2	3	4
A	Harbour		X		
B	Road Modification		X		
C	Road Furnishings		X		
D	Trees		X		
E	Site Entrance			X	
F	Bridge Calculations		X		
G	Traffic Control		X		

3.0 Project Data

Date of latest Route Assessment: 28/11/2023

Survey Undertaken By: (Rex J Andrews P/L)

Project Name: Yanco Big BESS

Location: Pt Kembla (NSW) to Yanco (NSW)

Proposed Load: 120MVA transformer (Bare transformer body without attachments **(for transportation)** L*W*H = 7500*2750*4000mm. 136.4 tons)

Overall Transport Dimensions: L*W*H = 44900* 4300*5000. 228.5 tons

Transport Combination: 1x Prime mover and 12x8 platform trailer, with back up prime mover

Pilot Requirement: 3 x Pilots for the duration of the journey

Return Route: Use same route in reverse. GPS Link: <https://maps.app.goo.gl/cCozMn4EZyq21dz57>

Proposed Travel Times: 1 x trip, timing to be determined by client upon approval.

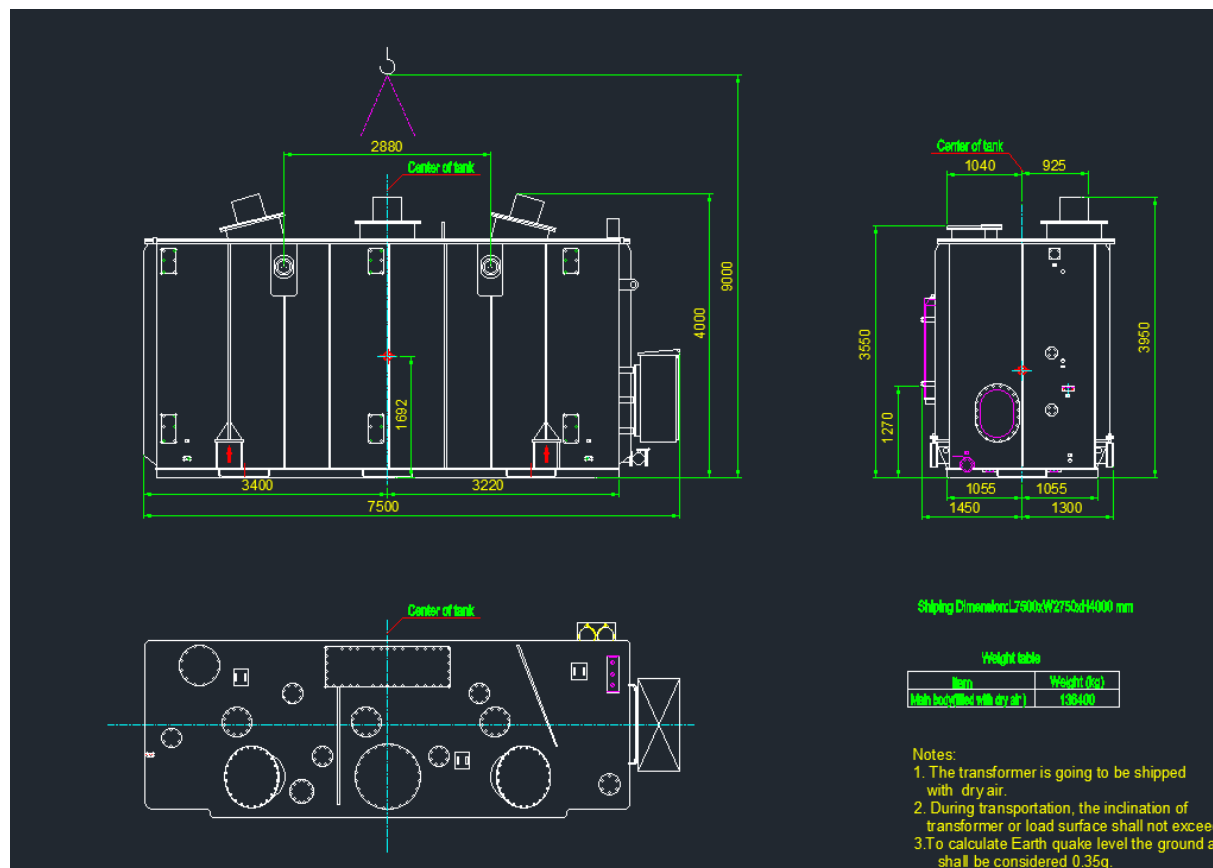


Figure 1 - Proposed Load

4.0 Indicative Transport Drawings

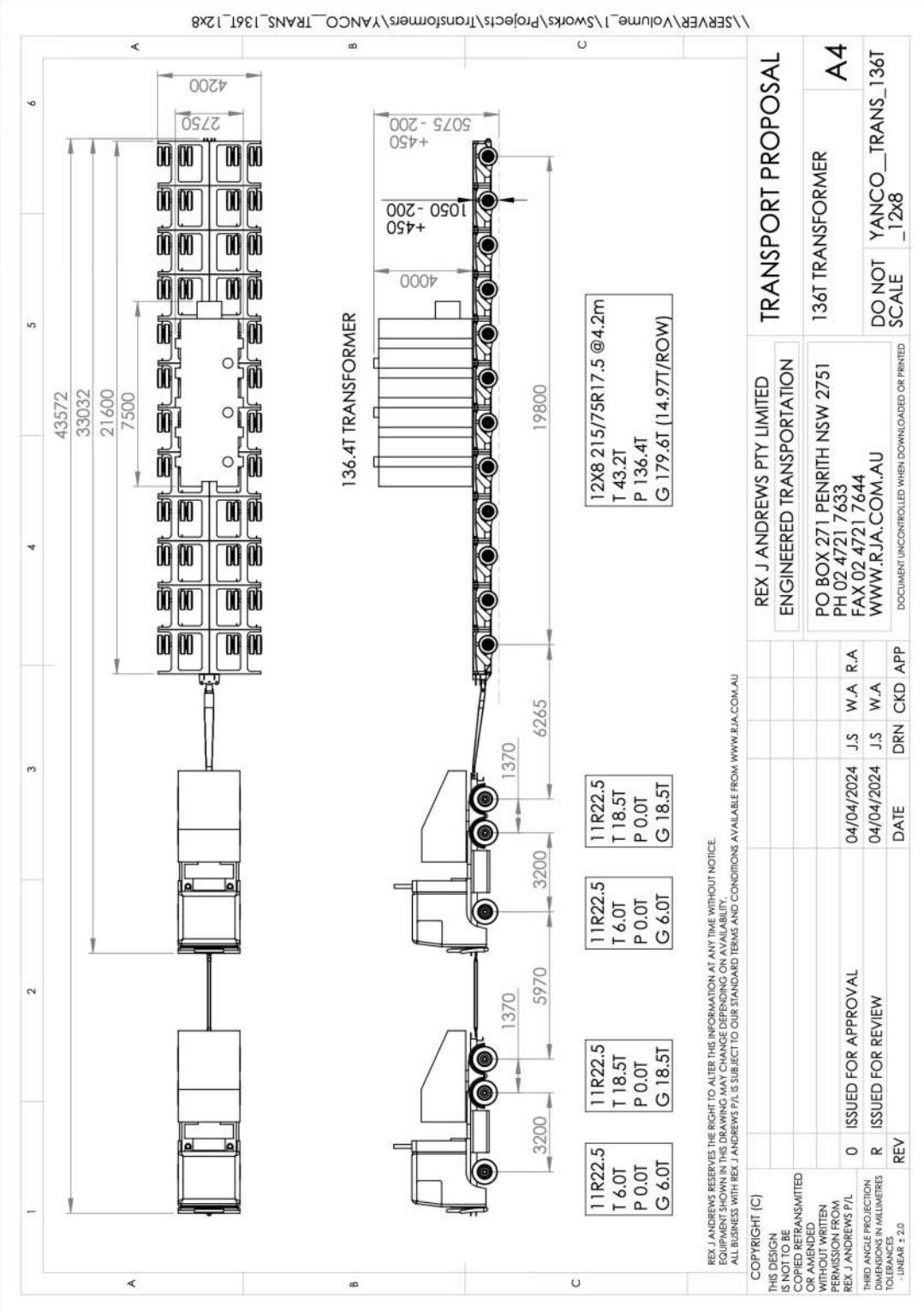


Figure 2 - 12x8 Platform trailer profile view

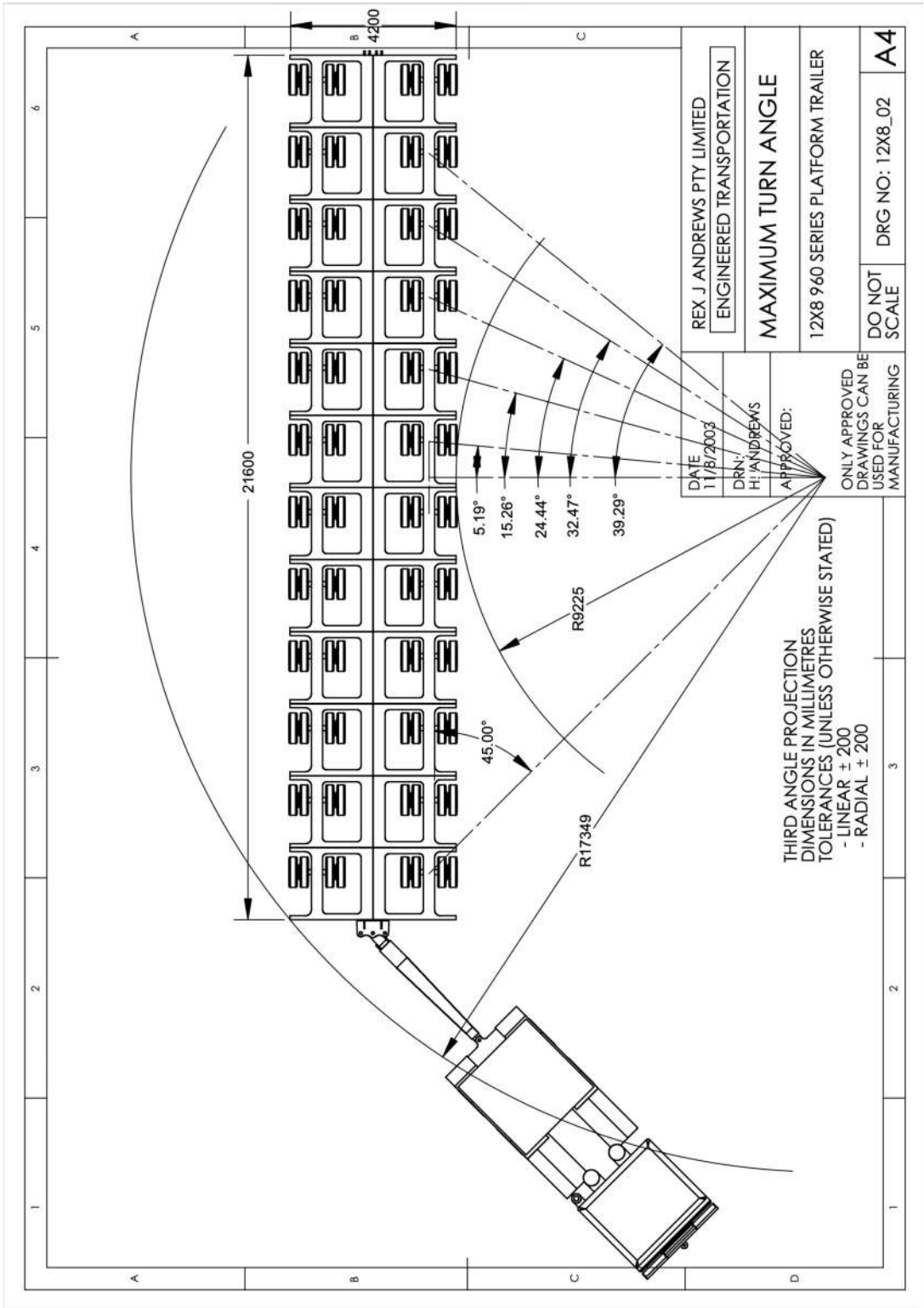


Figure 3 - 12x8 Platform trailer swept path

5.0 Port of Import

The transformer is to be imported from overseas and arrive via ship into Port Kembla. The ideal berth for these shipments is the AAT Terminal. This facility has a hardstand storage area of roughly 40,000 s/q metres, adjacent to the berth.

Access from the storage to the Public roads, is via a port operated road onto Tom Thumb Road.

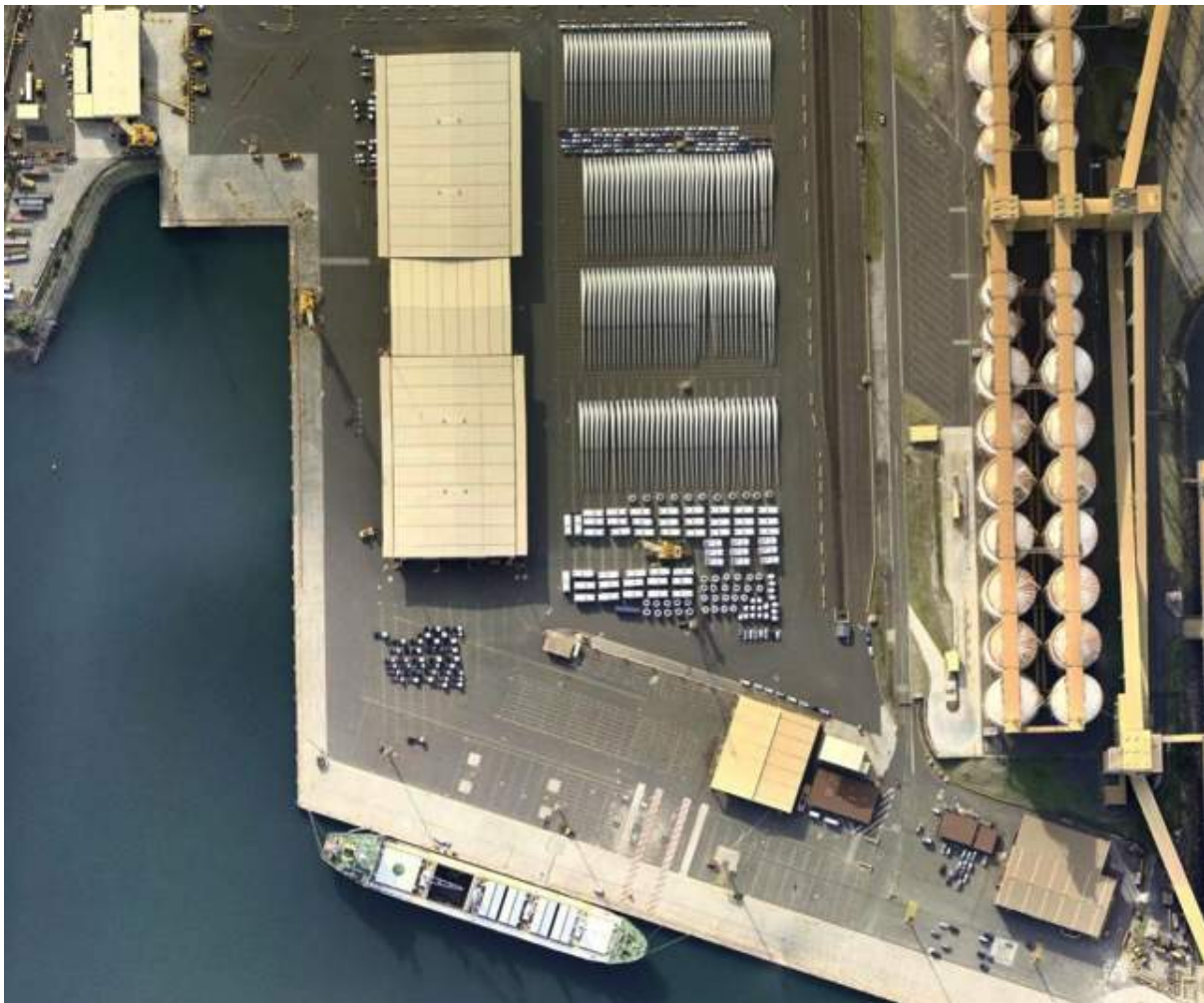


Figure 4 - Port Kembla AAT Terminal

The proposed Yanco Battery Energy Storage System (BESS) is located approximately 270 kilometers west of Canberra and 500 kilometers from Sydney.

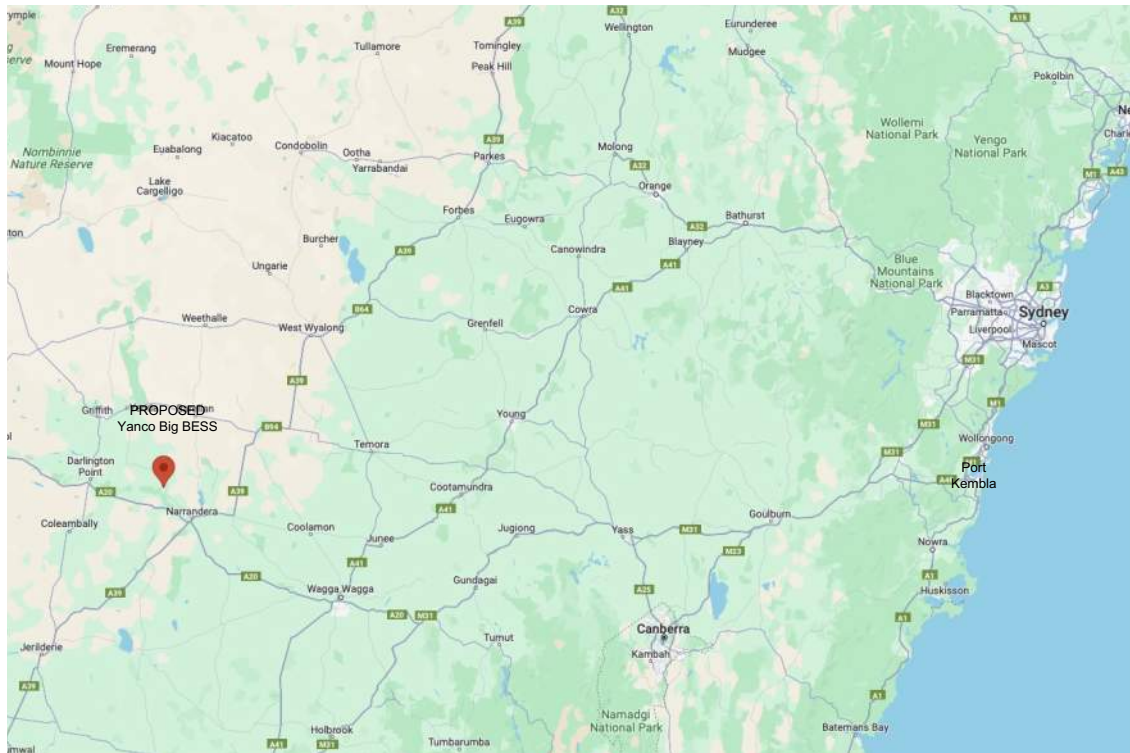


Figure 5 - Site Location

REX J. ANDREWS
ENGINEERED TRANSPORTATION



7.0 Transport Route: Port Kembla to Yanco Big BESS

The study is based on the transformer entering Australia via the AAT Terminal at Port Kembla. The study shows the likely route for the transformer and the constraints that may be encountered on the route.

Route 1

DISTANCE: 539 kilometres

GPS LINK: <https://maps.app.goo.gl/BMWadd8DiU4MfTbLA>

Route: Tom Thumb Road, Springhill Road, Masters Road, Princes Motorway, Mt Ousley Road, Picton-Wilton Road, Hume Highway, Sturt Hwy, Newell Hwy, Audley Street, Irrigation Way, Houghton Road, Hulme Road, Site Entry.

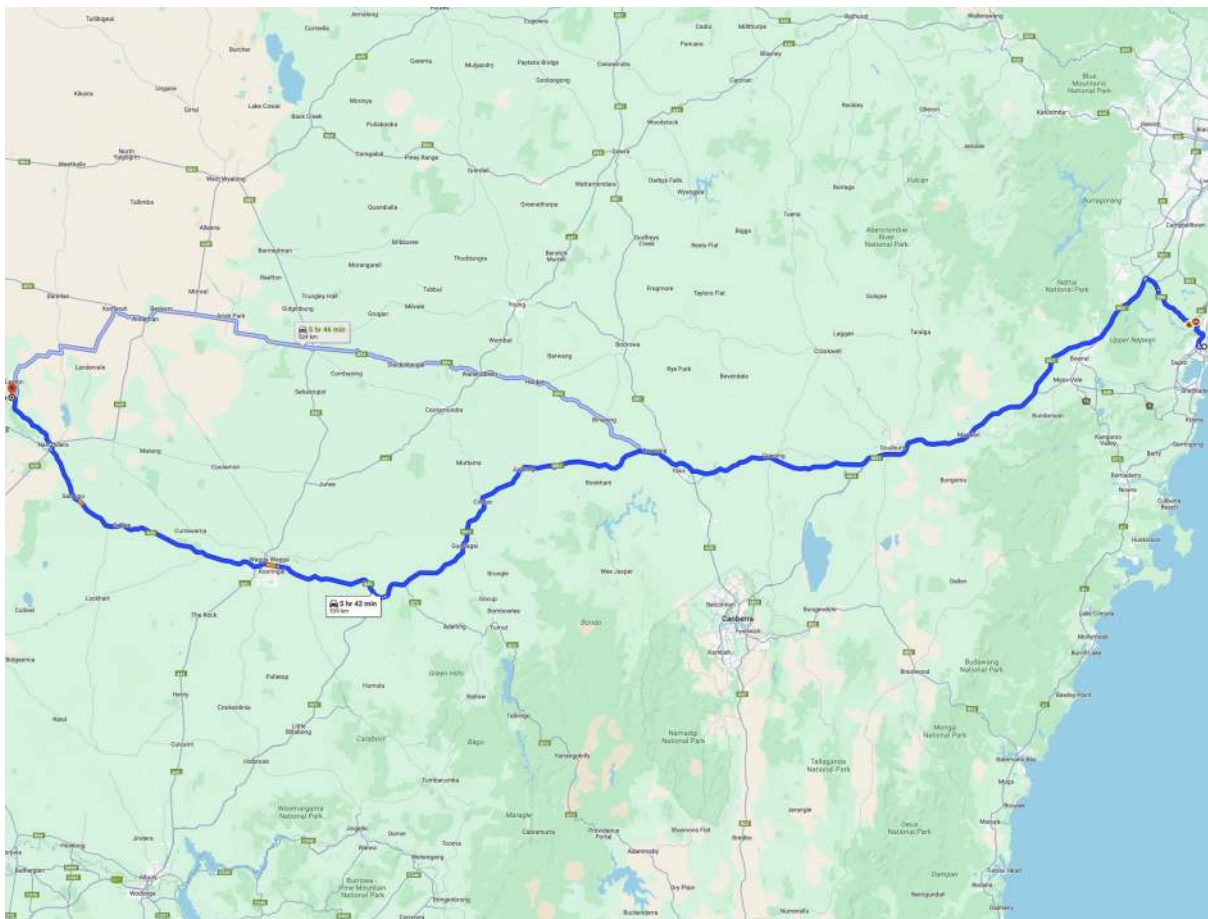


Figure 7 - Route 1

ROUTE STUDY YANCO BIG BESS

KEY	
MODIFICATIONS REQUIRED	
PINCH POINT	
EMERGENCY PARKING	

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
0.0	Port Kembla	Exit port onto Tom Thumb Road GPS link: https://goo.gl/maps/nXdxosvr1fQG6L2b9	Width: 5.5 metres	Travel directly ahead	No problems with this section of road
0.2	Port Kembla	Tom Thumb Road onto Springhill Road GPS link: https://goo.gl/maps/QB9L1BYNAUKJgoZ78	Length: 70.0 metres Width: 7.0 metres	Left hand turn	No problems with this section of road
1.4	Port Kembla	Springhill Road onto Masters Road GPS link: https://goo.gl/maps/pNxY2pLLej1KW4uh6	Length: 70.0 metres Width: 7.0 metres	Right hand turn	No problems with this section of road
2.6	Figtree	Masters Road onto Princes Motorway GPS link: https://goo.gl/maps/i57nvCKoETt8FYrs9	Length: 90.0 metres Width: 6.0 metres	Right hand sweeping bend	No problems with this section of road
2.7	Figtree	Princes Motorway under The Avenue GPS link: https://goo.gl/maps/qAGCrHkbqnMdNvNg6	Height clearances: Centre Lane: 5.4 mtrs	Travel directly ahead	Loads that exceed 5.3 metres will not be able to use this section of road.
6.4	Keiraville	Princes Motorway under Gipps Road GPS link: https://goo.gl/maps/VTqvHNfE25cpWXs7	Height clearances: Left Lane: 5.4 mtrs Centre Lane: 5.3 mtrs Right Lane: 5.3 mtrs	Travel directly ahead	Loads that exceed 5.3 metres will not be able to use this section of road.
6.5	Keiraville	Mount Ousley Road under the University Bridge GPS link: https://goo.gl/maps/S9kYztURpquEk3EQ7	Height clearances: Left Lane: 5.0 mtrs Centre Lane: 5.0 mtrs Right Lane: 4.9 mtrs	Travel directly ahead	Loads that exceed 4.9 metres will not be able to use this section of road. Detour for up to 5.2 metres high via Memorial Drive and the Princes Highway.
7.7	Mt Ousley	Princes Motorway GPS link: https://goo.gl/maps/9LCLZVycbbaom8rv8	Width: 8.0 metres	Travel directly ahead	No problems with this section of road
13.0	Mount Ousley	Mount Ousley Road onto Picton-Wilton Road GPS link: https://goo.gl/maps/8m1Er1RF785No29z5	Length: 70.0 metres Width: 6.0 metres	Left hand turn	No problems with this section of road
40.2	Wilton	Picton-Wilton Road onto the Hume Highway GPS link: https://goo.gl/maps/ZQKvS4wJ1yqWH3Ab7	Length: 70.0 metres Width: 7.0 metres	Left Hand Turn	No problems with this section of road

ROUTE STUDY

YANCO BIG BESS

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
103.0	Sutton Forest	Hume Highway GPS link: https://goo.gl/maps/uT1ubtSuawS2	150.0 long x 10.0 wide	Merge to left	Large parking bay suitable for this load
152.0	Goulburn	Hume Highway GPS link: https://goo.gl/maps/7HywRciZiJy	80.0 long x 15.0 wide	Merge to left	Large parking bay suitable for this load
175.0	Breadalbane	Hume Highway https://goo.gl/maps/UWjx3XndLejWG1UD9	140.0 long x 14.0 wide	Merge to left	Large parking bay suitable for this load
253.0	Bowning	Hume Highway https://goo.gl/maps/vRMmSbJCke5d65PJ9	200 long x 8.0 wide	Merge to left	Large parking bay suitable for this load
310.0	Jugiong	Hume Highway https://goo.gl/maps/QzzfyAAAnQn3nwx8	140.0 long x 14.0 wide	Merge to left	Large parking bay suitable for this load
372.0	Tarcutta	Hume Hwy onto Sturt Hwy GPS Link: https://goo.gl/maps/ruqNDSw5vanJD4x5	Length: 200 metres Width: 5.5 metres	Left Hand Merge	Merge left to left lane to exit Hume Hwy, follow road right onto overpass onto Sturt Hwy. No problems with this section of road.
412.0	Wagga Wagga	Sturt Hwy Roundabout 1 GPS Link: https://goo.gl/maps/7VDWUyW8KnUhCEdd7	Length: 50 metres Width: 8.0 metres	Travel directly ahead	Load to roll over edge of roundabout if required.
415.0	Wagga Wagga	Sturt Hwy Roundabout 2 GPS Link: https://goo.gl/maps/VeavHs6e4AilLagqDA	Length: 50 metres Width: 8.0 metres	Travel directly ahead	Load to roll over edge of roundabout if required.
416.4	Wagga Wagga	Sturt Hwy Roundabout 3 GPS Link: https://goo.gl/maps/dBrte59BvHyvcGSr5	Length: 50 metres Width: 8.0 metres	Travel directly ahead	Load to roll over edge of roundabout if required.
416.9	Wagga Wagga	Sturt Hwy under rail overpass GPS Link: https://goo.gl/maps/JPtJBAYzJuMAiHUz8	Height clearances: 5.25m	Travel under rail overpass	Loads in excess of 5.25m require alternate route.
419.0	Wagga Wagga	Sturt Hwy Roundabout 4 GPS Link: https://goo.gl/maps/fx388veUAibvkiyPA	Length: 50 metres Width: 8.0 metres	Travel directly ahead	Load to roll over edge of roundabout if required.
492.0	Sandigo	Sturt Hwy – Sandigo Rest Area GPS Link: https://maps.app.goo.gl/wXHQC55zBnAQZXHw7	110m long	Merge to left	Large parking bay suitable for this load
513.0	Gillenhah	Sturt Hwy onto Newell Hwy GPS Link: https://maps.app.goo.gl/a2xKJNUeVCyr5X917	Width: 6.0 metres	Travel directly ahead	No problems with this section of road
515.1	Narrandera	Newell Hwy onto Audley St GPS Link: https://maps.app.goo.gl/TT6RUBBG71MC5Bdw6	Length: 70.0 metres Width: 7.0 metres	Left hand turn	Loads to cross to incorrect side of Newell Hwy and turn into incorrect side of Audley St.
515.9	Narrandera	Audley St onto Irrigation Way GPS Link: https://maps.app.goo.gl/fNwNnEsYPKpgPte07	Width: 4.5 metres	Travel directly ahead	No problems with this section of road
537.0	Yanco	Irrigation Way onto Houghton Rd GPS Link: https://maps.app.goo.gl/6uJnKCitAZdDWZAb7	Length: 35.0 metres Width: 6.0 metres	Left hand turn	No problems with this section of road

ROUTE STUDY
YANCO BIG BESS



KM index	Location	Section of road	Critical Measurement	Procedure	Notes
539.0	Yanco	Houghton Rd onto Hulme Rd/Site Entry GPS Link: https://www.google.com/maps/@34.5228651,149.0468677	Length: 30.0 metres Width: 10.0 metres	Left hand turn followed by right hand turn	Hardstand to be installed and roadways made suitable for proposed loads. Gates and fences to be wide enough for trailer to maneuver into site.

0.2 Km's: Tom Thumb Road onto Springhill Road

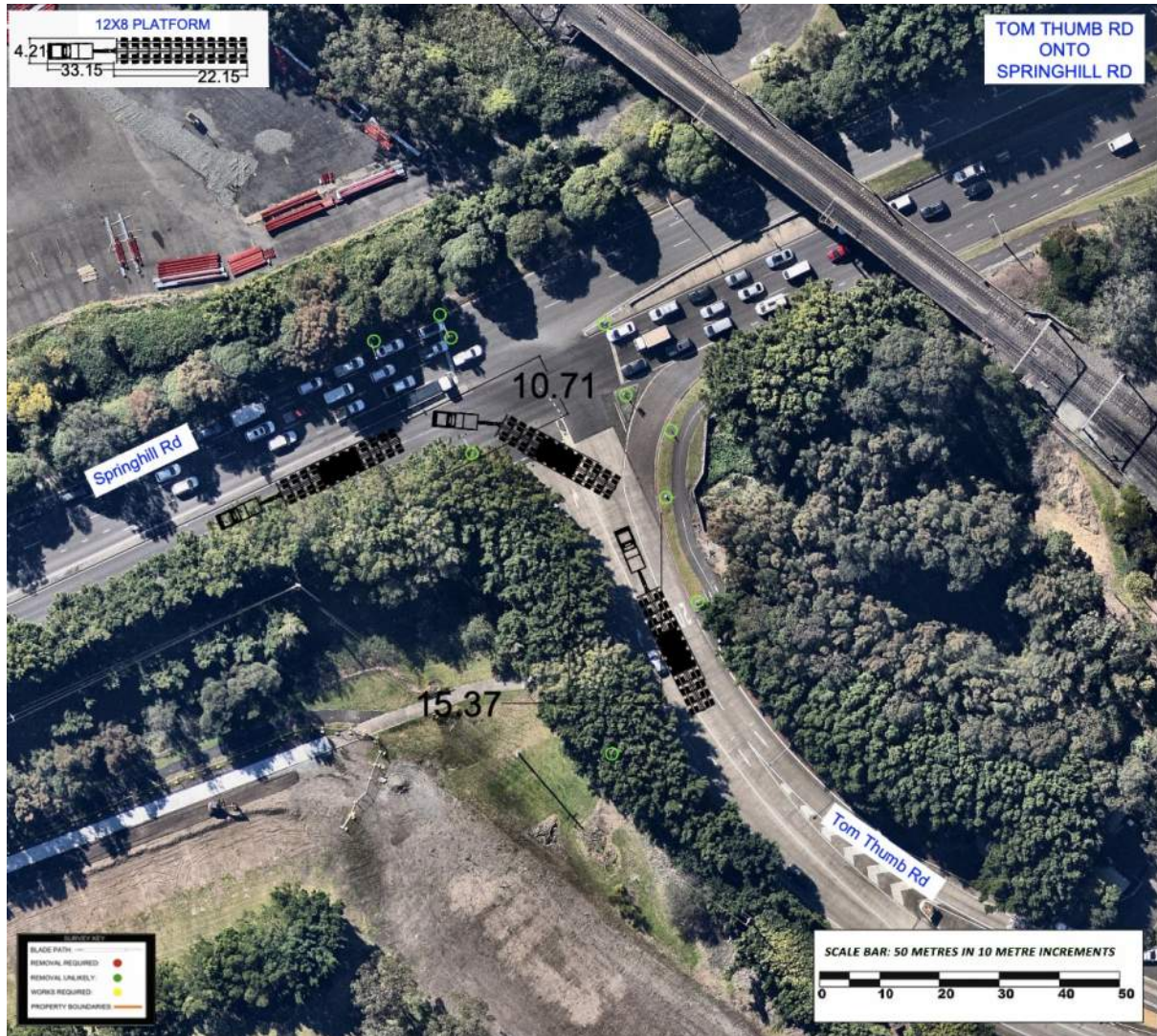


Figure 8 - Tom Thumb Road onto Springhill Road

GPS LINK FOR SECTION OF ROAD: <https://goo.gl/maps/QB9L1BYNAUKJgoZ78>

PROCEDURE: Left hand turn from Tom Thumb Road onto Springhill Road.

ROAD MODIFICATIONS: Nil.

1.4 Km's: Springhill Road onto Masters Road



Figure 9 - Springhill Road onto Masters Road

GPS LINK FOR SECTION OF ROAD: <https://goo.gl/maps/pNxY2pLLej1KW4uh6>

PROCEDURE: Right hand turn from Springhill Road onto Masters Road.

ROAD MODIFICATIONS: Nil.

6.5 Km's: University Overbridge on the Southern Freeway at Keiraville



Figure 10 - University Overbridge on the Southern Freeway

High Load Detour Route

VIA: Southern Freeway, Memorial Drive, Princes Highway, Mount Ousley Road.

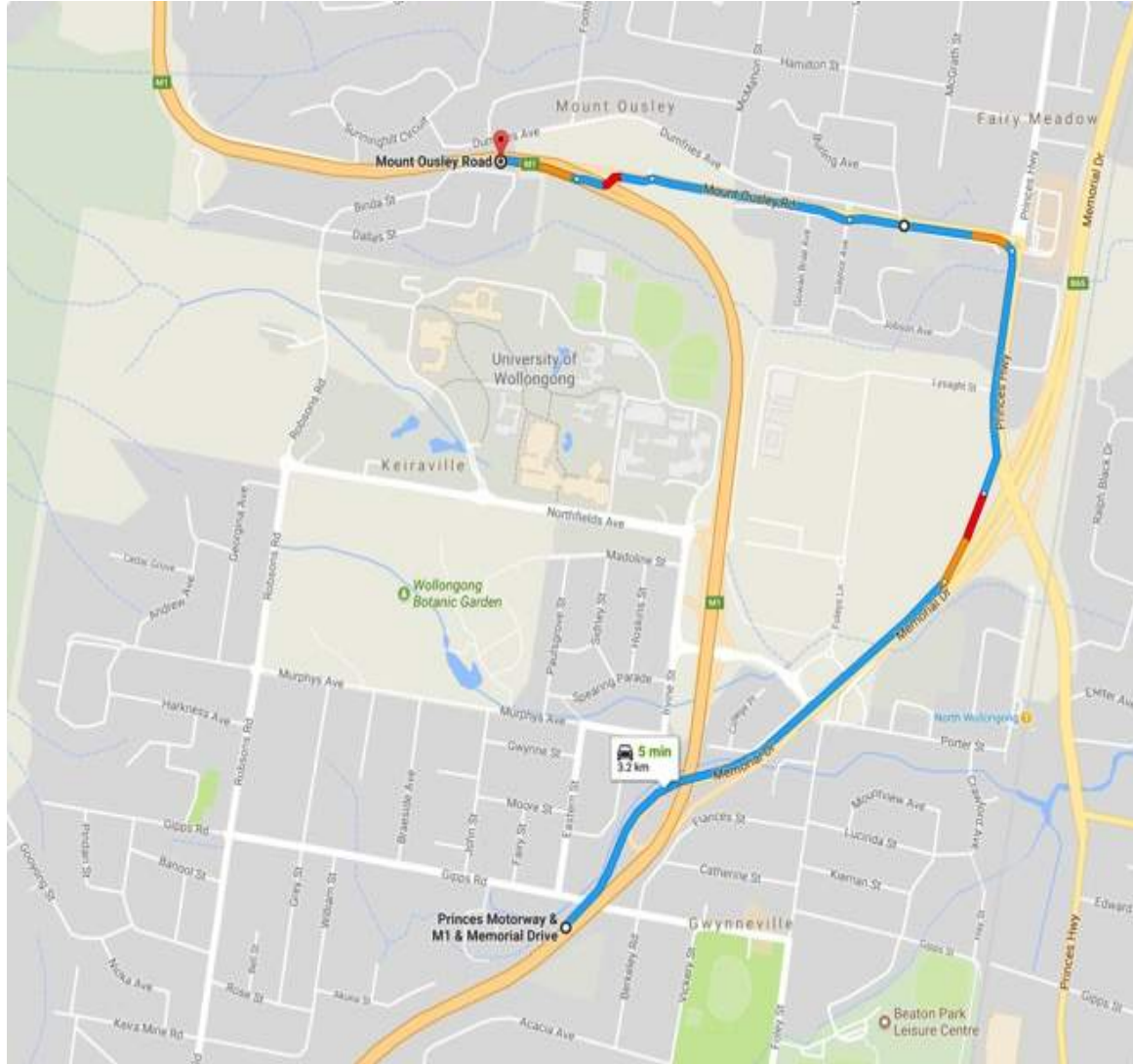


Figure 11 - High Load Detour Route

GPS LINK FOR SECTION OF ROAD: <https://goo.gl/maps/S9kYztURpquEk3EQ7>

PROCEDURE: Travel under bridge in the left-hand lane.

CONCLUSION: Loads that exceed 4.9 metres high will need to use the following High load detour. Loads must be a maximum of 5.2m high to use the high load detour.

ROAD MODIFICATIONS: Nil.

13.1 Km's: Mt Ousley Road onto Picton-Wilton Road



Figure 12 - Mt Ousley Road onto Picton-Wilton Road

GPS LINK FOR SECTION OF ROAD: <https://goo.gl/maps/8m1Er1RF785No29z5>

PROCEDURE: Left hand turn from Mt Ousley Road onto Picton-Wilton Road.

ROAD MODIFICATIONS: Nil.

40.2 Km's: Picton-Wilton Road onto the Hume Highway

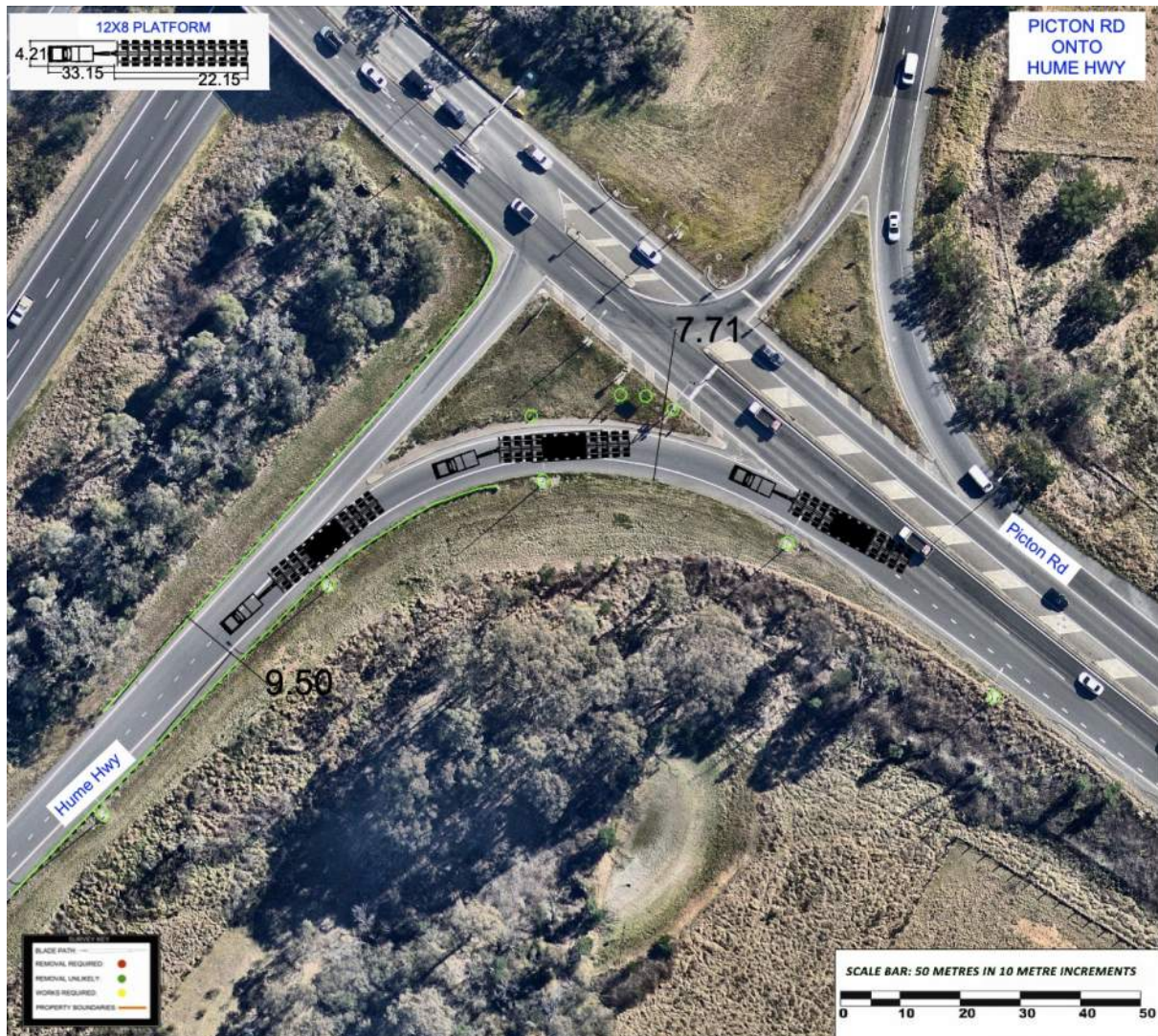


Figure 13 - Picton-Wilton Road onto the Hume Highway

GPS LINK FOR SECTION OF ROAD: <https://goo.gl/maps/ZQKvS4wJ1ygWH3Ab7>

PROCEDURE: Right hand turn from Picton-Wilton Road onto the Hume Highway.

ROAD MODIFICATIONS: Nil.

412.0 Km's: Sturt Highway Roundabout 1



Figure 14 - Sturt Hwy Roundabout 1

GPS LINK FOR SECTION OF ROAD: <https://goo.gl/maps/7VDWUyW8KnUhCEdd7>

PROCEDURE: Travel directly ahead. Load to roll over edge of roundabout if required.

ROAD MODIFICATIONS: Nil.

415.0 Km's: Sturt Highway Roundabout 2

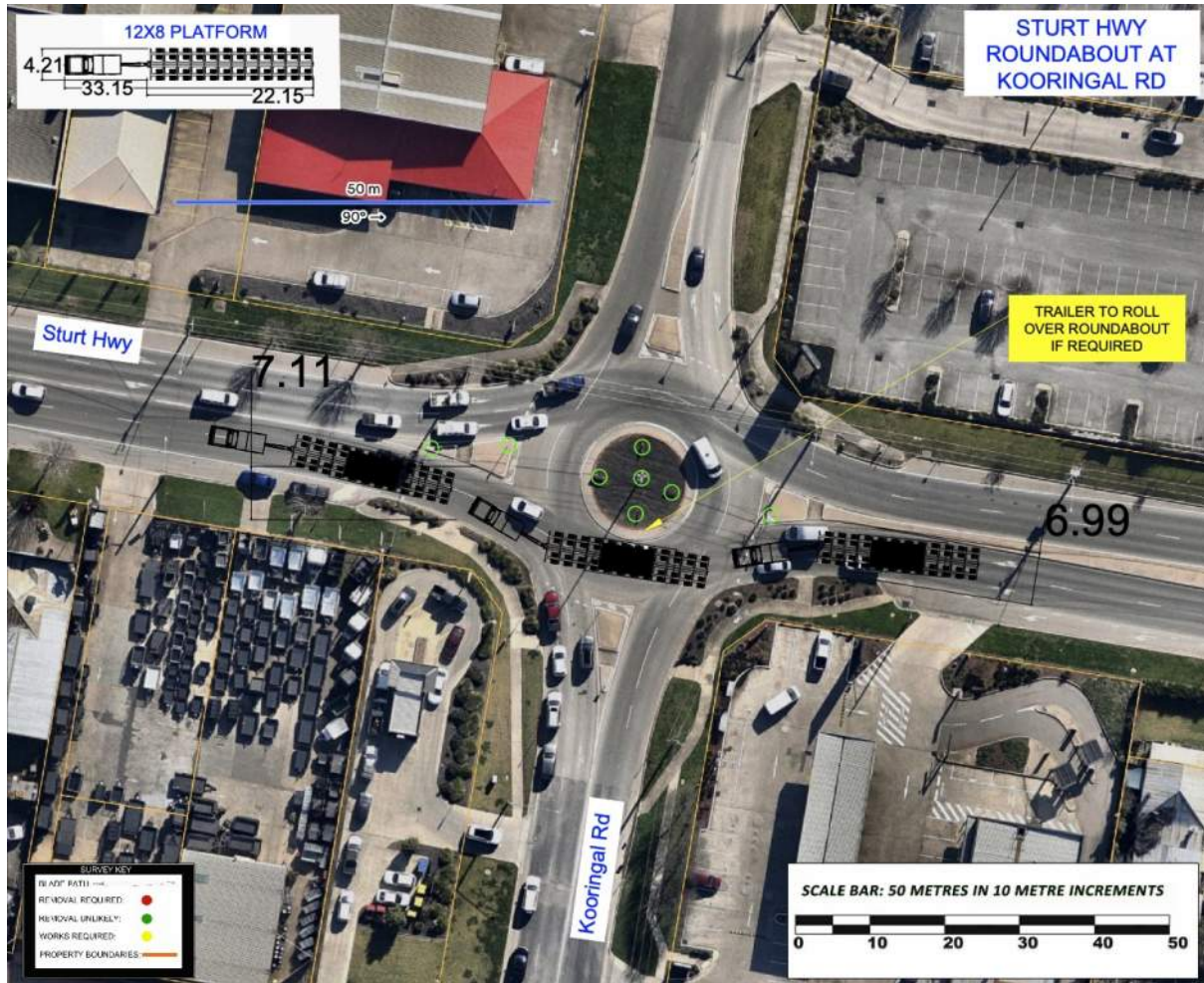


Figure 15 - Sturt Hwy Roundabout 2

GPS LINK FOR SECTION OF ROAD: <https://goo.gl/maps/VeavHs6e4AjLagqDA>

PROCEDURE: Travel directly ahead. Load to roll over edge of roundabout if required.

ROAD MODIFICATIONS: Nil.

416.4.0 Km's: Sturt Highway Roundabout 3

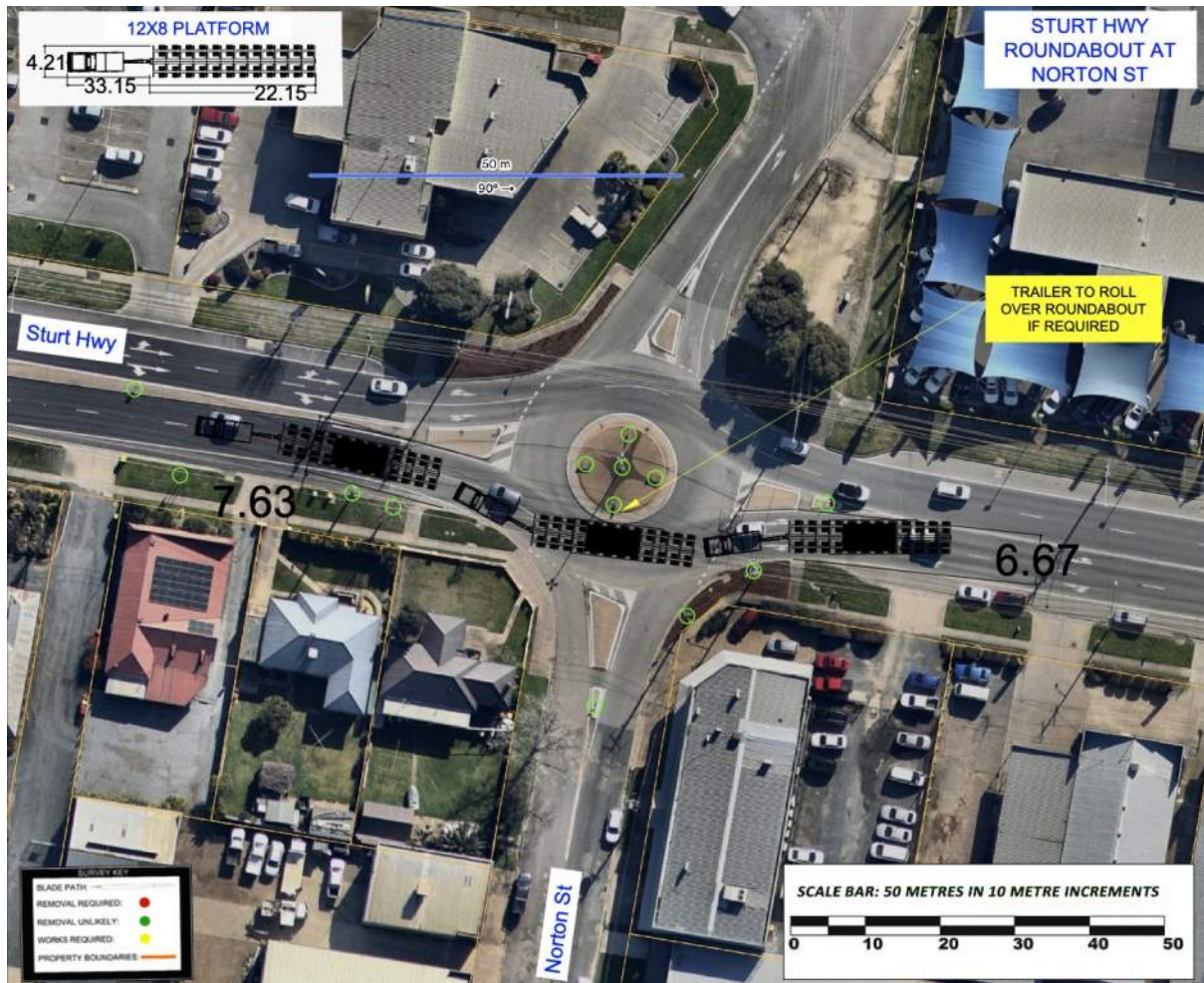


Figure 16 - Sturt Hwy Roundabout 3

GPS LINK FOR SECTION OF ROAD:

PROCEDURE: Travel directly ahead. Load to roll over edge of roundabout if required.

ROAD MODIFICATIONS: Nil.

419.0 Km's: Sturt Highway Roundabout 4



Figure 17 - Sturt Highway Roundabout 4

GPS LINK FOR SECTION OF ROAD: <https://goo.gl/maps/fx388veUAjbykiyPA>

PROCEDURE: Travel directly ahead. Load to roll over edge of roundabout if required.

ROAD MODIFICATIONS: Nil.

515.1 Km's: Newell Hwy onto Audley St



Figure 18 - Newell Hwy onto Audley St

GPS LINK FOR SECTION OF ROAD: <https://maps.app.goo.gl/TT6RUBBG71MC5Bdw6>

PROCEDURE: Left hand turn. Loads to cross to incorrect side of Newell Hwy and turn into incorrect side of Audley St.

ROAD MODIFICATIONS: Nil.

537.0 Km's: Irrigation Way onto Houghton Rd

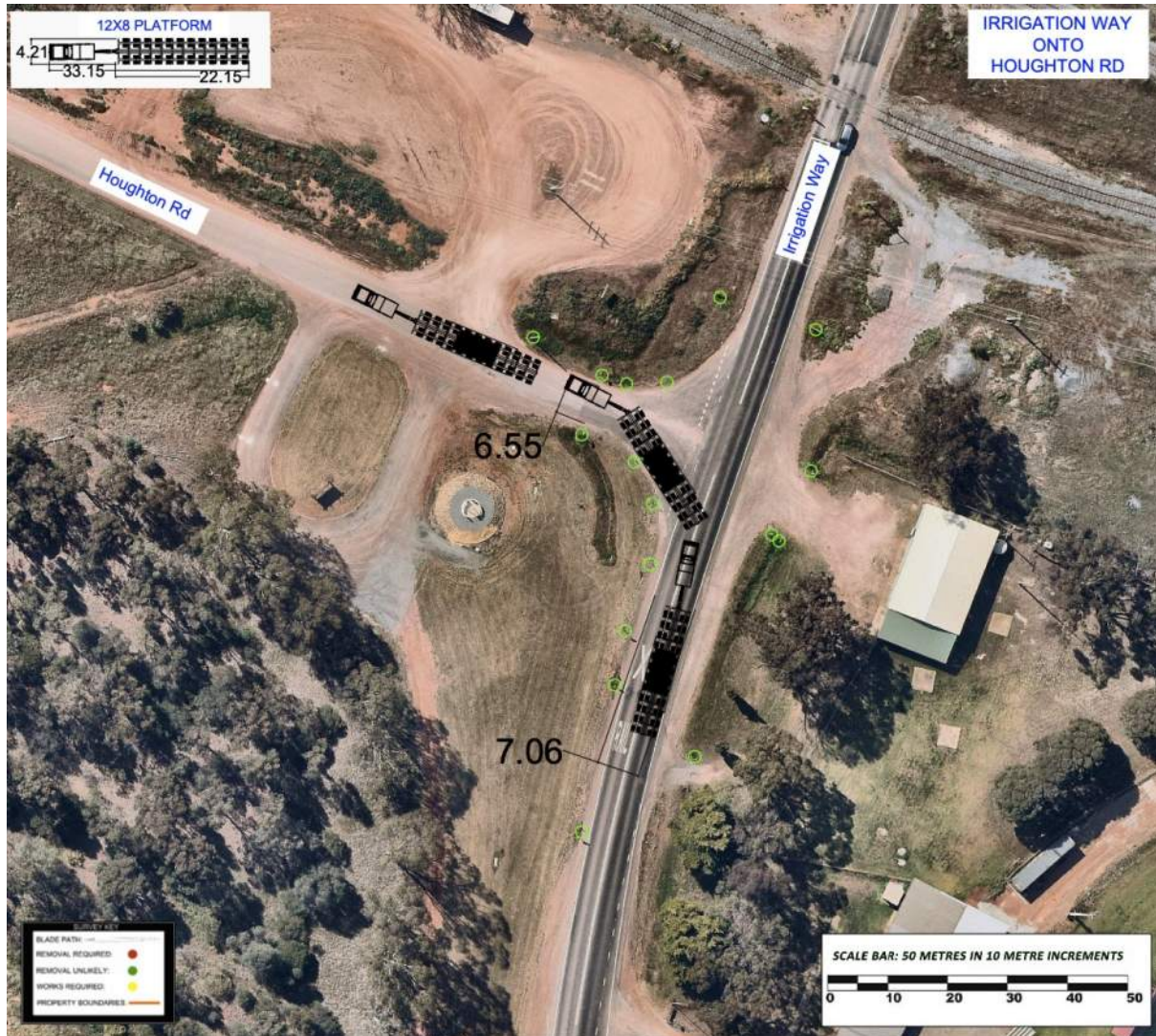


Figure 19 - Irrigation Way onto Houghton Rd

GPS LINK FOR SECTION OF ROAD: <https://maps.app.goo.gl/6uJnKCitAZdDWZAb7>

PROCEDURE: Left hand turn

ROAD MODIFICATIONS: Nil.

539.0 Km's: Houghton Rd onto Hulme Rd/Site Entry

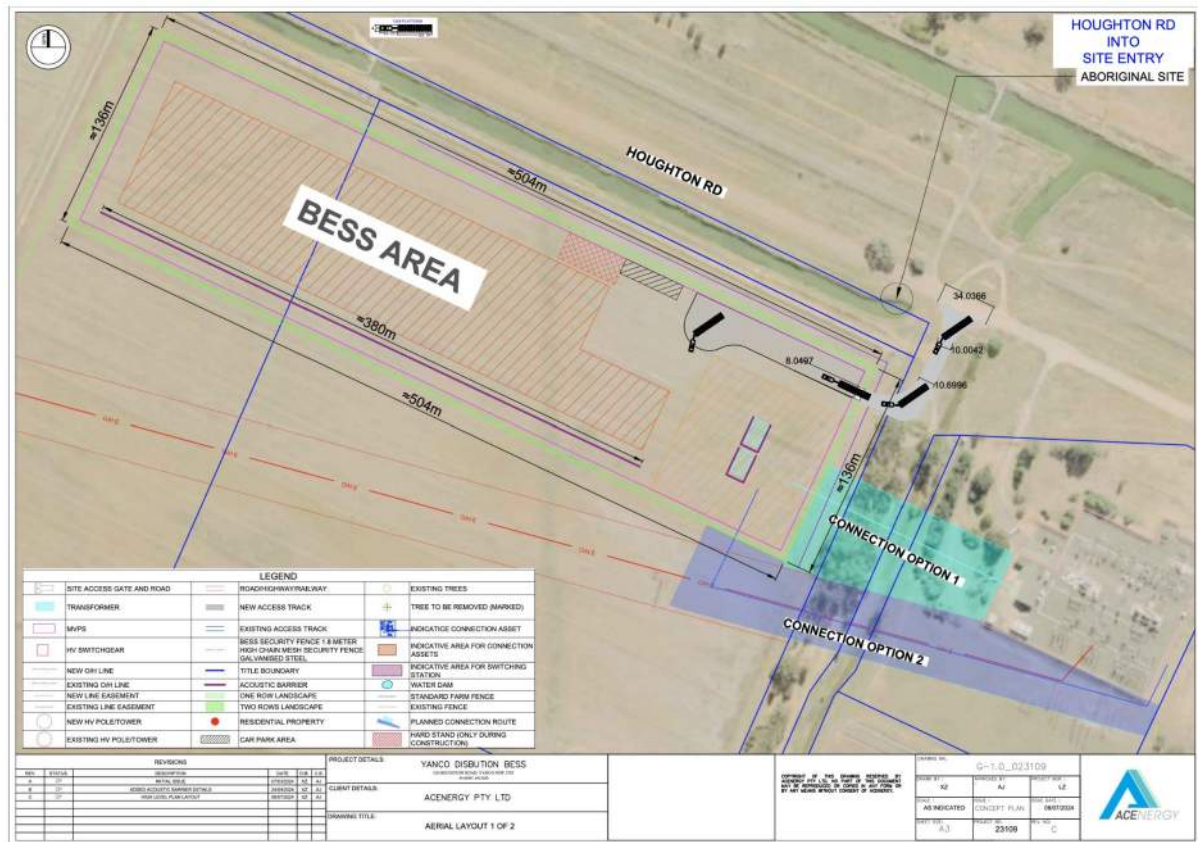


Figure 20 - Houghton Rd onto Hulme Rd/Site Entry

GPS LINK FOR SECTION OF ROAD: <https://maps.app.goo.gl/1uXZZKFLLpmzqKB77>

PROCEDURE: Left hand turn followed by right hand turn

ROAD MODIFICATIONS: The design of the site entrance is suitable for the swept path of the transporter.

8.0 Conclusion

After studying all options and undertaking a route survey, the route in its current condition will require minor upgrades before it could be deemed suitable for transporting the proposed load.

The following are the key points that need to be taken into consideration, if the project moves forward with this route.

BRIDGES:

- ☐ There are a number of bridges on route that will require bridge assessments. All of TfNSW structures have been checked and are adequate for the weight of the load.

OVERHEAD STRUCTURES: (5.2 Maximum loaded height)

- ☐ There are a number of overhead structures between Pt Kembla and the Yanco Big BESS. The lowest of these structures is the Princes Motorway under the University Bridge at Wollongong which has a maximum allowable load height of 4.9 metres. (The load would have to be under 4.9 metres loaded height to exit Pt Kembla). There is a detour via Memorial Drive and the Princes Highway that would allow a loaded height of up to 5.2 metres.
- ☐ **Summary**
Loads up to 4.9m loaded height can travel from Port Kembla to Yanco on the proposed route.
Loads between 4.9m and 5.2m loaded height take the detour shown in the report.
- ☐ With the transport dimensions provided by the client
(L*W*H =7500*2750*4000mm) the proposed transport combination can be lowered to 4.9m overall transport height.

OVERHEAD UTILITIES

- ☐ This route will need to be checked by an authorised scoping company. It is likely that a route of at least 5.2 metres is required for this project.

VEGETATION

- ☐ There are no major vegetation works required on the route.

WIDTH

- ☐ The maximum width of the proposed transport combination is 4.2m.

PAVEMENT

- ☐ The route up until Houghton Rd is of highway standard. Houghton Road to the site is gravel. Non sealed roads will need to be maintained to a suitable level to accommodate the proposed weight of the load.
- ☐ The turn from Houghton Rd into the site will require widening with hardstand to accommodate the swept path of the trailer.
- ☐ Non sealed roads may be adversely affected by wet weather preventing travel.

ROADWORKS

- ☐ The project will need to start discussions with government authorities at least 18 months prior to turbine transport to understand if the project would conflict with any upcoming roadworks. Once a TMP has been approved for the transport of the turbines, then the exact movement dates need to be communicated with transport NSW to make all road stakeholders aware of the movements.

WOLLONGONG

- ☐ The University Drive overpass on the Princes Motorway dictates the maximum allowable height of the blade. The blade cannot exceed 4.9 metres in height as there is no alternative route out of Pt Kembla.
- ☐ Towers cannot exceed a loaded height of 5.2 metres as there is no alternative route out of Pt Kembla if they exceed this.

SITE

- ☐ The site design has suitable access for the proposed transporter, if constructed to plan.

9.0 References

Australian Load Restraint Guide
Rex J Andrews P/L Drawings
Rex J Andrews route survey # 431 REV01
Acenergy
Google Earth/Maps
Nearmaps
NHVR (OSOM)
NHVAS Maintenance Management (NHVAS21193)
NHVAS Basic Fatigue Management (NHVAS21193)

Disclaimer:

This route study is a guide only. Government approvals would be required before these routes could be deemed suitable for transporting the components over the listed routes.

Any, and all parties using information contained this submission do so at own risk.

RJA accept no responsibility for the use of all information contained within this report.

Actual approved routes may differ from those surveyed.

Proposed routes may change subject to approvals from authorities.

This study was undertaken using data supplied by Rex J Andrews P/L. Equipment and swept paths might vary if using transport methodology other than the data supplied by Rex J Andrews.

10.0 Appendix A: TfNSW Bridge investigation.

PT2848 Port Kembla to Yanco for Rex J Andrews Pty Ltd

VEHICLE CONSIDERED:

Permit No.:	2848	Date Received:	12/04/2024
Vehicle Description:	2x Prime Movers + 12x8		
Item Carried:	Transformer		
Item Weight:	136.4		
Axle Width:	4.2		
Axle Spacings:	3.2, 1.25, 5.9, 3.2, 1.25, 6.2, 1.8x11		
Axles:	0-00/ 0-00/ 000000000000		
Wheels per Axle:	2-44/ 2-44/ 888888888888		
Tyre Dimensions:	295mm on Prime Movers/ 215mm on Trailer		
Gross Weight per Axle:	6.5, 18.5, 6.5, 18.5, 179.6	14.97t per axle for platform	
Total Weight:	229.60		
Axle Summary:	12x8/ 4.2		
Weight Summary:			
Tonne per Axle Group 1:			
Tonne per Axle Group 2:			
Width:	4.2		
Length:	43.5		
Height:	5		
Starting Point:	Port Kembla		
Destination:	Yanco		
Route Requested:	Tom Thumb Road (CCL), Springhill Road (MR581), Masters Road (MR602), Princes Motorway (6006), Mt Ousley Road (MR95), Picton Rd (MR95), Hume Highway (HW2), Sturt Hwy (HW14), Newell Hwy (HW17), Audley Street/Irrigation Way(MR80), Houghton Road (CCL), Hulme Road (CCL)		

Axle spacings must not be less than above and weights must not be greater than above.

ASSUMPTIONS:

In assessing the bridges on the route, assumption has been made that the bridges are in fair to good condition, and do not have any inadequacies.

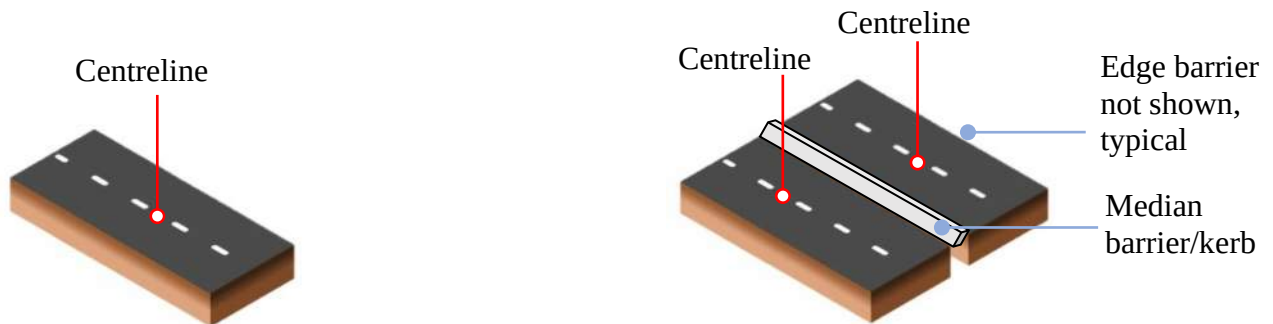
Route: The route assessed are as above. Alternative route was not assessed.
(TRAVEL IN ONE DIRECTION)

The vehicle travelling as a permit vehicle can be permitted to travel over the requested route as shown in this permit subject to the following:

1. The vehicles travel on all the bridges on the route at a speed not exceeding 10 km/h with no sudden braking or acceleration. No other vehicles are permitted on the bridge while the Permit vehicle is on the bridge.

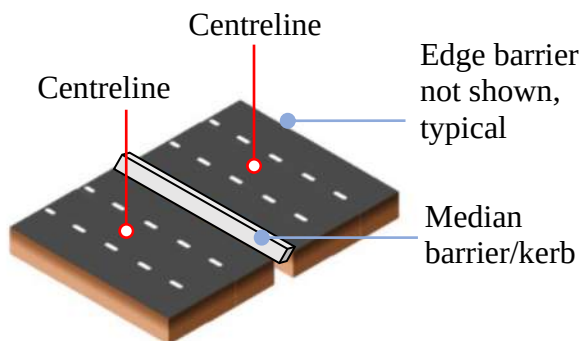
2. The vehicle shall travel only along centreline of the carriageway of all the bridges (except BN0952).

Note: The centreline of the carriageway on the bridge is the centreline of the roadway between the faces of the barriers/kerbs.



Bridge supporting single carriageway with two-way traffic with any line marking in middle – Permit vehicle to travel along centreline of carriageway

Bridge supporting two carriageways with median barrier/kerb as divider between carriageway – Permit vehicle to travel along the centreline of each carriageway



Bridge supporting two carriageways with three lanes each way traffic with median barrier or kerb as divider between carriageway – Permit vehicle to travel along centreline of middle lane / carriageway.

3. On Masters Road On Ramp onto Princes Motorway at BN0952 Bridge on MR 602, Over F.6, at Fig Tree, Masters Road Bridge: the vehicle shall travel along the left (southern) line marking of the chevron.

[Note: The left line marking of the chevron, is on the southern side of the chevron and the line borders the chevron median pattern marking, as shown as red dashed line in figure 1 below.]



Figure 1. Bridge BN0952 Masters Road Bridge

4. Greater Sydney and Southern Region's concurrence is obtained to the movement of the vehicles over the route.
5. Transport firm is required to obtain approval from third party asset owners including but not limited to UGL/ARTC, Sydney Trains (formerly Railway Access Corporation or State Rail Authority), NSW Ports, and Department of Land and Water Conservation or private infrastructure owners for travel over their infrastructures. The TfNSW Bridge Inventory shows the following:

Bridge Number	Bridge Description and Bridge Name	Asset Owner
941	N/B AND S/B BRIDGE OVER RAILWAY AT CONISTON; TRIANGLE BRIDGES	Sydney Trains
942	N/B AND S/B BRIDGE OVER RAILWAY AT CONISTON; JJ MATTHEWS BRIDGE	Sydney Trains
5664	IRRIGATION CANAL OVER MAIN CANAL AT 3KM W NARRANDERA	Dept. of Water Resources
5665	CULVERT OV ROACHES OVER ESCAPE CHANNEL AT 15.3KM W NARRANDERA	Dept. of Water Resources
6250	BRIDGE OVER RAILWAY (STHBOUND) NEAR YARRA	A.R.T.C
6251	BRIDGE OVER RAILWAY (NTHBOUND) NEAR YARRA	A.R.T.C

6. Councils' approval is obtained by the transport firm for travel over the structures on the route maintained by the Councils, and for travel over the local roads.
7. The transport firm shall satisfy itself that adequate height clearance is available under the overhead structures on the above route. The firm should refer to Region for further details.

The TfNSW Bridge Inventory shows the following:

Bridge Number	Bridge Description and Bridge Name	Road No	Estimated Height Clearance
625	BRIDGE ON GIPP'S RD OVER F.6 AT WEST WOLLONGONG; GIPPS ROAD BRIDGE	4970510	5
624	BRIDGE OVER F6 AT UNIVERSITY AVE AT GWYNNEVILLE; UNIVERSITY AVENUE BRIDGE	4972287	4.6

The above list is not exhaustive, the transport firm shall confirm all the overhead structures on the route.

Note:.. The height clearance may depend on the lanes that the permit vehicle will travel on. Refer to Region for further details.

8. The transport firm shall satisfy itself that the vehicle width including load can navigate the bridges on the above route. The firm should refer to Region for further details.
9. This approval is for the direction of route from **Port Kembla to Yanco** along the route stated above, with no laden return trip.

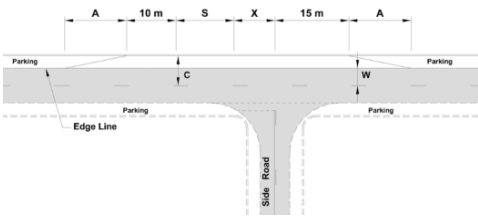
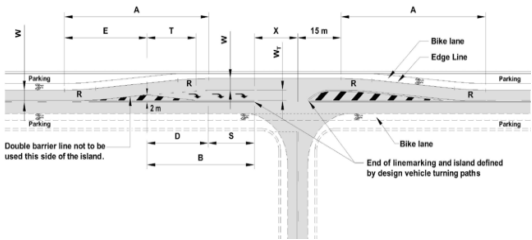
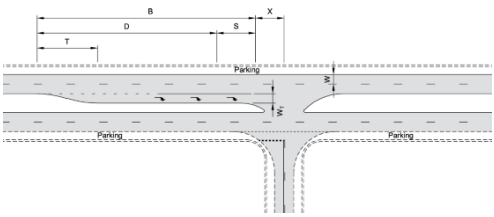
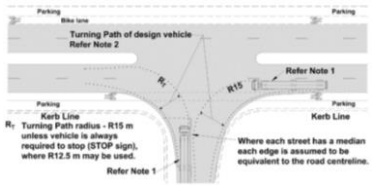
Cost of assessment is \$1300 + GST.

Shah M Parvez
Senior Bridge Engineer
Bridge Assessment and Evaluation
17 June 2024

Appendix 6 – Turn treatments

A6.1 – Urban turn treatments

Table 14: Turn Treatment Descriptions (**Urban**) (Source: Section 7.7, 7.8 and 8.3 of Austroads Guide to Road Design Part 4A)

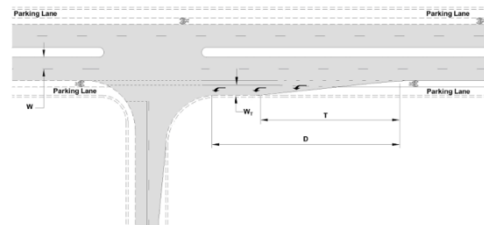
Turn treatment	Description	
BAR	BAsic Right turn treatment on the major road, features a widened area (usually in place of parking) on the major road that allows through vehicles to pass to the left of turning vehicles (<i>Figure 7.6 of Austroads Guide to Road Design Part 4A</i>).	
CHR(S)	CHannelised Right (Short) turn is a shorter version of the Channelised Right turn treatment which is reduced by removing space provided for storage in the right lane. This treatment type can only be used with line marking (<i>Figure 7.7 of Austroads Guide to Road Design Part 4A</i>).	
CHR	CHannelised Right turn treatment has two vehicle travel paths (through and right turns) separated by physical or painted medians or islands (<i>Figure 7.8 of Austroads Guide to Road Design Part 4A</i>).	
BAL	BAsic Left turn treatment on the major road has a radius large enough to accommodate a design vehicle turning left into the minor road without crossing the centre line of the minor road (<i>Figure A15 of Austroads Guide to Road Design Part 4</i>).	

Turn treatment

Description

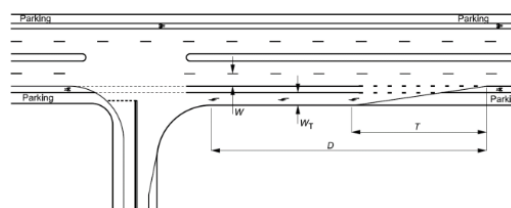
AUL(S)

AUXiliary Left (**S**hort) turn treatment is a shorter version of the Auxiliary Left turn treatment which is reduced by allowing some deceleration to occur in the through lane on the major road. This turn treatment also allows through vehicles to pass to the right of turning vehicles (*Figure A17 of Austroads Guide to Road Design Part 4*).



AUL

AUXiliary Left turn treatment is a left turn lane on the major road that allows through vehicles to pass to the right of turning vehicles (*Figure 8.6 of Austroads Guide to Road Design Part 4A*).



A6.2 – Rural turn treatments

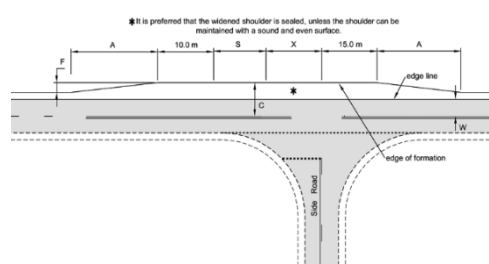
Table 15: Turn Lane Treatment Descriptions (**Rural**) (Source: Section 7.5 and 8.2 of Austroads Guide to Road Design Part 4A)

Turn treatment

Description

BAR

BAasic Right turn treatment on the major road, features a widened area (usually in place of parking) on the major road that allows through vehicles to pass to the left of turning vehicles (*Figure A6 of Austroads Guide to Road Design Part 4*).

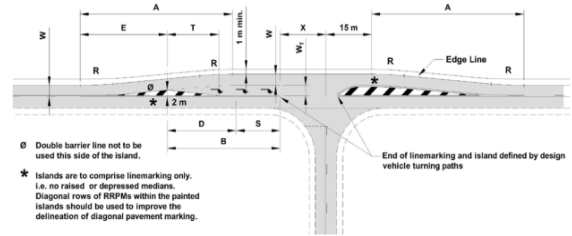


Turn treatment

Description

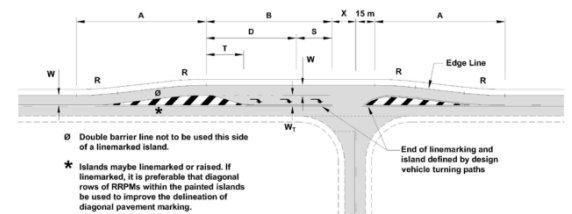
CHR(S)

CHannelised Right (**S**hort) turn is a shorter version of the Channelised Right turn treatment which is reduced by removing space provided for storage in the right lane. This treatment type can only be used with line marking (Figure A7 of Austroads Guide to Road Design Part 4).



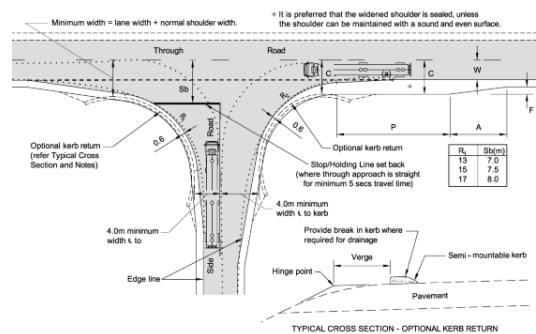
CHR

CHannelised Right turn treatment has two vehicle travel paths (through and right turns) separated by physical or painted medians or islands (Figure A8 of Austroads Guide to Road Design Part 4).



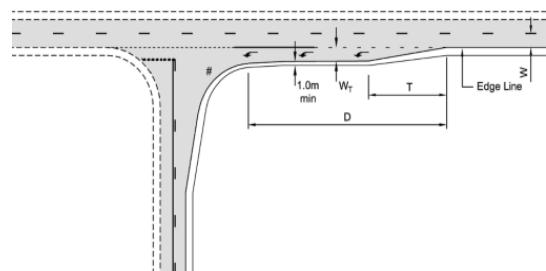
BAL

BAsic Left turn treatment on the major road has a radius large enough to accommodate a design vehicle turning left into the minor road without crossing the centre line of the minor road (Figure 8.2 of Austroads Guide to Road Design Part 4A).



AUL(S)

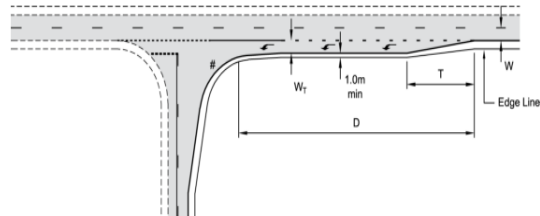
AUXiliary Left (**S**hort) turn treatment is a shorter version of the Auxiliary Left turn treatment which is reduced by allowing some deceleration to occur in the through lane on the major road. This turn treatment also allows through vehicles to pass to the right of turning vehicles (Figure 8.3 of Austroads Guide to Road Design Part 4A).



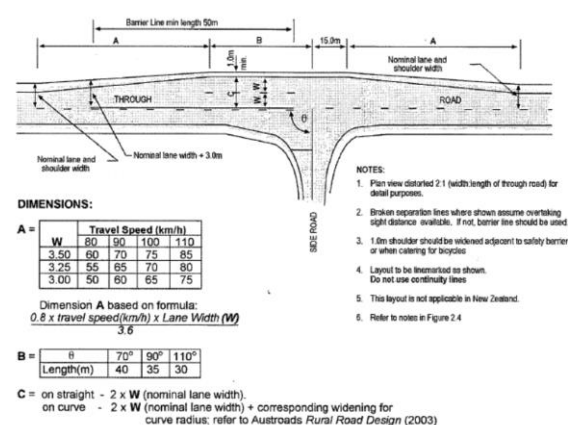
Turn treatment

Description

AUL AUXiliary Left turn treatment is a left turn lane on the major road that allows through vehicles to pass to the right of turning vehicles (*Figure 8.4 of Austroads Guide to Road Design Part 4A*).



AUR In addition to the above, DoT will allow the use of the rural **AUXiliary lane Right** turn treatment (from GTEP Part 5) in lieu of the CHR(s) treatment, (refer *Sections 7.5.2 and 7.7.2 of VicRoads Supplement to AGRD4A*)



Appendix 7 – Acronyms and terms

Acronyms / terms	Definition
AGRD4	Austroads Guide to Road Design Part 4 – Intersections and crossings
AGRD4A	Austroads Guide to Road Design Part 4A – Unsignalised and signalised intersections
AGTM6	Austroads Guide to Traffic Management Part 6 – Intersections, interchanges and crossings management
AGTM8	Austroads Guide to Traffic Management Part 8 – Local street management
AS/NZS2890.2	Australian Standard 2890.2 Parking facilities Part 2: Off-street commercial vehicle facilities
DPE	Department of Planning and Environment
ESD	Entering site distance
SIDRA	SIDRA intersection – micro analytical traffic engineering software to model the performance of intersections
SISD	safe intersection sight distance
TIA	traffic impact assessment
TfNSW	Transport for New South Wales
vpd	vehicles per day
vph	vehicles per hour