



Blind Creek Solar Farm

Traffic Impact Assessment

April 2022

Reference: 167 rep 220412 final

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Prepared for: NGH Pty Ltd Status: Final report Date: 12 April 2022 Reference: 167 rep 220412 final

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1. Background

1.1 Background

Amber Organisation Pty Ltd has been engaged by NGH Consulting Pty Ltd to conduct a review of the traffic implications of the Blind Creek Solar Farm (BCSF) and prepare a Traffic Impact Assessment (TIA).

The solar farm is located approximately 8km north of Bungendore and is proposed to have a capacity of 400MW Alternating Current (AC). Access to the site is proposed via an existing private access from Tarago Road which currently services a small sand quarry (the access is referred to as the Blind Creek Entrance within this report). Staff will primarily be located in Bungendore with all plant expected to be delivered from Sydney.

Figure 1 shows the proposed layout for the site in relation to the road network and the access location.



Figure 1: Site Layout

Source: NGH Consulting

1.2 Environmental Assessment Requirements

NSW Department of Planning & Environment issued Secretary's Environmental Assessment Requirements (SEARs) for the project. The required traffic and transport matters include the following:

- An assessment of the peak and average traffic generation, including over-dimensional vehicles and construction worker transportation;
- An assessment of the likely transport impacts to the site access route (including, but not limited to, Tarago Road, Currandooley Road, Bungendore Road, Braidwood Road, Kings Highway, Hume Highway and Federal Highway), site access point(s), any Crown land, particularly in relation to the capacity and condition of the roads, road safety and intersection performance;
- A cumulative impact assessment of traffic from nearby developments;
- Provide details of measures to mitigate and / or manage potential impacts including a schedule of all required road upgrades (including resulting from heavy vehicle and over mass / over dimensional traffic haulage routes), road maintenance contributions, and any other traffic control measures, developed in consultation with the relevant road authority; and
- construction, operational and decommissioning traffic impacts of the development;

1.3 Purpose of Document

This TIA has been prepared to assess the construction, operational and decommissioning traffic impacts, and the access arrangements of the solar farm. The assessment responds to the SEARs and details how road impacts of the project traffic, particularly from heavy vehicle use and oversize and overmass vehicles, will be avoided or managed using road-use management strategies.

More specifically, the report addresses the following key matters:

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

The traffic assessment has been undertaken in conjunction with consultation with Transport for NSW and Queanbeyan–Palerang Regional Council.



2. Existing Conditions

2.1 Site Location

The BCSF is proposed to be located 8km north of Bungendore and has an area of approximately 1,208ha. The site is currently occupied by agricultural land, with access provided via an existing private access from Tarago Road which currently services a small sand quarry (Blind Creek Entrance) and Currandooley Road. It is noted that the majority of Currandooley Road is located within private land.

The site and the surrounding area are primarily zoned RU1 Primary Production and E3 Environmental Management and is predominantly agricultural land use.

2.2 Road Network

Tarago Road is a Regional road under the care and management of Council. It runs in a general northeast-southwest alignment extending from its continuation as Bungendore Road northeast of Mount Fairy Road to its continuation as Molonglo Street south of the Turallo Creek Bridge. It has a sealed carriageway width of approximately 7.0 metres in the vicinity of the site which accommodates one lane of traffic in each direction. Wide grassed berms are provided on both sides of the road and it has a posted speed limit of 100km/hr.

Tarago Road is currently used for a variety of purposes and already carries heavy vehicles for local sand mines, waste to Vieollia's Woodlawn landfill site, agricultural transport, and coastal traffic via Nerriga.

The site gains access via the Blind Creek Entrance and the section of Currandooley Road located within private land. The sections of each road proposed to be used by site traffic has an unsealed surface with a carriageway width in the order of 4.0 metres.

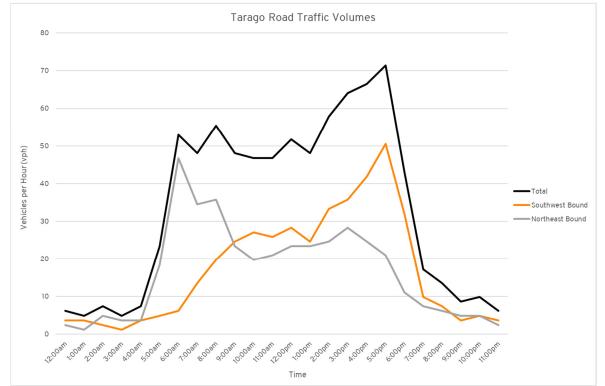
2.3 Traffic Volumes

Traffic volume data for Tarago Road was obtained from the TfNSW traffic volume viewer. The closest available data was located 1.73 kilometres west of Bungendore Road and is summarised below in Table 1. In order to calculate the current traffic volumes on the road network a growth rate has been applied to calculate the traffic volumes for 2021.

Road	Survey Location	Survey Year	Recorded Volume	Peak Hour	Growth Factor	Current Traffic Volume
Tarago Road	1.73km west of Bungendore Road	2008	658 vpd 91% light 9% heavy	AM - 45 vph PM - 58 vph	1.5%	810 vpd 53 vph (AM) 71 vph (PM)

Table 1: Barton	Highway	Traffic	Volume	Data
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The 2021 traffic volumes have also been calculated for each hour and separated in to north and southbound movements. The traffic volumes are shown below in Graph 1.



Graph 1: Tarago Road Traffic Volume Data Calculated to 2021

The TfNSW survey data indicates that Tarago Road currently experiences pronounced directional peaks with most vehicle movements being northeast bound in the morning and southwest bound in the evening. The morning peak hour is not dissimilar to the midday peak. However, the evening peak is higher than the morning peak at 71 vehicle movements per hour. Overall, the survey data suggests Tarago Road currently accommodates a modest level of traffic.

2.4 Public Transport Services

No public transport services are provided within the vicinity of the site.

2.5 Restricted Vehicle Access

The TfNSW Restricted Vehicle Access Map for the surrounding area is provided within Figure 2. The green lines indicate B-Double routes while the black lines represent approved routes with travel conditions. As can be seen from the figure the State roads within the vicinity of the site are approved routes. Tarago Road is generally specified as an approved route with travel conditions with some sections near Bungendore and Mount Fairy Road being unclassified.





Figure 1: TfNSW Restricted Access Vehicle Map

Source: TfNSW Restricted Vehicle Access Map

2.6 Crash History

Amber has conducted a review of the TfNSW Centre for Road Safety Crash and Casualty Statistics database for all injury crashes along the full length of Tarago Road. The crash database provides the location and severity of all injury and fatal crashes for the five-year period from 2015 to 2019. The crash search revealed the following crashes along Targo Road:

- 1 x fatal rear end crash;
- 1 x serious off the road to the right on left bend hitting object crash;
- 3 x moderate injury crashes, including:
 - 1 x off the road to the right on left bend hitting object crash;
 - 1 x off road to right crash; and
 - 1 x struck animal crash.



- 6 x minor/other injury crashes, including:
 - 2 x struck animal crash;
 - 1 x off road to the left on right bend hitting object;
 - 1 x off road to the right on right bend hitting object;
 - 1 x rear end crash; and
 - 1 x off road to the right hitting object crash.

The crash search indicates that there are no discernible crash trends within the surrounding road network. It is also noted that only 3 crashes were recorded in the past 3 years of data. As such, it is concluded that the road network is currently operating in a relatively safe manner.



3. Traffic Assessment

3.1 Traffic Generation

3.1.1 Construction Traffic

The solar farm construction is expected to take approximately 12-18 months, with the peak construction period expected to take 6-9 months. Construction activities would be undertaken during standard daytime construction hours, as follows:

- Monday to Friday: 7am 6pm
- Saturday: 8am 1pm

There may, however, be a need to work outside these hours due to, for example:

- To avoid disrupting traffic when delivering bulky equipment.
- To avoid taking outages of existing high voltage transmission lines during periods of high load.

Any construction outside of these normal working hours would only be undertaken with prior approval from relevant authorities. A maximum of 300 staff will be on-site during peak construction periods.

Construction traffic generated by the solar farm can broadly be separated into the following three categories:

- Light vehicles associated with transporting staff to/from the site;
- Medium and Heavy Rigid Trucks (MRV and HRV as defined within AS 2890.2:2018) will be used to deliver raw materials and smaller plant; and
- Articulated Vehicles (AV as defined within AS 2890.2:2018) and B-Doubles will be used to transport larger plant.

Restricted Access Vehicles / oversized and overmass (OSOM) vehicles will be required for the delivery of larger plant to the site, such as the substation transformer and earthwork machinery, and are subject to separate permit applications and regulations. The impacts of the OSOM vehicles are discussed within Section 4.1 with the following assessment focusing on the impacts of the light and heavy vehicles which generate the bulk of the traffic and represent the typical traffic impact of the project on a day-to-day basis.

The construction traffic volumes for the project have been provided by the Applicant. It is anticipated that during peak construction the site could generate up to 70 heavy and 100 light vehicle movements per day. Table 1 summarises the traffic movements generated during the construction period of the solar farm.

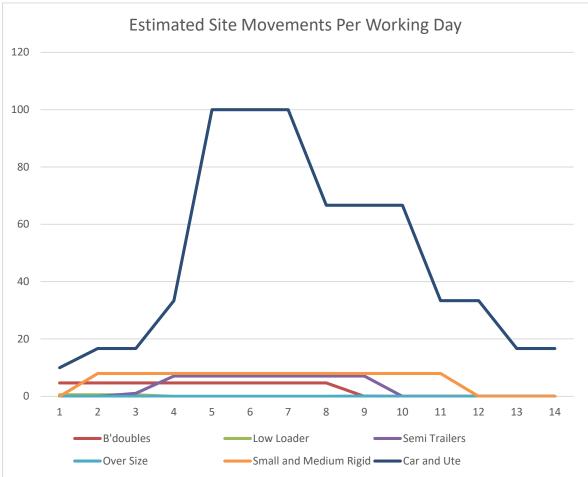


Vehicle Type		• Movements per ay	Peak Vehicle Movements per Day		
	Daily (vpd)	Peak Hour (vph)	Daily (vpd)	Peak Hour (vph)	
Light Vehicle (car / 4WD)	48	20	100	50	
MRV/HRV	6	1	40	4	
AV	4	1	20	2	
B-Double	4	1	10	1	
Total	62	23	170	57	

Table 2: Traffic Generation During Peak Construction Periods

The Applicant has provided a breakdown of the number of vehicle movements based on the construction month which is illustrated within Graph 2.

Graph 2: Expected Site Traffic Volumes



Accordingly, the site is expected to generate approximately 57 vehicle movements in the peak hour during peak construction periods.

3.1.2 Operational Traffic

During operation the solar farm is expected to generate a minimal level of traffic associated with maintenance and operation services. The solar farm is expected to generate up to 10 vehicle movements per day which would result in a negligible change to the traffic environment.

3.1.3 Decommissioning Traffic

At the end of the operational life of the project all above ground infrastructure will be dismantled and removed from the project site. Internal roads, if not required for ongoing farming purposes or fire access, would be removed and the site reinstated as close as possible to its original state.

Traffic generation during decommissioning would be similar to traffic generation during the average construction period. A comprehensive Construction Traffic Management Plan would be prepared prior to the decommissioning phase in conjunction with the relevant road authorities. This would aim to ensure adequate road safety and road network operations are maintained.

3.2 Traffic Distribution

Traffic accessing the site will do so via Tarago Road before entering the site via the Blind Creek Entrance. The following provides a breakdown of the access distribution for each of the vehicle classifications outlined within Table 1:

- Light Vehicles: It is anticipated that most staff will be local within Bungendore, with all staff travelling to/from the south.
- MRV/HRV: These vehicles will predominantly be water trucks and vehicles transporting materials such as concrete and fencing supplies which will be sourced within the surrounding area. The Applicant has advised that the majority of movements will be to/from the north.
- AV/B-Double: Plant will be transported via Sydney and will be to/from the north.

Accordingly, the majority of light vehicle movements are expected to access the site from the south and the majority of heavy vehicles are expected to access the site from the north.

The peak hour for the solar farm will occur at the start and end of the day when staff are transported to/from the site. During the morning peak all vehicle movements will be towards the site and in the evening peak all vehicle movements will be away from the site. Heavy vehicle movements will be distributed throughout the day and will be split evenly between inbound and outbound movements.

3.3 Traffic Assessment

Tarago Road is currently estimated to be carrying in the order of 53 and 71 vehicles per hour in the morning and evening peak hours respectively. During peak construction the traffic volumes would increase to approximately 110 and 128 vehicles movements per hour. These traffic volumes can be readily accommodated on the road network and Tarago Road is expected to continue to operate with a good level of service based on the Level of Service classification outlined within the *RTA Guide to Traffic Generating Developments*.



The existing access to the site (Blind Creek Entrance) is currently utilised by a small sand quarry. The Applicant has advised that the quarry currently generates a low level of traffic which includes approximately 2 vehicle movements in each of the peak hours. As such, the intersection of the access with Tarago Road is expected to operate with a good level of service.

An assessment has not been undertaken for the Blind Creek Entrance or the section of Currandooley Road that are located within private land as they are not within the scope of this assessment.

Accordingly, it is concluded that the road network is able to accommodate the traffic generated by the solar farm during the construction period.

3.4 Cumulative Impacts

Existing approval has been granted by the NSW State Government for the 50MW Capital Solar Farm (App. No. MP10_0121) ("Capital Solar"), on land neighbouring the Blind Creek project site. If viable development approval is gained for the 400MW AC capacity BCSF, there is no intention to build Capital Solar. There is also a legacy planning approval from DPIE for nine turbines on the project site as part of Capital Wind Farm 2 (App. No. MP10_0135). Since approval, both technology and market conditions have changed such that the currently approved turbines are no longer considered a commercially viable prospect. A modification of the existing approval for those turbines would be required before they could be developed. As such consideration of those turbines does not form part of the consideration of the BCSF cumulative assessment.

A search has been undertaken of the NSW Government Major Projects website to conduct a review of the potential cumulative traffic impacts of surrounding projects. The review suggests there are no other major projects that would generate a significant level of traffic within Bungendore that would interact with construction traffic. Whilst there are a number of renewable projects in the area it is likely that staff for these projects would be located within other nearby towns.

It is noted that the other nearby renewable projects may generate heavy vehicle movements on the wider road network. However, the number of vehicle movements on Tarago Road where the majority of the site traffic will be concentrated is expected to be minimal. Accordingly, the cumulative traffic impact of nearby projects is expected to be minimal.



4. Route Assessment

Sydney has been identified as the location where the solar farm plant will be imported. The proposed construction traffic access route from Sydney to the site is proposed to be via Hume Highway, Braidwood Road, Bungendore Road and Tarago Road. The State roads are designated for B-Double vehicles as outlined within the TfNSW Restricted Access Vehicle Map provided within Figure 2. Accordingly, the access route is able to accommodate the loads and type of vehicle movement to be generated during construction of the solar farm.

It is also noted that some oversize and overmass vehicles will be required to deliver larger plant to the site such as the sub-station transformer and earthmoving equipment. The vehicles are subject to specific road permits that will be applied for by the contractor once the dimensions of the load and the specific delivery vehicle are known.



5. Intersection Assessment

5.1 Turn Treatments

Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings specifies the turning treatments required at intersections. Figure 2.26 of the guide specifies the required turn treatments on the major road at unsignalised intersections, and is provided below in Figure 3 for a design speed of greater than or equal to 100km/hr.

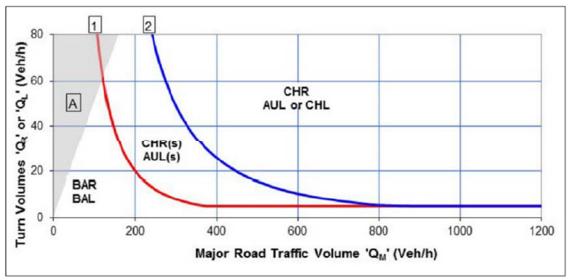


Figure 2: Figure 2.26 of Austroads Guide to Traffic Management Part 6

The peak hour turning volumes will predominantly be generated by staff accessing the site in the morning which occurs from 6:00am to 7:00am. Table 3 identifies the required turning treatments based on the expected traffic volumes at the intersection.

Turning Treatment	Traffic Vo	Deminent	
Turning Treatment	Turn Volume	Major Road	Requirement
Right Turn	7	53	BAR
Left Turn	50	6	BAL

Table 3: Turning Volumes for Turn Treatment Calculations

The intersection is already provided with Basic Right Turn (BAR) associated with the existing quarry but is not provided with a Basic Left Turn (BAL) treatment. The existing intersection design is provided within Appendix A.

A design for the intersection has been prepared in accordance with *Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* for a Basic Left Turn facility. The design is provided within Appendix B and has been prepared based on the largest vehicle to access the site which is a B-Double. The turn treatment has been designed based on the following assumptions:

- Design speed of 110km/hr
- Lane width of 3.0 metres
- Formation/carriageway widening is 3.0 metres

- Taper lengths calculate to 46 metres
- Minimum length of parallel widened shoulder used from Table 8.1 is 35 metres

A swept path assessment has been undertaken for the intersection to confirm B-Doubles are able to suitably access and egress the Blind Creek Entrance. The assessment has been prepared using the AutoTrack vehicle tracking software and is presented within Appendix B. The assessment demonstrates that additional widening is required in the north-eastern corner of the intersection to allow B-Doubles to exit the site to the north.

Therefore, the turn facilities meet the requirements of the Austroads Guideline subject to the proposed intersection upgrades. Accordingly, the intersection of Tarago Road and the Blind Creek Entrance is expected to be able to accommodate the traffic generated by the solar farm in a safe manner.

5.2 OSOM Vehicle Access

A swept path assessment has been prepared for the site access based on the largest transport vehicle expected to access the site. The vehicle has been determined based on the expected weight and dimensions of the transformer however, the actual vehicle utilised for transport of the component may vary at the time of construction. The swept path assessment is provided within Appendix C and shows that the vehicle is able to enter and exit the site in a suitable manner. The vehicle will be required to utilise the full width of Tarago Road which can be managed with traffic management measures that will determined at the time of seeking the permit for the transport of the transformer.

5.3 Sight Distance

Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections specifies the Safe Intersection Sight Distance (SISD) as the minimum sight distance which should be provided along the major road at any intersection. Table 3.1 of the guide specifies the SISD required for various design speeds. Given Tarago Road has a speed limit of 100km/hr, a design speed of 110km/hr has been adopted, which requires a SISD of 285 metres. The available sight distance at the intersection greatly exceeds the Austroads requirements.



6. Construction Management Plan

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

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

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

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

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



7. Conclusion

Amber has assessed the traffic impacts of the 400MW solar farm located approximately 8km north of Bungendore. Access to the site will be provided via an existing private access from Tarago Road which currently services a small sand quarry. Staff will primarily be located in Bungendore with all plant expected to be delivered from Sydney. The above assessment determined the following:

- The site will generate up to 170 vehicle movements per day during peak construction times, including 70 truck movements;
- The road network is able to accommodate the traffic generated by the development during the construction, operation and decommissioning stages. Further, the cumulative impact of the site traffic with nearby developments is expected to be minimal;
- The site access is proposed to be upgraded to accommodate a BAL treatment and has been designed to accommodate B-Double vehicles;
- The proposed construction traffic access route from Sydney to the site is proposed to be via Hume Highway, Braidwood Road, Bungendore Road and Tarago Road. The State roads are designated for B-Double vehicles and as such, the access route is able to accommodate the loads and type of vehicle movement to be generated during construction of the solar farm.
- It is also noted that some oversize and overmass vehicles will be required to deliver larger plant to the site such as the sub-station transformer and earthmoving equipment. The vehicles are subject to specific road permits that will be applied for by the contractor once the dimensions of the load and the specific delivery vehicle are known; and
- In order to mitigate the impacts of the development during construction a CTMP will be prepared which should include the recommendations provided within this document.

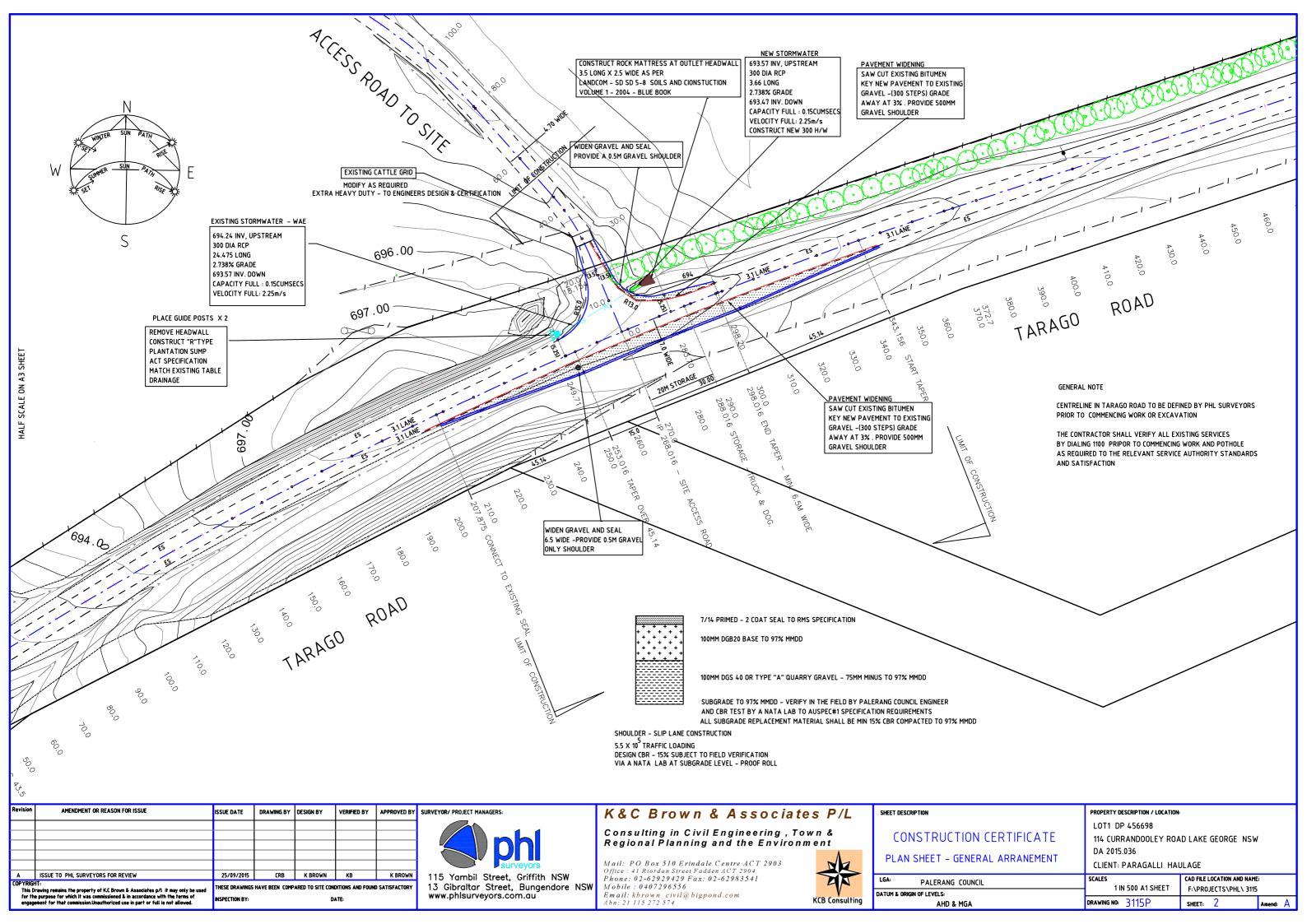
Accordingly, based on the assessment above, it is concluded that the proposed access arrangements for the solar farm are suitable to accommodate the expected construction vehicle types and traffic volumes during the construction, operation and decommissioning phase of the project.

Amber Organisation

Appendix A

Existing Intersection Design

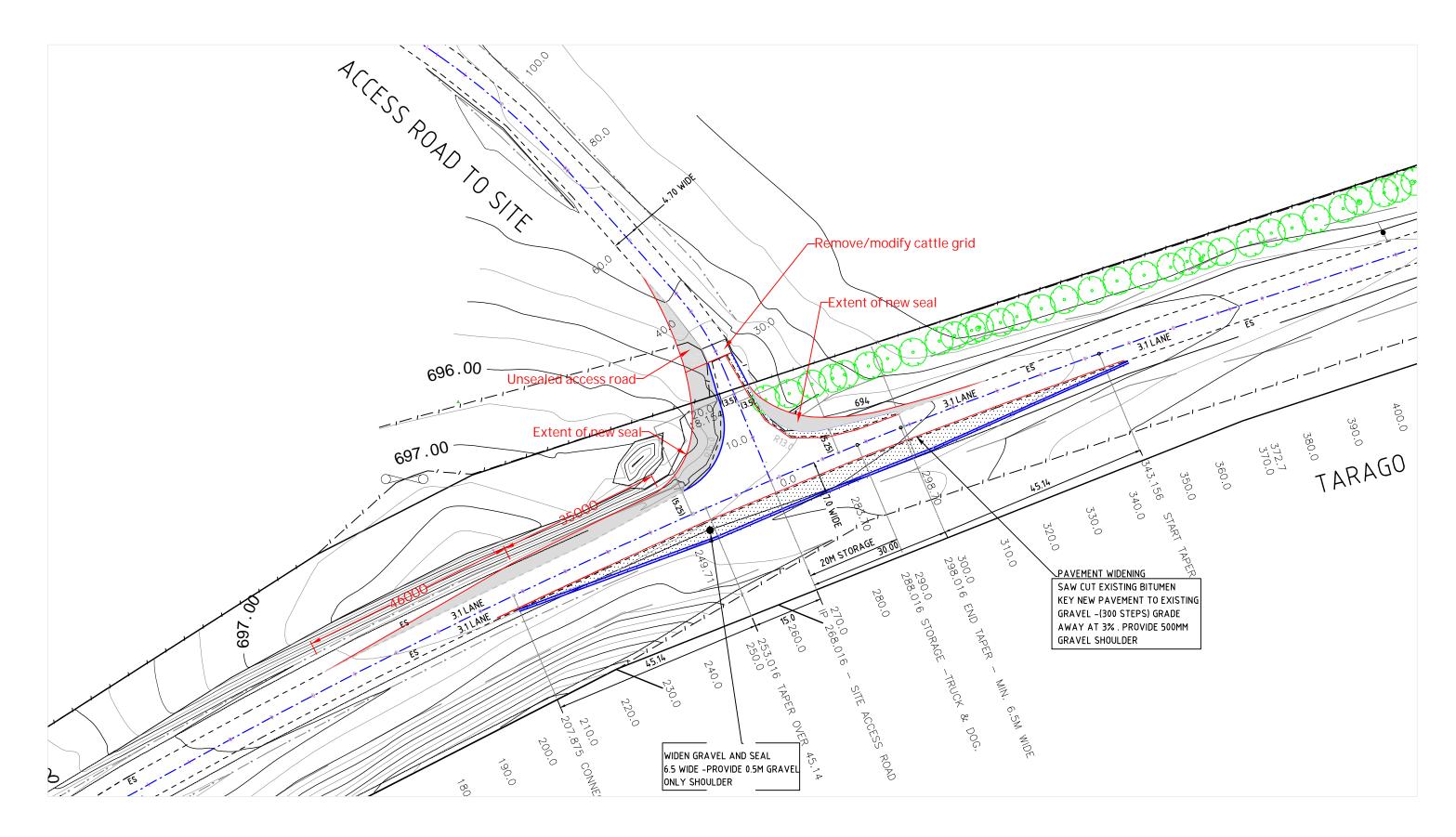




Appendix B

Proposed Intersection Design

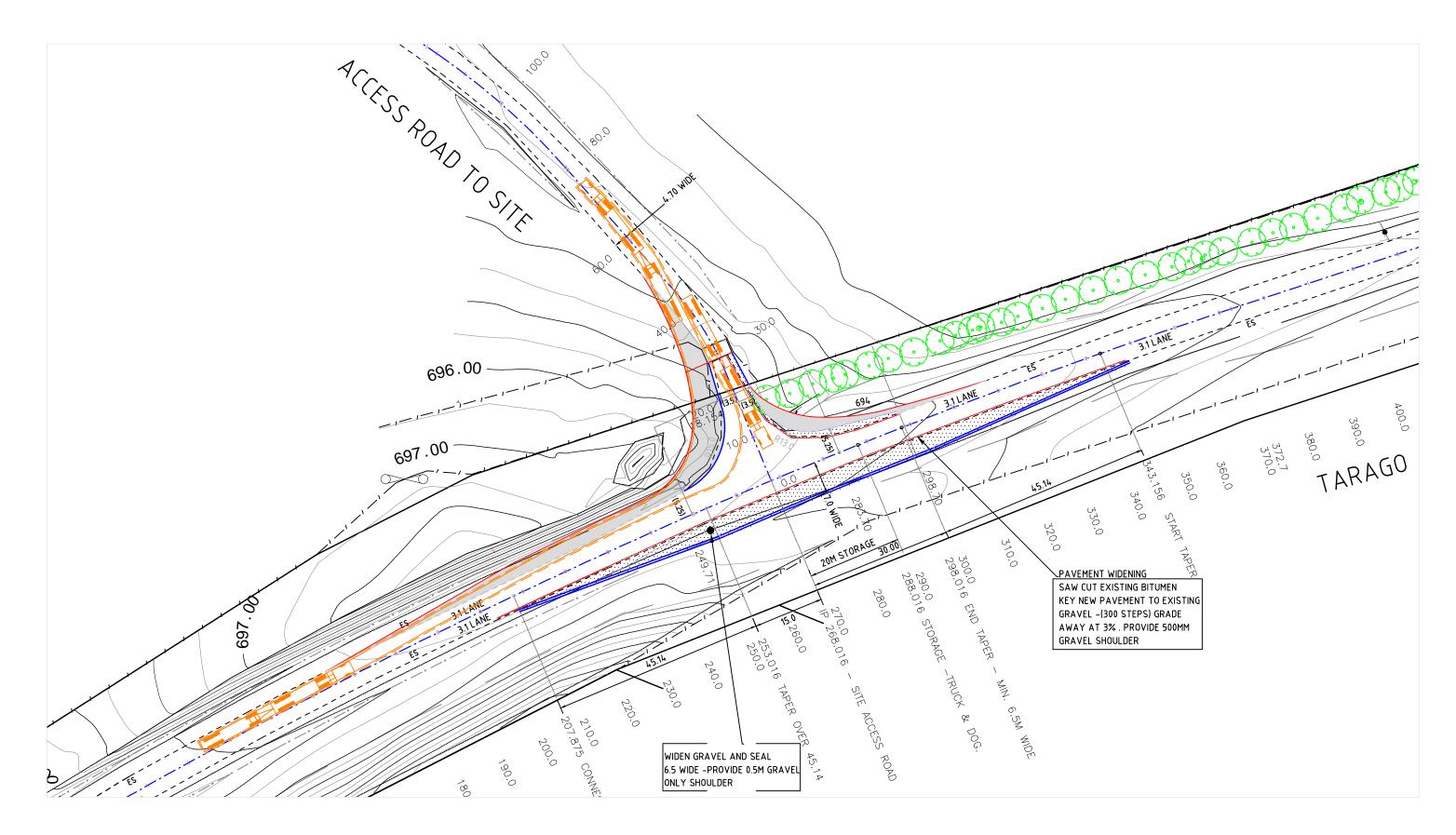


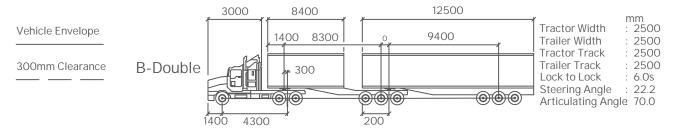


Blind Creek

Solar Farm Intersection Design

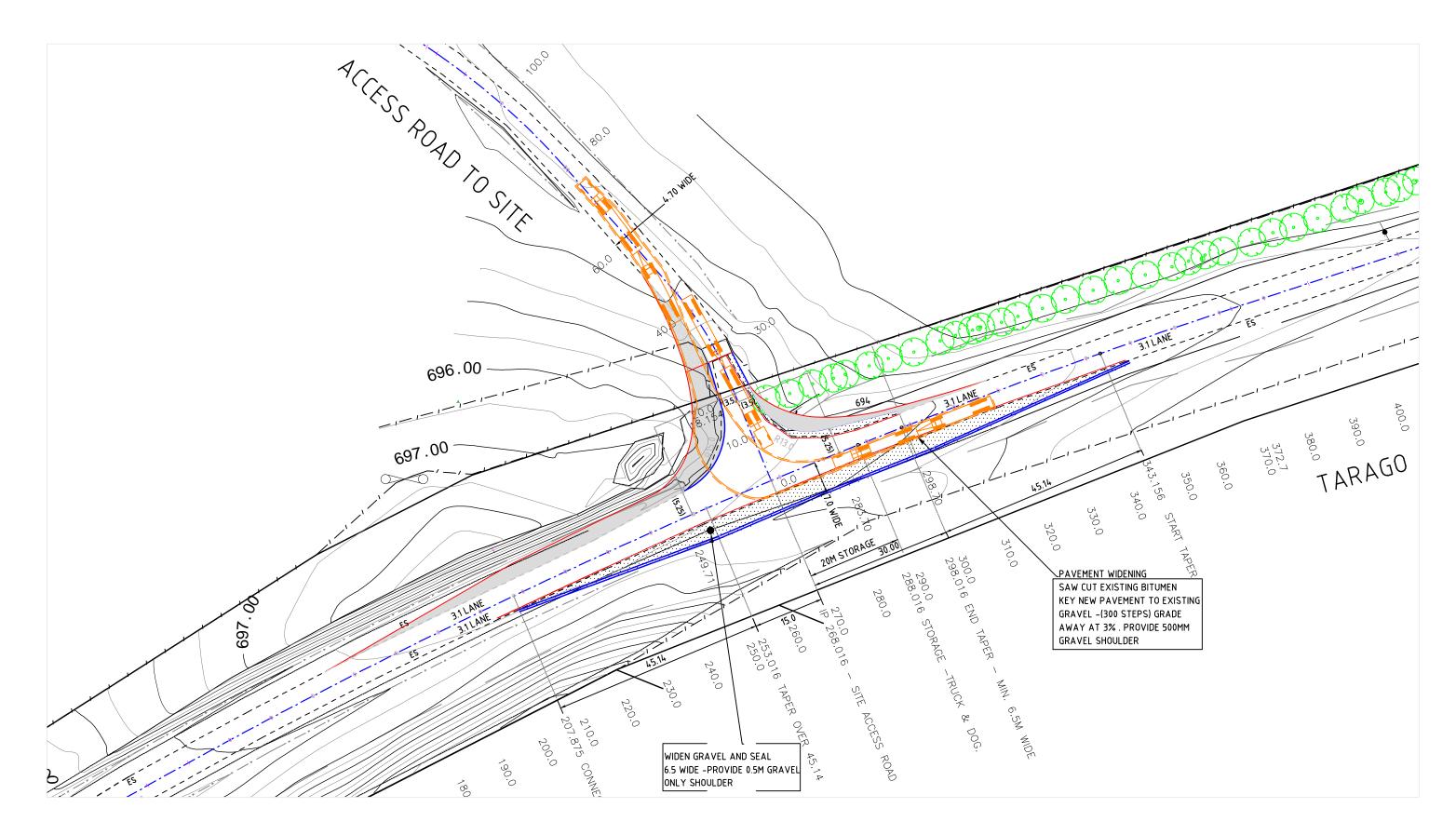


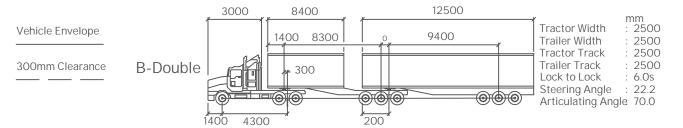






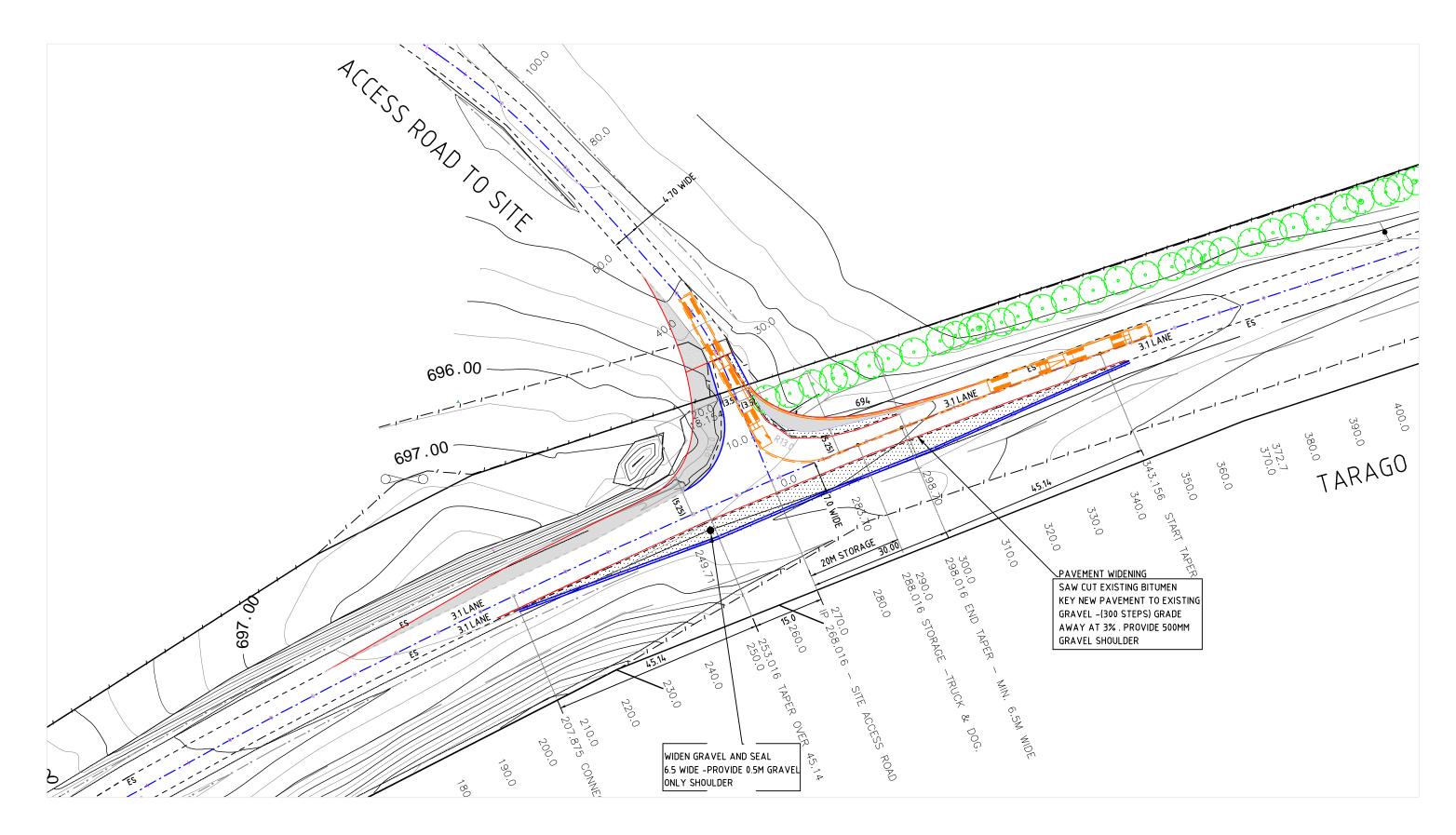


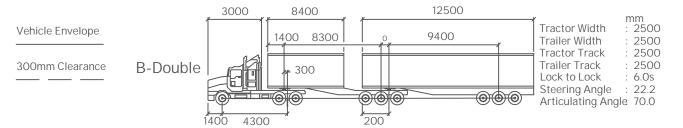












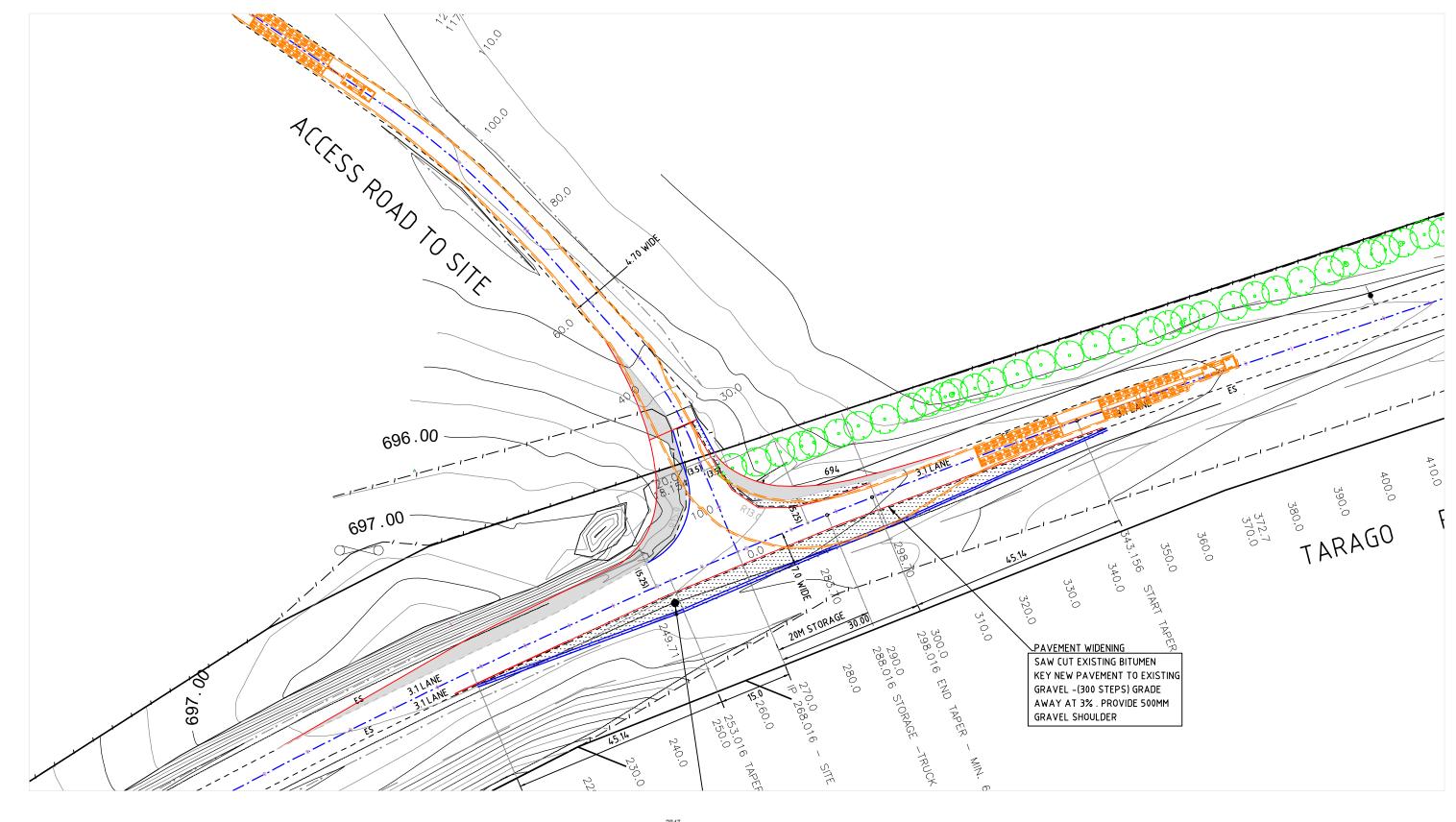


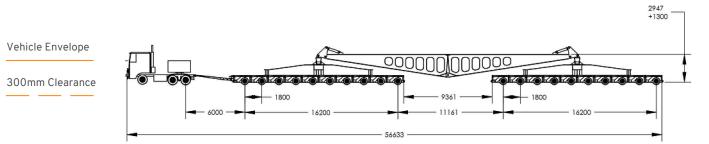


Appendix C

OSOM Swept Path Assessment



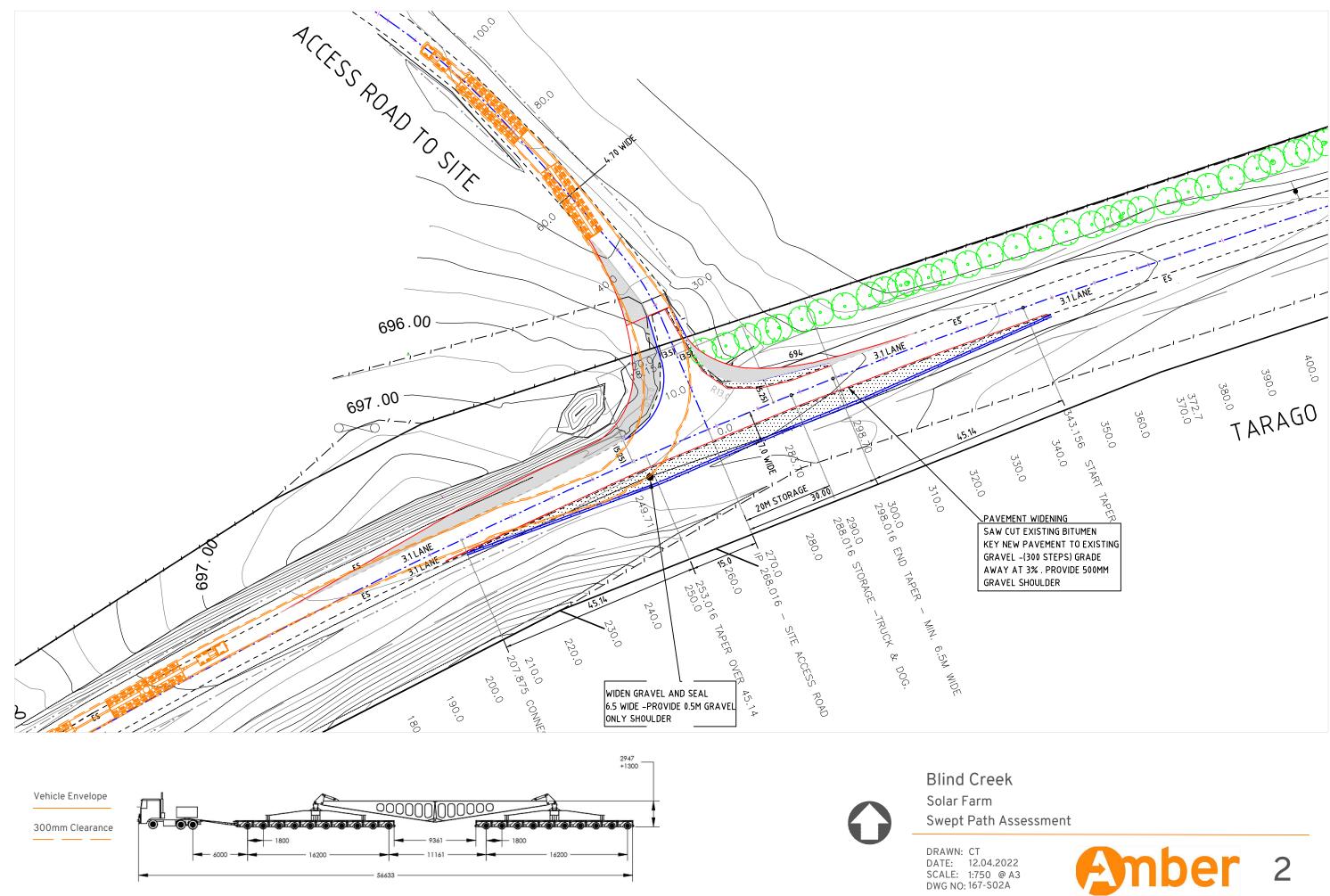


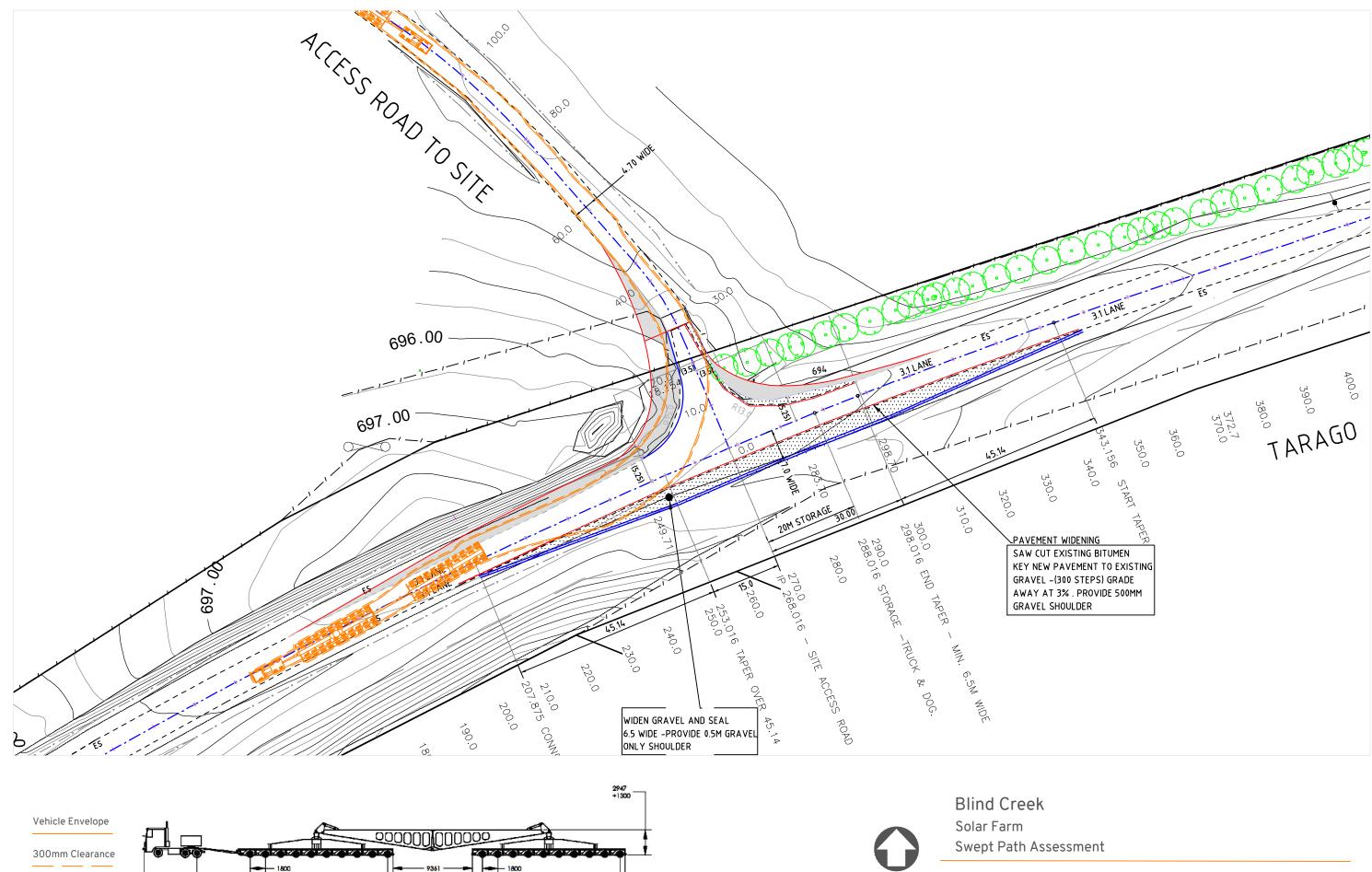




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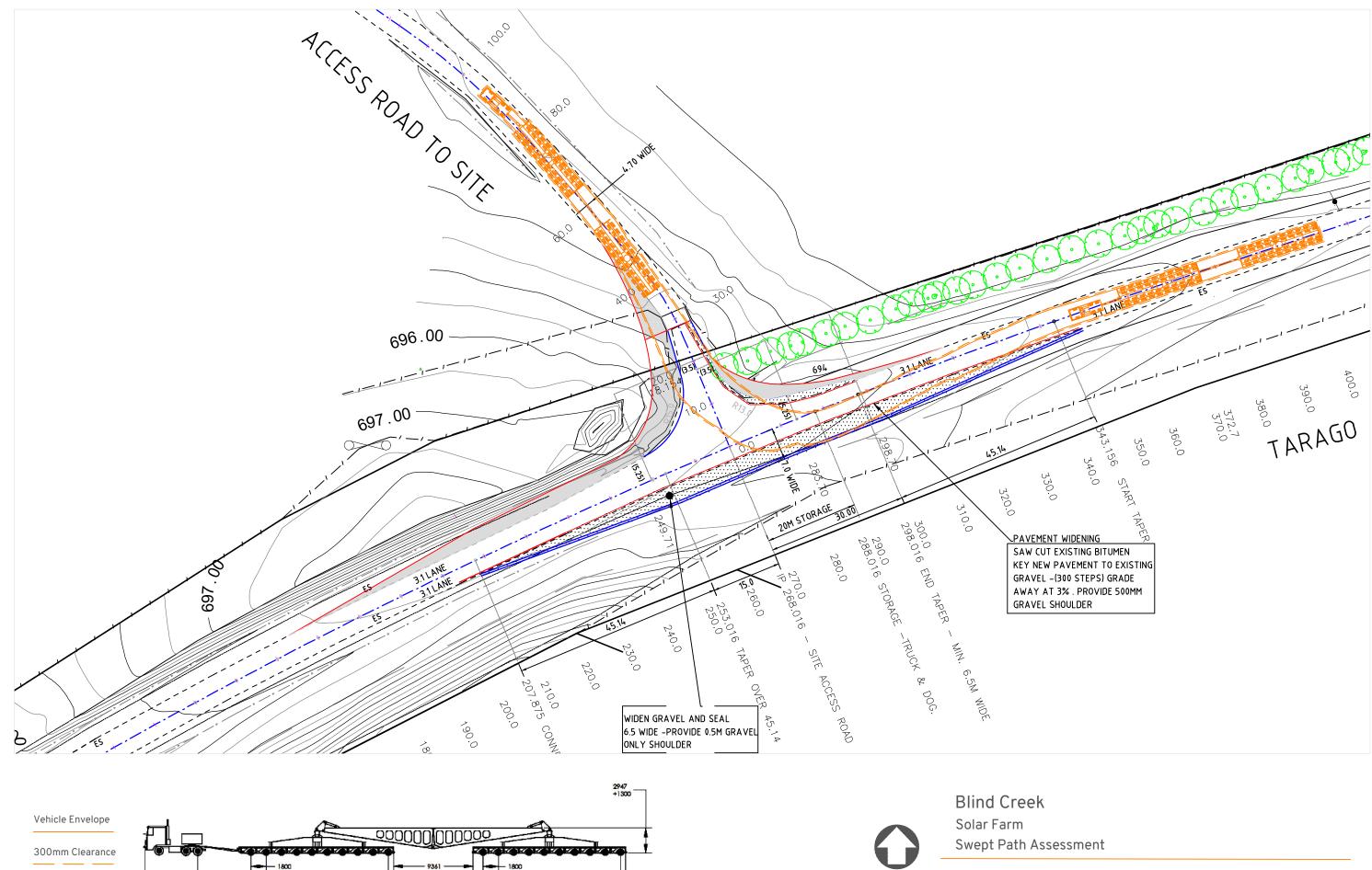




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