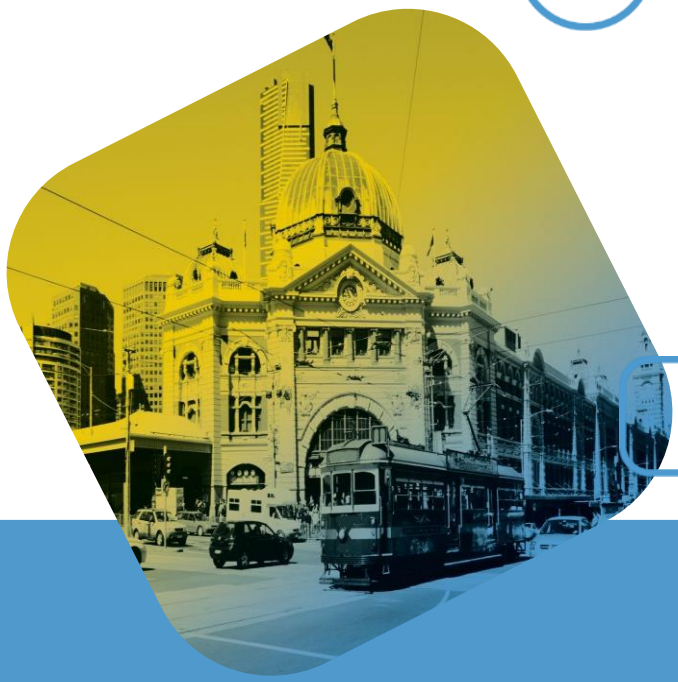
37°44'20.2"S
143°59'13.4"E

Elaine Solar Farm: Midland Highway, Elaine



Traffic and Transport Assessment

21 September 2023
Prepared for Urbis

IMP2208056REP01F01

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	Urbis
Report Title	Elaine Solar Farm: Midland Highway, Elaine
Report Reference	IMP2208056REP01F01
Date of Issue	21 September 2023
Approved By	Henry Ma

Document Control

Version	Date	Author
FINAL 01	21 September 2023	Kaitlyn Ash

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Appendices

1 IMPACT® Snap Shot

Development Proposition		
Location	37°44'49.0"S 143°59'58.0"E	Midland Highway & Woolshed Road, Elaine
Use	Solar Farm & BESS Facility - 150 MW capacity and PV capacity of 162.9MWp	
Project Duration	Construction is expected start in Q1 2025 and take approximately 18 months to complete with a peak period of four (4) months.	
Access	Four (4) access points; Site 1 Access from Horsehill Road (northern and western boundary), Site 2 Primary Access located on the southern end of site boundary and accessed from the unmade Government Road and Secondary Access from Woolshed Road.	

Traffic Considerations	
Haulage Route	
Proposed Route	It is expected that the haulage of Solar Farm components will be from Port Melbourne. Accordingly, the following route is proposed: *Port Melbourne - Todd Road - West Gate Freeway - Princes Highway - Anakie Road - Lovely Banks Road - Steiglitz Road - Midland Highway* *- Horsehill Road - Site 1 Access with Primary Access located on the northern boundary and Second Access from the western boundary* *- Murphys Road - Government Road (Unmade) - Site 2 Primary Access* *- Woolshed Road - Site 2 Secondary Access* Notwithstanding, haulage of water and aggregates will be undertaken via local routes originating from Elaine / nearby quarries and is further described within this report.
Pre-Approved Routes	Todd Road, West Gate Freeway, Princes Highway, Anakie Road, Steiglitz Road and Midland Highway are pre-approved for the haulage of B-doubles and HML vehicles. Conversely, the local roads such as Lovely Banks Road, Horsehill Road, Murphys Road and Woolshed Road are not pre-approved and will require an application to be put forward to the satisfaction of Council / NHVR.
Traffic Generation	
Construction Traffic	A total of up to 167 additional daily vehicle movements are expected during peak construction activities assuming that construction workers travel to site via individual vehicles. Notwithstanding, in order to reduce the number of traffic movements along Midland Highway, it is proposed to transport all construction workers to and from the site via 15-seater buses. The introduction of buses will reduce the overall impact that construction vehicles will have on the road network and limit the extent of road works required.
Operation & Maintenance	Up to two (2) vehicle movements are expected with routine maintenance during operations. There will also be, on occasion some additional

	movements associated with more thorough maintenance (to be taking place on a 2 and 3 yearly basis, i.e. transformer testing).
Traffic Impact	The level of traffic generated from the development is not expected to have any material impact on the operation of the external road network.
Design Considerations	
Access Design	The proposal seeks to utilise the existing crossover located at the subject land, particularly for access at the site access points from Horsehill Road for the western-most land parcel and from Government Road for the eastern-most land parcel. In addition, a secondary access is proposed along Woolshed Road and Horsehill Road for emergency access if required. We are advised that components will be delivered to the site by vehicles up to 26m (B-doubles).
Turn Treatments	The development considers low traffic volumes and therefore triggers basic turning treatments in place of the more formal channelised treatments. It is therefore considered appropriate to utilise the full width of the road for passing if required in place of a more formal BAL/BAR treatment. Further, it is also recommended that temporary advanced warning signs (such as 'trucks crossing' and reduced speeds) be implemented along the site access to mitigate risks and assist with safe accessibility during the construction period.
Sight Distances	It is recommended that a physical sight distance assessment be undertaken prior to construction, and trees be trimmed if required. In addition, it is recommended that traffic management devices be implemented during the construction period.
Recommendations	
Maintenance Plan	It is recommended that the applicant liaise with Council to form an agreement on the construction standard required to implement an 'all weather' standard pavement along Murphys Road and Woolshed Road, in addition to determining an appropriate maintenance agreement during the construction period.
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

IMPACT® have been engaged by Urbis to undertake a Traffic and Transport Impact Assessment for the proposed Solar Farm and Battery Energy Storage System (BESS) facility.

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 and BESS facility located along Midland Highway and Woolshed Road in Elaine Victoria.

In preparing this assessment, we have referenced the following:

- Development Plans prepared by Urbis (Drawing No. CS-001 & CS-002 Revision A;
- Department of Transport (DoT) Heavy Vehicle Network Maps in Victoria;
- National Heavy Vehicle Regulator (NHVR) journey planner and website;
- Moorabool Shire Council Clause 53.13 - Renewable Energy Facility;
- Department of Transport Traffic Volume Viewer;
- Infrastructure Design Manual (2020); and
- Austroads Guide to Traffic Management Part 6 Intersections, Interchanges and Crossing.

3 Elaine Solar Farm & BESS Facility

3.1 Location

The subject site is located on both the eastern and western side of Midland Highway in Elaine as illustrated in Figure 1.

Figure 1 Location of Subject Site

The site is primarily surrounded by farmland as well as an existing electrical substation and windfarm located to the southeast of site 2.

3.2 Site Context

The site is located approximately 6km north of Elaine and 9km south of Lal Lal Townships.

Further, larger Townships such as Meredith is located 15km north and Buninyong located 15km south-east of the site.

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.

Currently, there is an existing electrical substation and windfarm located on the southeast corner of site 2. There is also an existing transmission line located on the eastern side of site 2 and extends beyond Woolshed Road to the north and Murphys Road to the south.

3.3 Planning Zone

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

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

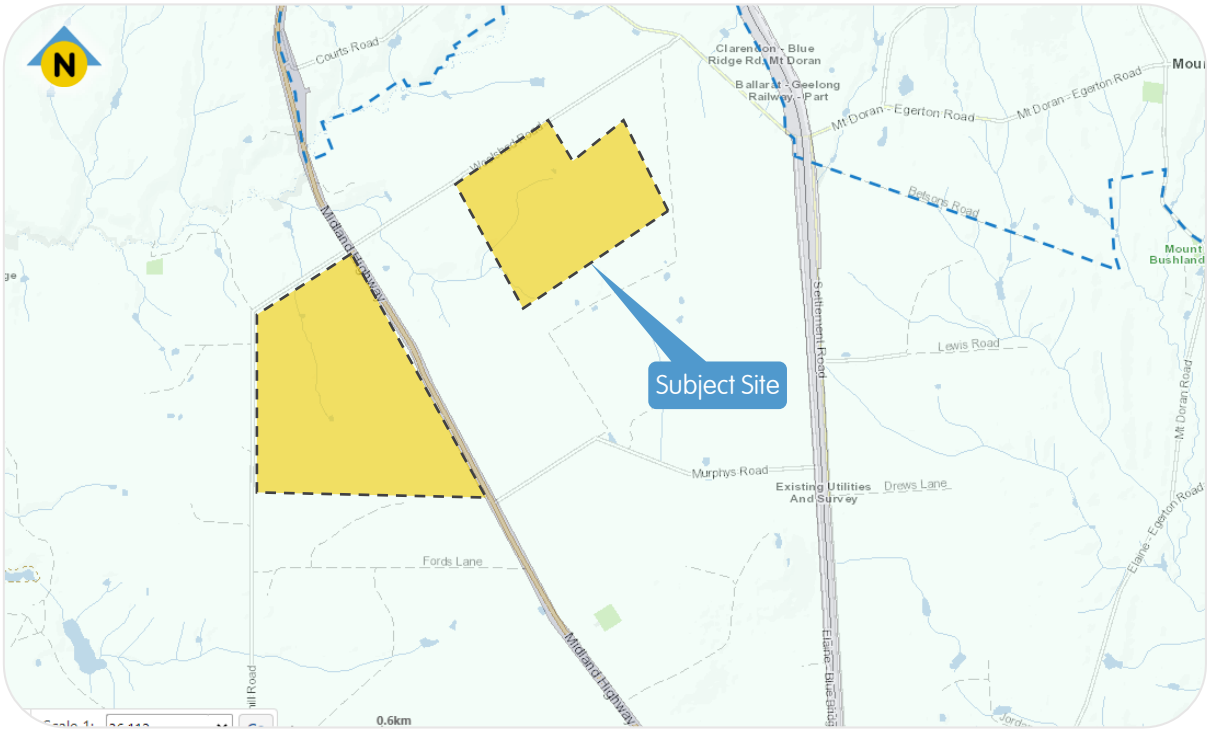


Figure 2 Land Use Planning Zone

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 Existing Road Network

3.4.1 Midland Highway

Classified as an Arterial Road, Midland Highway extends in a general north-south direction between Calder Freeway to the north and Church Street to the south.

A review of the aerial imagery shows that Midland Highway has been constructed as a sealed road measuring approximately 6.5-10.5 metres wide (allowing for one-lane of trafficable lane in each direction with sections allowing for an overtaking lane in one-direction).

A posted speed limit of 80km/hr applies to this road.

Traffic volumes provided from the Department of Transport's Traffic Volume viewer indicates that Midland Highway carries in the order of 5,900 vehicles (two-way) per day or 590 vehicles during the peak hour.

A view of Midland Highway is shown in Figure 3.

Figure 3 Views of Midland Highway Facing South

3.4.2 Murphys Road

Classified as a rural access road, Murphys Road extends in a general northeast-southwest direction between Elaine-Blue Bridge Road to the east and Midland Highway to the west.

A review of the aerial imagery shows that in proximity to the subject site, Murphys Road has been constructed with an unsealed / compacted gravel with approximately 6 metres in width.

A default speed limit of 100km/hr applies to the section of road located near the subject site.

Murphys Road also provides access to the Elaine Windfarm and existing transmission line track and the electrical substation and is expected that traffic generated from these uses to be limited to operational and maintenance vehicles.

Notwithstanding, it is conservatively assumed that Murphys Road carries up to 50 vehicle movements per day or five (5) vehicle movements during a typical peak hour (noting that it is generally accepted that 10% of daily movements occur during the peak hour).

A view of Murphys Road near the site is shown in Figure 4.

Figure 4 Views of Murphys Road Facing East Adjacent the Subject Site

3.4.3 Woolshed Road

Classified as a rural access road, Woolshed Road extends in a general northeast-southwest direction between Midland Highway to the west and Clarendon-Blue Bridge Road to the east.

A review of the aerial imagery shows that in proximity to the subject site, Woolshed Road is an unmade road with an unsealed / compacted gravel with sections of soil with approximately 3.5 metres in width.

A default speed limit of 50km/hr applies to the section of road located near the subject site.

Woolshed Road provides access to rural properties whereby the traffic generated will be limited to heavy vehicles (e.g. trucks and trailers). Accordingly, traffic volumes along Woolshed Road is expected to be low.

Conservatively, it is assumed that Woolshed Road carries up to 50 vehicle movements per day or five (5) vehicle movements during a typical peak hour.

A view of Woolshed Road near the site is shown in Figure 5.

Figure 5 Views of Woolshed Road Facing West Adjacent the Subject Site

3.4.4 Horsehill Road

Classified as a rural access road, Horsehill Road extends in a general northeast-south direction between Midland Highway to the northeast and Elaine-Mount Mercer Road to the south.

A review of the aerial imagery shows that, Horsehill Road has been constructed with a sealed pavement measuring approximately 3.5m wide with gravel shoulders approximately 1-1.5m wide.

With no posted speed limit, the default rural limit of 100 km/hr applies to this road.

Horsehill Road provides access to rural properties whereby the traffic generated will be limited to heavy vehicles (e.g. trucks and trailers). Accordingly, traffic volumes along Horsehill Road is expected to be low.

Conservatively, it is assumed that Horsehill Road carries up to 50 vehicle movements per day or five (5) vehicle movements during a typical peak hour.

A view of Horsehill Road near the site is shown in Figure 6.

Figure 6 Views of Horsehill Road Facing East Adjacent the Subject Site

3.4.5 Neighbouring Developments

The Elaine Battery Energy Storage System (BESS) project, developed by Akaysha Energy is proposed directly east of the subject site and is located at 225 Elaine-Blue Bridge Road accessed from Murphys Road.

We understand that the project was submitted and received by the Department of Planning on 24/05/2023 and has recently gone to exhibition / community feedback on 1/09/2023 and 16/09/2023.

Although, as the project is currently under assessment by DTP, it is likely that any approvals or construction stage to begin in 2024 with construction expected to last up to 12 months. As stated within the traffic report undertaken by One Mile Grid, the construction works is expected to peak up to 68 vehicle movements per day or up to seven (7) vehicle movements per hour.

In the event that the proposed Elaine BESS coincides with the peak construction period of the current proposal, the level of traffic is not expected to impact on the operation of the road network.

Further, it is acknowledged that an existing electrical substation and windfarm is currently located southeast of the subject site. Given that the site is currently operating, it is expected that traffic generated from this development will be minimal and not expected to impact on the operation of the proposed Solar Farm construction works.

3.5 Crash Statistics

A review of the reported casualty accident history for the roads and intersections between 2019-2014 (five (5) year period) in the vicinity of the subject site has been sourced from VicRoads CrashStats accident database.

This database records all accidents causing injury that have occurred in Victoria since 1987 (as recorded by Victorian Police) and categorises these accidents as follows:

- Fatal Injury: At least one person was killed in the accident or died within 30 days as a result of the accident;
- Serious injury: At least one person was sent to the hospital as a result of the accident; and
- Other injury: At least one person required medical treatment as a result of the accident.

The data extracted from the database reveals no accidents have occurred (or recorded) in the immediate vicinity of the subject site.

3.6 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 7.

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.

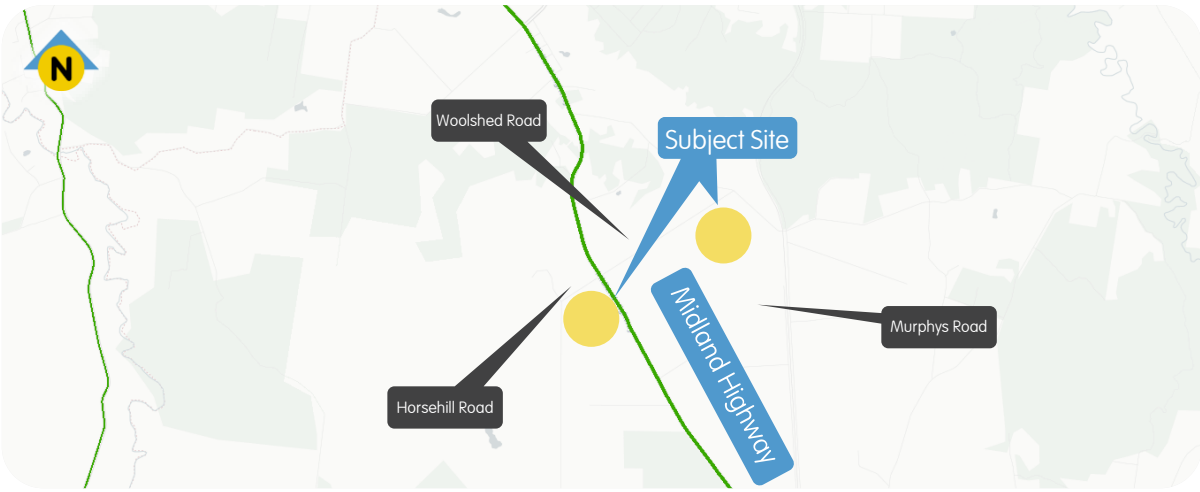


Figure 7 VicRoads Pre-Approved B-Double Haulage& Higher Mass Limits (HML) Network Map

As per above, the following road pre-approved for the haulage of B-doubles and Higher Mass vehicles is Midland Highway.

Conversely, none of the local roads (Horsehill Road, Murphys Road and Woolshed Road) are pre-approved or conditionally approved for the haulage of B-double/HML vehicles and will require an application to be put forward to the satisfaction of Council / NHVR and the Department of Transport (DoT).

3.7 Elaine Solar Farm & Energy Storage Facility

IMPACT® have been advised that the project will consist of a solar energy and BESS facility comprising approximately of 227,280 solar panels (modules) and a capacity to generate up to 150 MW and PV capacity of 162.9MWp.

It is expected that the site will connect directly into the existing power / transmission line located east of site 2 of the subject land.

Further, we have been advised of the following:

- Access to the site will be provided via four (4) crossovers; for the western land parcel, primary access will be located near the northeast corner of site 1 accessed from Horsehill Road, a secondary access located along the western boundary from Horsehill Road. For the eastern land parcel, the primary access point is located on the southern end of site 2 and accessed from the unmade Government Road and an emergency access point to site 2 from Woolshed Road;
- The site access points (for primary access) will be built to accommodate construction vehicle traffic, including vehicles of up to 26m in length (B-doubles);
- 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 8 and Figure 9 in addition to the copy of this plan attached in Appendix A.

Figure 8 Site Layout - Western Land Parcel

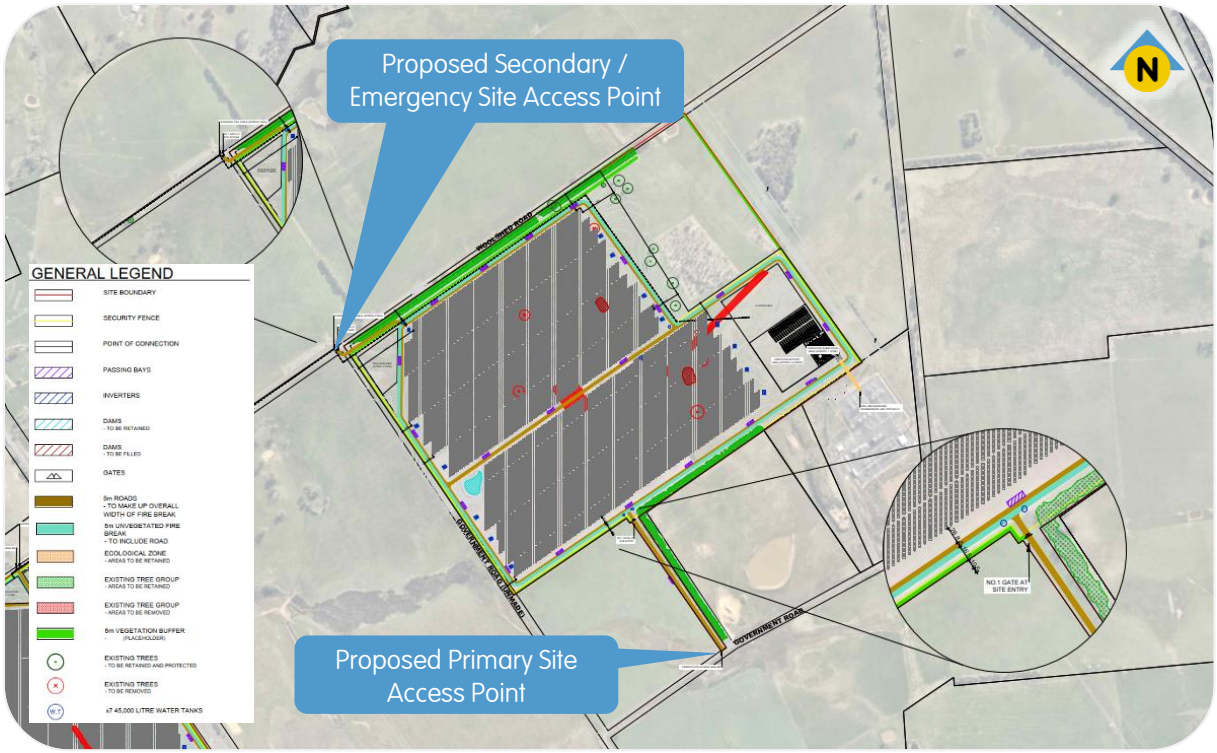


Figure 9 Site Layout - Eastern Land Parcel

ADVERTISED PLAN

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 (2) broad categories:

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

4.2 Traffic Generation

4.2.1 Construction Traffic Volumes

Construction is expected start in Q1 2025 and take approximately 18 months to complete with a peak period of four (4) months.

IMPACT® have been advised by the applicant that the following movements are likely to occur as described in Table 1.

Note: These volumes are based on Solar Farms of similar size and capacity.

Table 1 Anticipated Vehicle Movements

Vehicle Type	Average Vehicle Movements (per day)		Peak Vehicle Movements (per day)	
	Daily (vpd)	Peak Hour (vph)	Daily (vpd)	Peak Hour (vph)
Light Vehicle (car/4WD)	30	15	107	50
MRV/HRV	5	1	13	3
AV/B-double	20	-	47	-
Total	**55**	**16**	**167**	**53**

Overall, a total of 167 daily movements and 53 peak hour movements are expected during the peak operating periods (4 month period) of the project. It is noted that any AV/B-double deliveries will occur outside of the peak period / to occur before the peak period.

As above, it is expected that up to 50 peak period light vehicle movements could be expected during the height of construction activities. These movements could be further reduced by transporting workers to and from the site via. minibus's which generally have a 7 to 16 seater capacity.

Notwithstanding, it is assumed that the project team will transport staff to and from site via a 15-seater bus and thus reduce the peak hour movements of 50 vehicles per hour to 4 vehicles per hour.

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. It is understood that operation and maintenance vehicles will likely occur on a quarterly basis with advanced maintenance operations to be undertaken on a 2 and 3 year basis

(i.e. transformer testing). The quarterly site attendance will involve a single commercial vehicle equivalent to a ute.

To provide a basis for traffic volume estimations, the following traffic generation numbers have been provided based on past experiences with Solar Farms of similar capacity:

- Light Vehicle Movements:
  - Daily peak of up to 2 vehicle movements
- Heavy Vehicle Movements:
  - Daily peak of up to 0 vehicle movements

It is expected that a total of three (3) workers will be on site at any given time.

It is anticipated that three (3) parking spaces will be provided (within the designated hardstand zone within the construction area).

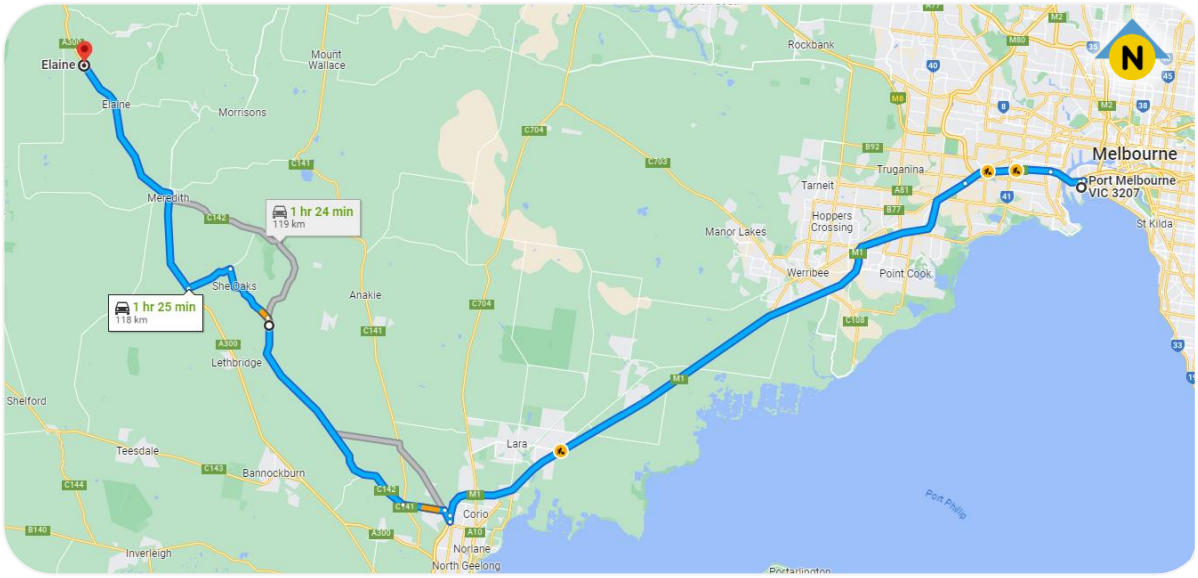
In the context of construction traffic and also the existing traffic along Midland Highway, operating traffic is expected to be minimal.

4.3 Vehicle Access Routes

4.3.1 Access Route Assessment

A review of the subject site and possible routes (from Melbourne) to the site identified the following route for delivery and is as follows:

Route: Todd Road - West Gate Freeway - Princes Highway - Anakie Road - Lovely Banks Road - Steiglitz Road - Midland Highway - Horsehill Road - Site 1 Access
- Murphys Road - Government Road (Unmade) - Site 2 Primary Access
- Woolshed Road - Site 2 Secondary Access



In relation to this access route, the following observations are made:

- Todd Road, West Gate Freeway, Princes Highway, Anakie Road, Steiglitz Road and Midland Highway are all pre-approved B-double haulage routes.
  - The remaining local roads (Lovely Banks Road, Horsehill Road, Murphys Road and Woolshed Road) are not currently approved for the haulage of B-double vehicles.
- Lovely Banks Road and Horsehill Road is sealed with sufficient width for two vehicles to pass one another

    - In practice vehicles would possibly slow down to pass another vehicle, however, would not be required / necessary.
- Murphys Road is an unsealed road
    - Sufficient width is available for vehicles to pass one another, however in practice if largely operates as one lane at a time, with vehicles coming to a slow speed to pass one another where required.
- Murphys Road whilst traversable in wet conditions would likely deteriorate quickly from its current condition, if used regularly during wet conditions.
    - Noting that site observations identified potholes along this gravel road currently.
- Woolshed Road and Government Road are currently unsealed.

4.3.2 Construction Material Delivery

Appendix B illustrates the vehicle swept paths for the route outlined previously and the extent of widening required. Notwithstanding, the following describes the access routes in further detail.

4.3.2.1 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 from Walsh Ballarat Quarries located on Dunnstown-Yendon Road (approximately 20km north of the subject site).

The proposed route to the site is as follows:

Dunnstown-Yendon Road - Yendon-Egerton Road - Yendon-Lal Lal Road - Midland Highway:

- **Horsehill Road - Site 1 Primary Access (northern boundary) and Site 2 Secondary Access (western boundary)**
- **Murphys Road - Government Road (Unmade) - Site 2 Primary Access**
- **Woolshed Road - Site 2 Secondary Access.**

4.3.2.2 Water Deliveries

We understand that water deliveries required during construction and for dust suppression will be sourced locally, either from Elaine or directly from the land-owner. Midland Highway will be leveraged if deliveries were to occur from Elaine.

4.3.2.3 Solar Modules / Thermal Energy Components

IMPACT® are advised that due to the specialised nature of these components, these materials will be sourced from Port Melbourne.

It is advised that materials will be transported to the site by road. The anticipated (indicative) route is as follows:

Port Melbourne - Todd Road - West Gate Freeway - Princes Highway - Anakie Road - Lovely Banks Road - Steiglitz Road - Midland Highway

- **Horsehill Road - Site 1 Primary Access**
- **Murphys Road - Government Road (Unmade) - Site 2 Primary Access**

4.3.3 Construction Staff

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

Ballarat - Midland Highway

- **Horsehill Road - Site 1 Primary Access**
- **Murphys Road - Government Road (Unmade) - Site 2 Primary Access**

4.4 Traffic Impact

4.4.1 Vehicle Access Routes

As highlighted in Section 4.3, Lovely Banks Road, Horsehill Road, Murphys Road and Woolshed Road are not pre-approved for the haulage of B-double/HML vehicles and will require an application to be put forward to the satisfaction of Council / NHVR and the Department of Transport (DoT).

As mentioned previously, Murphys Road, Woolshed Road and Government Road (Unmade) pavement is currently unsealed. As a result, we would expect the road pavement to comfortably cater for the proposed construction traffic in dry weather only. Accordingly, we recommend that this section of road be upgraded to an 'all weather' standard which will decrease the likelihood of ongoing / frequent maintenance and repairs required / risk of delays associated with wet weather events.

Accordingly, it is suggested that the applicant liaise with Council and agree on the construction standard required for a gravel all weather road, in addition to determining an appropriate maintenance agreement during the construction period.

4.4.2 Road Capacity

The proposed development is projected to generate up to 167 daily vehicle movements during peak construction activities or up to 63 peak hour movements.

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

<u>Murphys Road</u>

Murphys Road is classified as a rural access road. These roads are typically expected to carry up to 1,000 vehicles each day or 100 vehicles during the peak periods.

As discussed in Chapter 3.4, it is conservatively assumed that Murphys Road would likely carry in the order of 50 vehicle movements per day or five (5) vehicle movements during the peak periods.

Accordingly, during the peak construction stages of the project, this road can be expected to carry up to 217 daily vehicle movements and up to 68 vehicle movements during any one peak period. This level of traffic sits comfortably within the acceptable range for this classification of road.

<u>Woolshed Road</u>

Woolshed Road is classified as a rural access road. These roads are typically expected to carry up to 1,000 vehicles each day or 100 vehicles during the peak periods.

As discussed in Chapter 3.4, it is conservatively assumed that Woolshed Road would likely carry in the order of 50 vehicle movements per day or five (5) vehicle movements during the peak periods.

Accordingly, during the peak construction stages of the project, this road can be expected to carry up to 217 daily vehicle movements and up to 68 vehicle movements during any one peak period. This level of traffic sits comfortably within the acceptable range for this classification of road.

Horsehill Road

Horsehill Road is classified as a rural access road. These roads are typically expected to carry up to 1,000 vehicles each day or 100 vehicles during the peak periods.

As discussed in Chapter 3.4, it is conservatively assumed that Horsehill Road would likely carry in the order of 50 vehicle movements per day or five (5) vehicle movements during the peak periods.

Accordingly, during the peak construction stages of the project, this road can be expected to carry up to 217 daily vehicle movements and up to 68 vehicle movements during any one peak period. This level of traffic sits comfortably within the acceptable range for this classification of road.

4.4.3 General Maintenance During Construction

4.4.3.1 Local Roads

Prior to construction, it is recommended that the applicant liaise with Council in respect to maintenance and repair work along the relevant sections of these roads during the construction period.

This liaison can be used to help ensure that the impact of the construction related traffic movements on the external road network is minimal and managed appropriately. This will be warranted during the construction phase, however once the construction has been completed, the traffic generated from the site is expected to be minimal with up to 1-2 staff operating on site.

In addition, given that construction is likely to occur during the wetter months, it is recommended to upgrade Murphys Road, Woolshed Road and Government Road (unmade) to an all-weather standard pavement. Accordingly, this would decrease the likelihood of ongoing / frequent maintenance and repairs being required and reduce the risk of delays associated with wet weather events.

Prior to the above, a conditions survey is proposed to be undertaken prior to the commencement and completion of the project. Details of this survey, in addition to maintenance agreements and procedures for carrying out repairs or maintenance deemed necessary as a result of the construction activities on local roads is to be further discussed within the Traffic Management Plan (TMP).

4.4.3.2 Arterial Roads

Given the short construction period (and relatively low construction volumes) we expect that the Department of Transport (DoT) will retain maintenance responsibilities for these roads (e.g. Midland Highway).

4.5 Other Impacts

Further safety considerations have been outlined as part of this preliminary assessment, these potential safety measures and issues may require control measures to mitigate the risks as required of which will be developed within the TMP and in consultation with the relevant road authorities.

4.5.1 Noise Impact and Dust

Construction vehicles will naturally generate noise and dust pollution to the surrounding area however noting that the majority of uses along the proposed haulage route (particularly within the local / Council roads) are generally empty farm-land with minimal dwellings.

Nevertheless, noise management and dust suppression mitigation measures will be addressed within the Environmental Impact Statement (EIS).

4.5.2 Operating Speeds and Access

It is envisaged that during the construction period, construction vehicles will be travelling at slower speeds and result in wider turning circles at the relevant intersections along the designated route.

It is therefore recommended to adopt appropriate signages including reduced posted speed limits and increased signages where appropriate, all to be adopted and recognised within the TMP.

4.5.3 Over-Dimensional and Over-Sized (OSOM) vehicles

We are advised that the largest vehicle for this project will be up to 26m (B-doubles) and that this report considers the impacts as a result of only this vehicle size. However, in the event that an over-sized &/or over-dimensional vehicle is required, an application will need to be undertaken as part of the National Heavy Vehicles Register (NVHR) application process whereby this submission will confirm the type of temporary traffic management measures required to transport these larger vehicles to site.

Notwithstanding, located east of the subject site's eastern-most land parcel resides the existing Elaine Windfarm which in the past involved the transportation and delivery of oversized/overmass turbines and components to the subject site from Midland Highway.

It is noted that any oversized/overmass deliveries if required for the subject site will utilise similar routes as the Elaine Windfarm project.

5 Design Considerations

5.1 Site Access Design

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

Swept paths (provided in Appendix B) have been assessed to show access via 26m B-doubles.

Based on the aforementioned, the access points will be designed to accommodate vehicles up to 26 metres in length.

5.2 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.

Note: The above applies to new intersections and does not apply to existing intersections or access points. Notwithstanding, this has been referenced for information purposes.

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.

Figure 10 illustrates the turning lane treatments for unsignalised intersections for vehicles travelling at speeds greater or equal to 100km/hr.

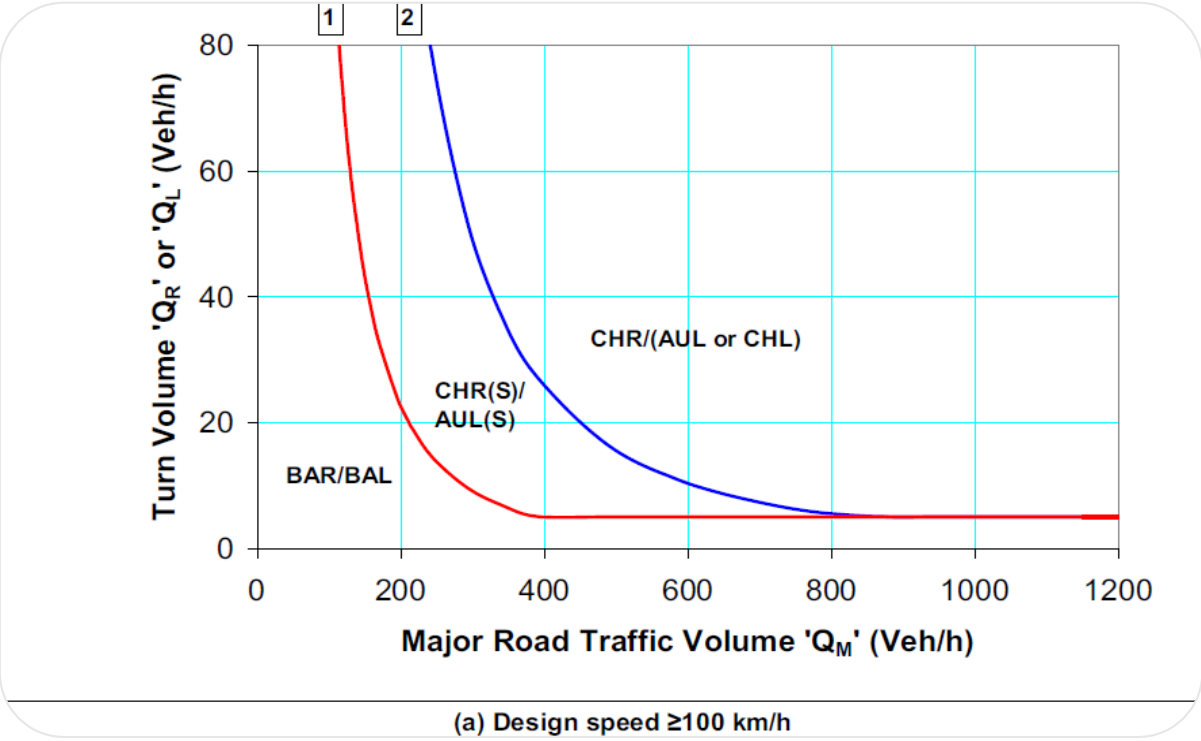


Figure 10 Warrants for Turn Treatments at Unsignalised Intersections

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

For the purposes of this assessment, it is assumed that traffic from construction workers and heavy vehicles (excluding AV/B-doubles as this will be travelling to site outside of peak periods) will be split evenly between northbound and southbound directions.

Table 2 highlights the turning treatment requirements.

Table 2 Intersection Turning Treatment Requirements

Major Road		Minor Road		Turning Treatment
Road Name	Peak Hour Volumes (Qm)	Road Name	Peak Hour Volumes (Qr / QL)	
Midland Highway	590	Horsehill Road	QL = 1, Qr = 2	BAL
Midland Highway	590	Woolshed Road	-*	BAR
Midland Highway	590	Murphys Road	QL = 2, Qr = 2	BAR

*Note: this access point is proposed as an emergency access only and is not expected to generate movements associated with staff and the construction of the Solar Farm.

Based on the foregoing, the construction traffic is expected to trigger at-most, a basic left-turn and right-turn treatment along Midland Highway and the local roads (Horsehill Road, Woolshed Road, Murphys Road and Government Road).

Due to the short-term nature of the construction period and the low construction volumes, it is recommended to utilise the full width for passing if required in place of a more formal BAL and BAR treatment for access via Horsehill Road and Murphys Road.

Further it is noted that an existing right-turn lane is located at the intersection of Midland Highway and Horsehill Road which will assist in facilitating movements to and from this intersection during the construction stages.

It is also recommended to implement traffic management principles / advanced warning signages at the proposed site access during the construction period to assist with vehicle access.

5.3 Sight Distance Assessment

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

5.3.1 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 11 overleaf.

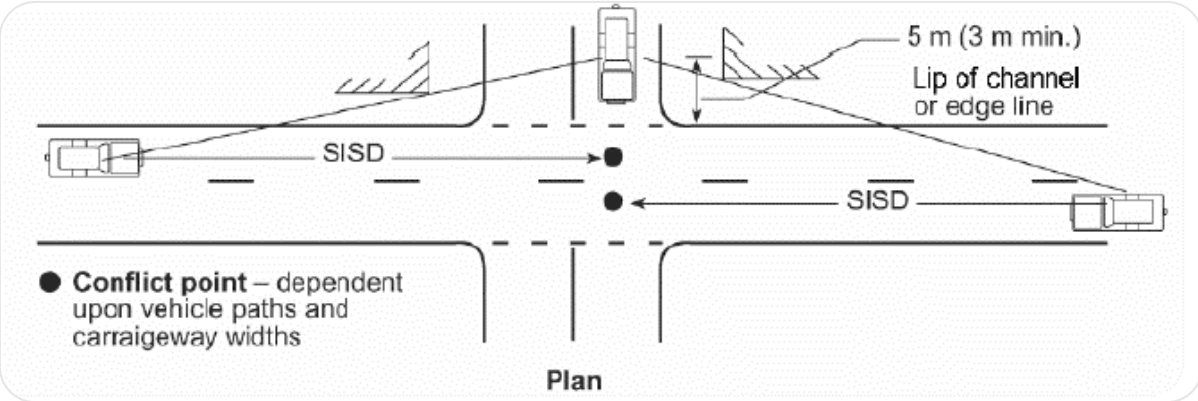


Figure 11 Guide to measuring SISD for unsignalised intersections

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 based on the road section:

- Midland Highway / Murphys Road / Woolshed Road / Horsehill Road
  - 100 km/hr design speed
    - Minimum SISD of 289 metres for heavy vehicles
    - Minimum SISD of 238 metres for light vehicles

5.3.2 Assessed Site Access Sight Distance

This section depicts the available sight distances along the designated route as shown below:

Midland Highway / Horsehill Road

Midland Highway / Horsehill Road

Horsehill Road / Site Access

Murpheys Road / Site Access

5.3.3 Sight Distance - Conclusion

Based on the foregoing, it can be concluded that adequate sight lines are available for vehicles travelling to / from the proposed route.

Notwithstanding, we recommend that advanced warning signs and reduced speed limits be put in place during construction activities to warn motorists that vehicles may be entering / exiting the site.

Further, 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) at all of the intersections along the proposed route.

6 Traffic Management Plan

Typically, with renewable energy projects, following planning approval, a condition of the permit will be to produce a Traffic Management Plan subject to the appointment of a supplier / contractor.

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 Council, VicRoads, 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; and
- Confirm on-site the adequacy of available sight distances along all proposed site access locations and intersections.

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

Further, in parallel with the TMP, concept plans detailing appropriate mitigation measures are to be developed as the project progresses and detailed site layout and construction methodology are finalised.

APPENDIX A
Site Layout Plan

ADVERTISED PLAN

ELAINE SOLAR FARM

WINDY LANDSCAPE SITE PLAN

ADVERTISED PLAN

ALL DRAWINGS ARE DESIGNED TO BE PRINTED AND READ IN COLOUR

IT IS THE CONTRACTORS' RESPONSIBILITY TO PRINT DRAWINGS IN COLOUR TO AVOID ANY POTENTIAL DISCREPANCIES IF DRAWINGS ARE PRINTED IN BLACK AND WHITE

PROJECT DETAILS (WINDY)

BOUNDARY AREA	171.4 Ha
PANEL AREA	82.67%
GROUND COVERAGE RATIO	43.35%
GATES	2
DC CAPACITY	APPROX. 129.51 MWp
AC CAPACITY	APPROX. X MWac
PV MODULE	196,230 x Canadian Solar BiHiKu7 CS7N-660MB-AG
1-STRING TRACKER	99
2-STRING TRACKER	199
3-STRING TRACKER	1991
SOLAR INVERTER	20 x SMA SC4200 UP
BESS INVERTER	20 x SMA SCS 3600 UP-XT, total 54 MVA
ROW DISTANCE	5.5m PITCH
FENCE LENGTH	APPROX. 5385 (m)

GENERAL LEGEND

- SITE BOUNDARY
- SECURITY FENCE
- POINT OF CONNECTION
- PASSING BAYS
- INVERTERS
- DAMS - TO BE RETAINED
- DAMS - TO BE FILLED
- GATES
- 5m ROADS - TO MAKE UP OVERALL WIDTH OF FIRE BREAK
- 5m UNVEGETATED FIRE BREAK - TO INCLUDE ROAD
- ECOLOGICAL ZONE - AREAS TO BE RETAINED
- EXISTING TREE GROUP - AREAS TO BE RETAINED
- EXISTING TREE GROUP - AREAS TO BE REMOVED
- 5m VEGETATION BUFFER - (PLACEHOLDER)
- EXISTING TREES - TO BE RETAINED AND PROTECTED
- EXISTING TREES - TO BE REMOVED
- W.T x7 45,000 LITRE WATER TANKS
- 1-STRING TRACKER - 31 PANELS
- 2-STRING TRACKER - 62 PANELS
- 3-STRING TRACKER - 93 PANELS

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PLOT DATE: 21.09.2023

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PROJECT

ELAINE SOLAR FARM

Olderfleet, Level 10, 477 Collins Street | Melbourne VIC 3000 AUSTRALIA | +61 3 8663 4888 | URBIS Pty Ltd | ABN 50 105 256 228

KEY PLAN

REV	DESCRIPTION	DWN	CHK	DATE
B	FOR SUBMISSION	OS	CA	18.09.2023
A	FOR REVIEW	OS	CA	05.09.2023

PROJECT DIRECTOR: ----

CLIENT

ELGIN ENERGY

DRAWING TITLE

COVER SHEET

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ISSUE

FOR REVIEW

PROJECT NO.

P0042161

SCALE

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50 100 150 200 250 m

NORTH

DRAWING NO.

CS-001

REVISION

B

ELAINE SOLAR FARM

PETERS LANDSCAPE SITE PLAN

ADVERTISED PLAN

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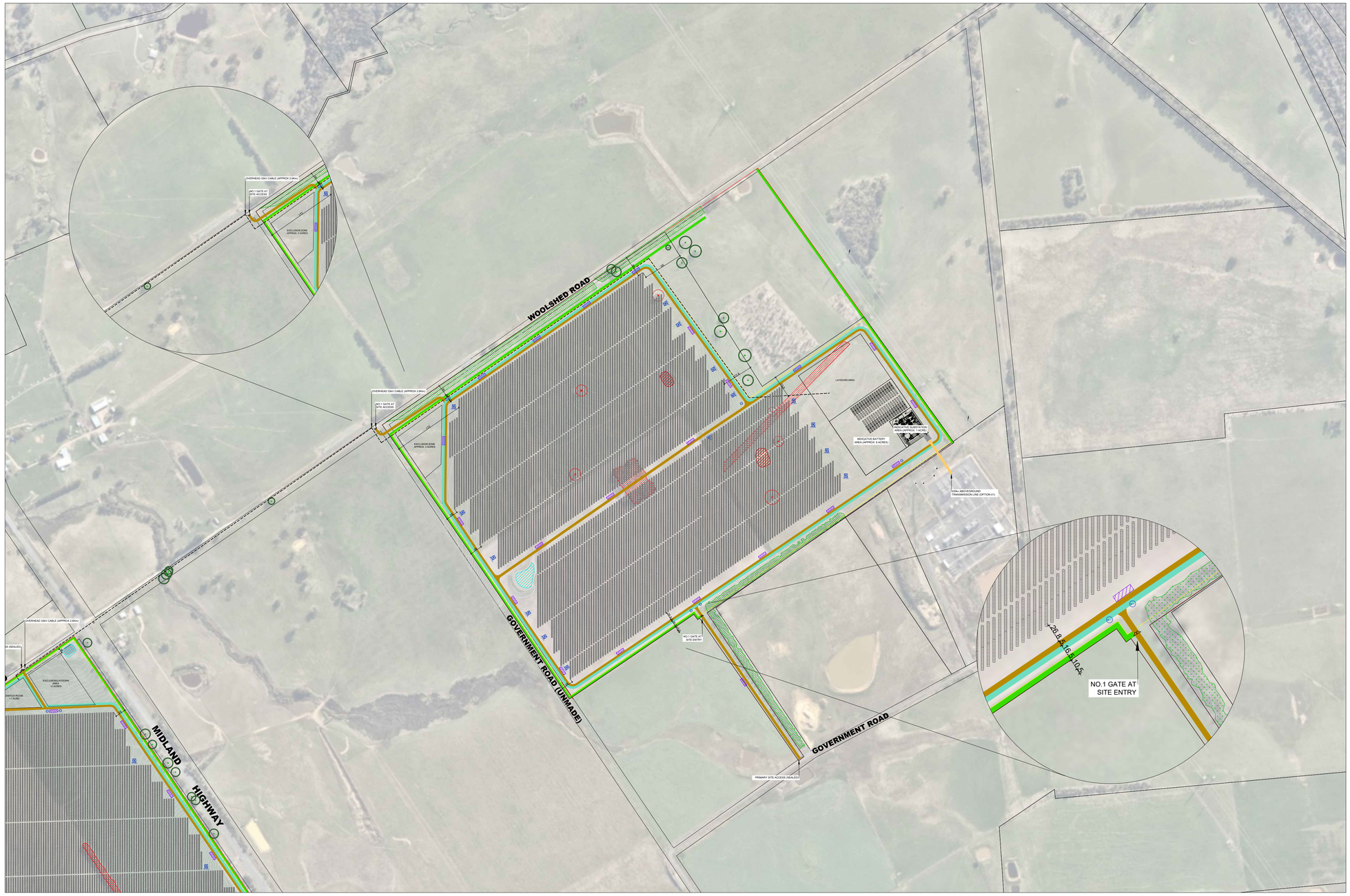
PROJECT DETAILS (PETERS)

BOUNDARY AREA	74.85 Ha
PANEL AREA	60.60.%
GROUND COVERAGE RATIO	43.35%
GATES	1
DC CAPACITY	APPROX. 40.02 MWp
AC CAPACITY	APPROX. X MWac
PV MODULE	60,636 x Canadian Solar BiHiKu7 CS7N-660MB-AG
1-STRING TRACKER	189
2-STRING TRACKER	216
3-STRING TRACKER	445
SOLAR INVERTER	15 x SMA SC4200 UP
BESS INVERTER	15 x SMA SCS 3600 UP-XT, total 54 MVA
ROW DISTANCE	5.5m PITCH
FENCE LENGTH	APPROX. 4060 (m)

GENERAL LEGEND

- SITE BOUNDARY
- SECURITY FENCE
- POINT OF CONNECTION
- PASSING BAYS
- INVERTERS
- DAMS - TO BE RETAINED
- DAMS - TO BE FILLED
- GATES
- 5m ROADS - TO MAKE UP OVERALL WIDTH OF FIRE BREAK
- 5m UNVEGETATED FIRE BREAK - TO INCLUDE ROAD
- ECOLOGICAL ZONE - AREAS TO BE RETAINED
- EXISTING TREE GROUP - AREAS TO BE RETAINED
- EXISTING TREE GROUP - AREAS TO BE REMOVED
- 5m VEGETATION BUFFER - (PLACEHOLDER)
- EXISTING TREES - TO BE RETAINED AND PROTECTED
- EXISTING TREES - TO BE REMOVED
- W.T x5 45,000 LITRE WATER TANKS
- 1-STRING TRACKER - 31 PANELS
- 2-STRING TRACKER - 62 PANELS
- 3-STRING TRACKER - 93 PANELS



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ELAINE SOLAR FARM

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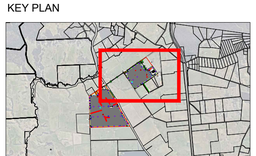
KEY PLAN



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B	FOR SUBMISSION	OS	CA	18.09.2023
A	FOR REVIEW	OS	CA	05.09.2023

PROJECT DIRECTOR: ----

CLIENT

ELGIN ENERGY

DRAWING TITLE

COVER SHEET 02

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ISSUE

FOR REVIEW

PROJECT NO.

P0042161

SCALE

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NORTH

DRAWING NO.

CS-002

REVISION

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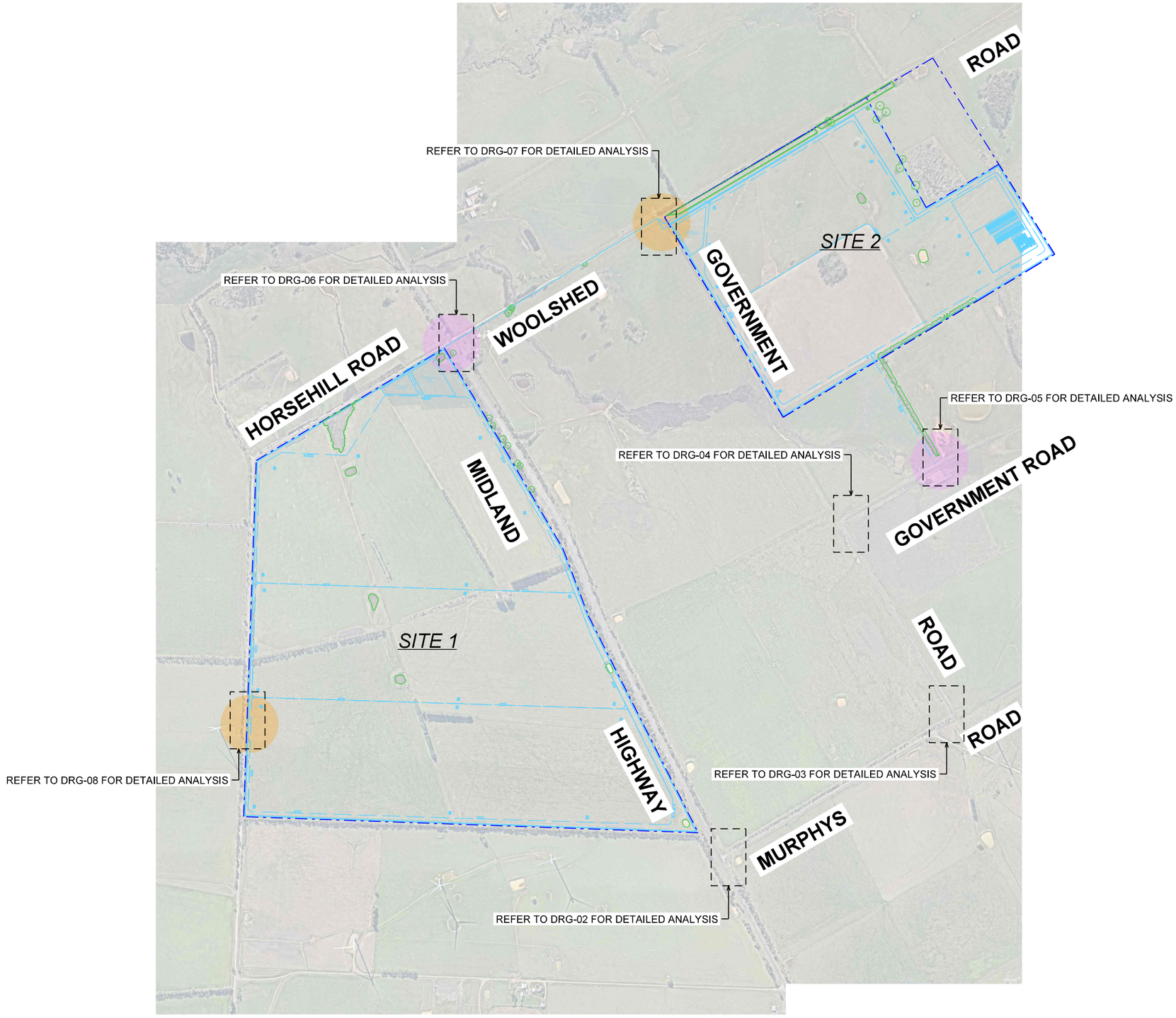
APPENDIX B
Swept Path Analysis

Design Vehicle

— 26m B-doubles



ADVERTISED PLAN

GENERAL NOTES:
1. ALL DIMENSIONS ARE TO FACE OF KERB AND CHANNEL UNLESS NOTED OTHERWISE.
2. LOCAL ROADS - HORSEHILL ROAD (SPEED ZONE 100KM/H)
   - WOOLSHED ROAD (SPEED ZONE 100KM/H)
   - MURPHYS ROAD (SPEED ZONE 100KM/H)
   DECLARED ROADS - MIDLAND HIGHWAY (SPEED ZONE 100KM/H).
3. BASE INFORMATION FROM NEARMAP AERIAL PHOTOGRAPHY DATED 27.07.2022 AND URBIS P0042161_ElaineSF_SITE PLAN.dwg DATED 06.09.2023

LEGEND

PRIMARY ACCESS

SECONDARY ACCESS

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Date 2023-09-22
Drawn / Approved TD / HM

Project
ELAINE SOLAR FARM DEVELOPMENT
MIDLAND HIGHWAY, ELAINE
SHIRE OF MOORABOOL

Title
B-DOUBLE HEAVY TRANSPORT ROUTE ASSESSMENT
SITE 1 & SITE 2 ACCESS

Status
PRELIMINARY

Drawing Number
IMP2208056 - DRG-01-01

Revision
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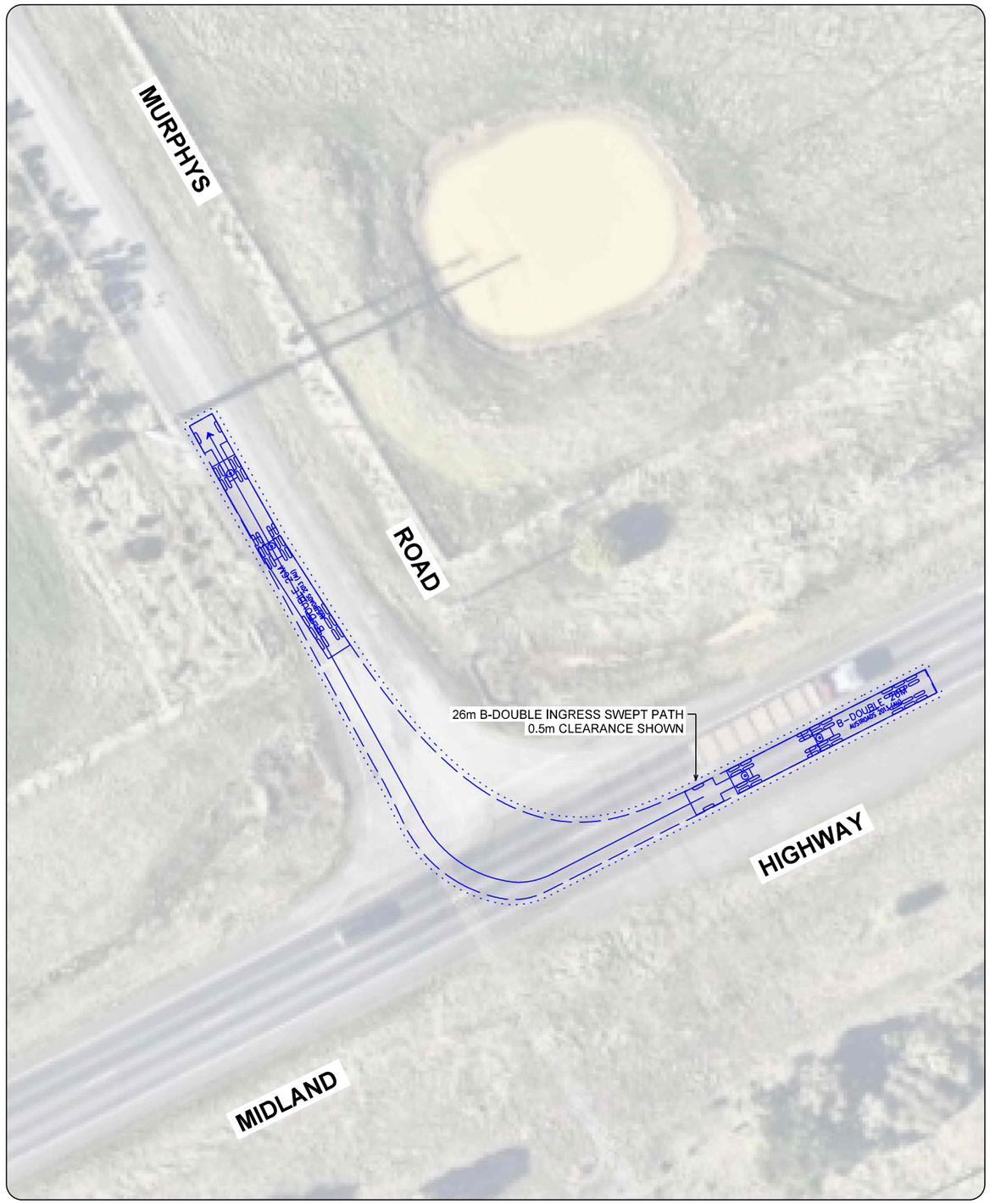

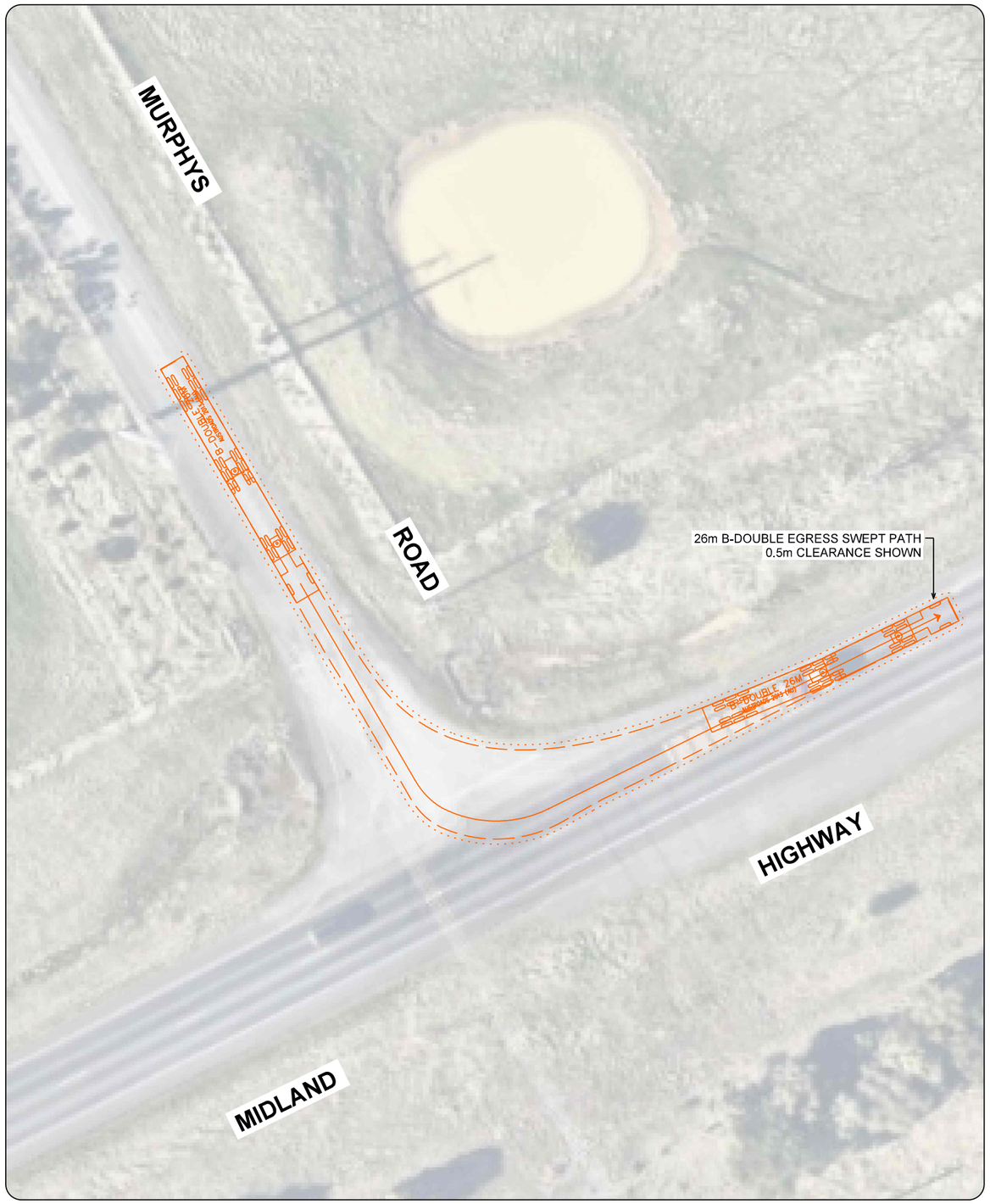

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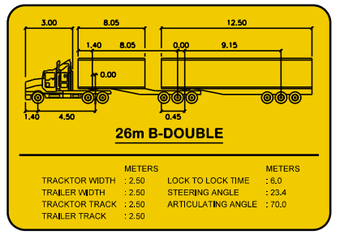

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TRAILER WIDTH	: 2.50	STEERING ANGLE	: 23.4
TRACKTOR TRACK	: 2.50	ARTICULATING ANGLE	: 70.0
TRAILER TRACK	: 2.50		

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Date 2023-09-22
Drawn / Approved TD / HM

Project
ELAINE SOLAR FARM DEVELOPMENT
MIDLAND HIGHWAY, ELAINE
SHIRE OF MOORABOOL

Title
B-DOUBLE HEAVY TRANSPORT ROUTE ASSESSMENT
PRELIMINARY SWEPT PATH ANALYSIS
26m B-DOUBLE TRUCK

Status
PRELIMINARY

Drawing Number
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Revision
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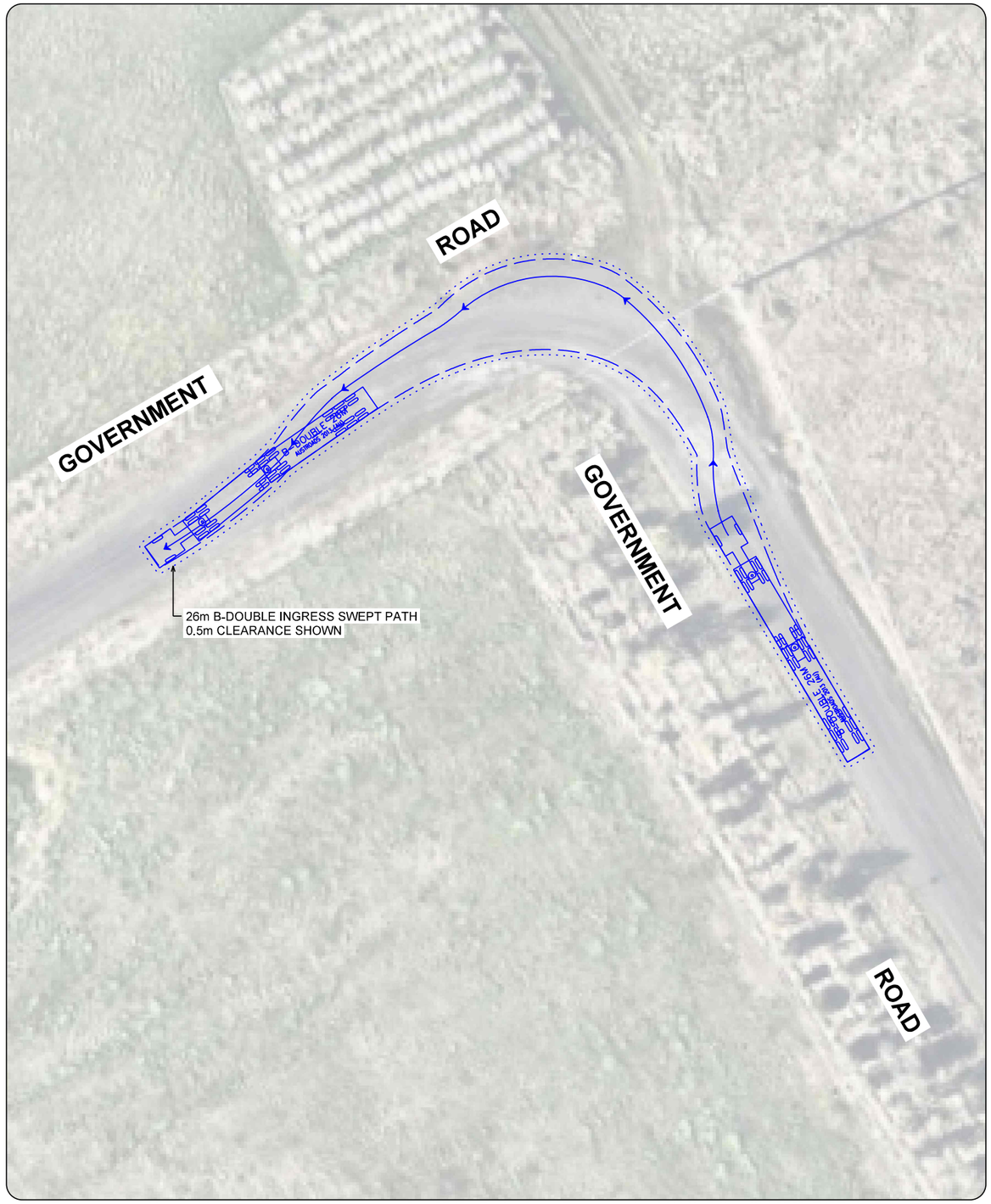

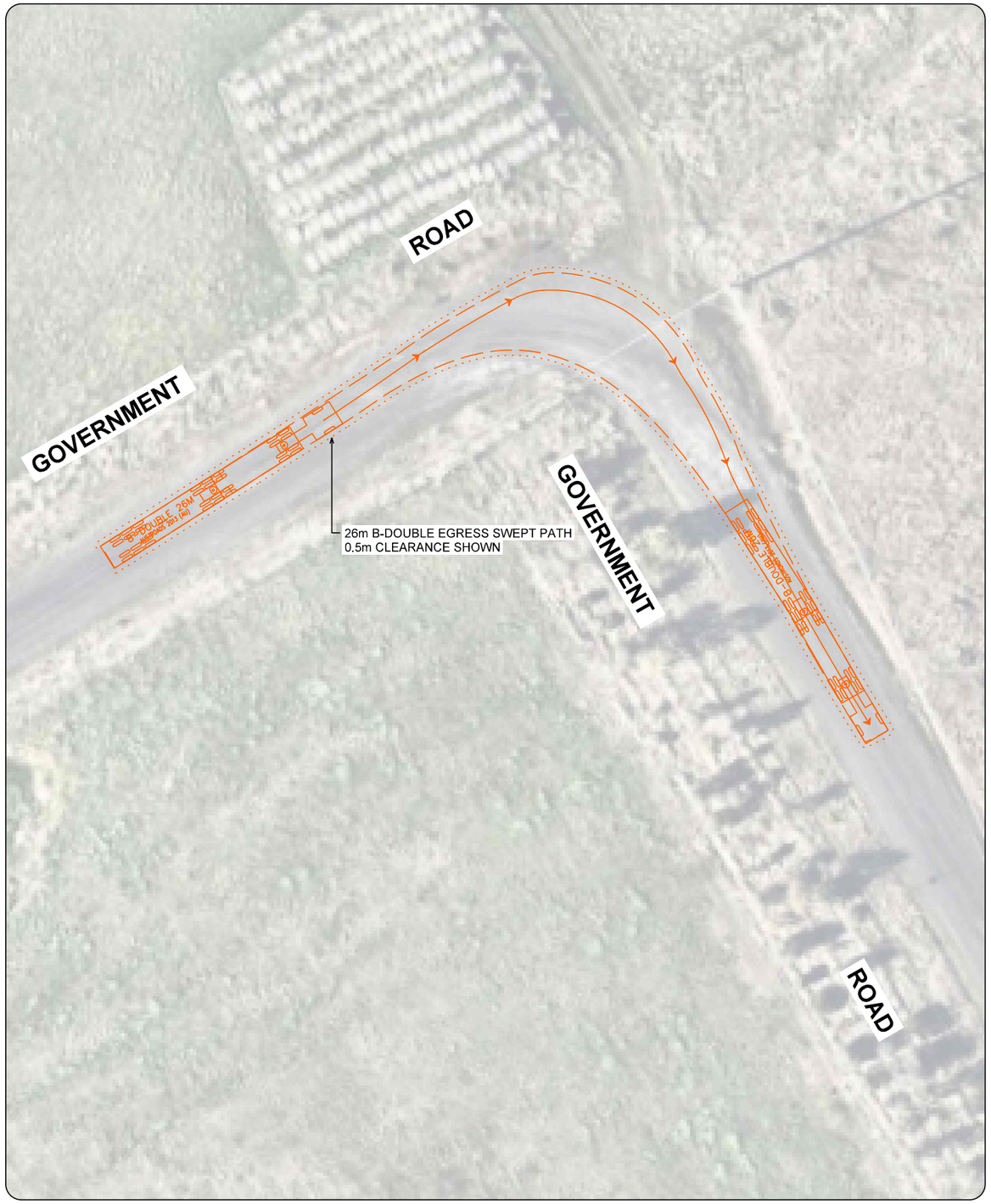

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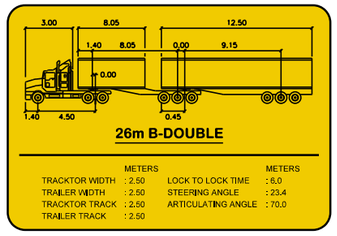

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Date **2023-09-22**
Drawn / Approved **TD / HM**

Project
ELAINE SOLAR FARM DEVELOPMENT
MIDLAND HIGHWAY, ELAINE
SHIRE OF MOORABOOL

Title
B-DOUBLE HEAVY TRANSPORT ROUTE ASSESSMENT
PRELIMINARY SWEPT PATH ANALYSIS
26m B-DOUBLE TRUCK

Status
PRELIMINARY

Drawing Number
IMP2208056 - DRG-01-03

Revision
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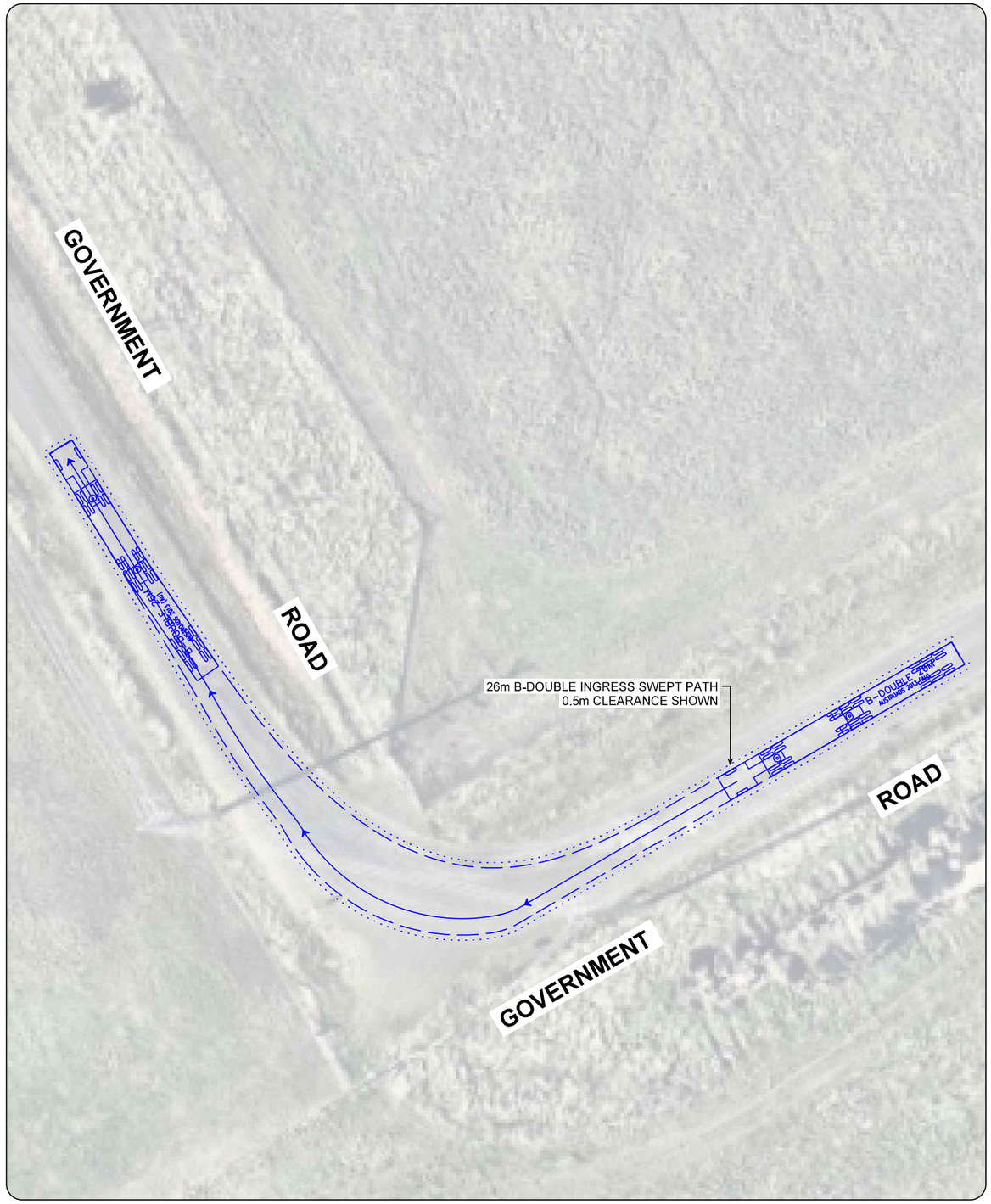

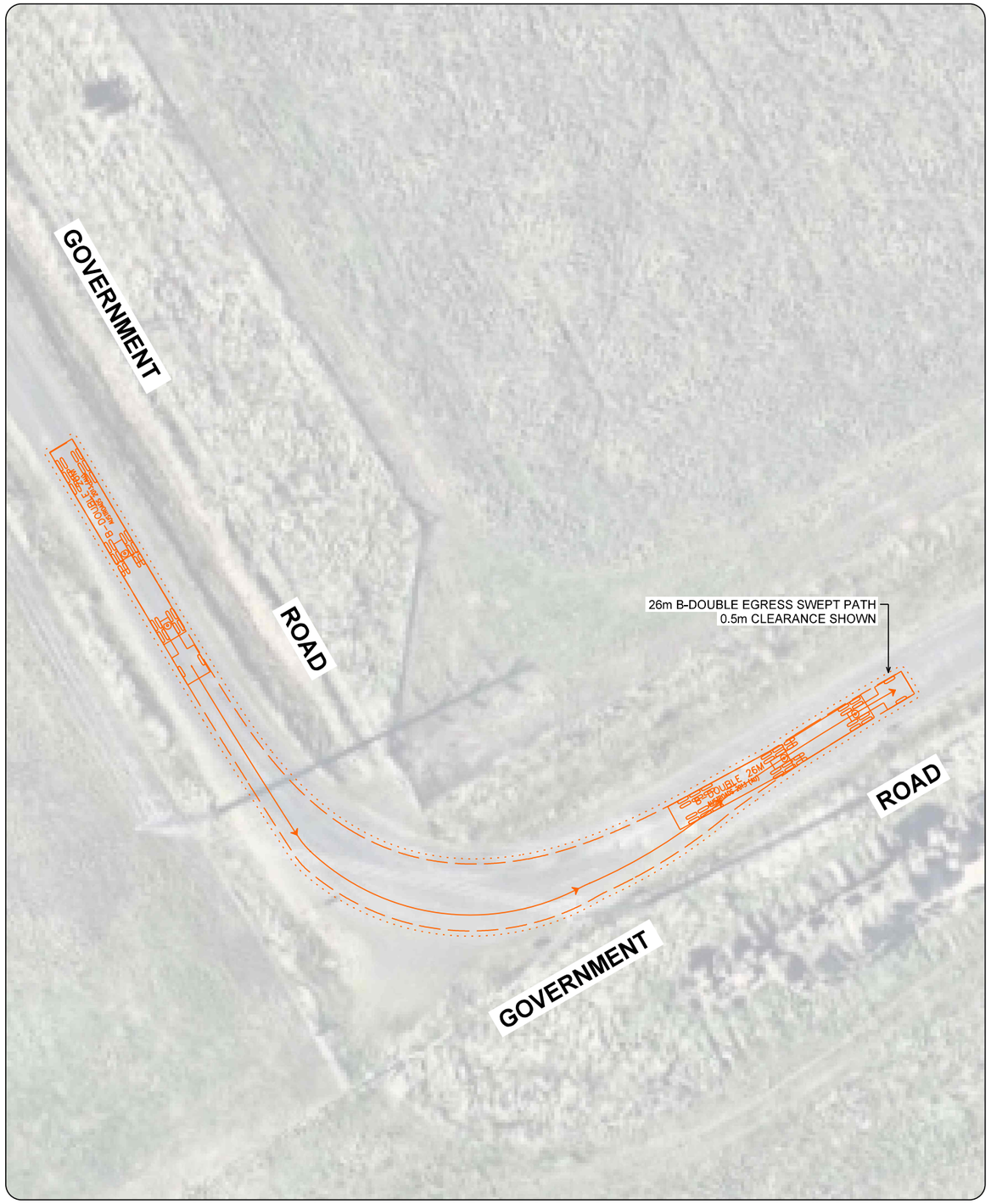

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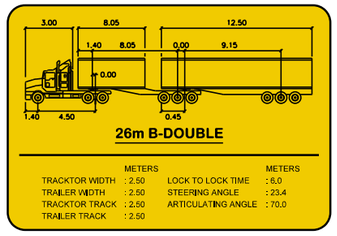

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Date **2023-09-22**
Drawn / Approved **TD / HM**

Project
ELAINE SOLAR FARM DEVELOPMENT
MIDLAND HIGHWAY, ELAINE
SHIRE OF MOORABOOL

Title
B-DOUBLE HEAVY TRANSPORT ROUTE ASSESSMENT
PRELIMINARY SWEPT PATH ANALYSIS
26m B-DOUBLE TRUCK

Status
PRELIMINARY

Drawing Number
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Revision
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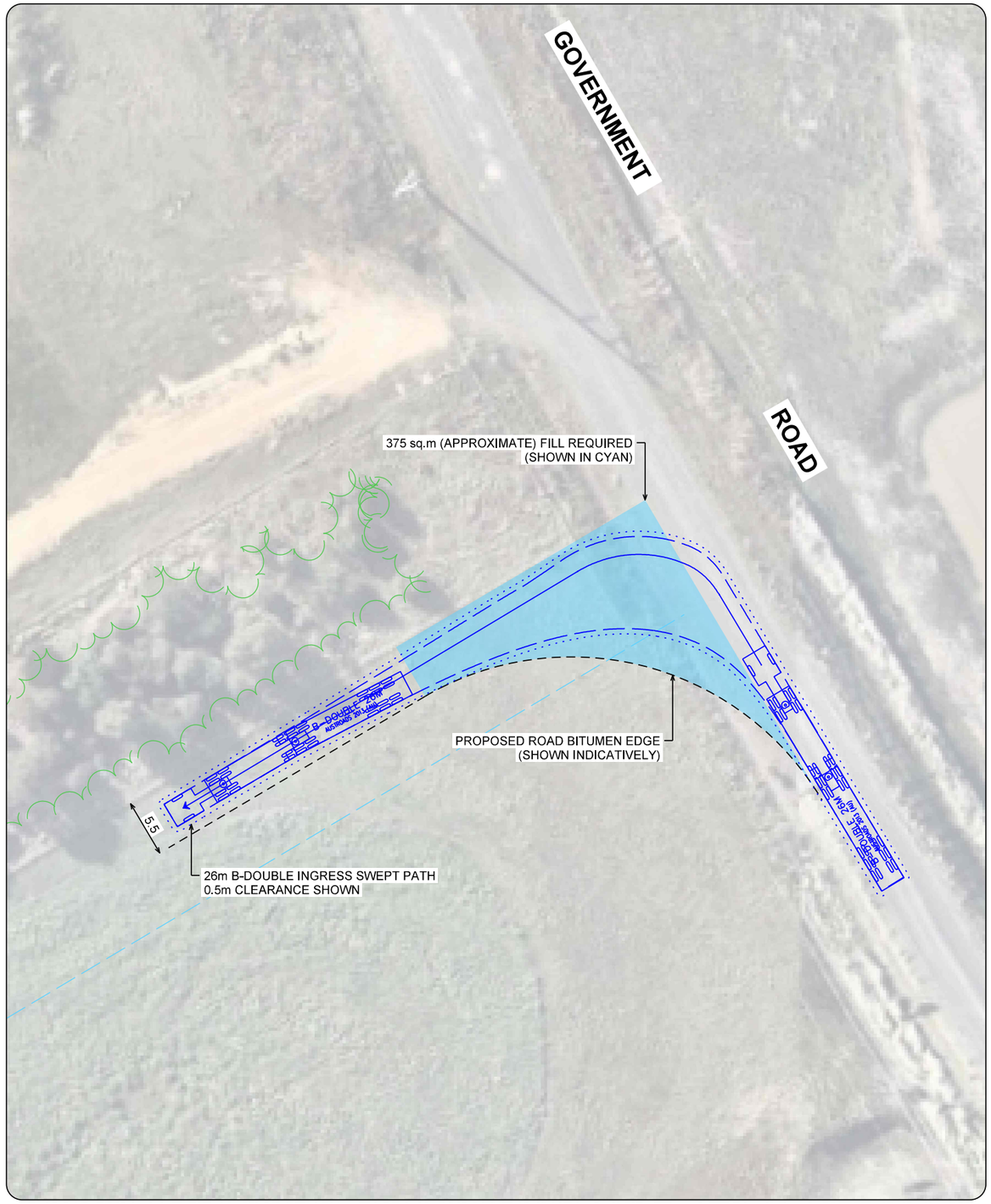

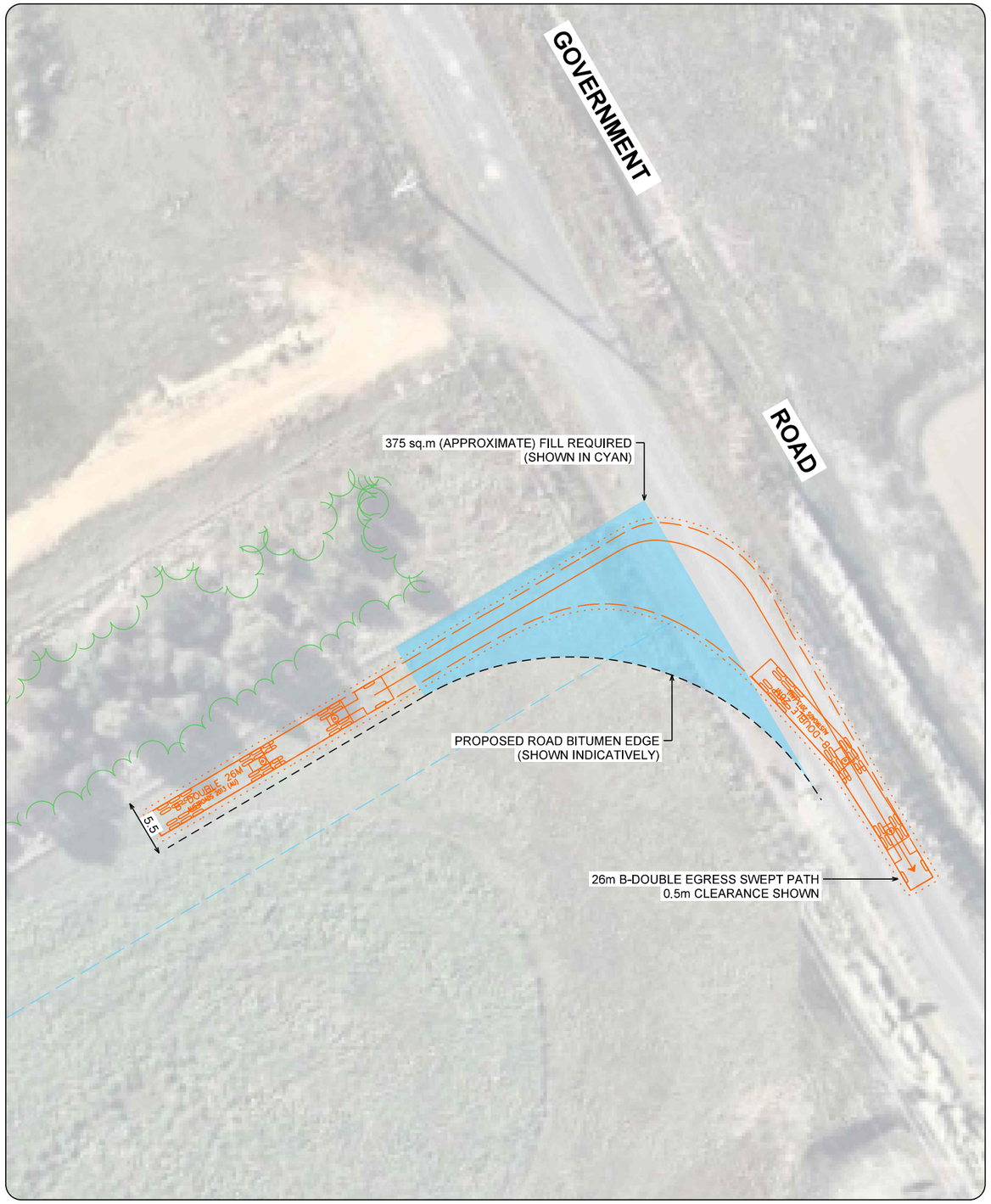

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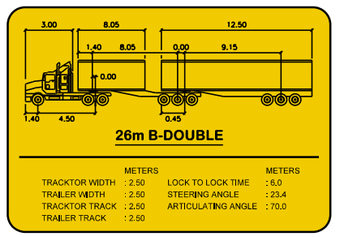

26m B-DOUBLE

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TRAILER WIDTH	: 2.50	STEERING ANGLE	: 23.4
TRACKTOR TRACK	: 2.50	ARTICULATING ANGLE	: 70.0
TRAILER TRACK	: 2.50		

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Date **2023-09-22**
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Project
ELAINE SOLAR FARM DEVELOPMENT
MIDLAND HIGHWAY, ELAINE
SHIRE OF MOORABOOL

Title
B-DOUBLE HEAVY TRANSPORT ROUTE ASSESSMENT
PRELIMINARY SWEPT PATH ANALYSIS
26m B-DOUBLE TRUCK

Status
PRELIMINARY

Drawing Number
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Revision
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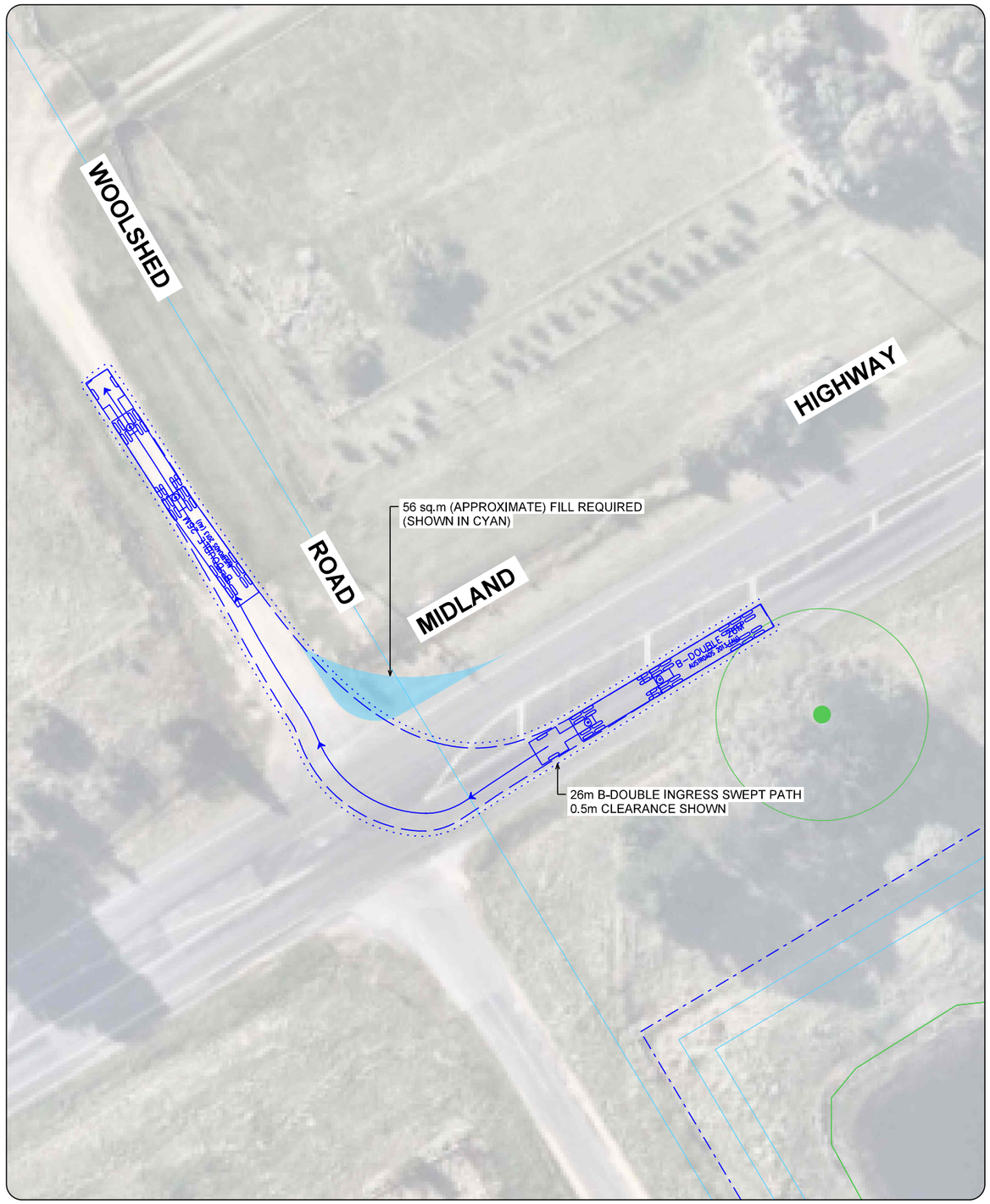

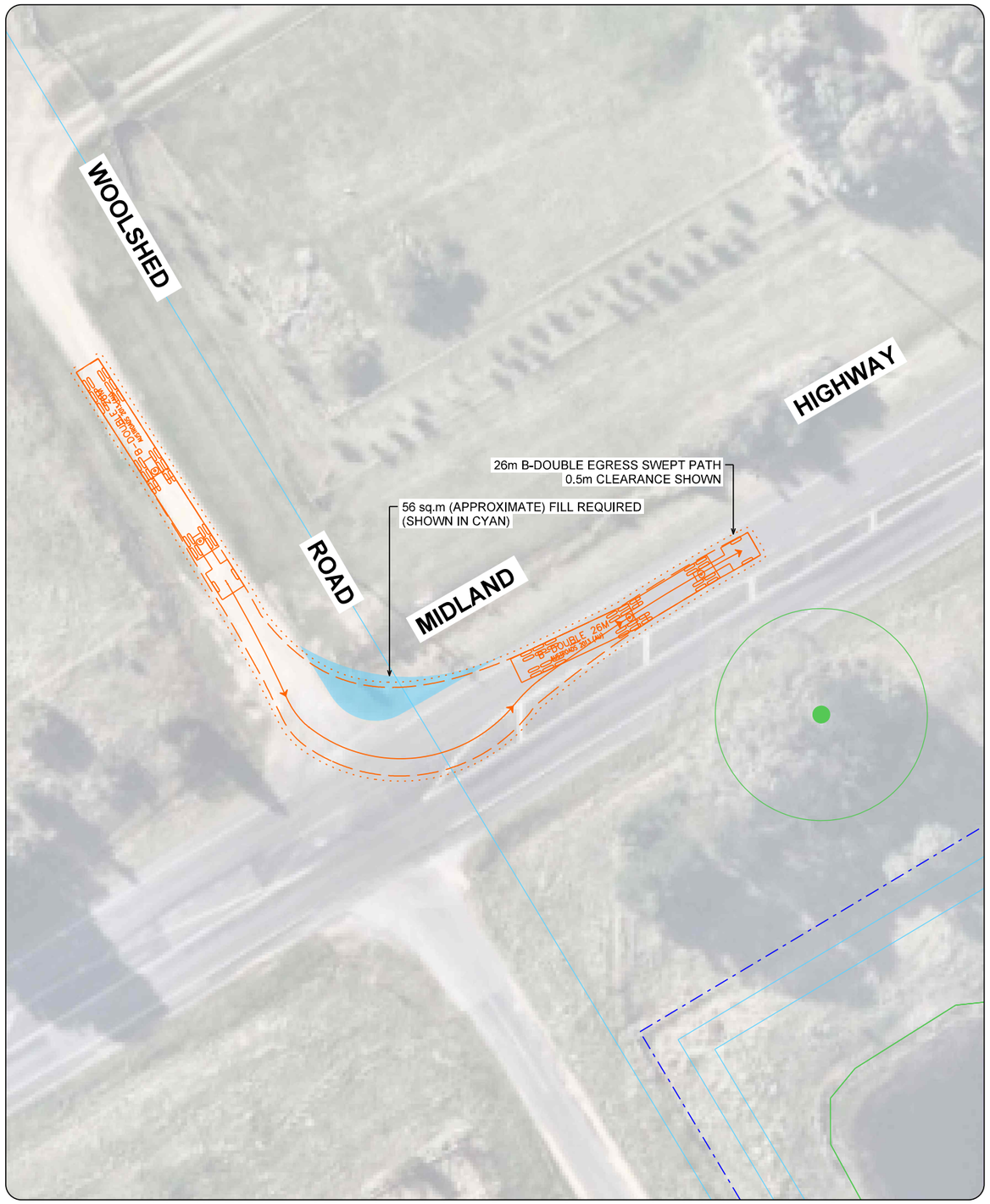

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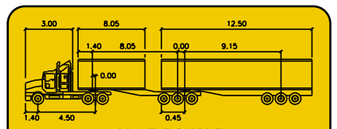

26m B-DOUBLE

	METERS		METERS
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TRAILER WIDTH	: 2.50	STEERING ANGLE	: 23.4
TRACKTOR TRACK	: 2.50	ARTICULATING ANGLE	: 70.0
TRAILER TRACK	: 2.50		

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Client
URBIS

Date **2023-09-22**
Drawn / Approved **TD / HM**

Project
ELAINE SOLAR FARM DEVELOPMENT
MIDLAND HIGHWAY, ELAINE
SHIRE OF MOORABOOL

Title
B-DOUBLE HEAVY TRANSPORT ROUTE ASSESSMENT
PRELIMINARY SWEPT PATH ANALYSIS
26m B-DOUBLE TRUCK

Status
PRELIMINARY

Drawing Number
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Revision
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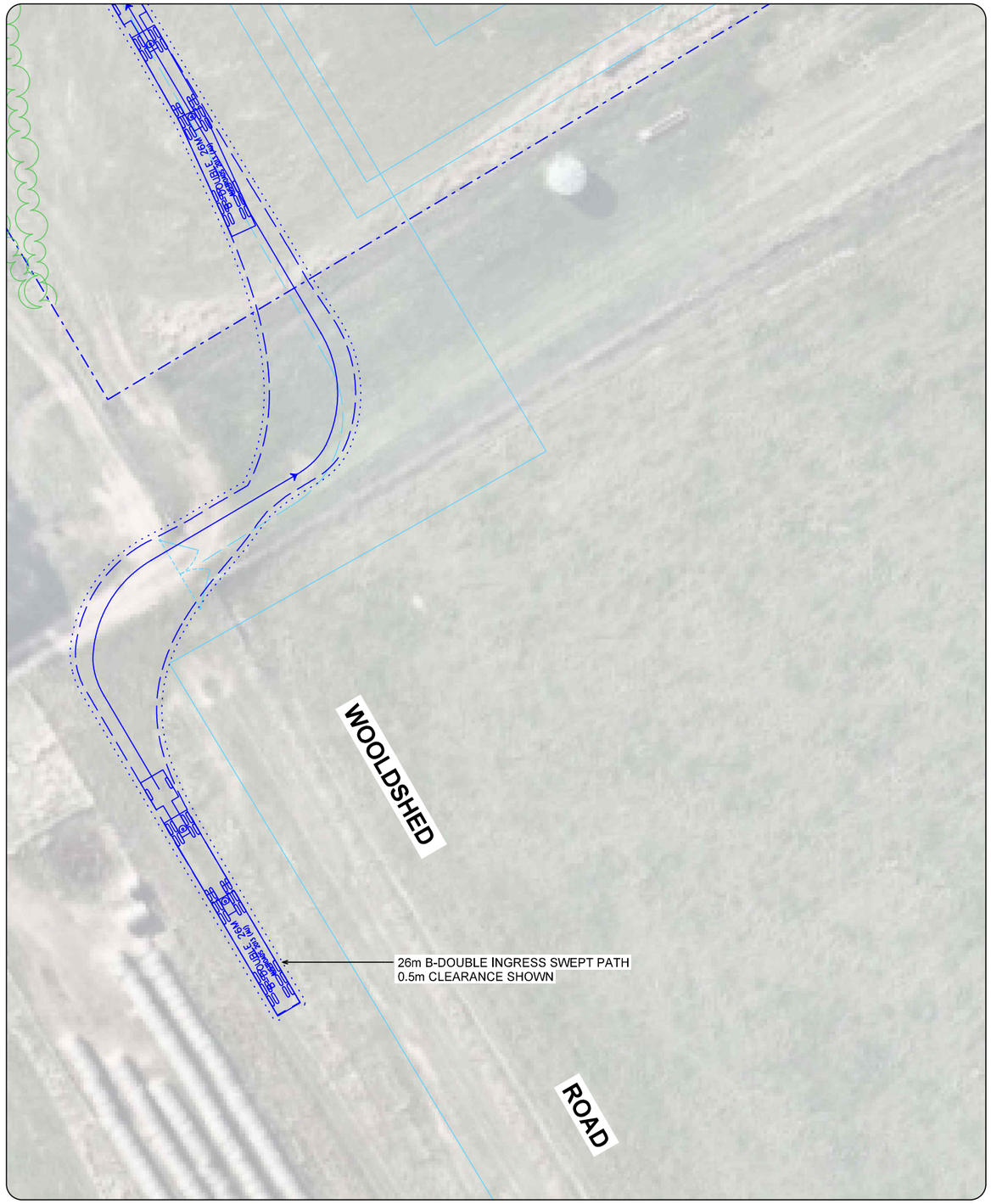

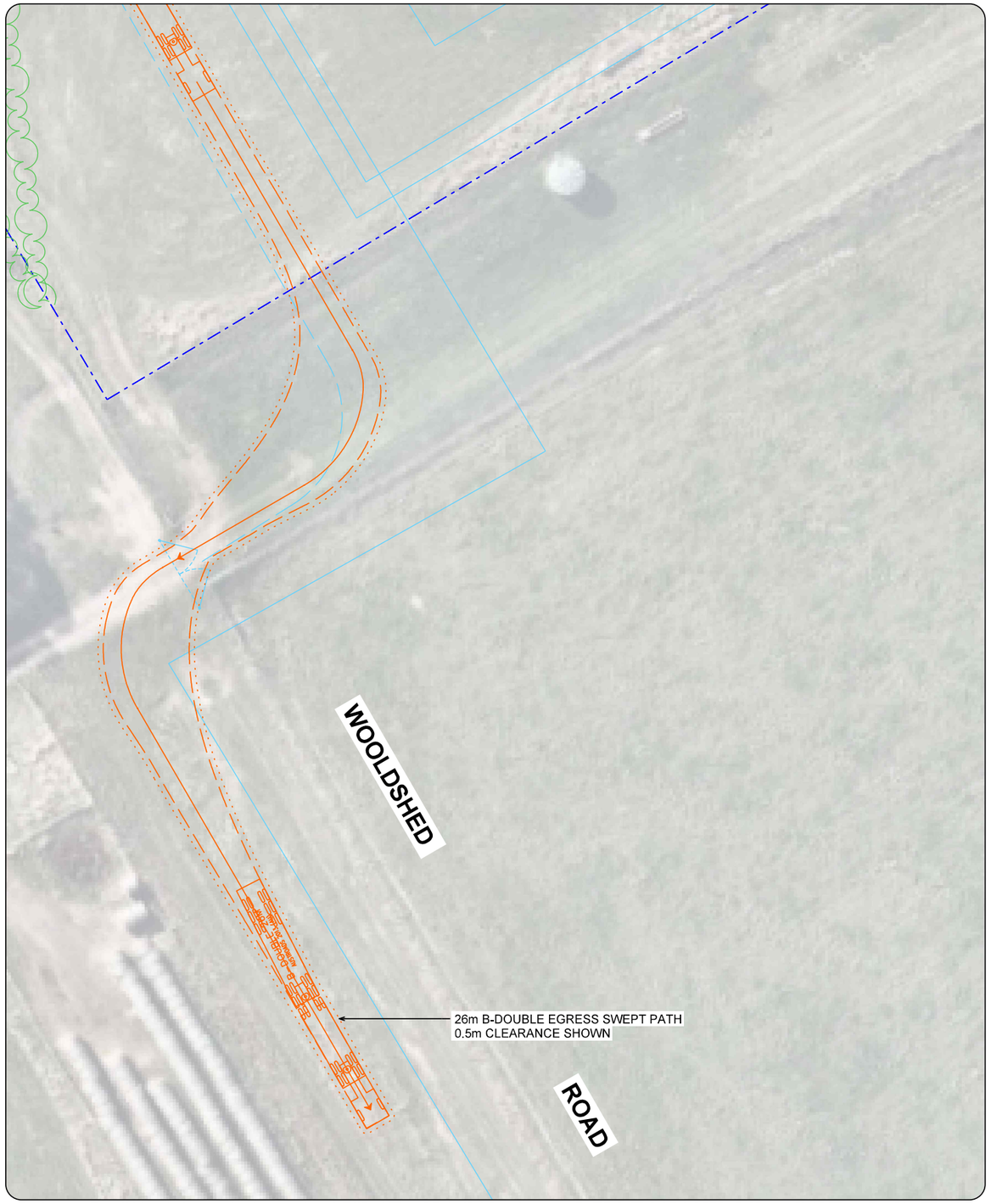

ADVERTISED PLAN

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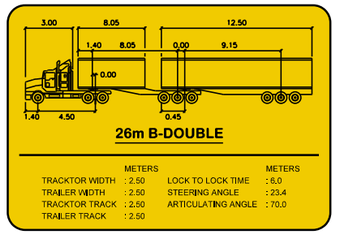


URBIS

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

SCALE
1:500 @ A3

Client
URBIS

Date **2023-09-22**
Drawn / Approved **TD / HM**

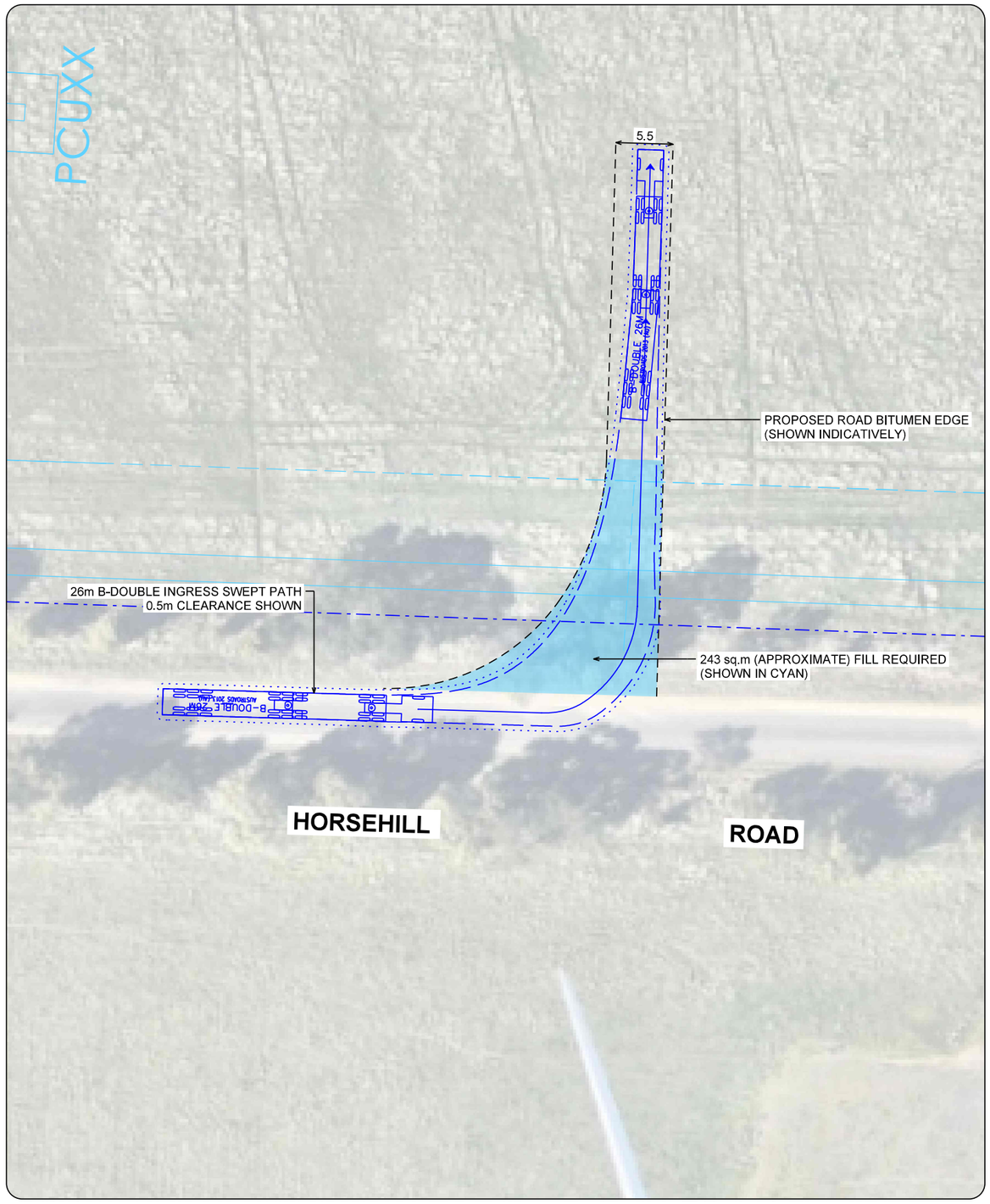
Project
ELAINE SOLAR FARM DEVELOPMENT
MIDLAND HIGHWAY, ELAINE
SHIRE OF MOORABOOL

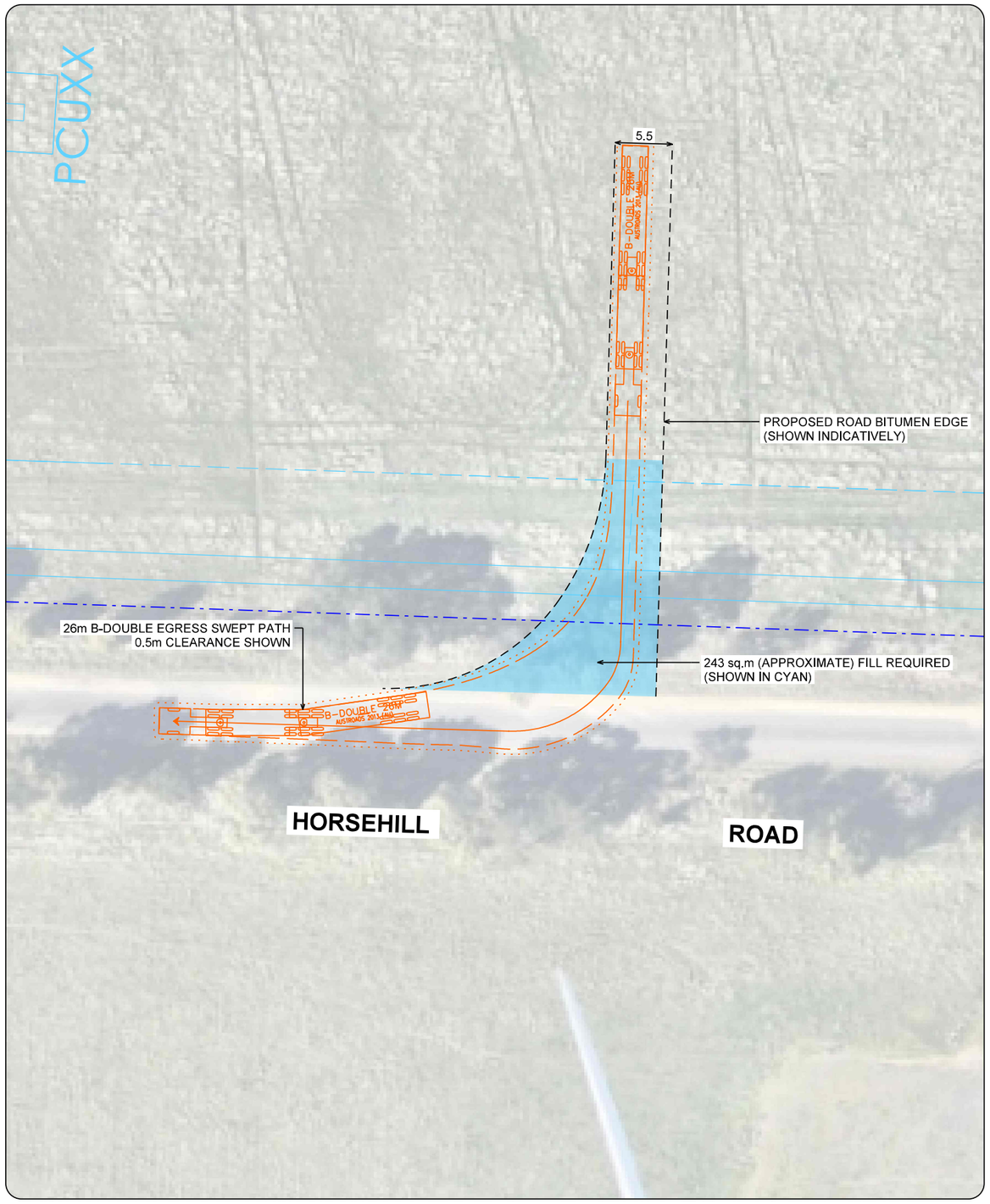
Title
B-DOUBLE HEAVY TRANSPORT ROUTE ASSESSMENT
PRELIMINARY SWEPT PATH ANALYSIS
26m B-DOUBLE TRUCK

Status
PRELIMINARY

Drawing Number
IMP2208056 - DRG-01-07

Revision
B





ADVERTISED PLAN

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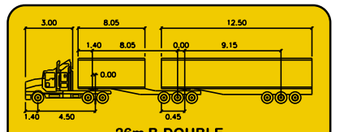

26m B-DOUBLE

	METERS		METERS
TRACKTOR WIDTH	: 2.50	LOCK TO LOCK TIME	: 6.0
TRAILER WIDTH	: 2.50	STEERING ANGLE	: 23.4
TRACKTOR TRACK	: 2.50	ARTICULATING ANGLE	: 70.0
TRAILER TRACK	: 2.50		

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SCALE
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Client
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Date **2023-09-22**
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Project
ELAINE SOLAR FARM DEVELOPMENT
MIDLAND HIGHWAY, ELAINE
SHIRE OF MOORABOOL

Title
B-DOUBLE HEAVY TRANSPORT ROUTE ASSESSMENT
PRELIMINARY SWEPT PATH ANALYSIS
26m B-DOUBLE TRUCK

Status
PRELIMINARY

Drawing Number
IMP2208056 - DRG-01-08

Revision
B

ADVERTISED PLAN

Simplexity