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Traffic Impact Assessment Report

409 Gwydir Highway, Glen Innes, NSW

Project Number 230730
Final Report 4/06/2024

Client Green Gold Energy Pty Ltd

Document control record

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Executive summary

Green Gold Energy Pty Ltd engaged Trafficworks to undertake a traffic impact assessment (TIA) for the proposed solar energy facility development at **409 Gwydir Highway, Glen Innes, NSW.**

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

Address	409 Gwydir Highway, Glen Innes, NSW
Zoning	RU1: Primary Production
Proposed development	Solar Energy Facility
Road network	Gwydir Highway (B76)
Traffic generation	Daily and peak hour traffic volumes of: — 50 vehicles per day (vpd) — 21 vehicles per hour (vph)
Car parking	20 light vehicle parking spaces
Conclusion	We conclude that subject to the implementation of our recommendations, there are no traffic engineering reasons that would prevent the development from proceeding: — the peak traffic generation will occur during the construction phase of the development, where 20 light vehicles (generating 40 trips per day) and 5 heavy vehicles (generating 10 trips per day) will access the subject site — the car parking demand during the development's construction phase will likely be 20 spaces — the alignment of the road and a small bridge with safety barriers may restrict the sight distance requirements on the western approach / departure of the subject site access — the setback of the security fencing for the subject site will provide the minimum 20 m required to allow storage of a 19 m semi-trailer clear of the traffic lane on Gwydir Highway — the intersection of Gwydir Highway and the subject site access meets the warrant for a type BAL turn lane; however, no additional work is considered necessary to accommodate the development traffic.

Recommendations	It is recommended that: — **Recommendation 1:** the proposed development plan should be updated to indicate a formal on-site car parking provision for 20 vehicles. — **Recommendation 2:** before the commencement of work, inspect the subject site access and, if necessary, provide mitigation treatments to ensure compliance with the applicable sight distance requirement of 160 m. — **Recommendation 3:** the subject site access driveway should be constructed according to Figure 7.4 in Austroads Guide to Road Design Part 4 requirements and to the council's satisfaction. — **Recommendation 4:** truck warning signs should be displayed near the subject site access during the construction phase when heavy vehicles are making deliveries.

Referenced documents

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

- Austroads Guide to Road Design
    - Part 4A – Unsignalised and Signalised Intersections, for sight distance criteria and provision for turning vehicles at intersections (AGRD4)
- Austroads Guide to Traffic Management
    - Part 6 – Intersections, Interchanges and Crossings Management, for sight distance criteria and provision for turning vehicles at intersections (AGTM6)
- Australian Standards:
    - AS 2890.1-2004 Parking facilities - Off-street car parking
    - AS 2890.2-2018 Parking facilities - Off-street commercial vehicle facilities
- RTA Guide to Traffic Generating Developments, Version 2.2, October 2002
- Glen Innes Severn Shire Council
    - Development Control Plan (DCP) 2014
    - Local Environmental Plan (LEP) 2012

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Table of Contents

1 Introduction

Green Gold Energy Pty Ltd engaged Trafficworks to undertake a traffic impact assessment (TIA) for the proposed solar energy facility development at **409 Gwydir Highway, Glen Innes, NSW.**

For the details about:

- existing site conditions – see section 2
- description of the proposed development – see section 3
- 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 Subject site

The subject site is:

- located across multiple parcels of land known as Lots 59, 60, 61 and 62 of DP1834), approximately 3 km west of Glen Innes, NSW
- surrounded by land currently used for farming and agricultural activities, including some residential rural properties.

Vehicular access to the subject site is available from Gwydir Highway.

Figure 1 shows the subject site's location, surrounded predominantly by farmland properties.

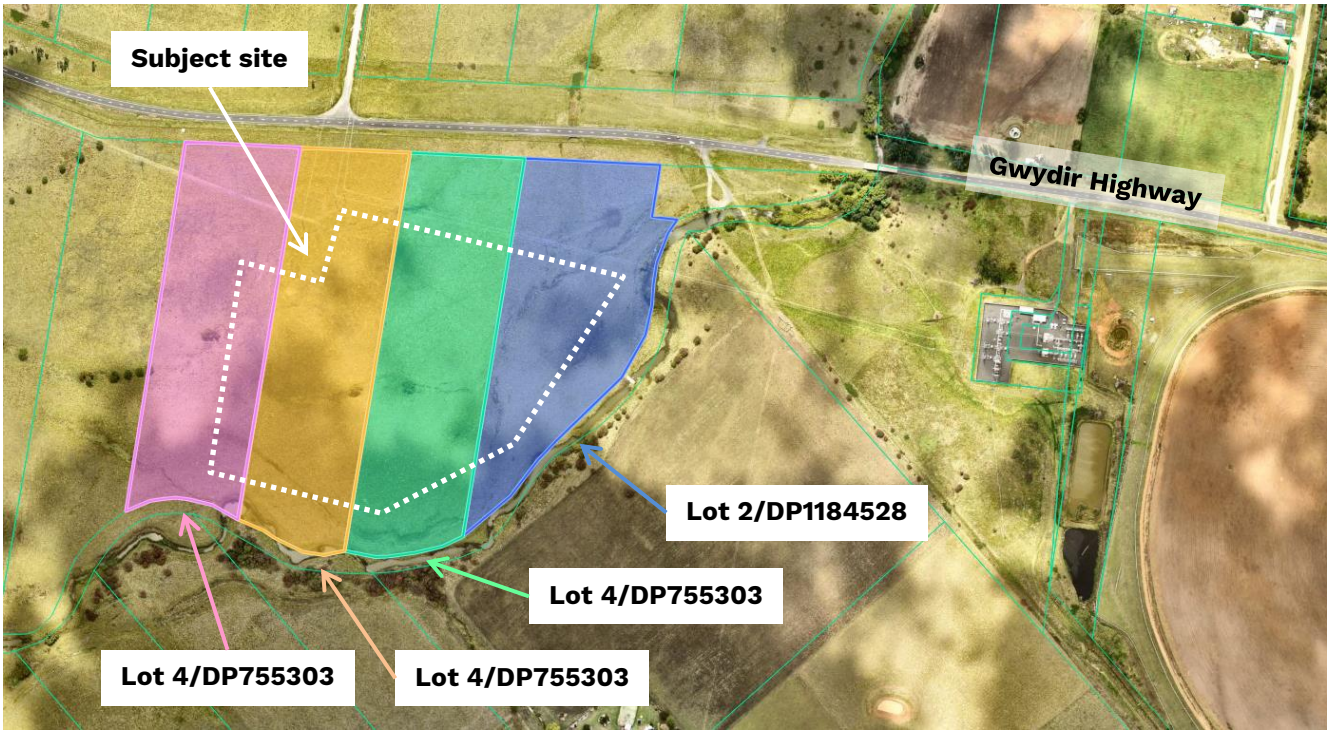


Figure 1: Location plan (reproduced with permission from Nearmap)

The subject site and most of the surrounding land is located within a Primary Production Zone (RU1), as per the Glen Innes Severn Shire Council (Council) Local Environmental Plan 2012 (LEP).

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

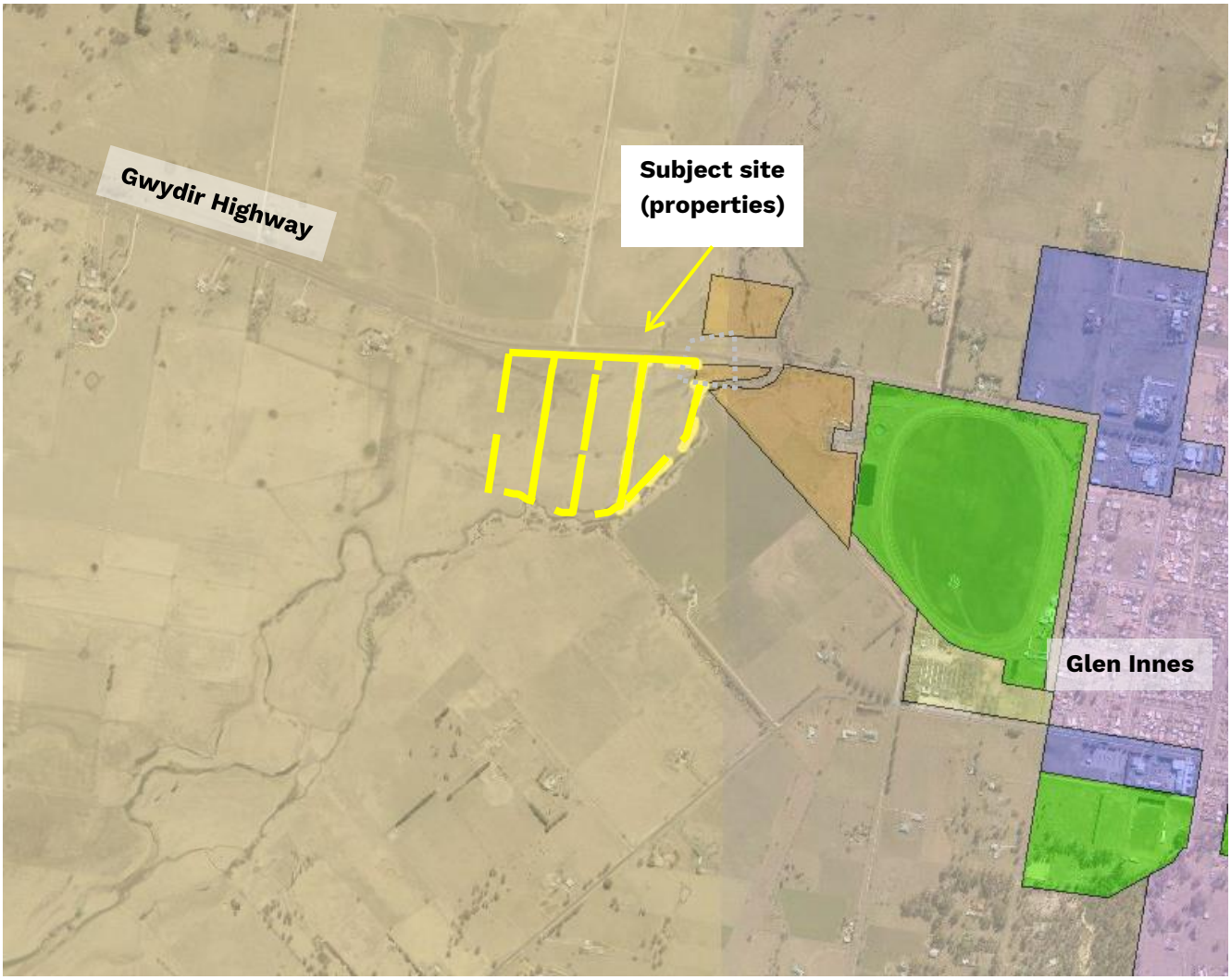


Figure 2: Zoning plan (reproduced from NSW ePlanning Spatial Viewer)

2.2 Road network

2.2.1 Gwydir Highway (B76)

Table 1 describes the features of this road.

Table 1: Gwydir Highway features

Feature	Description
Road type	Classified state arterial road (B76) managed by Transport for New South Wales (TfNSW)
Access	Provides access between Grafton, to the east, and the Castlereagh Highway, near Walgett, to the west
Carriageway	Two-way, two-lane road with 3.5 m traffic lanes and 1.0 m sealed shoulders on each side Road safety barrier (115 m length) on both sides of the road approx. 80 m west of the subject site access Road safety barrier (100 m length) on both sides of the road approx. 145 m east of the subject site access
Road reservation	80 m wide
Speed limit	A posted speed limit of 100 km/h

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

Figure 3: Gwydir Highway facing west adjacent to the subject site access (on the left) – Source: Google

Figure 4: Gwydir Highway facing east adjacent to the subject site access (on the right) – Source: Google

2.3 Traffic volumes

TfNSW Traffic Volume Viewer details traffic volumes for many of the arterial roads in New South Wales. Scrutiny of the records indicates that in 2024, 1,432 vehicles per day (vpd) travelled along the section of Gwydir Highway located less than 1 km west of the subject site (Station Id: 6134).

The two-way traffic volumes recorded by the station indicate the following:

- a daily traffic volume of 717 vpd eastbound and 715 vpd westbound
- AM commuter peak (8:00 am to 9:00 am) of 74 vehicles per hour (vph) eastbound bound and 56 vph westbound
- PM commuter peak (3:00 pm to 4:00 pm) of 64 vehicles per hour (vph) eastbound and 64 vph westbound.

2.4 Crash history

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

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

3 Traffic assessment of the proposed development

3.1 Development summary

The proposed development in Glen Innes involves constructing a solar energy facility to generate power to connect to the local electricity grid. The facility will provide a reliable power source to the local community. The proposed development plan is provided in Appendix 1.

The proposed facility will be un-staffed, and the period that will generate the most traffic will be the construction phase. Any access to the site once in operation will be for security or maintenance purposes.

The development will have direct access to Gwydir Highway via an existing access.

3.1.1 Construction

On-site construction for the proposed solar energy facility is mainly limited to the assembly and connection of components, with the typical solar panels readily transportable via 12.5 m rigid trucks.

Access to the site by a larger vehicle will only be required to deliver the inverter / transformer / power station (in a 40 ft container). This will need access to the subject site by a 19 m semi-trailer.

The typical construction delivery schedule for this type of Solar Energy Facility is shown in Table 2.

Table 2: Construction delivery schedule

Time period	Site Works
Month 1	Civil earthworks, fencing and landscaping
Months 2 to 5	Delivery of long lead materials
	PV panel and LV cable installation
Months 5 to 8	HV station installation, testing and commissioning
Month 9	Site clean-up and demobilisation

There is a 9-month construction phase before the full operation of the facility.

3.1.2 Heavy vehicle access to the subject site

The proposed heavy vehicle route from Sydney to the site during construction is via New England Highway, turning left to Gwydir Highway in Glen Innes.

Figure 5 indicates the recommended route for all heavy vehicles to the subject site.

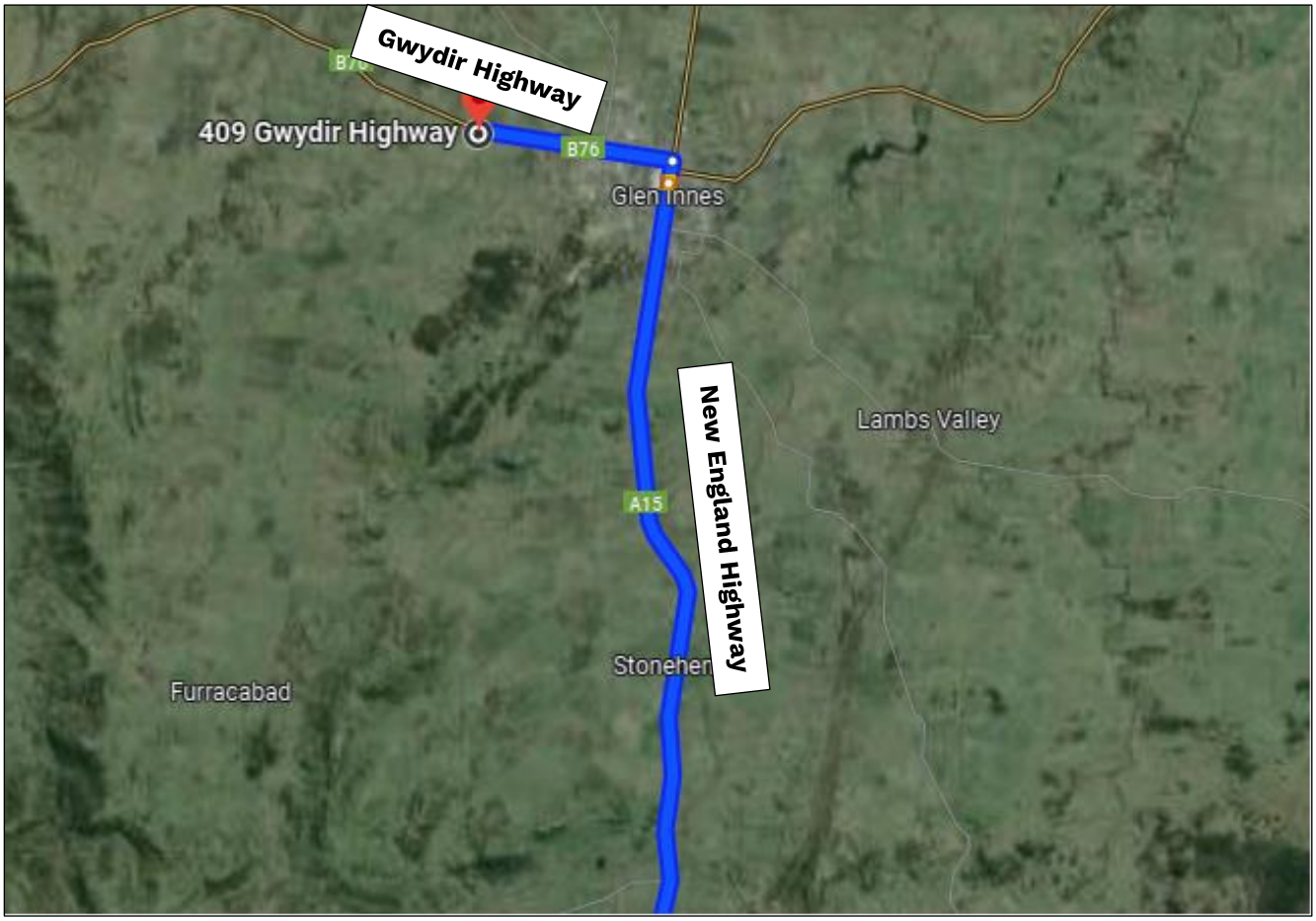


Figure 5: Recommended route to/from the subject site

3.1.3 Operation / decommissioning

Upon completion of the leasing period, if the lease is not renewed, it will be incumbent on the facility's operator to decommission the facility, remove all installations and restore the subject site 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.

3.2 Traffic generation

Traffic generation for new developments is typically estimated using the traffic generation rates provided in the RTA Guide to Traffic Generating Developments (2002). However, the RTA Guide's traffic generation rates are unavailable for solar energy facilities.

Therefore, an empirical assessment was undertaken to estimate the traffic generation to/from the proposed development. Traffic generation analysis was undertaken for the construction and operational phases of the development to establish peak traffic generation.

3.2.1 Construction phase traffic volumes

Based on the information provided, the peak light vehicle traffic generation will likely occur during the second month of the construction phase.

It is expected that 20 construction staff vehicles will access the subject site per day, resulting in a total daily traffic generation of 40 vpd, including:

- 20 vpd arriving at the start of the shift at approximately 7.00 am
- 20 vpd departing at the end of the shift at approximately 5.00 pm.

Assessment of the heavy vehicles accessing the subject site during the construction phase revealed that the peak traffic generation is likely to occur from the start of the second month to the end of the fifth month. During this period, 5 heavy vehicles per day will access the subject site, resulting in a total daily heavy vehicle traffic generation of 10 vpd (5 vpd arriving and 5 vpd departing).

Assuming the construction work will be undertaken during normal working hours, the 5 vehicles will be expected to access the subject site outside commuter peak hours. The impact of heavy vehicles on the morning and afternoon commuter peaks is considered negligible. However, conservatively, for this assessment, it has been assumed that a single heavy vehicle will arrive / depart the subject site during the AM and PM peak hours.

The heavy vehicles accessing the subject site will be mainly 12.5 m rigid trucks, with occasional 19 m semi-trailers (i.e., no B-double trucks will require access). The trucks will access the subject site via a left turn from Gwydir Highway.

3.2.2 Operational phase traffic volumes

The proposed solar energy facility will have remote monitoring in real-time, allowing for constant surveillance and monitoring without on-site staffing.

The compound will contain key infrastructure that requires a high degree of security. Upon identification of potential issues, action can be taken indirectly from the control centre or directly using chosen contractors to travel to the site. Up to 2 light vehicles will attend the subject site every 6 months during the operational phase for general maintenance.

3.2.3 Peak traffic generation

Assessment of the traffic generation volumes during the construction and operational phases of the development revealed that the peak traffic generation for the subject site would occur during the construction phase. This will see 20 light vehicles (generating 40 trips per day) and 5 heavy vehicles (generating 10 trips per day) access the subject site daily.

Conclusion 1: the peak traffic generation will occur during the construction phase of the development, where 20 light vehicles (generating 40 trips per day) and 5 heavy vehicles (generating 10 trips per day) will access the subject site.

3.3 Traffic distribution assumptions

Our traffic distribution assumptions are the following:

- 100% of light vehicles will arrive to/from the east (Glen Innes)
- all heavy vehicles will arrive to/from the south (Port of Sydney).

3.4 Anticipated traffic volumes

From the information provided in Section 3.2.1, the AM and PM development peaks along Gwydir Highway will occur when staff arrive / depart the subject site, as they generate the most traffic. As a result, the development peaks are expected to occur between:

- 6:00 am – 8:00 am
- 4:00 pm – 6:00 pm

Based on the time periods listed, the development peak will generally occur outside the commuter peak. Table 3 shows the anticipated peak hour traffic volumes at the proposed access to the development.

Table 3: Anticipated peak hour traffic volumes at the proposed access to the development

Period	Type	Left In	Right In	Left Out	Right Out	Total
AM Peak	Light	20	0	0	0	20
	Heavy	1	0	0	0	1
	TOTAL	**21**	**0**	**0**	**0**	**21**
PM Peak	Light	0	0	0	20	20
	Heavy	0	0	0	1	1
	TOTAL	**0**	**0**	**0**	**21**	**21**

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 solar energy storage facilities is currently unavailable. Therefore, an empirical assessment was undertaken to estimate the demand for car parking of the proposed development.

Section 3.2.1 outlined that up to 20 light vehicles will access the subject site during the development's construction phase, generating a demand for 20-space car parking.

The proposed site plan does not indicate a provision for 20 formal on-site car parking spaces. However, there is sufficient space to provide this within the subject site.

Conclusion 2: the car parking demand during the development's construction phase will likely be 20 spaces.

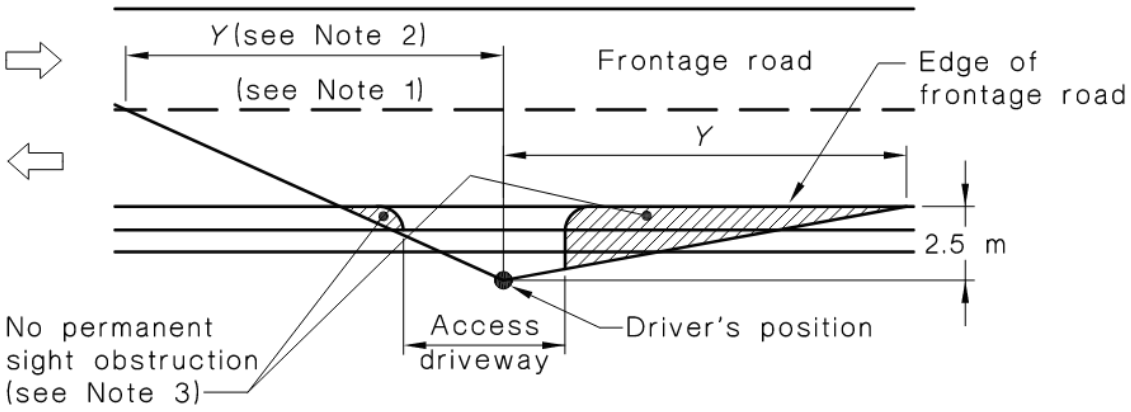
Recommendation 1: the proposed development plan should be updated to indicate a formal on-site car parking provision for 20 vehicles.

5 Access to the site

5.1 Site access – Access driveway ESD requirement

Section 3.2.4 in AS/NZS 2980.1 Parking Facilities – Part 1: Off-street car parking sets out the entering sight distance (ESD) criteria for a driver exiting an access driveway to traffic on the frontage road.

Un-signalised access driveways shall be located so the intersection sight distance available to drivers leaving the driveway along the frontage road is at least that shown in Figure 3.2 of AS/NZS 2890.1 (reproduced in Figure 6).



Frontage road speed (Note 4) km/h	Distance (Y) along frontage road m		
	Access driveways other than domestic (Note 5)		Domestic property access (Note 6)
	Desirable 5 s gap	Minimum SSD	
40	55	35	30
50	69	45	40
60	83	65	55
70	97	85	70
80	111	105	95
90	125	130	Use values from 2nd and 3rd columns
100	139	160	
110	153	190	

Figure 6: Sight distance requirements at driveways (Source: Figure 3.2 from AS/NZS 2890.1)

The proposed site access to the development along Gwydir Highway is subject to an expected operating speed of 100 km/h. The corresponding minimum Stopping Sight Distance (SSD) is 160 m.

The desktop assessment of the approaches to the subject site access on Gwydir Highway determined the subject length had no vertical (crests / dips) alignment features that would restrict sight lines. However, there is a large radius bend on the western approach / departure with a small bridge and associated road safety barriers. This may impact sightlines to the west of the subject site access.

Conclusion 3: the alignment of the road and a small bridge with safety barriers may restrict the sight distance requirements on the western approach / departure of the subject site access.

Recommendation 2: before the commencement of work, inspect the subject site access and, if necessary, provide mitigation treatments to ensure compliance with the applicable sight distance requirement of 160 m.

5.2 Access location and operation

The subject site access driveway is recommended to be constructed per Figure 7.4 in Austroads Guide to Road Design Part 4: Intersections and Crossings requirements and to the council's satisfaction (refer to Figure 7). It should provide sufficient width to facilitate the movements of a 19 m semi-trailer accessing the subject site.

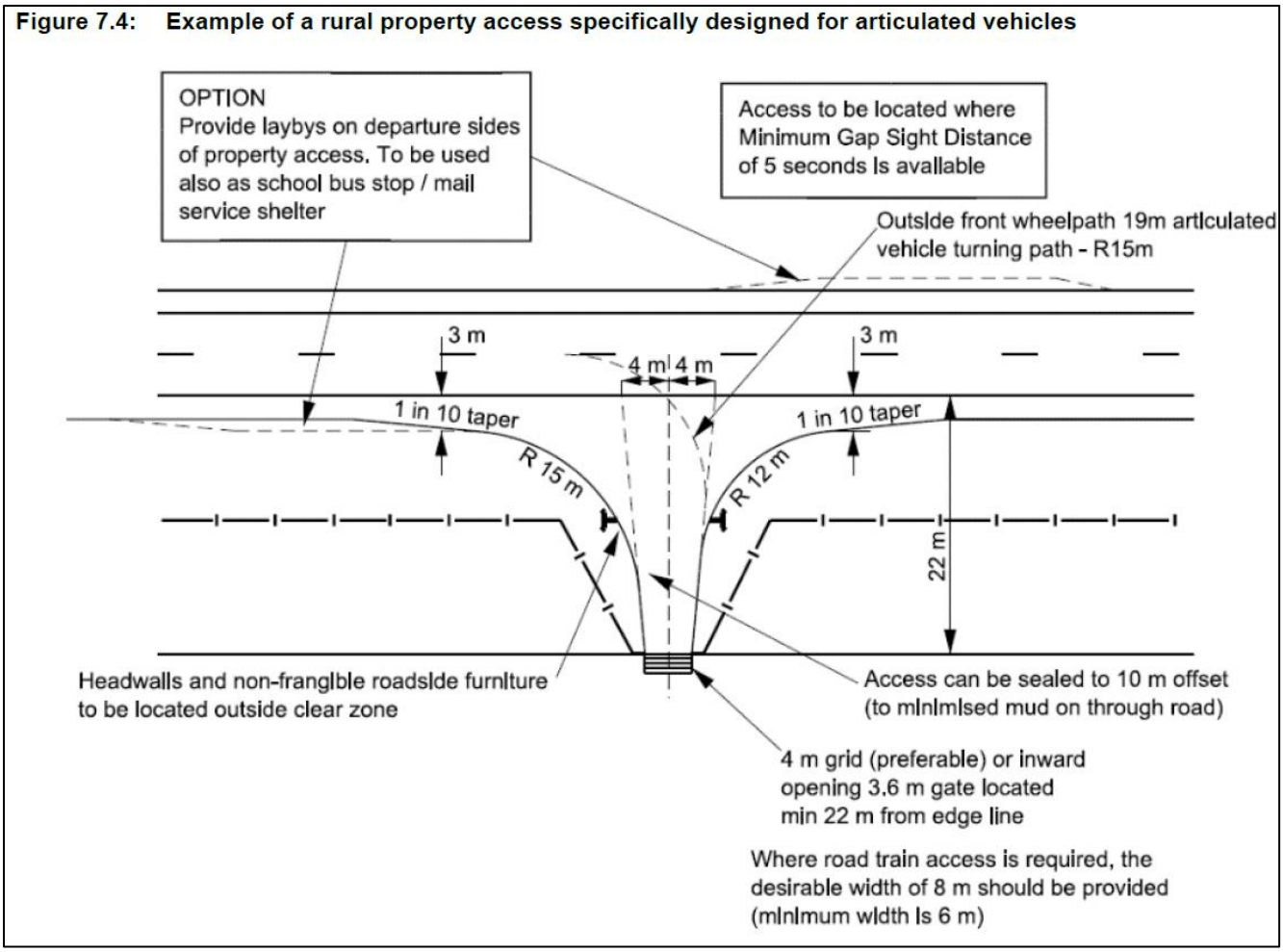


Figure 7: rural property access designed for an articulated vehicle

Recommendation 3: the subject site access driveway should be constructed according to Figure 7.4 in Austroads Guide to Road Design Part 4 requirements and to the council's satisfaction.

5.3 Site security

The proposed development will likely include installing site security to restrict access to authorised vehicles only. This will involve the provision of security gates installed at the access to the development.

Should the development include security gates, they should be installed to cater for all queuing vehicles. It is indicated that only one truck is expected to arrive and queue at any time. If the gate for the subject site access were setback 20 m from Gwydir Highway, this would allow for a 19 m semi-trailer waiting for clearance to enter the subject site.

The subject site's fencing is more than 20 m from Gwydir Highway's edge of the traffic lane. Therefore, the setback will provide the minimum required to store one heavy vehicle clear of the traffic lane.

Conclusion 4: the setback of the security fencing for the subject site will provide the minimum 20 m required to allow storage of a 19 m semi-trailer clear of the traffic lane on Gwydir Highway.

5.4 Turn provisions impact

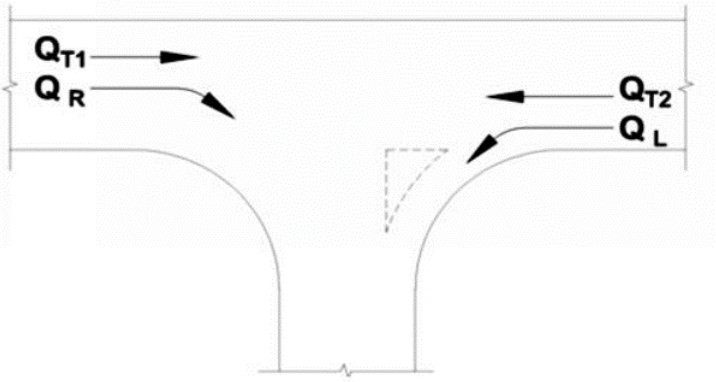
The traffic turning from major roads into minor roads should not delay through traffic.

Generally, turn treatments from major roads into minor roads at sign-controlled intersections are provided for safe and efficient intersection operation.

Figure 8 shows the formulas determining the major road volume (QM).

The results were then applied to Figure 3.25, Austroads Guide to Traffic Management Part 6 (AGTM6), to determine the intersections' turning treatments.

Figure 3.26: Calculation of the major road traffic volume Q_M



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

Figure 8: Formulas used to determine major road traffic (Source: Figure 3.26 from AGTM6)

5.4.1 Turn lane treatments

Traffic volumes help determine appropriate turn lane treatments at access intersections to development sites.

5.4.2 Anticipated conditions for the site access intersection

To determine anticipated conditions at the intersection, traffic volumes Table 3 were used to determine the warrants shown in Table 4 and were applied in Figure 9.

Table 4: Right turn lane treatments on Gwydir Highway at the subject site intersection – anticipated conditions

Road	Peak Period	Left Turn Q_L (vph)	Right Turn Q_R (vph)	Through Q_T (vph)		Q_M Left Turn	Q_M Right Turn
Gwydir Highway	AM	21	0	Q_{T1}	74	56	0
				Q_{T2}	56		
	PM	0	0	Q_{T1}	64	0	0
				Q_{T2}	64		

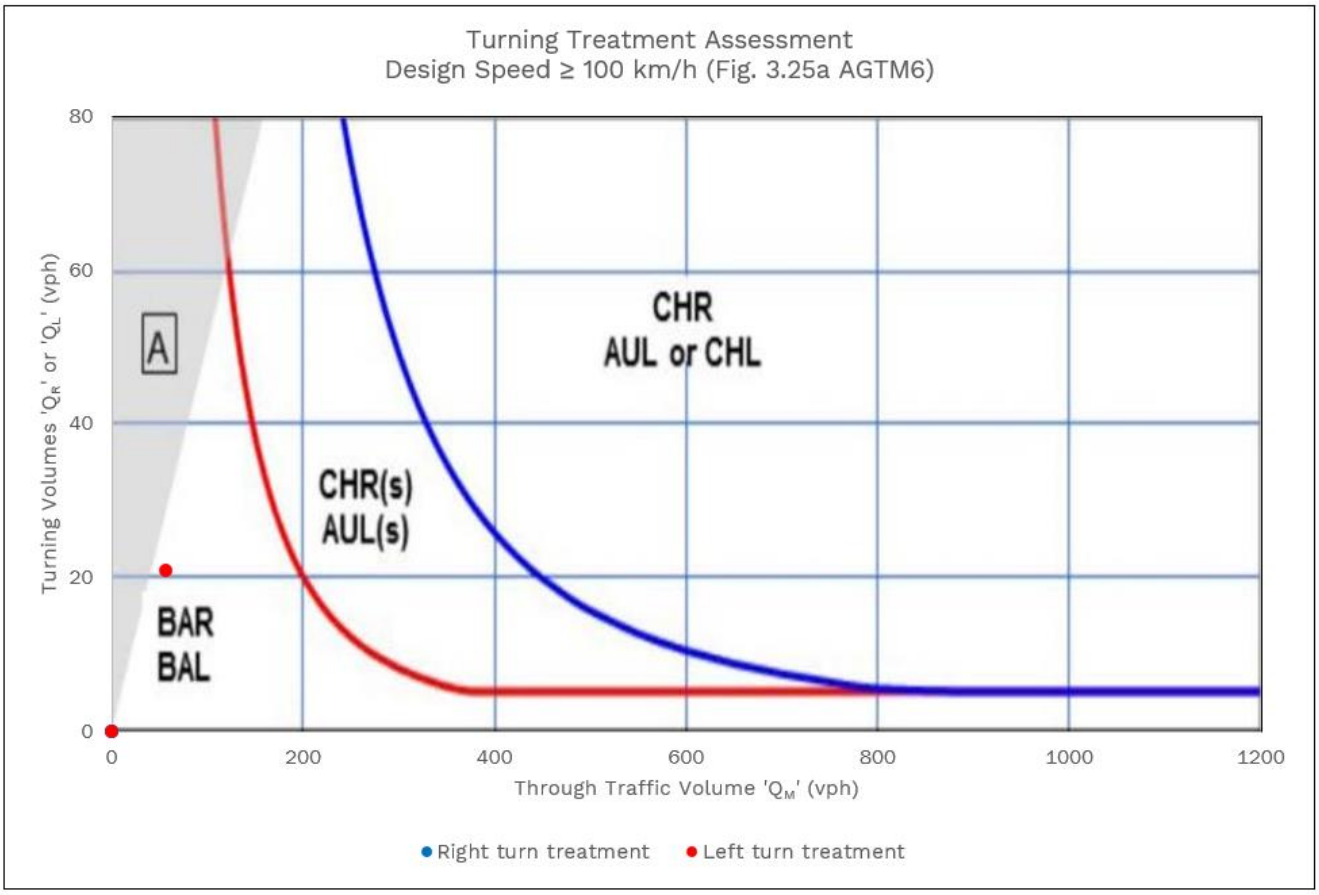


Figure 9: Graph used to determine the turn treatments Gwydir Highway at site access intersection – anticipated conditions

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

- left turn from Gwydir Highway into the subject site access meets the warrants for a BAL treatment in the morning peak period
- right turn from Gwydir Highway into the subject site; access treatment is not required.

Conclusion 5: the intersection of Gwydir Highway and the subject site access meets the warrant for a type BAL turn lane.

The intersection is subject to low volumes along Gwydir Highway, and the additional traffic generated by the development will only occur during the construction phase (approximately 9 months). As a result, upgrading the turn treatments for a short construction period is considered unnecessary.

Conclusion 6: no additional work is required at the intersection of Gwydir Highway and the subject site access to accommodate the development traffic.

However, it is recommended that truck warning signs be displayed near the subject site access during the phases when heavy vehicles are making deliveries.

Recommendation 4: truck warning signs should be displayed near the subject site access during the phases when heavy vehicles are making deliveries.

6 Conclusions and recommendations

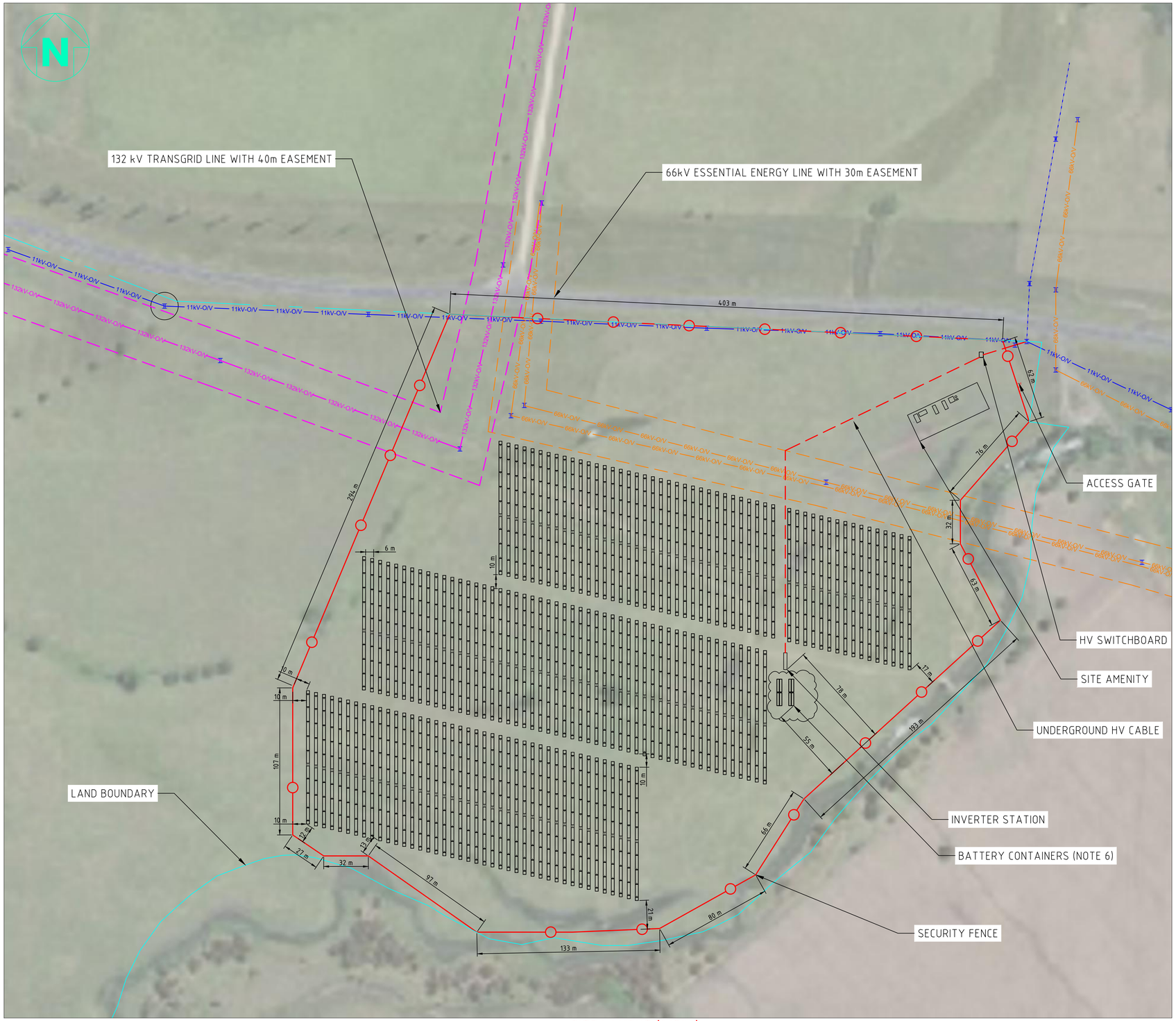
We conclude there are no traffic engineering reasons that would prevent the development from proceeding, as outlined below:

- the peak traffic generation will occur during the construction phase of the development, where 20 light vehicles (generating 40 trips per day) and 5 heavy vehicles (generating 10 trips per day) will access the subject site
- the car parking demand during the development's construction phase will likely be 20 spaces
- the alignment of the road and a small bridge with safety barriers may restrict the sight distance requirements on the western approach / departure of the subject site access
- the setback of the security fencing for the subject site will provide the minimum 20 m required to allow storage of a 19 m semi-trailer clear of the traffic lane on Gwydir Highway
- the intersection of Gwydir Highway and the subject site access meets the warrant for a type BAL turn lane; however, no additional work is considered necessary to accommodate the development traffic.

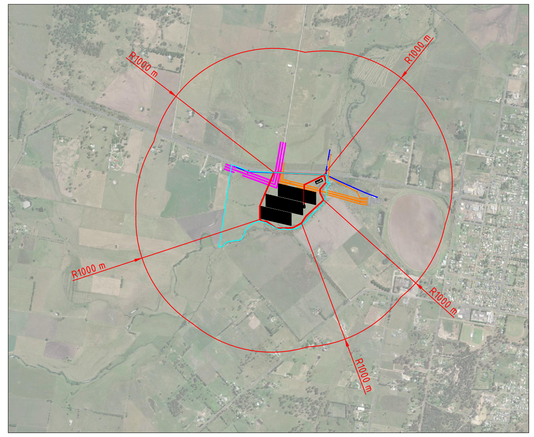
However, this TIA has identified a number of recommendations that need to be addressed:

- **Recommendation 1:** the proposed development plan should be updated to indicate a formal on-site car parking provision for 20 vehicles.
- **Recommendation 2:** before the commencement of work, inspect the subject site access and, if necessary, provide mitigation treatments to ensure compliance with the applicable sight distance requirement of 160 m.
- **Recommendation 3:** the subject site access driveway should be constructed according to Figure 7.4 in Austroads Guide to Road Design Part 4 requirements and to the council's satisfaction.
- **Recommendation 4:** truck warning signs should be displayed near the subject site access during the phases when heavy vehicles are making deliveries.

Appendix 1 – Development Plans



SITE LAYOUT (1:1500)



LOCALITY PLAN

NOTES

1. ACTUAL DIMENSIONS AND CLEARANCES MAY VARY SUBJECT TO SITE CONDITIONS.
2. DIMENSIONS OF ELECTRICAL EQUIPMENT ARE INDICATIVE ONLY. ACTUAL DIMENSIONS TO BE CONFIRMED.
3. EXISTING ESSENTIAL ENERGY 11kV POLES ARE ILLUSTRATIVE ONLY. ACTUAL POSITION IS SUBJECT TO THE ACTUAL MEASUREMENT ON SITE.
4. TWO NEW POLES WILL BE INSTALLED TO CARRY OVERHEAD POWER LINES AND CONNECT TO ESSENTIAL ENERGY NETWORK.
5. SITE STORAGE AND AMENITY FACILITIES TO BE ON SITE ONLY DURING CONSTRUCTION PHASE. NO PERMANENT BUILDINGS TO BE KEPT ON SITE AFTER CONSTRUCTION COMPLETED.
6. THE NUMBER OF BATTERY CONTAINERS IS FOR INDICATION ONLY AND VARIES FROM 2 TO 8.

LEGEND

- PROPOSED PV ARRAY
- SECURITY FENCE
- PROPERTY BOUNDARY

SYSTEM SPECIFICATIONS				
DC	6.42	MW	TOTAL MODULES	11664
MODULE CAPACITY	550	W	MODULES PER STRING	27
NUMBER OF INVERTERS	1	-	NUMBER OF STRINGS	432
INVERTER MODEL	SG4950HV-MV	-	MODULE MODEL	LR5-72HPH-550M
NUMBER OF BATTERIES	TBD	-	BATTERY MODEL	ST-2752UX

FOR INFORMATION

SITE SPECIFICATIONS		
FENCE PERIMETER	1701	m
AREA WITHIN FENCE	18.11	Ha
PV AREA	8.35	Ha
PAVED AREA	-	m^2

No	DATE	DRN	CHK	ENG	Q.A.	PROJECT	DESCRIPTION	NUMBER	TITLE
B	05/04/24	D.S.	ACE	D.S.	ACE	NSW-158	UPDATE SITE PLAN		
A	16/05/23	M.G.	ACE	M.G.	ACE	NSW-158	DRAFT LAYOUT		
REVISION								REFERENCE DRAWINGS	

GREEN GOLD ENERGY

409 GWYDIR HWY, GLENN INNES, NSW, 2370
4.95MVA PV & BESS EXPORT SYSTEM
SITE PLAN

DATE: 05/04/24	DRN: M.G.	CHK: ACE	ENG: M.G.	Q.A: ACE	SCALE: 1:1500
PROJ No: NSW-158	DRG No				REV: B

AUTOCAD A1SHEET

Appendix 2 – 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/NZS2890.1	Australian Standard / New Zealand Standard 2890.1 Parking facilities Part 1: Off-street car parking
DPE	Department of Planning and Environment
ESD	Entering site distance
PSP	Precinct structure plan
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 (NSW)
vpd	vehicles per day
vph	vehicles per hour