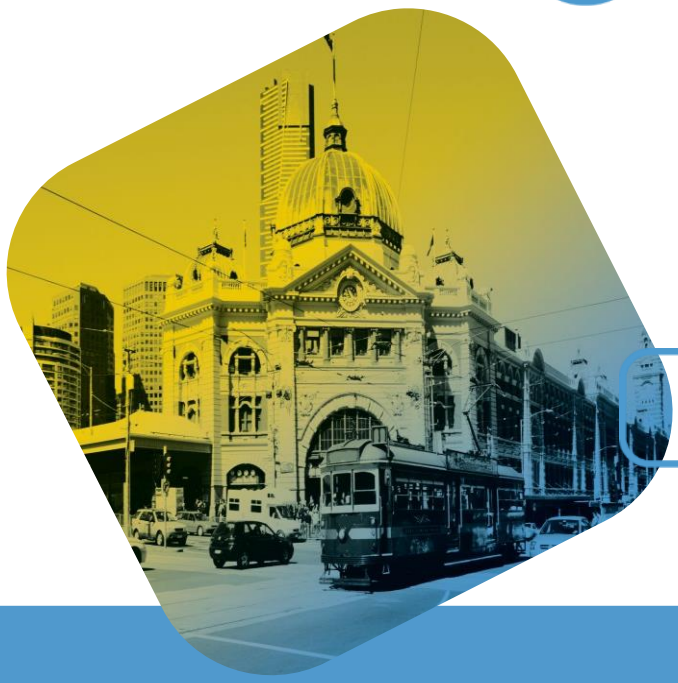
36°55'42.3"S
145°10'53.2"E

Mangalore Solar Farm: Station Road, Mangalore



Traffic and Transport Assessment

17 February 2021
Prepared for Tetris Energy

IMP200915REP01F01

Impact

Company Information

Impact Traffic Engineering Pty Ltd

Level 17, 31 Queen Street, Melbourne, Victoria, 3000

ABN: 78 611 424 107

Email create@impactaustralia.com.au

Website www.impactaustralia.com.au

Document Information

Client	Tetris Energy
Report Title	Mangalore Solar Farm: Station Road, Mangalore
Report Reference	IMP200915REP01F01
Date of Issue	27 November 2020
Approved By	Will Drew

Document Control

Version	Date	Author
FINAL 02	27 November 2020	Henry Ma
FINAL 01	27 November 2020	Henry Ma

Contents

Tables

Figures

Appendices

1 IMPACT® Snap Shot

Development Proposition		
Location	36°55'42.3"S 145°10'53.2"E	Station Road, Mangalore
Use	Solar Farm Facility - 4.60 MW capacity	
Access	Primary access to the subject site will be undertaken from Station Road.	

Traffic Considerations

Traffic Generation	
Construction Traffic	Up to 26 additional daily vehicle movements are expected during peak construction activities (8 heavy vehicles & 18 light vehicles)
Operation	Up to four (4) movements per week are expected with routine maintenance during operations. There will also be, on occasion some additional movements associated with more thorough maintenance. This level of construction traffic will not have any material impact on the operation of the external road network.
Traffic Impact	To ensure the physical impact on the external local road network is appropriately managed, we recommend, that the applicant enter into an agreement with the Shire of Strathbogie to ensure appropriate repair and maintenance during the construction period.
Design Considerations	
Access Design	We are advised that the proposal seeks to create a new access point to Station Road. We are advised that components will be delivered to the site by vehicles up to 19 metres in length (Semi-trailers). Swept paths show the additional pavement required at the site access to cater for these vehicles.
Sight Distances	A desktop assessment shows that there is sufficient sight distance from the site access in accordance with relevant Austroads guidelines. It is recommended that a physical sight distance assessment be undertaken prior to construction, and trees be trimmed.
Turn Treatments	Given the low traffic volumes, combined with the relatively short construction period, it is considered appropriate to utilise the road shoulders for vehicles to pass if required in place of a more formal BAR treatment at the site access. Temporary advance warning signs can be put in place to mitigate risks during the construction period.

Recommendations	
Maintenance Plan	As above, we recommend that a repair and maintenance agreement be put in place to ensure any damage to the external road network caused by construction traffic is mitigated and managed appropriately.
Traffic Management Plan	It is recommended that a detail Traffic Management Plan (TMP) be prepared once the project design is complete and prior to commencement of the project construction, to confirm requirements for mitigation and management works.

Conclusion

— There are no traffic and transport grounds that should prohibit the issue of a permit.

2 Introduction

2.1 Engagement

Tetris Energy are currently looking to develop a number of small solar farm sites in rural Victoria.

IMPACT® have been engaged by Energy Forms on behalf of Tetris Energy to undertake a Traffic and Transport Impact Assessment for the proposed Solar Farm development on the eastern side of Station Road in Mangalore Victoria.

2.2 Scope of Engagement

This Traffic and Transport Impact Assessment has been prepared to accompany a town planning submission for the proposed Solar Farm Site 3 at 101 Coombes Road, Mangalore (Strathbogie Shire).

3 Mangalore Solar Farm

3.1 Location

The subject site is located on the eastern side of Station Road in Mangalore as illustrated in Figure 1.

Figure 1 Location of Subject Site

The site is primarily surrounded by farmland (to the west, north and east) with some nearby dwellings located to the south.

3.2 Site Context

The site is located approximately 5km southwest of Avenel.

The site is currently vacant farmland which has primarily been used in the past for farming / grazing purposes; the surrounding land in the area is also typically farmland.

Most notably, an existing level crossing is located approximately 500m south-west of the subject site. Mangalore Airport is located approximately 4km from the site.

Currently, there is an existing transmission line located on the south-eastern end of Seymour-Avenel Road.

3.3 Planning Zone

The subject site is located within the Farming Zone (as outlined in the Strathbogie Planning Scheme) and is illustrated in Figure 2.

No specific overlays relevant to Traffic and Transport apply to the subject site.

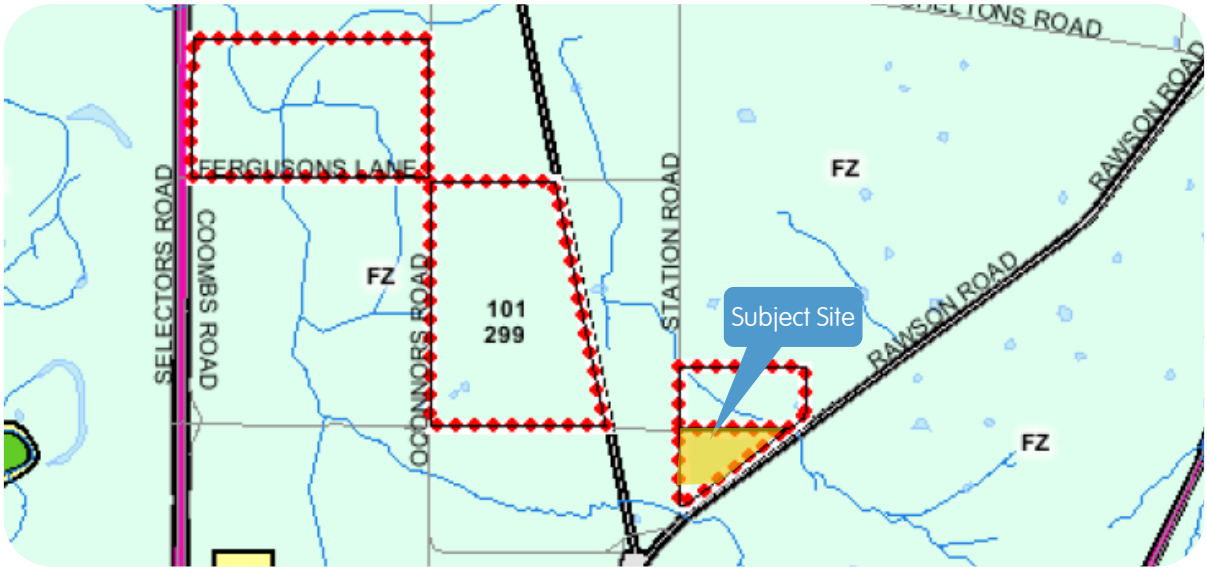


Figure 2 Land Use Planning Zone

3.3.1 Planning Framework

3.3.1.1 Clause 53.13 - Renewable Energy Facility

Clause 53.13 of the Victorian Planning Provisions outlines the relevant application requirements associated with the development of renewable energy facilities such as the proposed. Relevant to traffic and access matters, considerations under Clause 53.13 include:

- A design response, including a written report and assessment which addresses:
  - The effect of traffic to be generated on roads.
- The responsible authority must also consider, as appropriate:
  - Whether the proposal will require traffic management measures

3.4 Road Network

3.4.1 Station Road

Classified as a local road, Station Road extends in a general north-south direction for approximately 3.6 km between O'conners Road to the south and Aerodrome Road to the north.

A review of the aerial imagery shows that in proximity to the subject site, Station Road has been constructed as an unsealed gravel road with approximately 6.0 metres of trafficable width with 1.0 metre shoulders on each side of the carriageway. With no posted speed limit, the default rural limit of 100 km/hr applies to this road.

Traffic count data provided by the Shire of Strathbogie suggest that Station Road carries up to 60 vehicles per day (based on 2016 counts). A general rule of thumb is that peak period traffic generally represents 10% of the total daily movements or 6 peak movements in this instance.

A view of Station Road near the site is shown in Figure 3.

Figure 3 Views of Station Road facing north adjacent the subject site (Source: Google Street View)

3.4.2 Gerrards Road

Gerrards Road is a local road which extends in a general east-west direction between Goulburn Valley Freeway to the west and Station Road to the east.

In proximity to the subject site, Gerrards Road has been constructed as an unsealed gravel road with approximately 4.0 metres in trafficable width.

3.4.3 O'Connors Road

O'Connors Road is a local road which extends in a general east-west direction between Magpie Lane to the west and Station Road to the east.

In proximity to the subject site, O'Connors has been constructed as a sealed road with approximately 4.0 metres in trafficable width with 1.5m unsealed gravel shoulders.

O'Connors Road currently carries up to 70 vehicles per day according to traffic data collected by the Shire of Strathbogie.

3.4.4 Seymour-Avenue Road

Seymour-Avenue Road is a local road that extends in a general north-south direction between Goulburn Valley Highway to the south and terminates at north-east at Henry Street / Lambing Gully Road intersection towards the north-east.

In proximity to the subject site, Seymour-Avenue Road has been constructed with a sealed road in the order of 7m (allowing for 3.5 metre trafficable lane in each direction) plus unsealed shoulders measuring approximately 2.0 metres on each side of the carriageway.

Seymour-Avenue Road carries up to 1,140 vehicles per day according to traffic data collected by the Shire of Strathbogie in 2014.

3.5 VicRoads Road Network Limits

The VicRoads pre-approved B-Double and High Performance Freight Vehicle (HPFV) network in the locality of the development are reproduced in Figure 4 and Figure 5.

These network diagrams are typically read as follows:

- Green Roads - pre-approved for haulage and typically a permit is not required
- Orange Roads - conditionally approved, haulage along these roads are subject to conditions
- Red Roads - restrict access, an assessment and permit is required for haulage along these sections
- Unhighlighted Roads - require an assessment and approval from the responsible authority.

Figure 4 VicRoads Pre-Approved B-Double Haulage Network Map

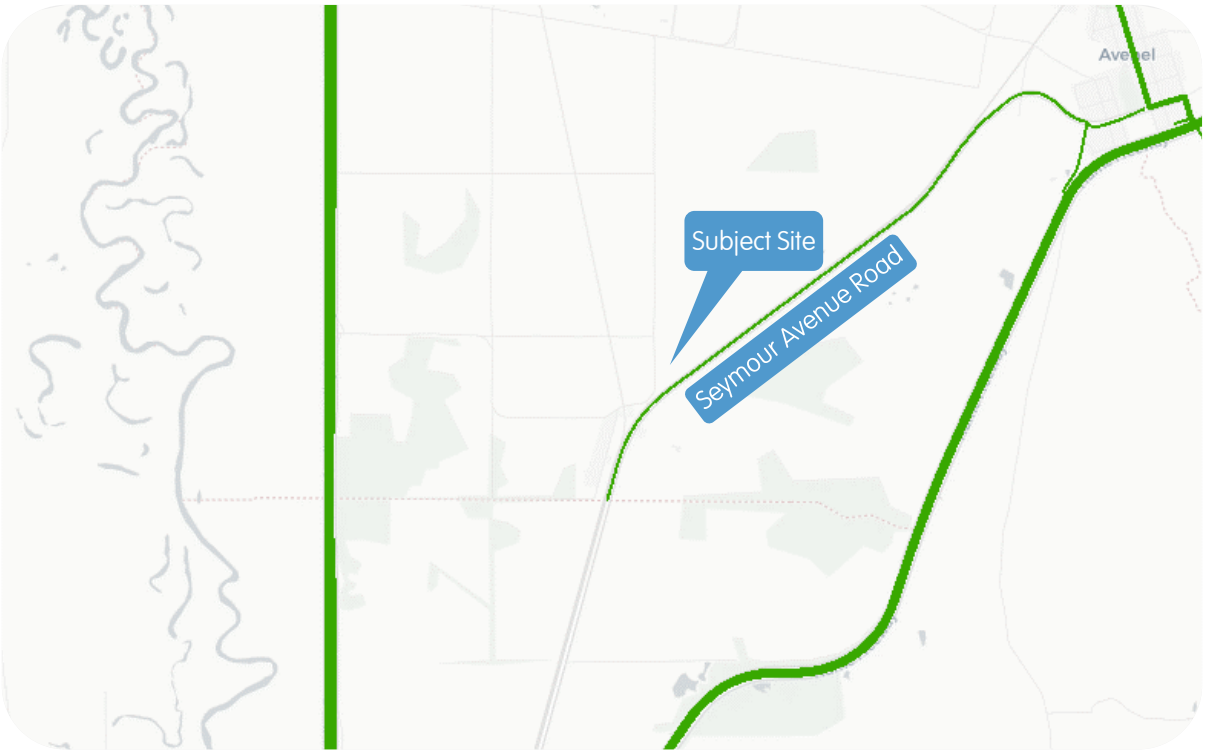


Figure 5 VicRoads Pre-Approved Higher Mass Limits (HML) Network Map

As per above, the green lines represent roads which are pre-approved for haulage and typically a permit is not required for haulage on these roads.

As shown above, Seymour Avenue Road is pre-approved for haulage of both standard B-Double and HPFV vehicles (Super B-Doubles). As noted, the above-mentioned road is approved for standard B-Double's and as such is deemed to be suitable for the haulage of 19m Semi-trailers.

It is noted that O'Connors Road and Station road are not pre-approved and accordingly, a permit will be required from the relevant authority (Council) for the haulage of freight movements along these routes.

3.6 Mangalore Solar Farm

IMPACT® have been advised that the project will consist of a solar energy facility comprising approximately of 18,508 solar panels (modules) and a capacity to generate up to 4.95 MW.

It is expected that the site will connect directly into the existing power line located along the southern boundary of the subject land.

A detailed car park / access design has not yet been determined, however **IMPACT**® are advised that:

- Access to the site will be provided via a new crossover / accessway located approximately 80m south of Gerrards Road. The site access point will be built to accommodate construction vehicle traffic, including 19 metre Semi-trailers;
- During construction, vehicles will be stored on-site either within the designated laydown / storage locations, or where construction activities are occurring; and
- During operations, operational, and maintenance staff vehicles will be accommodated on-site within a vehicle parking area located adjacent to the site office.

The current indicative site layout is shown in Figure 6 in addition to the copy of this plan attached in Appendix A.

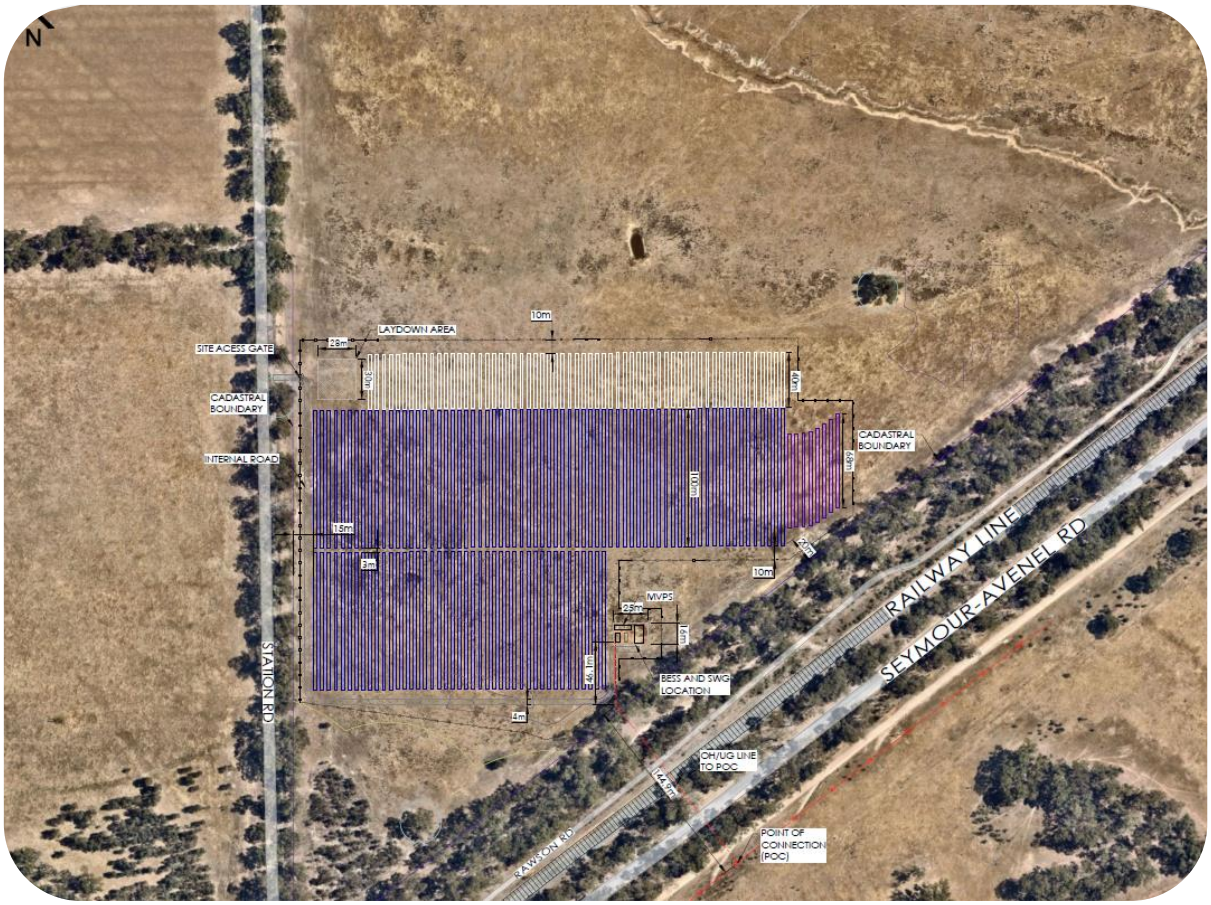


Figure 6 Indicative Site Layout

4 Traffic Considerations

4.1 General

The Solar Farm access road network will typically limit internal construction traffic to internal access roads, with only deliveries and staff movements to and from the site required to travel across the external road network.

External traffic generated by the subject site will generally be split into two broad categories:

- General traffic generated by staff & couriers travelling to/from the subject site;
- Other heavy vehicle movements (HV) which are used for the delivery of solar panel components and construction materials such as aggregate and water; and

4.2 Traffic Generation

4.2.1 Construction Traffic Volumes

Construction is expected to take approximately six (6) months to complete. The vehicle movements (as outlined in the following sections) are expected to be generated by the subject site during the construction period.

Staff Vehicle Movements

During the construction period most staff are expected to reside in Seymour, located approximately 10km from the subject site.

Staff will be bussed to / from the site with a maximum occupancy mini-bus of 20 members per bus. It is anticipated that a workforce of 80 staff will be required during the peak construction months and thus is expected to generate an additional eight (8) vehicle movements during the day, split evenly between the drop-off and pick-up times.

It is also assumed that five (5) additional movements will be prioritised for managerial staff, thus equating to ten (10) vehicle movements per day.

Heavy vehicle traffic to / from the subject site will typically be distributed between various categories, including: aggregate deliveries, solar farm components and other construction materials / machinery.

A summary of the anticipated traffic vehicle volumes is shown in Table 1. These volumes represent one-way traffic movements only, with an equal number of unloaded outbound movements also expected.

A full list of the assumptions / calculations made to determine these volumes is provided in Appendix B.

Table 1 Estimated Average One-Way Construction Traffic (Daily)

Type of Movement						
Construction Month	1	2	3	4	5	6
Staff Movements (LV)	9	9	9	9	9	9
HV Deliveries						
Aggregate Deliveries	0.3	0.4	0.4	0.4	0.4	0.4
SF Component Deliveries	0.3	0.2	0.4	0.3	0.6	0.2
Other Construction Vehicles	0.5	-	-	-	-	-
Water for Dust Suppression	2	2	2	2	2	2
HV Subtotal	3.1	2.6	2.8	2.7	3.0	2.6

4.2.2 Operation and Maintenance Traffic Volumes

For majority of the time, solar farms operate with limited staff and generate minimal traffic movements.

Accordingly, apart from the initial construction phase, the proposal is anticipated to have a negligible impact upon traffic on the load road network. Details of likely traffic generation during the operation are estimated as follows:

- Weekly route operations and maintenance carried out by up to five people. It is assumed that traffic generation will not exceed ten (10) vehicle movements per week to the local road network, with all other movements being internal to the site.
- Occasional maintenance will occur when components of the development need to be replaced, such as replacing solar panels/reflectors, or thermal heat/cooling components. This is expected to occur occasionally and will have no discernible impact on the external road network.
- Visitors to the site such as office-based staff and courier deliveries etc.

In the context of construction traffic and also the existing traffic along Station Road, operating traffic will be minimal.

4.3 Vehicle Access Routes

Vehicle deliveries will be split between various categories. The following sections outlines the anticipated vehicle routes for various types of delivery / construction vehicles.

4.3.1 Course Aggregate and Fine Crushed Gravel Deliveries

We understand that both coarse and fine gravel for the construction of hardstand areas and access tracks will be sourced locally.

It is expected that aggregates will be sourced from the Seymour area and thus will leverage **Goulburn Valley Freeway - Hume Freeway - Lambing Gully Road - Seymour-Avenue Road - O'Connors Road - Station Road** to access the site.

4.3.2 Water Deliveries

We understand that water deliveries required during construction and for dust suppression will be sourced locally, either from Seymour or the land owner. The following route will be leveraged for water deliveries from Seymour:

Goulburn Valley Freeway - Hume Freeway - Lambing Gully Road - Seymour-Avenue Road - O'Connors Road - Station Road

4.3.3 Solar Modules / Thermal Energy Components

IMPACT® are advised that due to the specialised nature of these components, these materials are sourced overseas or specially manufactured.

Materials will likely be imported to Melbourne and then transported to the site by road. The anticipated route from Melbourne is as follows:

Melbourne - CityLink - Western Ring Road (M80) - Hume Freeway - Goulburn Valley Freeway - Hume Freeway - Lambing Gully Road - Seymour-Avenue Road - O'Connors Road - Station Road

4.3.4 Construction Staff

During the delivery of the project, it is expected that staff will typically reside in Seymour. Accordingly, the majority of staff vehicle movements (bus and light vehicles) will arrive at the site via:

Seymour-Avenue Road - O'Connors Road - Station Road

Figure 7 provides a visual representation of the various delivery types and associated access routes (for the local area).

Figure 7 Proposed Vehicle Access Routes (local area)

4.4 Traffic Impact

4.4.1 Vehicle Access Routes

As highlighted in Section 3.5, Station Road is not pre-approved for the haulage of any higher mass limit vehicles. Accordingly, a permit will be required from Strathbogie Shire Council and NHVR for the use of this road for the haulage of any delivery vehicles during the delivery of this project.

The remainder of the haulage route will be contained within pre-approved roads, and thus will not require any specific permit for the haulage of these vehicles.

4.4.2 Road Capacity

The proposed development is projected to generate up to 26 additional movements (4 one-way heavy vehicle movements, 4 one-way mini-bus movements and 5 one-way light-vehicle movements) per day during peak construction activities (months 4-5).

This volume of traffic is not expected to have any material impact on the operation of these roads.

Station Road

Station Road is a classified as an unsealed local road.

Typically, unsealed roads are designed to cater up to 150 vehicles on a daily basis (based on the values outlined in the Infrastructure Design Manual (IDM)).

As discussed in Section 3.4.1, Station Road would likely carry in the order of 60 daily vehicle movements under the existing conditions.

Accordingly, during the peak construction stages of the project, this road can be expected to carry up to 86 daily vehicle movements. This level of traffic sits comfortably within the acceptable range for this classification of road.

As described above, Station Road is not preapproved for the haulage of higher mass delivery vehicles such as 19m Semi-trailers. Accordingly, it can be expected that the road pavement along Station Road has not been designed to cater for 19m Semi-vehicle access.

Noting the forgoing, we expected that the increase in movements, particularly heavy vehicle movements could cause the road to deteriorate. As part of the permit process for haulage of construction vehicles, **we recommend** that at a minimum, the proponent enter into an agreement with Council to ensure the ongoing maintenance and repair of Station Road is undertaken during construction.

Notwithstanding this, it is recommended that construction activity be limited to dry weather conditions/periods only however if Station Road is to be used within the wetter months of the year then the unsealed section should be updated to an "all weather" road.

Post construction, traffic volumes will revert to existing conditions with an additional 10 trips per week (associated with operational traffic for the solar farm). This level of traffic sits comfortably within the environmental capacity of the road and is not expected to require any significant ongoing maintenance outside the Council's standard maintenance schedule.

O'Connors Road

O'Connors Road is classified as a sealed rural collector road.

A Sealed rural access road (4 metre seal) is indicatively designed to cater for in the order of 50-150 vehicles on a daily basis (based on the Infrastructure Design Manual IDM guidelines).

As discussed in Section 3.4.3. O'Connors Road would likely carry in the order of 70 daily vehicle movements.

Accordingly, during the peak construction stages of the project, this road can be expected to carry up to 96 daily movements. This level of traffic sits comfortably within the acceptable range for this classification of road.

5 Design Considerations

5.1 Site Access Design

No detailed design for each of the site access points is available at this stage.

We are advised however that each site access point will be designed to accommodate vehicles up to 19 metres in length, i.e. Semi-trailers.

When available, the capacity for each site access point to cater to these vehicles should be confirmed.

Swept paths (provided in Appendix C), show the approximate area / pavement required to cater for up to 19 metre Semi-trailers.

5.2 Sight Distance Assessment

A desktop assessment of the sight distance available from the site access points has been undertaken using aerial imagery and Google Street View (where available). We note that an on-site assessment should be undertaken to validate the following assessment prior to construction.

5.2.1 Available / Assessed Sight Distances

5.2.1.1 Station Road Site Access & Site Distance

North of Site Access

North of the site access, Station Road is relatively straight and flat. In addition, the trees at the proposed access are set back from the road carriageway as to not impede on sight distances.

By virtue of these conditions, sightlines to and from the north are relatively unrestricted.

The desktop assessment indicates that vehicles can achieve sight distances in the order of 350 metres in this direction.

South of Site Access

As above, we note that Station Road south is relative straight and flat.

The tree line south of the site access point is set back from the road carriageway and is not expected to impede on sightlines.

Accordingly, the available sight distance in this direction is 350 metres.

Note: An unposted 100 km/hr speed limit applies for vehicles travelling from this direction.

5.2.2 Sight Distance Requirements

Austroads Guide to Road Design - Part 4A: Unsignalised Intersections set out the sight distance requirements for unsignalised intersections, including:

- Approach Sight Distance
- Safe Intersections Sight Distance (SISD); and
- Minimum Gap Sight Distance

The guide recommends that Safe Intersection Sight Distances (SISD) is the minimum distance that should be provided on the Major Road at any intersection.

SISD is measured as shown in Figure 8.

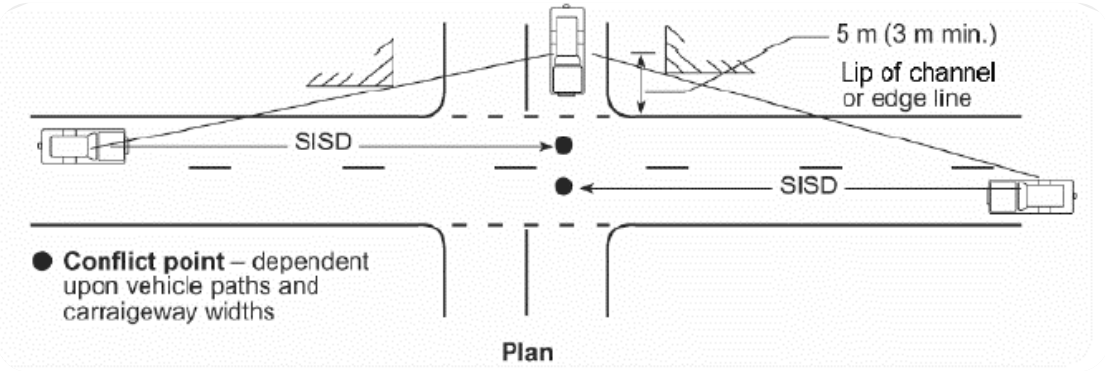


Figure 8 Guide to measuring SISD for unsignalised intersections

The Austroads Guide provides SISD values for commuter vehicles at varying design speeds. For heavy vehicles the SISD values are calculated using the following formulae:

$$SISD = \frac{D_T \times V}{3.6} + \frac{V^2}{254 \times (d + 0.01 \times a)}$$

where

SISD = safe intersection sight distance (m)

D_T = decision time (sec) = observation time (3 sec) + reaction time (sec) – refer to *AGRD Part 3* (Austroads 2016b) for a guide to values

V = operating (85th percentile) speed (km/h)

d = coefficient of deceleration – refer to Table 3.3 and *AGRD Part 3* for a guide to values

a = longitudinal grade in % (in direction of travel: positive for uphill grade, negative for downhill grade)

Based on the formula above, the minimum SISD requirements can be determined for the following operating speeds:

- 100 km/hr design speed
  - Minimum SISD of 300 metres for heavy vehicles

5.2.3 Sight Distance - Conclusion

Based on the foregoing, it can be concluded that adequate sight lines are available in each direction to/from the proposed site access point, specifically:

- To / from the north
  - 300 metres required;
  - 350 metres available;
- To / from the south
  - 300 metres required;
  - 350 metres available;

As discussed above, prior to construction, we recommend that an on-site assessment be undertaken to confirm that there is no vegetation impeding on the integrity of the available SISD's (minor trimming could be undertaken if required). In addition to the aforementioned, Station Road is relatively straight and flat, thus unrestricted sight lines should ensure drivers have a view of vehicles turning into / out of the site and approaching vehicles can either choose to stop or pass on the shoulder if required.

5.3 Turning Lane Assessment

Reference has been made to Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings[1] (AGTM Part 6). This document provides guidance on the warrants for various turn treatments at unsignalised intersections.

These warrants provide guidance on where a full-length deceleration lane must be used and where a shorter lane, designated Auxiliary Left Turn Lane (AUL) and Channelised Right Turn (CHR), may be acceptable based on traffic volumes.

5.3.1 Station Road / Site Access

As discussed previously, traffic data provided by Council indicate that Station Road historically carried in the order of 60 daily vehicle movements and 6 vehicles during the peak periods (based on the 'rule of thumb' discussed above).

This proposal is projected to generate in the order of 26 daily vehicle movements during the peak construction period, of which 13 are expected to be inbound vehicle movements. Conservatively, it is assumed that 50% of these inbound movements will occur during the external road peak period, equating to approximately 7 vehicles going to site.

Based on the foregoing, this intersection triggers a warrant for a basic right turn (BAR) treatment (noting vehicles will only approach from the south) if it was a new intersection.

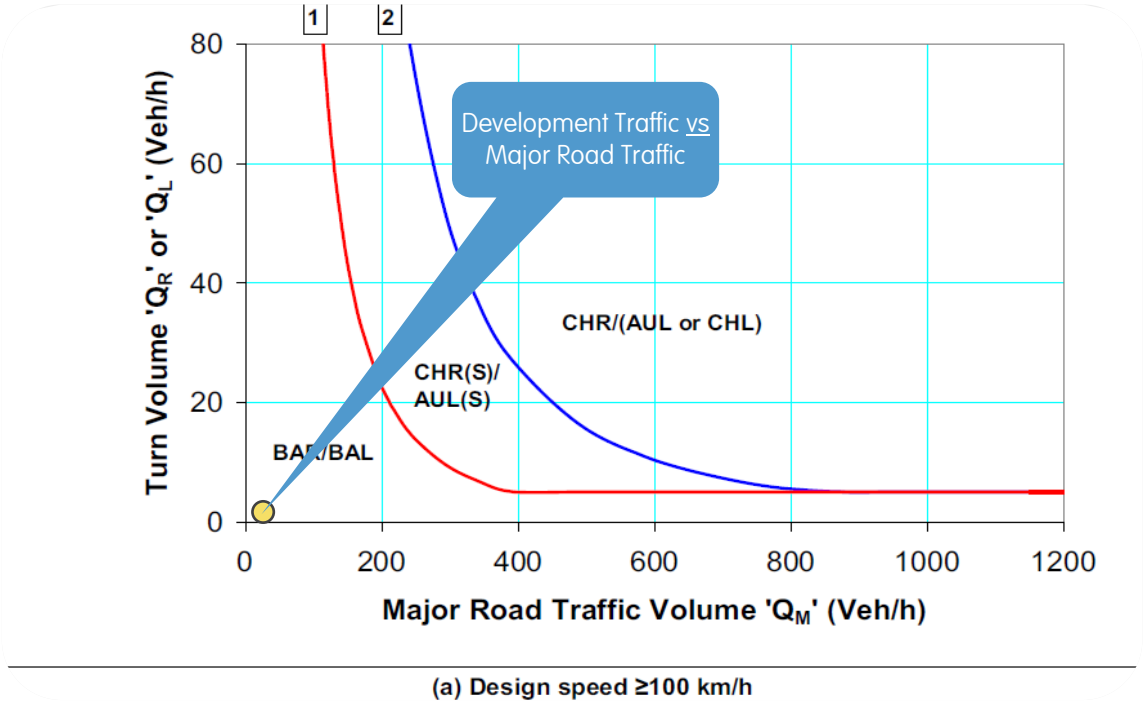


Figure 9 Warrants for Turn Treatments at Unsignalised Intersections

Given the short-term nature of the construction period (6-month construction traffic only) and the low construction traffic volumes combined with relatively low volumes along Station Road, it is considered appropriate to utilise the full width of each road for passing if required in place of a more formal BAL / BAR treatment. In addition, the likelihood of a vehicle needing to pass a turning vehicle is considered to be very low.

[1] Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings, Austroads 2017 Edition)

5.3.2 Station Road / O'Connors Road

As discussed previously, traffic data provided by Council indicates that O'Connors Road would carry in the order of 70 daily vehicle movements of which it is commonly assumed that 10% (7 vehicles) of the daily traffic will occur during the peak period.

As above we expect that there will be up to seven (7) inbound vehicle movements during the peak construction period. This level of traffic in-conjunction with the expected daily traffic is deemed to be very low from a traffic perspective.

Based on the foregoing, this intersection triggers a warrant for a basic right turn (BAR) treatment (noting vehicles will only approach from the south, without any left turns required).

Currently, the intersection of Station Road / O'Connors Road is configured as a 5.4m wide sealed road with 1.5m wide shoulders on each end of the carriageway. Due to the short-term nature of the construction period and low traffic volumes, it is considered appropriate for vehicles to utilise the shoulders for passing if required in place of a more formal BAR treatment.

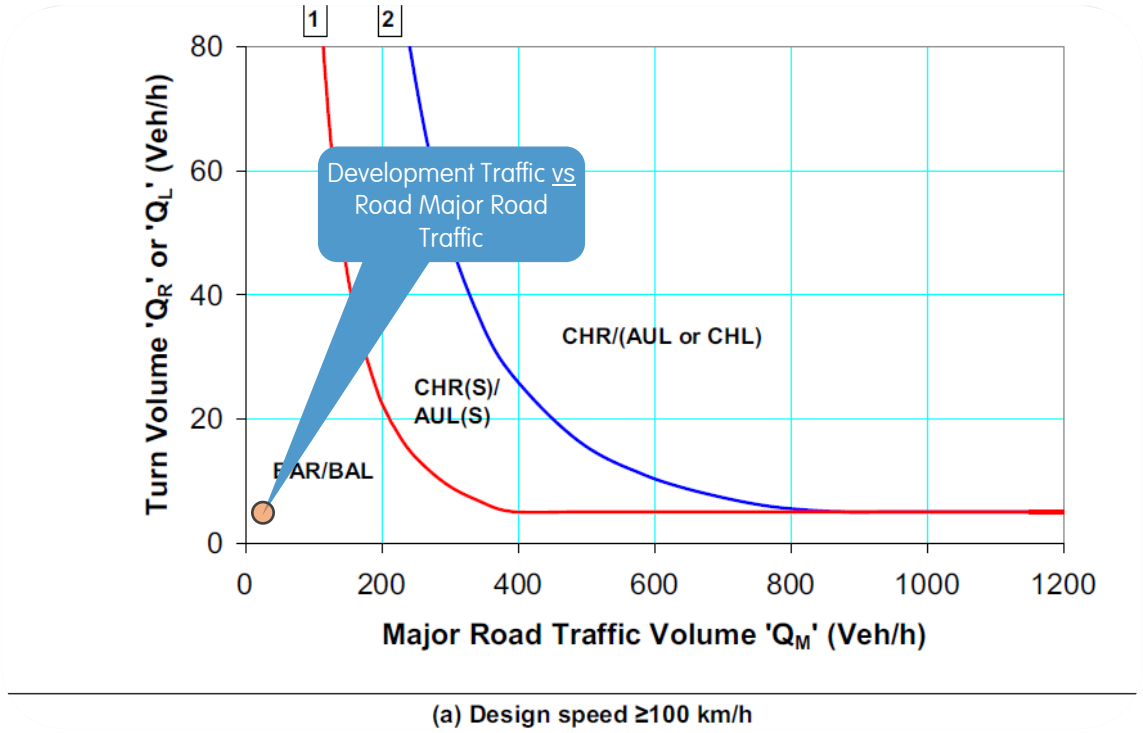


Figure 10 Warrants for Turn Treatments at Unsignalised Intersections

5.3.3 Seymour-Avenel Road / O'Connors Road

As discussed previously, traffic data provided by Council indicates that Seymour-Avenel Road would carry in the order of 1,140 daily vehicle movements of which it is commonly assumed that 10% (114 vehicles) of the daily traffic will occur during the peak period.

As above we expect that there will be up seven (7) inbound vehicle movements during the peak construction period. This level of traffic in-conjunction with the expected daily traffic for this road is deemed to be very low from a traffic perspective.

Currently, the intersection of Seymour-Avenel Road / O'Connors Road is configured as a 7.0m wide sealed road with 2.0 m wide shoulders on each end of the carriageway. This intersection currently provides a basic right-turn treatment (BAR) and allows for passing vehicles to effectively manoeuvre through.

6 Traffic Management Plan

Subject to the appointment of a supplier / construction contractor and other considerations, aspects of the Mangalore Solar Farm (the project) may be subject to review.

In addition, construction / work programs for the project will not be fully resolved until closer to the project commencement. As such, subject to commencement timeframes, there is potential for changes to the existing road conditions and Solar Farm haulage assumptions as considered within this report.

Based on the foregoing, and our experience with similar projects, we expect that a detailed Traffic Management Plan (TMP) will need to be prepared prior to the commencement of the construction of the project to confirm any mitigation measures and management works required at that time.

The TMP would be implemented as a condition of any Development Consent issued for the Solar Farm and would be developed in consultation with Strathbogie Shire Council, VicRoads, Tetris Capital and any other relevant stakeholders to provide a more accurate indication of traffic impacts and generally identify responsibilities for road maintenance and upgrades throughout the construction period.

In general, the TMP should include:

- Confirmation of the Solar Farm construction timeframe and work stages.
- Confirmation of expected traffic volumes generated by the solar farm for all work stages.
- Identification of all HV and OD vehicle haulage routes for all work stages.
- A mechanism to review identified haulage route road conditions prior to the commencement of works.
- Mechanisms/agreements (if deemed necessary) to maintain haulage route roads and road infrastructure, including local public roads used by site traffic, during construction works and to reinstate roads to at least pre-construction conditions.
- Qualify any requirement for specific work stage construction traffic management plans.
- Qualify and identify any relevant mechanisms for OD vehicle permits and traffic management requirements.
- Confirm on-site the adequacy of available sight distances along Holden Road from the site access.

Please note that this is not an exhaustive list, and that the final TMP requirements will be as per those outlined in the Development Consent.

APPENDIX A
Site Layout Plan

TETRIS ENERGY

PCC &ASSOCIATES

GENERAL NOTES:

1. EQUIPMENT LAYOUT AND SITE BOUNDARY BASED ON THE PROVIDED INFORMATION AND SATELLITE IMAGE NOT ACTUAL SURVEY DATA
2. FOR PRELIMINARY DESIGN ONLY. ACTUAL DETAIL TO BE FINALISED DURING DETAILED DESIGN
3. TRACKER DIMENSION IS ESTIMATED ONLY
4. DIMENSION SHOWN FOR MVPS, SWITCHGEAR, AND BESS ARE INDICATIVE. THIS IS SUBJECT TO FINALI SELECTION OF THE TECHNOLOGIES AND THEIR INSTALLATION REQUIREMENT

PROJECT SPECIFICATIONS

AC CAPACITY AT POINT OF CONNECTION	TBC	MW ac
INSTALLED AC CAPACITY	4.60	MW ac
DC CAPACITY AT STC	6.13	MW dc
DC:AC RATIO	1.31	
TRACKER CONFIGURATION	1P	
3-STRING TRACKER DIMENSIONS (78-MODULE)	100 x 2.31	m
2-STRING TRACKER DIMENSIONS (52 MODULE)	68 x 2.31	m
1-STRING TRACKER DIMENSIONS (26 MODULE)	40 x 2.31	m
TRACKER PITCH	5	m
TRACKER AZIMUTH	0	°
INVERTER CAPACITY	4.60	MVA
MODULE TYPE	Mono PERC Bi-Facial	
MODULE POWER	530	W
MODULES PER STRING	28	
MODULES PER TRACKER	28/ 56 / 84	
TOTAL INVERTERS	1	
TOTAL TRACKERS (84 MODULE)	112	
TOTAL TRACKERS (56 MODULE)	8	
TOATAL TRACKER (28 MODULE)	61	
TOTAL MODULES	11.564	
SITE AREA	9.0	Ha
SITE PERIMETER	1,378	m

LEGEND:

- GATE
- ACCESS ROAD
- MVPS AREA
- INVERTER
- POINT OF CONNECTION
- PROPOSED FENCE
- OH POWERLINE
- OH POWERLINE EASEMENT
- CADASTRAL BOUNDARY
- 3-STRING TRACKERS
- 2-STRING TRACKERS
- 1-STRING TRACKERS

REV:	DESCRIPTION:	BY:	DATE:
E	PRELIMINARY DESIGN	PC	4/02/21

STATUS: CONCEPT DESIGN
NOT FOR CONSTRUCTION

CLIENT: TETRIS ENERGY

DESIGNER: PCC & ASSOCIATES

SITE: MANGALORE SOLAR FARM
MANGALORE VIC 3663

TITLE: OVERALL SITE LAYOUT

SCALE AT A1:	DATE:	DRAWN:	AUTHORISED:
1:1250m	4/02/21	PC	PC

PROJECT NO:	DRAWING NO:	REVISION:
P20-0011	P20-0011-01	E

APPENDIX B
Traffic Volume Assumptions & Analysis

ASSUMPTIONS

Plant	Variable	Units	Quantity	
Plant	Capacity (MWAC)	MWAC	4.6	advised
Plant	Capacity (AC/DC)	AC/DC	1.26	assume consistent
Plant	Capacity (MWDC)	MWp	5	
Plant	Site Area	ha	13.4	Measured off plans
Design	Panel capacity	W	530	advised
Design	Inverter Capacity	MVA	4.98	advised
Design	Inverter per PCU	inverters	2	advised
Design	PCU	PCU	4	
Design	Total reactive power req	MVAr	1	assumed consistent
Design	Capacitor size	Mvar	0	assumed consistent
Design	Nameplate	MVA	5	Calculation assumed consistent
Design	DC trenching length total (PC-comb)	m	1302	
Design	DC trenching length total (comb-PCU)	m	504	
Design	(33kV) AC trenching length total	m	7320	
Design	DC cables (PC-comb)	bundles	31	
Design	DC cables (comb-PCU)	bundles	6	
Design	AC cables	bundles	1	
Design	Internal Road length	m	525	
Designhn	Gravel internal road	m3	315	
Design	String size	panels	28	advised
Design	Combiner box inputs	strings	21	assumed consistent
Design	Strings per tracker	strings	3	advised (2-3, mostly 3)
Design	Piles per tracker	piles	12	assumed consistent
Design	Weather station per MW	MWp	20	assumed consstitent
Design	Perimeter fencing	meters	1830	measured off plans
Design	Perimeter fencing poles/meter	poles	0.303030303	assumed consistent
Design	Perimeter fencing poles	poles	554	calculation
Design	Concrete (PCUs)	m3/PCU	16	assumed consistent
Design	Concrete (per fence pole)	m3/pole	0.0285	assumed consistent
Design	Concrete (O&M building & control)	m2	0	measured off plans
Design	Concrete (warehouse)	m2		
Design	Concrete (fence poles)	m3	15.789	
Design	Concrete (PCUs)	m3	64	
Design	Concrete (O&M building & control)	m3	0	calculation and depth assumed consistent
Design	Concrete (warehouse)	m3	0	no warehouse shown
Design	Concrete thickness (O&M building & c	m	0.2	assumed consistent
Design	Trench sand per metre	m2/m trenching	0.0675	assumed consistent
Design	Sand (DC trenching (PC-comb)		87	assumed consistent
Design	Sand (DC trenching (PC-comb)		34	
Design	Sand (33kV AC trenching)		494	
Design	Gravel (road)	m2	0.6	depth adopted from previous project - width from info received
Design	Gravel (substation)	m2	n/a	
Design	Gravel (TG substation)	m2	n/a	
Design	Gravel (substation total)	m3	n/a	
Design	Gravel (TG substation total)	m3	n/a	

input required
adopted from previous project
not applicable for this project

Design	Substation bench thickness	m	n/a	
Design	DC trenching length/combiner box	m/combiner box	42	assumed consistent
Design	DC trenching length/PCU	m/PCU	504	assumed consistent
Construction	Construction Duration	Months	12	assumed based on similar projects
Construction	Peak Workforce number	people	100	assumed based on similar projects
Construction	Working days per week	days	5.5	assumed based on similar projects
Vehicles	Bus capacity	People / bus	50	assumed consistent
Vehicles	Light bus vehicle	People / light bus	6	assumed consistent
Vehicles	Car capacity	People / car	2	assumed consistent - conservatively assume all staff drive in passenger cars
Vehicles	Water truck capacity	kL	20	assumed consistent
Vehicles	Concrete truck capacity	m3	6.1	assumed consistent
Vehicles	Gravel truck capacity	m3	21	assumed consistent

Delivery Details				
Panels	Panels per crate	27		Assume delivery details remain consistent
	Crates per 40'' truck	24		
	Panels per 40'' truck	648		
	Panels per b-double (20'' + 40'')	972		
	Trackers per 40''	50		
	Water trucks	20	kL/day	
	Construction buses			
	Piles per 40"	400		
	Combiner boxes per 20"	30		
	Fencing poles per 20"	1000		
	Chain mesh per 40"	300		
	DC cable bundles per b-double	40		
	AC cable bundles per 40" (bundles/40	2		

Quantities		Quantity	Trucks required	Delivery duration (months)	Average delivery / day	
advised	PV Modules	18508	19	6	0.1	all construction periods based on previous similar projects
advised	Combiner boxes	31	1	3	0.0	
advised	Strings	661	NA			
advised	Inverters	2	NA			
advised	PCUs	1	1	5	0.0	
advised	Trackers	246	4	5	0.0	
assume consist	Piles	2952	7	5	0.1	
no substation	Power transformers	0	0	0		
	Capacitor bank	1	1	2	0.0	
	Weather stations	0	2	1	0.1	
	Fencing poles	554	0	3	0.0	
	Fencing chain mesh	1830	6	3	0.1	
	Pre-fabricated O&M building	1	2	1	0.1	
	Switch station	1	2	1	0.1	
	DC cables (roll)	37	0	6	0.0	
	AC cables	1	0	3	0.0	
	Crib / site temp offices	3	3	1	0.1	
	SCADA and 33kV switchgear	2	2	1	0.1	
Material	Concete	79	12	7	0.1	
	Gravel	315	15	7	0.1	
	Sand	615	29	6	0.2	

	Water	40kL/day		entire construction period		2.0	
Machinery	Piling rigs	3	3	1		0.1	Machinery delivered at project start
	Excavator	3	3	1		0.1	Number of vehicles assumed, based on similar previous projects
	Cranes	1	1	1		0.0	
	Dozers	2	2	1		0.1	
	Fork lift	2	2	1		0.1	

		1	2	3	4	5	6
Category	Month	1	2	3	4	5	6
Delivery (Melbourne)	Piles delivered	0.06	0.06	0.06	0.06	0.06	
Delivery (Melbourne)	Trackers delivered	0.04	0.04	0.04	0.04	0.04	0.04
Delivery (Melbourne)	PCUs delivered		0.01	0.01	0.01	0.01	0.01
Delivery (Melbourne)	PV module delivered			0.14	0.14	0.14	0.14
Delivery (Melbourne)	Combiner Box delivered	0.02	0.02	0.02			
Delivery (Melbourne)	Power transformers						0
Delivery (Melbourne)	33kV switchgear & SCADA					0.09	
Delivery (Melbourne)	Cap banks					0.02	0.02
Delivery (Melbourne)	Prefabricated Control building				0.09	0.09	
Delivery (Melbourne)	Capacitor Bank						
Delivery (Melbourne)	Weather station					0.09	
Delivery (Melbourne)	Fencing	0.09	0.09	0.09			
Delivery (Melbourne)	Switch station					0.09	
Delivery (Melbourne)	DC cabling	0	0	0	0	0	0
Delivery (Melbourne)	AC cabling		0	0	0		
Delivery (Melbourne)	Crib/site temporary offices	0.14					
Delivery (material)	Concrete		0.08	0.08	0.08	0.08	0.08
Delivery (material)	Gravel	0.1	0.1	0.1	0.1	0.1	0.1
Delivery (material)	Sand	0.22	0.22	0.22	0.22	0.22	0.22
Delivery (machinery)	Piling rig	0.14					
Delivery (machinery)	Excavator	0.14					
Delivery (machinery)	Crane	0.05					
Delivery (machinery)	Dozer	0.09					
Delivery (machinery)	Fork lift	0.09					
Delivery (material)	Water*	2	2	2	2	2	2
Total LV movements	Workforce	12	20	28	40	40	28
Total HV movements	average trucks/day	3.16	2.61	2.75	2.74	3.03	2.61

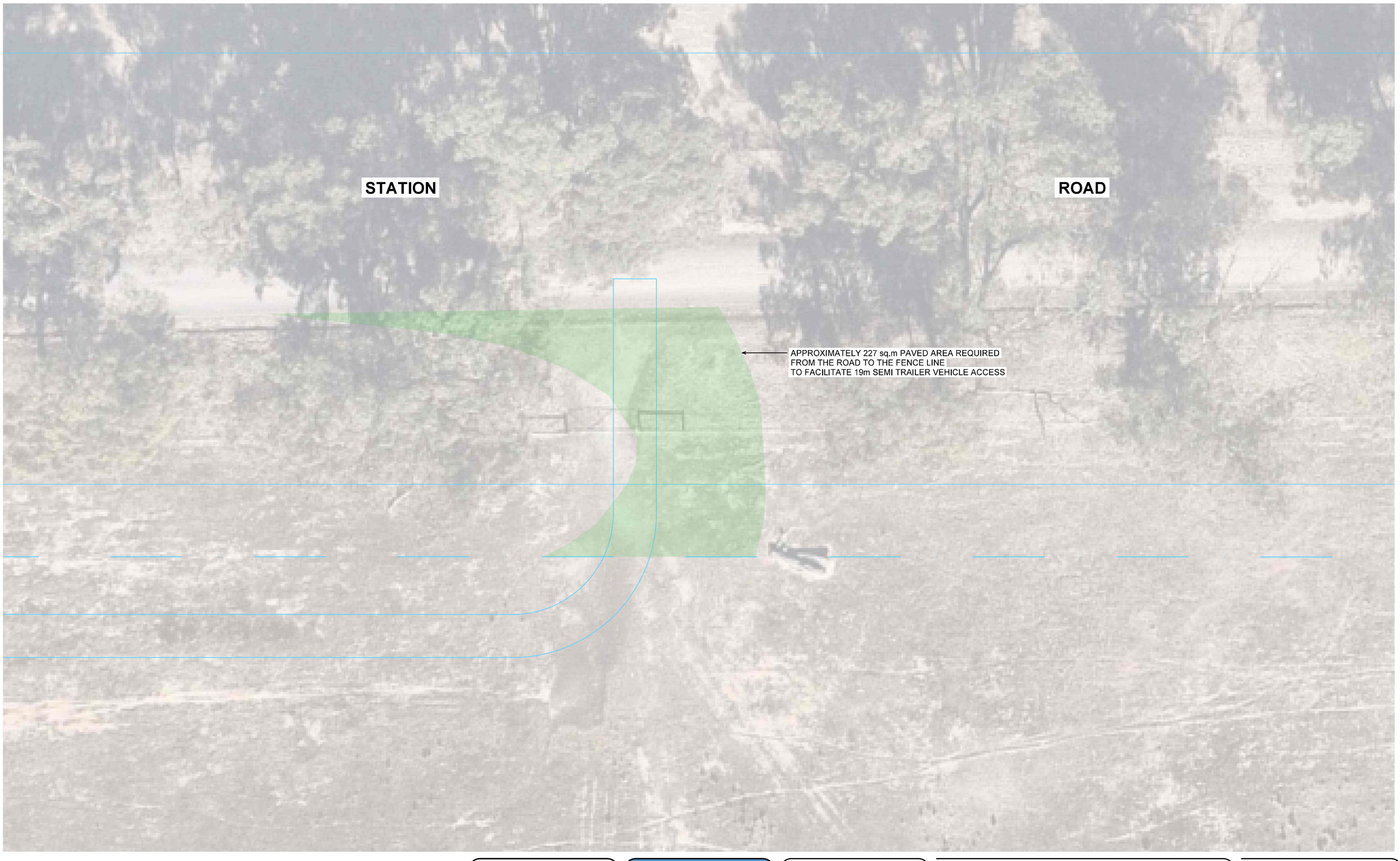
Peak Workforce	80						
Workforce	% of peak workforce	30	50	70	100	100	70
Workforce	Size of workforce / day	24	40	56	80	80	56

*40kL of water assumed to be required for dust suppression

APPENDIX C
Swept Path Analysis

Design Vehicle

—19m Semi-Trailers



GENERAL NOTES:
1. ALL DIMENSIONS ARE TO FACE OF KERB AND CHANNEL UNLESS NOTED OTHERWISE.
2. LOCAL ROADS - STATION ROAD (SPEED ZONE 100 KM/H).
3. BASE INFORMATION FROM NEARMAP AERIAL PHOTOGRAPHY DATED 25.01.2020 AND ENERGY FORMS 2020-08-31-03 V4.dwg DATED 25.11.2020

IMPACT TRAFFIC ENGINEERING PTY LTD
ABN 78 611 424 107
LEVEL 17, 31 QUEEN STREET, MELBOURNE VIC 3000
create@Impactaustralia.com.au
Impactaustralia.com.au

MELWAY ONLINE REF: MAP X921 H10

SCALE
1:250 @ A3

Client
ENERGY FORMS

Status
PRELIMINARY

Project
TETRIS REGIONAL VICTORIA SOLAR FARM PROJECTS
101 COOMBS ROAD, MANGALORE
CITY OF STRATHBOGIE

Date
2020-11-26

Drawn / Approved
BM / WD

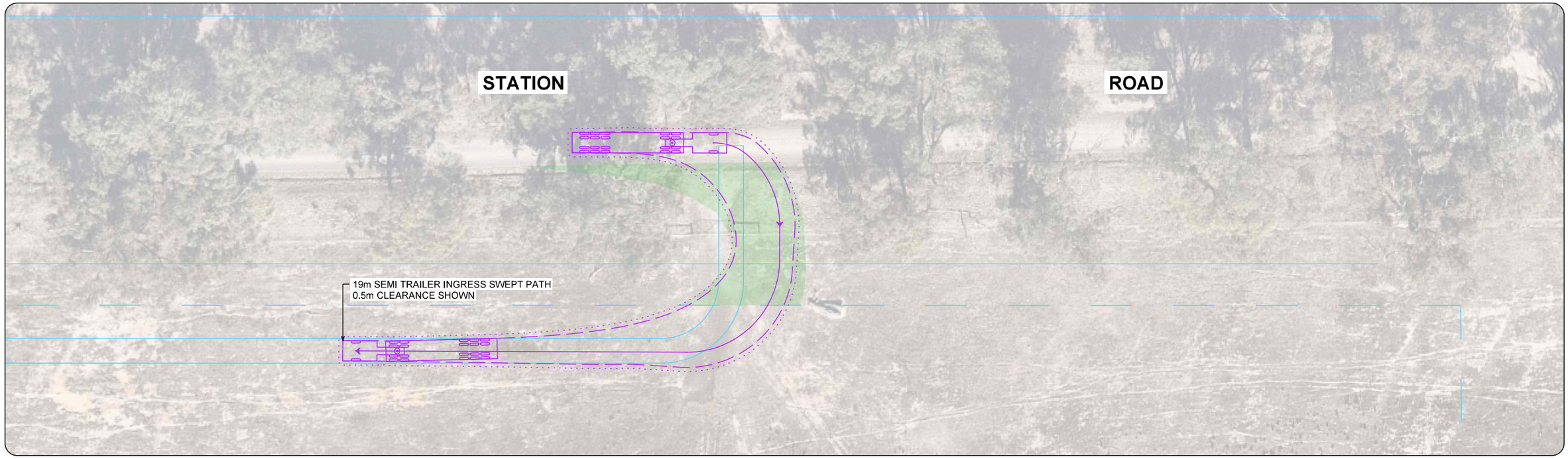
Revision Description
ISSUED FOR INFORMATION

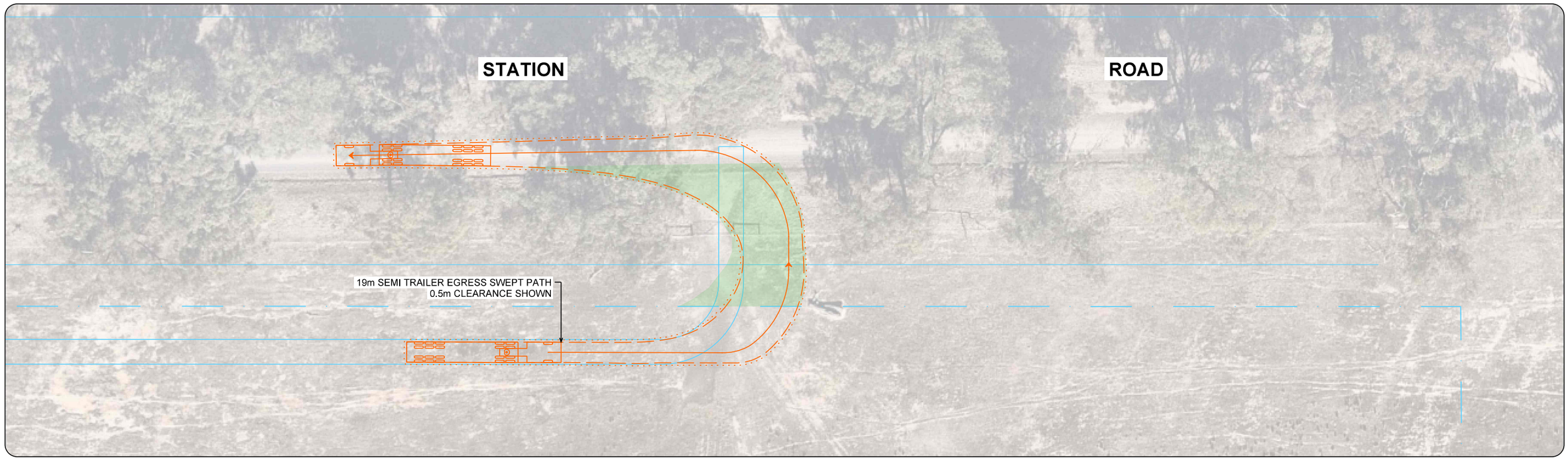
Title
INDICATIVE PAVEMENT AREA

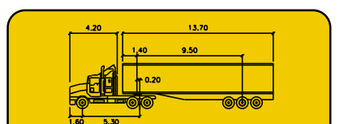
Drawing Number
IMP200915 - DG-01-01

Revision
C

26/11/2020 11:37:56 AM







19m SEMI-TRAILER

			METERS
TRACKTOR WIDTH:	2.50	LOCK TO LOCK TIME	: 6.0
TRAILER WIDTH	: 2.50	STEERING ANGLE	: 27.8
TRACKTOR TRACK:	2.50	ARTICULATING ANGLE	: 70.0
TRAILER TRACK	: 2.50		

ENERGY FORMS

Impact

IMPACT TRAFFIC ENGINEERING PTY LTD
ABN 76 611 424 107
LEVEL 17, 31 QUEEN STREET, MELBOURNE VIC 3000
create@Impactaustralia.com.au
Impactaustralia.com.au

MELWAY ONLINE REF: MAP X921 H10

SCALE
1:500 @ A3

Client
ENERGY FORMS

Status
PRELIMINARY

Project
TETRIS REGIONAL VICTORIA SOLAR FARM PROJECTS
101 COOMBS ROAD, MANGALORE
CITY OF STRATHBOGIE

Date
2020-11-26

Drawn / Approved
BM / WD

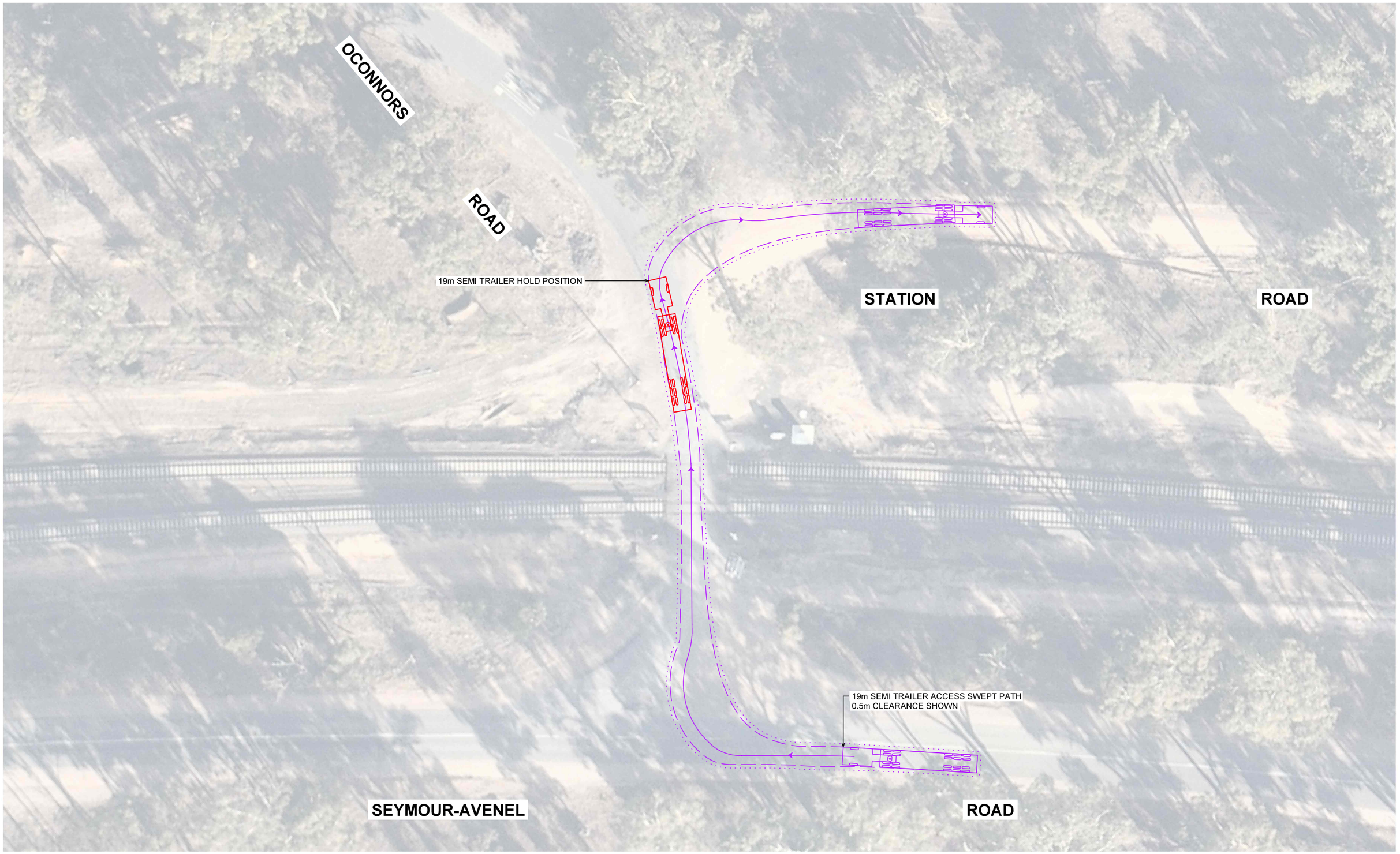
Revision Description
ISSUED FOR INFORMATION

Title
SWEPT PATH ANALYSIS
19m SEMI TRAILER

Drawing Number
IMP200915 - DG-01-02

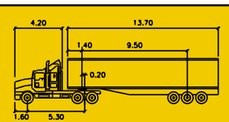
Revision
C

26/11/2020 11:37:58 AM



GENERAL NOTES:

1. ALL DIMENSIONS ARE TO FACE OF KERB AND CHANNEL UNLESS NOTED OTHERWISE.
2. LOCAL ROADS:
   - STATION ROAD (SPEED ZONE 100 KM/H)
   - SEYMOUR-AVENEL ROAD (SPEED ZONE 100 KM/H)
   - OCONNORS ROAD (SPEED ZONE 100 KM/H)
3. BASE INFORMATION FROM NEARMAP AERIAL PHOTOGRAPHY DATED 08.02.2010



19m SEMI-TRAILER

			METERS
TRACKTOR WIDTH	: 2.50	LOCK TO LOCK TIME	: 6.0
TRAILER WIDTH	: 2.50	STEERING ANGLE	: 27.8
TRACKTOR TRACK	: 2.50	ARTICULATING ANGLE	: 70.0
TRAILER TRACK	: 2.50		

ENERGY FORMS

Impact

IMPACT TRAFFIC ENGINEERING PTY LTD
ABN 78 611 424 107
LEVEL 17, 31 QUEEN STREET, MELBOURNE VIC 3000
create@Impactaustralia.com.au
Impactaustralia.com.au

MELWAY ONLINE REF: MAP X921 H10

SCALE
1:500 @ A3

Client
ENERGY FORMS

Status
PRELIMINARY

Project
TETRIS REGIONAL VICTORIA SOLAR FARM PROJECTS
101 COOMBS ROAD, MANGALORE
CITY OF STRATHBOGIE

Date
2020-11-27

Drawn / Approved
BM / WD

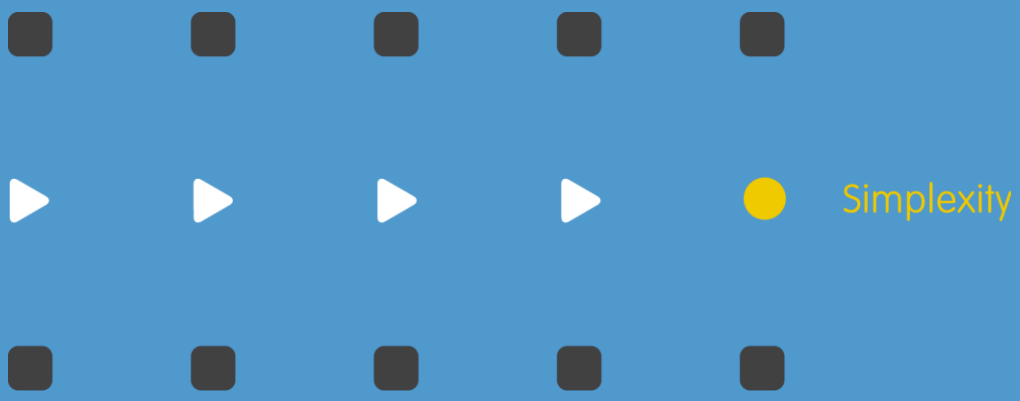
Revision Description
ISSUED FOR INFORMATION

Title
STATION ROAD ACCESS SWEPT PATH ANALYSIS
19m SEMI TRAILER

Drawing Number
IMP200915 - DG-02-01

Revision
A

27/11/2020 11:24:00 AM


Simplexity